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PREFACE

Dear readers,

It is my pleasure to introduce you a collection of papers from the 14th annual international scientific conference The European Financial Systems 2017 organized annually by Department of Finance of the Faculty of Economics and Administration, Masaryk University in Brno, Czech Republic. This year's conference was focused especially on the current issues related to accounting, banking sector, insurance, new regulations of financial markets, different tax systems, corporate finance, public finance, financing of non-profit organizations and financial literacy.

Because the collection of papers presents the latest scientific knowledge in this area, I believe you will get a number of new insights usable both for your scientific, and educational or practical activities. I would also like to express my conviction that we meet each other in occasion of the 15th year of this conference held in 2018.

I wish you pleasant reading

Petr Valouch

Chairman of the Program Committee

CONTENTS

Markov chain sensitivity analysis of expected paid/unpaid overdue receivables – SME case study

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Abstract: *The paper uses existing Markov chain theory to estimate expected paid/unpaid overdue receivables, and is focused mainly upon sensitivity analysis of calculated estimations. Since such calculations depend upon fundamental matrix of absorption Markov chain chosen, the particularly important role plays data and algorithm for its composition. As a case study, we selected a SME ranked company which provided us its accounting records with payment pattern details of related receivables. First, the available data are sorted to extract overdue receivables, which serve to estimate transition probability matrices of absorption Markov chains having several transient states and two absorption ones representing paid and unpaid overdue receivables. Based either on number of overdue receivables or their financial volumes we build different transition probability matrices. The sensitivity analysis of expected paid/unpaid overdue receivables concerns influence of different overdue threshold and tolerance accepted, conditional probabilities between transient and absorption states, as well as distribution of financial volumes in particular transient states registered. The results are discussed in detail showing their practical importance in financial management and providing deeper insight into overdue payment processes thus contributing to risk management, too. All computations and graphical issues are performed by sw Mathematica.*

Keywords: accounts receivable analysis, fundamental matrix, absorption Markov chains, sensitivity analysis

JEL codes: C65, G35

1 Introduction

Financial management in any company and cash flow management in particular, are vital to its health. Accounts receivable are the amounts owed to a business by its customers, and are comprised of a potentially large number of invoiced amounts. Accounts receivable constitute the primary source of incoming cash flow for most businesses. Gross amount of receivables and the allowance for doubtful accounts should be reported by accounting reports in detail.

Payment condition patterns and timing of claim payments play significant role in financial management. First, the corresponding data reported in usual accounting reports are extracted to yield records of delayed payment structures. Departments will also need to provide the necessary uncollectible account information in order to prepare the necessary accounting entries for prospective reserves and write-offs.

A schedule is prepared in which customer balances are classified by the length of time having been unpaid. Since emphasizing time, the schedule is called an aging schedule with corresponding accounts receivable aging analysis within well-established accounting framework, whereas in stochastic framework it might be called after-payment-due process analysis, as well.

In general, financial management of company ought to establish an acceptable percentage relationship between the amount of receivables and expected losses from uncollectible accounts. Hence, an estimation of such relation between collected and lost payments is very significant indeed, and it plays very important role in company life cycle. Especially, when the real economy slips into recession, business faces an additional

risk of customers running into financial difficulty and becoming unable to pay invoices, which all together can push a company over the edge.

After the accounts are arranged by age, the expected bad debt losses are to be determined. The most promising instrument for such task is application of absorption Markov chains. The sensitivity analysis of average amount of delayed claims paid stands in focus of financial management, too, since it enables to estimate effects of various after due diligence collection efforts.

Usage of Markov chains for accounts receivable analysis is not new. Standard textbooks of operations research and quantitative methods in management cover the topic in theoretical platform with transition probability matrix given a priori as usual, see for example Anderson et al (1988), and Render et al (2003), too.

The main topic in framework of existing absorption Markov chain theory concerns with detailed analysis of claim payment delayed process and construction of transition probability matrix from raw accounting data sources. This data serves to estimate distribution of paid/unpaid claims after payment due, and also to calculate average amount of delayed claims paid. Sensitivity analysis presented in the paper adopts an absorption Markov chain example excerpted from Lukáš (2009), and Hofman and Lukáš (2014), too. The theory of Markov chains is explained in Yin and Zhang (2005). Other aspects of delayed payment of claims are further discussed in Garmichael and Balatbat (2010), in particular from contractor's point of view. In Sopranzetti (1999), links between selling accounts receivable and underinvestment problem is discussed thoroughly.

The paper is organized as follows. After a brief introduction, the second section gives a theoretical framework of delayed payments analysis. The third section brings description of our procedure for estimation of fundamental matrix of absorption Markov chain well-suited for analysis of after-payment-due process. Further, the results of our case study are presented including the sensitivity analysis upon length of payment delay tolerance.

2 Analysis of delayed payments – theoretical framework

Let us consider an absorption Markov chain with discrete state space. There is well-known that transition probability matrix **P** of any absorption Markov chain has a canonical form

$$\mathbf{P} = \begin{bmatrix} \mathbf{I} & \mathbf{0} \\ \mathbf{R} & \mathbf{Q} \end{bmatrix}, \tag{1}$$

which provides a fundamental matrix **N** of size (*s*,*s*) of following form

$$\mathbf{N} = \sum_{n=0}^{\infty} \mathbf{Q}^n = (\mathbf{I} - \mathbf{Q})^{-1}, \tag{2}$$

here the **P** has size (*N*,*N*), the **Q** has size (*s*,*s*), the **R** has size (*s*,*N*–*s*), the **I** is unit sub-matrix of size (*N*–*s*,*N*–*s*), and **0** is null sub-matrix of size (*N*–*s*,*s*), where *N* denotes the total number of system states, *s* defines the number of transient states, and *N*–*s* gives the number of absorption states, in general.

Considering stochastic Markov chain analysis of paid/unpaid claims with after maturity pending payment, we get two absorption states, i.e. paid, and unpaid claims, hence *N*–*s* =2, thus providing *s* = *N* – 2, directly.

Now, our goal is to estimate distribution of considered quantity, e.g. financial amount, or number of pending credits, etc., in absorption states assuming the volumes of considered quantity in all transient cases are given, and being denoted by vector **t**. In matrix form, we have to compute

$$\mathbf{y}^{\mathrm{T}} = \mathbf{t}^{\mathrm{T}}\mathbf{B}\,, \quad \mathbf{B} = \mathbf{NR}, \tag{3}$$

assuming a system considered quantity balance condition to hold

$$\sum_{k=1}^{N-s=2} y_k = \sum_{i=1}^{s} t_i. \tag{4}$$

3 Estimation of transition probability matrix and case study

Let a_j, $j = 1,..,J$, denote a sequence of additive components which collection defines an event observed from M all possible realizations. As usual, the estimated probability of the event occurrence is given by adopted frequency fraction in following way

$$\pi_e = \sum_{j=1}^{J} a_j / M \ . \tag{5}$$

Case study

We have selected a particular company from West Bohemian region being ranked within the SME category. The company financial management provided us standard accounting reports of the period 2014Q1 – 2015Q2 in order to perform the accounts receivable analysis for the year 2014 thereof. First, in order to keep the company reports anonymous, we convert all financial data given in [CZK] into equivalent encrypted ones measured in a fictious monetary unit selected by company financial management and abbreviated [FMU].

First, using our Java application, we read accounting reports containing encrypted data imported in the MS-Excel csv format, and next, filter the data in order to get our problem-oriented dataset D_0 having the following structure

$$D_0 = \{m_k, {}_d d_k, {}_p d_k\},\ k=1,..,K \ ,$$

where m_k gives a payment amount in [FMU], and the couple ${}_d d_k$, ${}_p d_k$ determines the due-date and paid-date, all registered within the k-th invoice record. Further, K denotes the total number of invoice records processed by Java application.

The dataset D_0 is further transformed into dataset D_1, having the compact structure

$$D_1 = \{m_k, \delta_k\},\ k=1,..,K \ , \quad \delta_k = |{}_p d_k - {}_d d_k|_{\text{calendar}} \ ,$$

where the function $|{}_p d_k - {}_d d_k|_{\text{calendar}}$ yields the usual calendar time distance of dates ${}_d d_k$, ${}_p d_k$ in [days], respectively.

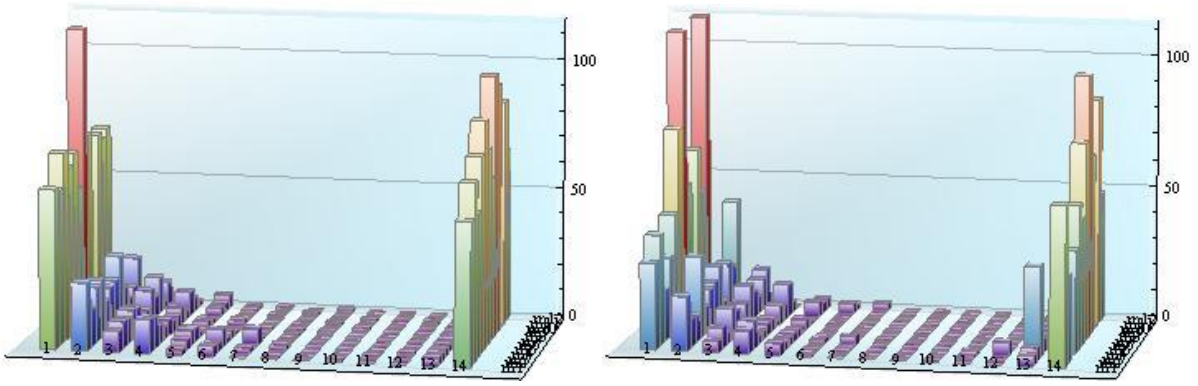
We adopt usual bucket length of $\Delta = 30$ days for sorting our datasets. Hence, we introduce states s_1, …, s_{14} so that to catch correctly any data within D_1

$$s_i = [(i-1)\Delta+1,\ i\Delta] \ ,\ i = 1,..,12, \quad s_{13} = [i\Delta+1,\ +\infty[,$$

and s_{14} for due date paid receivables, i.e such that having $|{}_p d_k - {}_d d_k|_{\text{calendar}} \le 0$.

Sorting of D_1 with respect to defined states s_i, $i = 1,..,14$ provides two different data denoted p_i, q_i, respectively, denoting accumulated financial amounts, and accumulated number of due date paid invoices which belong to particular state s_i.

Figure 1 Sorted receivables into s_i, $i = 1,..,14$, and months $j=1,..,12$. Left panel: number of invoices $q_i(j)$; Right panel: accumulated financial amounts $p_i(j)$.

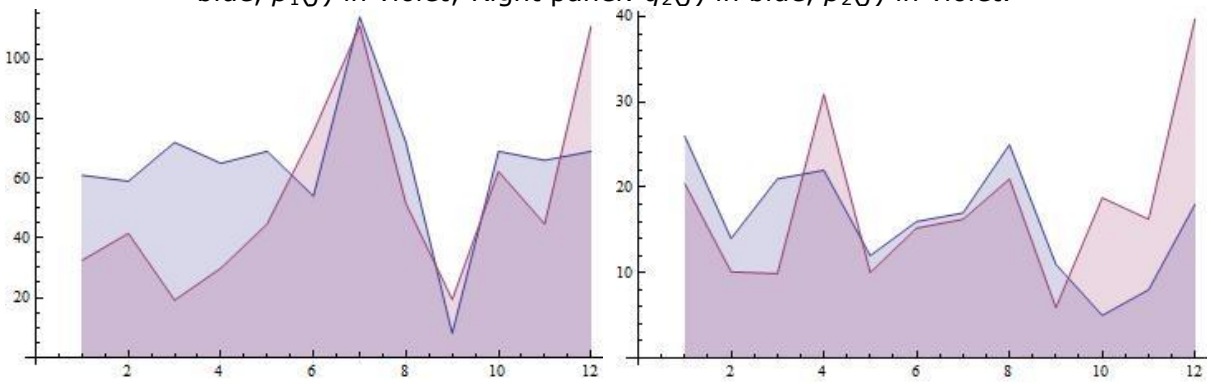


Source: own calculation.

The results of sorting D_1 are depicted in Figure 1, where horizontal axes keep s_i, lateral axes keep months in 2014, and vertical axes keep corresponding sorted amounts, i.e. in the left panel: the number of invoices sorted, while the right panel: accumulated financial amounts in [FMU].

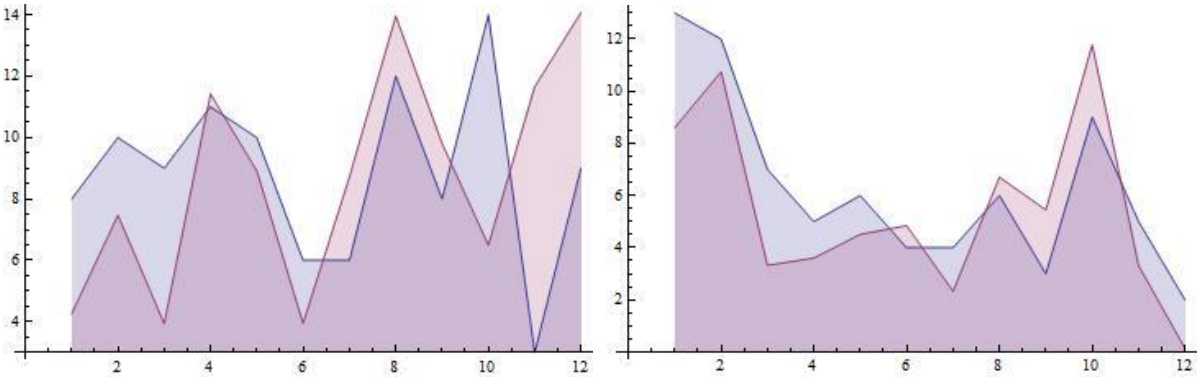
Inspecting Figure 1, we may conclude the states s_1, .., s_4 play very important role within delay payment structure. In the following figures, i.e. Figure 2 and Figure 3, respectively, we show the corresponding results. The horizontal axes keep months, j = 1,..,12, whereas the vertical axes keep proper scales for values $q_i(j)$, and $p_i(j)$, i = 1,2,3,4, preserving the units used already in Figure 1, i.e. numbers for $q_i(j)$, and [FMU] for $p_i(j)$, respectively. The values of $q_i(j)$, i = 1,2,3,4, are plotted in blue color, whilst the values of $p_i(j)$, i = 1,2,3,4, are plotted in violet one.

Figure 2 Sorted receivables into s_i, i = 1,2, and months j=1,..,12. Left panel: $q_1(j)$ in blue, $p_1(j)$ in violet; Right panel: $q_2(j)$ in blue, $p_2(j)$ in violet.



Source: own calculation.

Figure 3 Sorted receivables into s_i, i = 3,4, and months j=1,..,12. Left panel: $q_3(j)$ in blue, $p_3(j)$ in violet; Right panel: $q_4(j)$ in blue, $p_4(j)$ in violet.



Source: own calculation.

All results of sorting procedure collected, i.e. $q_i(j)$, and $p_i(j)$, i = 1,..,13, j = 1,..,12, provide sufficient material for construction of two transition probability matrices, denoted $\mathbf{P}_n$ and $\mathbf{P}_f$, respectively, which are built from $q_i(j)$, and $p_i(j)$, separately.

In general, we assume the states s_i, i = 1,..,12, to represent transient states of the absorption Markov chains considered, whereas s_{13}, and s_{14}, represent absorption states, in general. Noting in principle that we neglect within s_{14} all the due date paid receivables collected from the raw datasets, i.e. such that having $|_p d_k - _d d_k|_{\text{calendar}} \leq 0$, thus considering receivables paid during after-payment-due process course only.

Keeping in mind the structure of any transition probability matrix (1), we get the sub-matrices $\mathbf{Q}_n$ and $\mathbf{R}_n$, and vector $\mathbf{t}_n$ from $q_i(j)$ data, whereas the sub-matrices $\mathbf{Q}_f$ and $\mathbf{R}_f$,

and vector $\mathbf{t}_f$ from $p_i(j)$ data, respectively. Knowing matrices $\mathbf{P}_n$ and $\mathbf{P}_f$, the main purpose of the absorption Markov chains considered is to estimate an amount of paid/unpaid accounts receivables with delayed due date payments.

Due to logical structure of the transition probability matrices considered, the population of zero and non-zero transition probability entries in $\mathbf{Q}_n$ and $\mathbf{Q}_f$ is the same, and in $\mathbf{R}_n$ and $\mathbf{R}_f$, as well. Denoting $\pi_{m,n}$ a generic transition probability located at m-th row and n-th column, we can write the non-zero entries of either $\mathbf{Q}_n$ or $\mathbf{Q}_f$, in following way, ${}_u\pi_{i,i+1} > 0$, $i = 1,..,\ s-1$, $u = n,\ f$, when keeping s to denote the number of transient states of absorption Markov chain

$$ {}_n\pi_{i,i+1} = \sum_{j=1}^{12} q_i(j)/N\ , \quad N = \sum_{i}^{s-1}\sum_{j=1}^{12} q_i(j), \tag{6a} $$

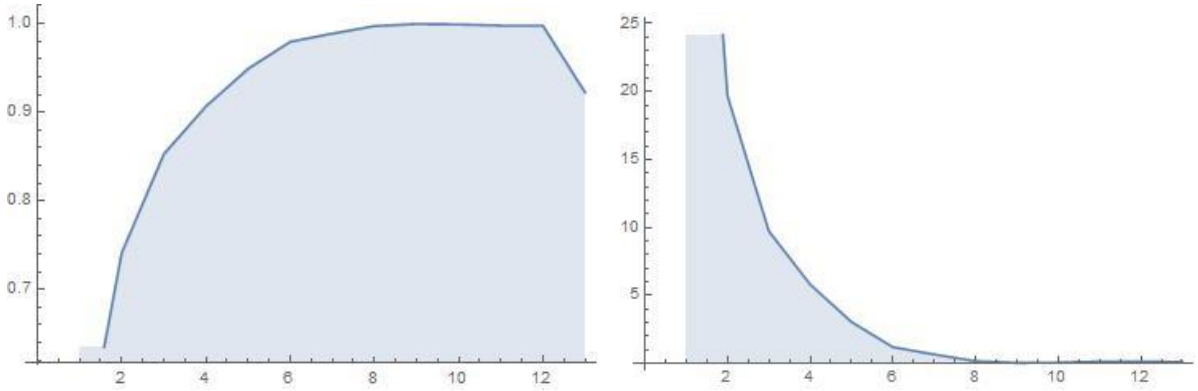
$$ {}_f\pi_{i,i+1} = \sum_{j=1}^{12} p_i(j)/M\ , \quad M = \sum_{i}^{s-1}\sum_{j=1}^{12} p_i(j). \tag{6b} $$

All entries of sub-matrices $\mathbf{R}_n$ and $\mathbf{R}_f$ can be expressed in following form

$${}_ur_{i,1} = 1 - {}_u\pi_{i,i+1} > 0,\ {}_ur_{i,2} = 0,\ i = 1,..,\ s-1, \text{ and } {}_ur_{s,1} = 1 - {}_u\omega > 0,\ {}_ur_{s,2} = {}_u\omega > 0,$$

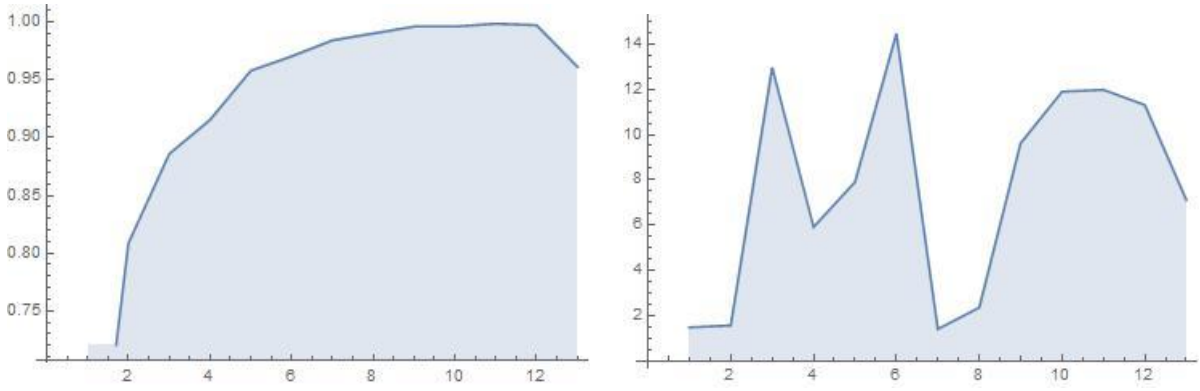
where ${}_u\omega$ denotes conditional probabilities of not-paying a claim within the last transient state s, when considering either $q_s(j)$ data, in correspondence with $u = n$, or $p_s(j)$ ones, in correspondence with $u = f$, respectively.

Figure 4 Transient states data. Left panel: first column of sub-matrix $\mathbf{R}_f$, $({}_fr_{i,1},\ i=1,..,\ s)$; Right panel: vector $\mathbf{t}_f$, i.e. distribution of averaged financial amounts in [FMU].



Source: own calculation.

Figure 5 Transient states data. Left panel: first column of sub-matrix $\mathbf{R}_n$, $({}_nr_{i,1},\ i=1,..,s)$; Right panel: hypothetic vector ${}_h\mathbf{t}_f$, i.e. distribution of averaged financial amounts in [FMU] generated by pseudo-random number generator U(0,1) in total volume of 100 [FMU].



Source: own calculation.

In Figure 4, we show the transient states data computed from $p_i(j)$ values, both transition probabilities, which are given as complementary values ${}_f r_{i,1} = 1 - {}_f \pi_{i,i+1}$, $i = 1,.., s-1$, and ${}_f r_{s,1} = 1 - {}_f \omega$, and components of vector $\mathbf{t}_f$, precisely.

In comparison with the previous figure, in Figure 5, we show another transient states data computed from $q_i(j)$ values. First, the transition probabilities ${}_n \pi_{i,i+1}$, given as complementary values $1 - {}_n \pi_{i,i+1}$, which occupy the first column of sub-matrix $\mathbf{R}_n$, again. Second, a hypothetic vector ${}_h \mathbf{t}_f$, giving simulated distribution of averaged financial amounts being generated by pseudo-random number generator having the uniform distribution U(0,1).

Now, given the sub-matrices $\mathbf{Q}_n$ and $\mathbf{Q}_f$, we may compute the corresponding fundamental matrices, denoted $\mathbf{N}_n$ or $\mathbf{N}_f$, respectively, using formula (2)

$$\mathbf{N}_n = \mathbf{N}(\mathbf{Q}_n), \quad \mathbf{N}_f = \mathbf{N}(\mathbf{Q}_f). \tag{7}$$

Table 1 Estimated total values of paid and unpaid/lost receivables in [FMU]

	Paid receivables	**Unpaid/lost receivables**
$\mathbf{y}_f(\mathbf{Q}_f)$	99.725	0.275
$\mathbf{y}_f(\mathbf{Q}_n)$	99.445	0.555

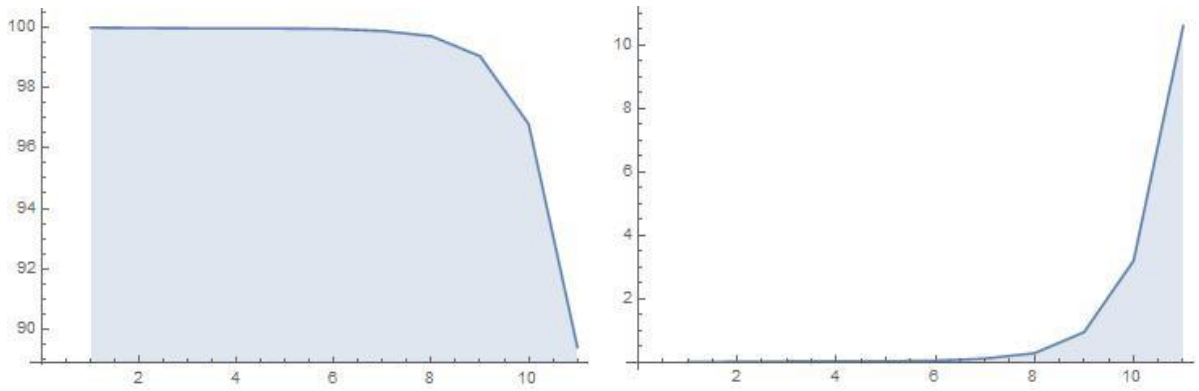
Source: own calculation

Using these matrices $\mathbf{N}_n$ and $\mathbf{N}_f$, we are able to get two different estimations of total paid and unpaid accounts receivables generated by stochastic stream of delayed due-date payments, respectively. The corresponding values are summarized in Table 1. We can observe just a slight difference between them so that $\mathbf{N}_n$, being constructed from $q_i(j)$ data yields more pessimistic estimation.

Rather interesting is sensitivity of estimated volumes of paid and unpaid accounts receivables with respect to payment delay tolerance, which is denoted δ, and given as number of Δ periods being expressed in months. The values presented in Table 1 are calculated assuming the payment delay tolerance of δ =12 months, precisely, which is rather long.

The results of numerical calculation obtained by our Mathematica notebook developed for paid/unpaid accounts receivables analysis are summarized in Figure 6.

Figure 6 Sensitivity of absorption states data upon payment delay parameter γ.
Left panel: expected paid receivables in [FMU] depending upon γ = 1,..,11;
Right panel: : expected unpaid receivables in [FMU] depending upon γ = 1,..,11.



Source: own calculation.

The payment delay tolerance is defined as follows

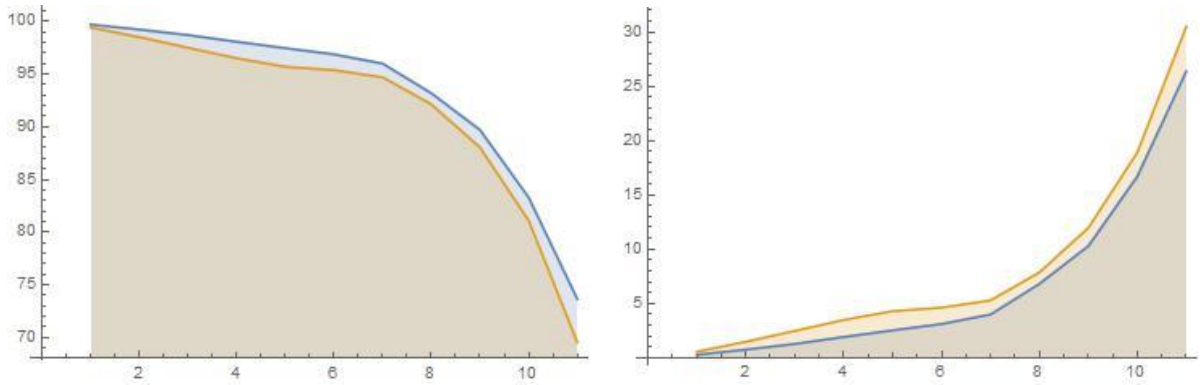
$$\delta = (s+1-\gamma)\,\Delta \ \text{[month]}, \tag{8}$$

where γ is payment delay parameter selected.

Inspecting both panels in Figure 6, we can conclude that rather progressive increase of unpaid accounts receivables appears for payment delay tolerance δ to be less or equal than four months, i.e. for $\gamma \geq 9$.

Having at disposal our Mathematica notebook, we may calculate another examples investigating sensitivity of paid/unpaid accounts receivables, too. In Figure 7, we present the corresponding results calculated for the hypothetical vector ${}_h\mathbf{t}_f$, giving distribution of averaged financial amounts in transient states having been generated by pseudo-random number generator U(0,1), and already depicted in Figure 5, Right panel.

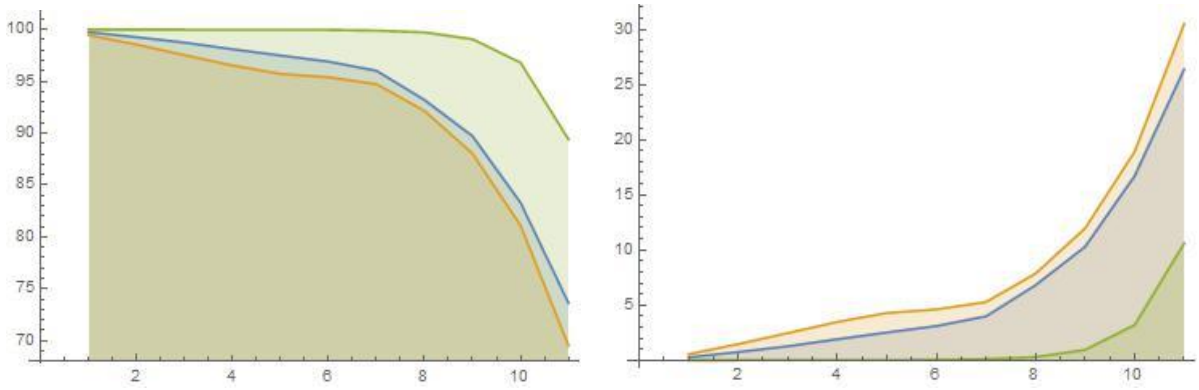
Figure 7 Sensitivity of absorption states upon payment delay parameter γ, for ${}_h\mathbf{t}_f$ given. Left panel: expected paid claims calculated by $\mathbf{N}_f$, (blue color), and $\mathbf{N}_n$, (light-red one); Right panel: expected unpaid claims calculated by $\mathbf{N}_f$, (blue), and $\mathbf{N}_n$, (light-red).



Source: own calculation.

Inspecting Figure 7, we may see two interesting facts. First, the progressive increase of unpaid accounts receivables appears already for $\gamma \geq 7$, i.e. for payment delay tolerance less or equal of a half of year. Second, the estimations calculated by fundamental matrix $\mathbf{N}_n$, i.e. constructed from $q_i(j)$ data, are more pessimistic than those ones calculated by similar procedure but with $\mathbf{N}_f$.

Figure 8 Sensitivity of absorption states upon payment delay parameter γ, ($\mathbf{t}_f$, ${}_h\mathbf{t}_f$ given). Left panel: expected paid claims; Right panel: expected unpaid.



Source: own calculation.

In Figure 8, we present all calculated results of absorption states data in sensitivity to payment delay tolerance represented by the parameter $\gamma = 1,..,11$. In Left panel, we may compare sensitivity of estimated paid accounts receivables upon γ being calculated by following expressions: $\mathbf{N}_f(\mathbf{t}_f(\delta);\delta)$ in green color, $\mathbf{N}_f({}_h\mathbf{t}_f(\delta);\delta)$ in blue one, and $\mathbf{N}_n({}_h\mathbf{t}_f(\delta);\delta)$ in light-red one, where we point out generally that both construction of

fundamental matrices and vectors of financial amounts registered in transient states depend upon payment delay tolerance δ. In Right panel, we may compare sensitivity of estimated unpaid accounts receivables upon γ being calculated by similar expressions.

4 Conclusions

In our paper, we have discussed usage of absorption Markov chains for stochastic analysis of paid/unpaid accounts receivables. Upon real life study case but with encrypted financial data, we described our procedure for construction of problem-oriented database from standard accounting reports data. We also discussed two basic possibilities of construction of fundamental matrix that plays crucial role within the absorption Markov chains theory. In general, we may collect and process either pending financial amounts, or numbers of pending receivables. Both data are closely related each other in their logics but may yield two different fundamental matrices. We use both of them for our numerical calculations. All results are calculated by our Mathematica notebook we developed for paid/unpaid accounts receivables analysis based upon absorption Markov chains theory. Forthcoming research will be focused on two challenging topics:

Further development of sensitivity analysis within the framework of collection possibilities of outstanding claims and its implementation in Mathematica;

Connection of account receivable advanced analysis with credit risk procedures.

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The Development of Debt Financial Markets – the Case of Selected CEE and Latin America Economies

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Abstract: *This article deals with loans and other debt sources provided to non-financial sector. Naturally, especially in perfect market conditions, all of the debt sources are substitutes to each other. However, in real economy the choice between loans and other debt (e.g. bonds) depends on many variables. Some studies state that the choice among variety of debt sources depends on the development of the financial market respectively of the economy as a whole. For example, it is quite well known that European market is rather bank-based, while US one rather capital-based. The aim of this paper is to characterize and compare the development of selected Central and Eastern European (CEE) and Latin America financial loan markets. For this purpose we analyzed the data from the Bank of International Settlements (BIS), which gathers these data from the reporting economies (e.g. advanced, emerging market and other economies). The method that was used for the data analysis was time series correlation analysis. From the conducted research there can be stated that there are no significant differences between the development of CEE and Latin America markets at aggregate level as well as among each analyzed country separately. The only notable exception is the development in Argentina, which still suffers from the consequences of state bankruptcy.*

Keywords: Debt, credit, corporate finance, financing policy, financial market.

JEL codes: G10, G32, O57

1 Introduction

It is quite natural that financial markets develop over time. Healthy financial system brings stable economy; it has a positive effect on international trade, and even on the development of society as a whole. There are many studies that seek to reveal which factor influences past, present as well as future characteristics of particular financial market the most. In this paper we are focusing on the development of debt financial markets from the perspective of the ability to switch between credit and other debt sources in selected Central and Eastern European (CEE) countries and Latin America economies. We have chosen these two regions because CEE is our home region and the European Union seeks to negotiate free trade agreement with Mercosur and Mexico (negotiations were (re)started in 2016). And that is why potential exporters, importers and investors from both regions need as much information as possible – including development and flexibility of debt. Our main aim is to characterize the development and potential changes within the the debt market of each analyzed economy and subsequently to compare these economies, respectively their development among themselves. We also want to discover if there are differences in mutual relationship between bank loans on one hand and other debt on the other hand provided to private non-financial sector (i.e. corporations plus households). The ability to switch among bank credits and other debt sources brings additional stability and thus reduced risks to the particular market (see Greenspan, 2000). For this purpose we analyzed the data from

the Bank for International Settlements (BIS) on total credit and bank credit to the private non-financial sector (i.e. corporations plus households).

We assume that due to in some aspects relatively similar recent historical events (communism, dictatorship, transformation and growth) there will not be significant differences in the recent development of analyzed debt financial markets. On the other hand, uncertainty of the political situation in some countries (especially Brazil, Poland and Hungary), negative economic circumstances in Argentina and potentially different market reactions to the Global financial crisis may result in different than expected results.

Literature Review

In accordance with the focus of this article, this part deals with the development of the debt market as a whole and with mutual development of bank credit and other debt (in the case of corporations mainly bonds). For example, Calza, Gartner and Sousa (2003) states that behavior of real loans is mainly influenced by short-term and long-term interest rates and by the development of the economy measured by real GDP. While the relationship between loans and interest rates is negative, the relationship between loans and GDP is positive. Jakubik (2011) points out that in the case of households there can be observed certain time lag in the development of credit affected by negative economic scenario. The impact on households is more persistent than in the corporate sector. Braun and Briones (2006) on the case of bond market development showed, that "*A big part of the degree of development of bond markets was shown to be explained by general economic development. Even after controlling for this, significant cross-country variation remains. This variation is not easy to be explained with differences in the macroeconomic context, or the quality of institutions and the policies that have been shown to correlate with the development of banking systems and stock markets. Demand in the form of the importance of institutional investors was shown to be a critical part of the story*" (Braun and Briones, 2006, pp. 27). There can be added, that continental European banks were historically protected from competition from capital markets and that is why bank financing plays significant role (Hawkins, 2002).

Some researches concentrate directly to certain economic periods, for example financial crises like Asian financial crisis or the Global recession (e.g. Jiang, Tang and Law, 2002; Yoshitomi and Shirai, 2001; Cowling, Liu and Ledger, 2012). Cowling et al. (2012) concludes that especially larger and older British firms had easier access to external financial sources throughout the Global recession. Jiang et al. (2001) and Yoshitomi and Shirai (2001) dealt with Asian financial crisis and Asian debt markets. In their conclusions they highlight that overreliance on the bank sector; especially on bank loans denominated in foreign currencies makes local financial market as well as the whole economy very fragile and prone to a crisis. That is why Yoshitomi and Shirai encourage the development of the bond market. On the other hand, Levine (2002) argues that it is almost irrelevant whether the financial market is rather bank- or market-based. The maturity of the markets institutions is important, i.e. who and how to offer the service. At first sight, this is a bit contrary to the Grennspan's speech. Greenspan (2000) states that in time of crisis in the bank market, capital market act as a "spare tire" and vice versa. However, both the banking and the capital markets are highly developed in the USA.

The richness and maturity of the economy also affect the debt market. Beck, Demirgüç-Kunt and Levine (2000) point out that richer countries (measured by GDP per capita) have larger bond market and issue more equity and especially private bonds. This is in line with the Yoshitomi and Shirai's scheme (2001, pp. 32). Yoshitomi and Shirai states that developing countries are rather bank-based, while developed countries (in other words rich countries) are rather bond market-based; at least as far as corporate financing is concerned.

There are also several studies that seek to reveal mutual development on the debt market among debt sources of corporate financing. Bank loans and corporate bonds are significant sources of business financing. As Miles (2000), Hyblerová (2014) or Mačí and Hovorková Valentová (2017) states these two financial instruments are in fact substitutes to each other. This statement is especially true under perfect market conditions. However, perfect market conditions can hardly be reached and that is why several researchers studied mutual behavior of these two financial instruments as well as the behavior of companies and their attitude to these sources of debt financing. Hale (2001; 2005; 2008) points out that small companies can hardly obtain a loan from a bank and that is why these companies issue bonds, more precisely junk bonds (very small and young companies are even excluded from the debt market because they are too risky for investors). Medium-sized companies obtain a loan from the bank and large companies prefer to issue bonds. Again, this behavior and attitude is primarily connected to riskiness of the enterprise for investors. Almost the same conclusions made Machnes (2010). In his study he points out that companies chose between bonds and loans according to the rating that these companies may obtain on the market. The higher the rating, the higher the probability that companies would prefer bond financing rather than loans. In other words, the more it is in the economy of large wealthy companies, the greater the development of the capital (bond) market. De Fiore and Uhlig (2011) studied differences between US and European attitudes to bond and loan corporate financing. They conclude that most differences can be explained by "*a relatively low level of disclosure of information about firms' credit risk in the euro area relative to the US*" and "*a higher need of European firms for the flexibility and information acquisition role provided by banks*" (De Fiore and Uhlig 2011, pp. 20). Miloš (2004) adds that relationships between banks and corporations as well as market regulations and overall quality of institutions plays significant role whether corporations prefer loans or bonds (this is consistent with the aforementioned Braun and Briones (2006)). Koziol (2006) concludes that companies should choose between bank loans and issuance of corporate bonds with respect to potential financial distress. Loosely speaking, if a company is in financial distress and have enough project with positive net present values, one creditor (bank) might be interested in rescuing the company while multiple creditors not. This is usually because of a lack of information on the side of multiple creditors. Altman, Gande and Saunders (2010) confirm that secondary loan market is informationally more efficient than secondary bond market.

Although the most of the studies presented above seems to be quite old, they are not obsolete. On the contrary, it is useful to apply them to the current shift in markets, whether these changes are economic, political or other. All of the above sources help solve the puzzle how the debt markets are likely to evolve.

2 Methodology and Data

The data used in this research come from the Bank for International Settlements (BIS). Time series of credit to the non-financial sector were used; more specifically time series of bank credit to the private non-financial sector and total credit to the private non-financial sector. By subtracting bank credit from total credit, we obtained the data about other debt. We used the Global Table provided by the BIS, which contains information about the countries we are interested in analyzing (Latin American countries and Central and Eastern European countries) over a period of 15 years, covering the years 2000 to 2015. The countries of Latin America analyzed were Brazil, Argentina, Mexico and Chile, and the countries of Central and Eastern Europe analyzed were the Czech Republic, Poland and Hungary (unfortunately, the data from Slovakia, which would definitely fit in our research scope, were unavailable).

Generally, a time series correlation has been applied. This means Pearson product moment correlation coefficient is calculated and consequently Durbin-Watson test used to reveal possible autocorrelation of residuals. The Durbin-Watson test is constructed in

simple linear regression model where the dependent variable (y) is expressed by the other credit instruments (mostly bonds) to the private non-financial sector time series and the independent variable (x) is the bank credit to the private non-financial sector time series. The parameters are estimated based on ordinary least squares method and the common significance level taken into consideration is 5 percent.

For correlations the null hypothesis consists in no significance of correlation between the bank credit to the private non-financial sector and other credit to the private non-financial sector. Alternative hypothesis is both-sided opposite. In Durbin-Watson test the null hypothesis expresses not significant serial correlation in the residuals.

3 Results and Discussion

In this section, there are presented and discussed the results of our analysis. In Table 1 there are the results from CEE countries, in Table 2 from Latin America countries and in Table 3, there are compared those two regions as a whole.

CEE Countries

The results of individual countries in Central and Eastern European area are shown in the next table (Table 1).

In Middle Europe environment there is strong positive correlation between bank credit to non-financial sector and other credit instruments. We reject both stated null hypothesis. Thus there is a possible serial correlation in the residuals.

Table 1 Results of correlation analysis in Central Eastern European area (Bank credit vs. other debt in 2000-2015)

Country	Slope	Correlation Coefficient	P-Value	D-W Test	P-Value
Czech Republic	0.6086	0.9662	0.0000	1.1196	0.0132
Hungary	1.1779	0.9297	0.0000	0.2744	0.0000
Poland	0.4740	0.9837	0.0000	0.7086	0.0004

Source: own calculation based on data from BIS (2017)

From the results presented in the Table 1 there can be also observed that the intensity of mutual development of bank credit and other debt differs. The strongest bond is between bank credit and other debt is in Poland, while in Hungary is the lowest. As far as the slopes are concerned, there can be stated that the lowest growth of other debt in relation to the bank credits is in Poland, while in Hungary other debt is growing faster than bank credits. Both correlation coefficients and slopes signalize very similar development of these debt sources of business financing. It is therefore obvious that these sources might be not only substitutes (as e.g. Miles (2000) states), but complements to each other as well. In the Czech Republic, there is the highest value of D-W test, which can be partly explained by the results presented in Mačí and Hovorková Valentová's study (2017). These authors showed that in the period they analyzed, long-term corporate bonds and bank loans provided to non-financial corporations are substitutes to each other.

Latin America Countries

As we can see from the Table 2, the results of Latin American Countries relatively copy the results of countries in our CEE region.

Table 2 Results of correlation analysis in Latin American area (bank credit vs. other debt in 2000-2015)

Country	Slope	Correlation Coefficient	P-Value	D-W Test	P-Value
Argentina	-0.1365	-0.3906	0.1347	0.1866	0.0000
Brazil	0.0484	0.8767	0.0000	0.8383	0.0016

Chile	0.6393	0.9473	0.0000	0.3345	0.0000
Mexico	0.8707	0.9573	0.0000	0.4183	0.0000

Source: own calculation based on data from BIS (2017)

Correlation coefficients only reach slightly lower values. However, there is one notable exception – Argentina. Argentina's results show insignificant correlation between two examined phenomena. One of the reasons, which may explain such result, is Argentina's state bankrupt in 2002. In 2002 bank loans dropped sharply. This event brought turbulences to the local financial markets and unfortunately the threat of further bankruptcy is still up to date in Argentina. Slopes presented in Table 2 shows different results among analyzed Latin America countries. Again, very different situation is observed in Argentina, where other debts are not significantly dependent on the growth of bank credits and vice versa. In relation to other observations, it can be concluded that in Argentina had to prevail a different element influencing the development of both time series than GDP and interest rates (cf. Calza, Gartner and Sousa (2003)). In Brazil, which suffered by drop in commodity prices and political instability because of presidential affairs, there is also positive but with comparison to other analyzed economies very low value of the slope. The values for Chile and Mexico are rather similar to those in CEE.

CEE Region versus Latin America Region

Finally, there are presented the complex results of both analyzed regions in Table 3 below. We can see that both parts of the world seems to have strongly and positively correlated bank credit and other debt instruments markets but these correlations also indicate a non-random pattern in the residuals. Thus there may be a third variable that influences credit options of companies in both analysed regions. This is consistent with the conclusions of e.g. Calza, Gartner and Sousa (2003) and Braun and Briones (2006) who states that the development of financial markets is mainly influenced by development of the economy measured by real GDP or general economic development. From this point of view, bank credits and other debt are rather complementary, not substitutes, to each other.

Table 3 Results of correlation analysis for the sum of Central Eastern European (CEE) region and sum of Latin American region (bank credit vs. other debt in 2000-2015)

Region	Slope	Correlation Coefficient	P-Value	D-W Test	P-Value
CEE	0.6396	0.9880	0.0000	0.8013	0.0011
Latin America	0.1506	0.9044	0.0000	0.4260	0.0000

Source: own calculation based on data from BIS (2017)

The interesting fact about the global tendencies is that Central and Eastern European area has rather higher slope than Latin American region. The overall increase of alternative instruments (mostly bonds) related financing is therefore relatively higher in CEE.

4 Conclusions

In this paper, there was analyzed the development of debt markets in selected Central and Eastern European and Latin America countries. The analysis was based on time series correlation analysis between bank credit (loans) and other debt provided to non-financial sector. Our main aim was to characterize the development and potential changes within the debt market of each analyzed economy and subsequently to compare economies, respectively their development among themselves. From the literature review, from some historical similarities mentioned in introduction and from current state of economic development, despite the fact that these two regions are relatively far away from each other, there could be anticipated that there will be no significant differences

among the observed economies. The results presented in this article confirmed our expectations, i.e. the volume of bank credits and other debts are developing in very similar ways. And at the same time, bank credits are growing rather faster than other debt in the analyzed period. On our research sample and associated data about credit to private non-financial sector thus cannot be applied what e.g. Miles (2000) observed that since 1980 bond financing, which is one financial tool among other debt sources, is being pushed forward at the expense of bank loans. This can be explained by the differences in the research samples in which we on the one hand excluded government and on the other hand we included households. While nowadays governments rather use bond financing, households mostly use bank credits. The only notable exception is the development in Argentina, which still suffers from the consequences of state bankruptcy. A little bit different development can be also observed in Brazil that was hit by falling prices of raw materials and some negative political affairs.

The challenges for further research consist in exclusion of time factor, decomposition of time series. This research also omits deeper possible interpretation of the results. We would also like to add into our study not only emerging markets, but developed economies as well. And last but not least, we would like to exclude households from the data and focus directly on corporations and their financing strategy.

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Interrelation of personal characteristics with financial literacy as a guide to financial behavior of Russian students

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Abstract: *The research is aimed at analyzing influence of various personal characteristics of young students along with financial literacy on their expected financial behavior. Besides financial literacy, we singled out such personal characteristics as prodigality, credulity, risk preference and propensity for offence or unethical behavior. Our research is based on the data obtained by sample questionnaire survey of full-time students learning economics at Lobachevsky State University of Nizhni Novgorord, Russia. For evaluation of each personal characteristic we asked respondents to answer twelve direct and indirect questions, which enabled us to both outline distribution of the estimated features among students and calculate their average values. For the whole sample we found medium positive correlation between prodigality, risk preference and propensity for offence or unethical behavior, while other pairs demonstrated weak correlations. Further clustering of the whole sample into six approximately equal groups with use of the Ward's method allowed us to receive more pronounced dependencies between characteristics within these groups, albeit different by sign. We found out that combining various characteristics with different level of financial literacy ensured quite opposite types of expected financial behavior. This emphasizes the role of personality development as a complex task even more important for students just entering the financial market.*

Keywords: financial literacy, financial behavior, students, personal characteristics, correlation

JEL codes: A 22, G02

1 Introduction

Modern researchers actively study the problems of financial literacy, its relationship with other personal characteristics and its influence on people's behavior in the financial sphere. A detailed review of such studies is represented in (Stolper and Walter, 2016).

First of all, scholars emphasize that concepts of financial knowledge and financial literacy are not synonymous. Apart from knowledge, financial literacy includes specific skills and competencies, embracing orientation in the flow of financial information, mastering of planning and accounting for income and expenses, operating with contemporary financial tools, assessing risks, as well as abilities to predict the consequences of financial decisions and to prevent breach of the law, etc. (Khudko, 2016). Financial literacy implies an attainment of financial independence, as well as development of a certain level of financial culture and financial discipline.

Financial literacy is examined from various standpoints. Some studies focus on methodological issues of financial literacy assessment (Huston, 2010). Other researches are dedicated to evaluation of the overall level of financial literacy within and between different countries and demographical groups. Thus, in 2010-2011 the experts of the Organization for Economic Cooperation and Development (OECD) and the International Network on Financial Education (INFE) carried out a pilot project covering 14 countries. It involved evaluation of financial knowledge, behavioral preferences and population's

attitudes toward personal finance. The research revealed a serious lack of financial knowledge among a sufficiently high proportion of the population (Atkinson and Messy, 2012).

Another range of literature concerns the relation of financial literacy to certain socio-demographical, institutional or macroeconomic indicators. Thus, (Bumcrot, Lin and Lusardi, 2011) comparing financial literacy in different regions of the United States found that urban residents have higher financial literacy than rural residents. Whereas (Jappelli, 2010) found positive dependency between financial literacy with human capital development indicators and its negative dependency with generosity of social security systems.

The researchers of financial literacy of Russian population emphasized its relationship with people's socio-economic adaptation to changing market conditions. Based on the materials of the Russian Monitoring of the Economic Situation and Public Health conducted by NRU-HSE, (Kozyreva, 2012) analyzed the trends and peculiarities of financial behavior of different social groups and strata of the Russian population during recession in economy. The author concluded that older aged respondents are more prone to conscious savings behavior. Other authors (Nivorozhkina and Sinyavskaya, 2012) demonstrated the influence of the level of financial literacy, the risk preference and the ability to identify suspicious financial transactions on the likelihood that clients of financial institutions could be involved in unlawful schemes.

By means of sociological survey (Fedorova et al., 2015) analyzed the impact of financial literacy on the awareness of Russian citizens toward financial services, their ability to effectively identify the highest-quality financial market offers that meet their personal needs. The authors concluded that in general Russian citizens have a fairly low level of financial literacy. By use of econometric modeling the author revealed that people who are more literate in finance are also more active in using financial instruments, investing in pension funds and having less debt on bank loans. Using another sociological survey, (Malkina and Khramova, 2016) found that the majority of depositors of the Russian banks demonstrated inherent risk aversion, which restricted their financial practices.

Some researchers are engaged in the study of the peculiarities of young people financial behavior. For example, the OECD experts conducted in 2012 an international study of financial literacy among 15-year-old schoolchildren from 18 countries (OECD, 2014). The results of the study showed a higher level of financial literacy among schoolchildren from China and Belgium, a wide variation of estimated literacy across countries and a large gap between the financial literacy levels within the countries.

The research of financial behavior of young students of Australian universities (Beal and Delpachitra, 2003) established insufficient financial literacy, excessive use of credit and inessential use of savings. It also revealed a positive parental influence on the improvement of students' financial skills. Meanwhile, the survey of 420 USA college students" behavior (Jorgensen and Savla, 2010) showed that perceived parental influence had direct and moderate impact on their financial attitude; indirect and moderate impact on their financial behavior mediated through financial attitude, whereas it did not have any noticeable effect on their financial knowledge. Studying Russian children behavior, (Fedorova et al., 2015) indicated that parents with relatively little experience in the stock market activity often advised them to refrain from buying securities and not to accept risks associated with them. Some authors (Worthy, et al., 2010) detected the difference in risk preference among students who have been employed on their professions and those who have not.

Our current research is aimed at analyzing the influence of personal characteristics on the peculiarities of the expected financial behavior of those students who have chosen various economic programs. These students already possess some knowledge and demonstrate aspirations in the financial and economic spheres; therefore, analysis of their perceptions and types of behavior is most interesting.

The hypothesis of our research affirms that financial behavior in general, and behavior of students of economic specialties in particular, depend on interference of the level of financial literacy with other personal characteristics influencing decision-making, namely prodigality, credulity, risk preference and propensity for offence or unethical behavior.

2 Methodology and Data

To test the above hypothesis, we conducted a survey among the day-time students training on the bachelor and master degree programs in economics and finance at the Lobachevsky State University of Nizhny Novgorod. In total we interviewed 179 different respondents. The main part of the questionnaire consisted of 5 blocks, 12 questions each. The respondents expressed their opinion on a scale from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was supplemented with a personal block embracing questions related to age, gender, number of family members, employment status.

The first block of questions of the main part of the questionnaire was purposed to identify and measure the respondents' *propensity for extravagance (prodigality)* and included questions of two types. Some questions were aimed at revealing the respondents' psychological predisposition to money spending, e.g. "Spending money cheers me up", "I will buy the things I like - even if it causes financial difficulties". Other questions identified the respondents' subconscious readiness to bear financial losses: "It's better to buy a new TV than pay for repairing the old one", "I often buy things that I do not really need".

The second set of questions was intended for assessing *the level of credulity* that was interpreted differently from other personality traits. The average level of credulity was considered optimal, while the extreme gullibility was supposed to negatively interact with other personality traits. On the one hand, gullible and semi-literate individuals can be involved in illegitimate activities by someone else's initiative and become a victim. On the other hand, the recognition of own credulity along with sufficient level of literacy can result in more cautious behavior, excessive risk avoidance and loss of income. At the same time, distrustful individuals, as a rule, have the worst communicative abilities and often cannot realize their potential in the financial market. We evaluated the level of credulity in relationships with relatives, familiar and unfamiliar people, institutional structures and responsible persons. The examples of this block questions are following: "Sometimes I can lend a large sum of money to a friend", "When buying household appliances it is better to trust the opinion of a consultant", "The investor can only rely on the state which would not let its citizens down", etc.

The third block of the questionnaire, devoted to the evaluation of propensity for risk, included questions related to both the risk within day-to-day professional activity and the personal financial risk. Examples of the first type of questions are: "I am ready to postpone the execution of important work on the last day", "I'm ready to suggest a new idea to the boss without predicting his response". Examples of the second type of questions are: "I'm ready to invest in risky financial assets with volatile returns", "I am ready to start my own business in a sphere that is not completely clear to me".

The fourth block of questions, investigating the *propensity for offence or unethical behavior*, estimated the respondents' attitude to deception or concealment of the truth, to informal monetary practices, etc. It should be noted that our survey gives only an approximate estimation of a person's inclination to illegitimate or ethically wrong actions. Moreover, the framework context of the asked questions varied significantly: "Sometimes breach of the law may be justified if it benefits good people", "If the fellow does not recall the monetary debt, it is acceptable not to repay it", "Some informal hospitality may stimulate the boss to resolve the issue in my favor", "Offence is tolerable in an extreme need".

The next set of questions was related to identification of the *level of financial literacy*. For this purpose we asked standard questions from various financial disciplines. According to our starting remark, financial literacy is not confined to stock of knowledge. However, the lack of experience in the financial sphere was a feature of the majority of our young respondents. Therefore, we assumed that their financial knowledge is an important prerequisite for correct decision-making and appropriate behavior in the future.

Calculation of the total scores in the first four blocks allowed us to measure four main characteristics of our respondents. The appraisal of the level of their financial literacy was obtained in a different way - by multiplying the number of correct answers by 5. The interrelationship between the characteristics was calculated by means of the Pearson's linear correlation and the Spearman's rank correlation coefficients.

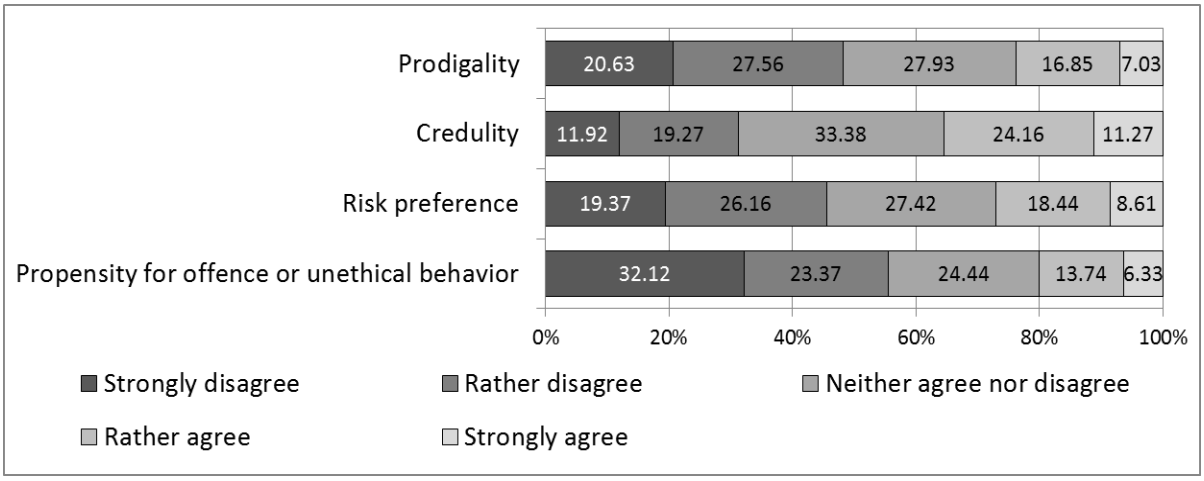
Next, we divided all students into groups with similar characteristics using the Stata-14 module for hierarchical cluster analysis. For clustering we have applied the Ward's method based on construction of the hierarchical tree (dendrogram). In this approach, the criterion for pooling observations in the same cluster is the decrease in total sum of Euclidean distances between all observations and the clusters' centers.

3 Results and Discussion

The survey covered students aged 18 to 24 (averaging 20). Boys and girls are presented in the proportion: 31% against 69%. Circa 58.1% of them live in smaller families (1-3 people), while 41.9% live in larger families (4-6 people). Additionally, 20% of the respondents are employed, 67% are economically inactive, and 13% are looking for a job.

Figure 1 shows the distribution of the respondents characteristics obtained with the questionnaire. The average assessments of characteristics are: prodigality – 2.6, credulity – 3, risk preference – 2.7, propensity for offence or unethical behavior – 2.4. Credulity appeared to be the most pronounced characteristic of our respondents, while readiness for illegitimate or unethical actions was rejected by the majority of them.

Figure 1 Distribution of the assessments of the respondents' characteristics, %



Source: authors own calculations based on the data obtained by sociological survey

The questions measuring the level of financial literacy ensured about 45% correct answers and 23% incorrect answers. Rather high proportion of respondents (32%) found it "difficult to answer". It should be noted that in our study the financial literacy is cardinal in interrelationship of personal characteristics. While literate people demonstrating risk preference take it deliberately, illiterate ones may undertake reckless actions. By assessing current situation incorrectly they could both lose money and be involved in various illegal schemes. However, more literate individuals can invent various

tricks to hide illegal nature of their activities. On the contrary, illiterate ones can refrain from making decisions in the financial sphere. Obviously, connection of financial literacy with other characteristics of individuals plays a crucial role in their financial behavior.

The calculated correlations between the levels of the characteristics examined for all respondents are represented in Table 1.

Table 1 Coefficients of correlation between personal characteristics for the entire sample (N=179)

	Prod	Offen	Risk	Cred	FinLit	Prod	Offen	Risk	Cred	FinLit
	The Pearson's coefficient					The Spearmen's coefficient				
Prod	**1**					**1**				
Offen	**0.332**	**1**				**0.341**	**1**			
Risk	**0.297**	**0.383**	**1**			**0.315**	**0.409**	**1**		
Cred	**0.156**	**-0.239**	**0.020**	**1**		**0.105**	**-0.226**	**-0.023**	**1**	
FinLit	**-0.165**	**-0.048**	**-0.107**	**-0.093**	**1**	**-0.164**	**-0.017**	**0.097**	**-0.082**	**1**

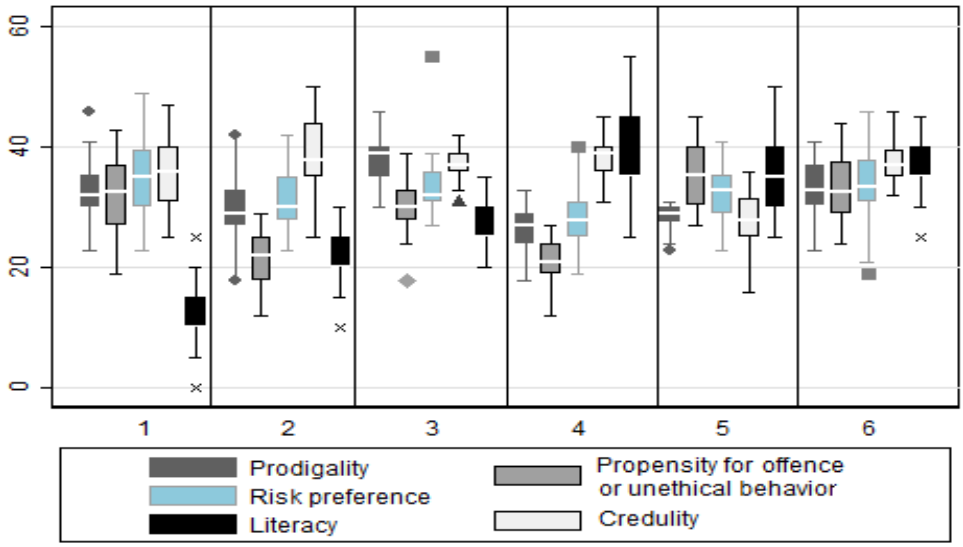
Note: Prod – prodigality, Offen – propensity for offence or unethical behavior, Risk- risk preference, Cred – credulity, FinLit – financial literacy

Source: authors own calculations

The correlation matrix constructed for the entire data indicates a tripartite positive relationship between prodigality, risk preference and propensity for offence or unethical behavior. In our opinion, positive relationship between extravagancy and propensity for misconduct may be explained by the increased interest of such people in overcoming existing budgetary constraints.

Subsequent application of the Ward's method allowed us to split the sample into 6 different clusters distinguished by combination of the respondents' features (Figure 2). Calculation of the correlation between the assessed levels of personal characteristics within isolated clusters enabled us to determine their interdependencies (Table 2).

Figure 2 Description of personal characteristics in the clusters singled out



Source: authors own calculations

Next, we describe each cluster and interrelationship of the personal characteristics in it separately.

Table 2 Matrix of the correlations of personal characteristics within the clusters

	Prod	Offen	Risk	Cred	FinLit	Prod	Offen	Risk	Cred	FinLit
	Cluster 1 (40 observations)					**Cluster 2 (37 observations)**				
Prod	**1**					**1**				
Offen	**0.446**	**1**				**0.188**	**1**			
Risk	**0.447**	**0.594**	**1**			**0.320**	**0.191**	**1**		
Cred	**0.184**	**0.080**	**0.089**	**1**		**0.502**	**0.261**	**0.563**	**1**	
FinLit	**-0.039**	**0.365**	**0.375**	**-0.201**	**1**	**0.287**	**-0.378**	**-0.139**	**-0.289**	**1**
	Cluster 3 (21 observations)					**Cluster 4 (25 observations)**				
Prod	**1**					**1**				
Offen	**0.013**	**1**				**-0.123**	**1**			
Risk	**0.224**	**-0.579**	**1**			**-0.325**	**0.038**	**1**		
Cred	**0.105**	**-0.004**	**0.085**	**1**		**0.129**	**-0.074**	**-0.066**	**1**	
FinLit	**0.150**	**-0.641**	**0.308**	**0.365**	**1**	**-0.193**	**0.063**	**0.416**	**0.236**	**1**
	Cluster 5 (20 observations)					**Cluster 6 (36 observations)**				
Prod	**1**					**1**				
Offen	**0.119**	**1**				**0.137**	**1**			
Risk	**0.147**	**-0.020**	**1**			**-0.181**	**0.301**	**1**		
Cred	**0.061**	**-0.170**	**-0.170**	**1**		**-0.370**	**-0.174**	**-0.201**	**1**	
FinLit	**-0.373**	**-0.529**	**0.317**	**0.069**	**1**	**0.281**	**-0.027**	**-0.144**	**-0.444**	**1**

Source: authors own calculations

Cluster 1 - «Low level of financial literacy + increased risk appetite»

A distinctive feature of this cluster is the lowest level of financial literacy among all respondents (the literacy mean value equals 11.75, while median value - 10.00). Another peculiarity of this cluster is a higher risk appetite (mean value at 35.28, and median value at 35.00). In this cluster the high level of risk preference demonstrates a positive correlation with both prodigality and propensity for offence or unethical behavior.

This cluster is also characterized by higher proportion of the respondents searching for the job. This group of students is at the risk zone, therefore they are not recommended to make independent decisions and should be under supervision of adults.

Cluster 2 – «Low level of financial literacy + trustfulness + adherence to law and ethics»

A feature of this cluster is the greatest proportion of girls (83.78%) demonstrating the highest level of credulity among all students (with mean value at 38.81). This group of students is also characterized by low level of financial literacy, which shows inverse dependency with propensity for illegal or unethical activities. Both risk preference and propensity for extravagance in this cluster are low.

Apparently, this cluster is represented by unconfident and cautious individuals who are not yet ready for professional activity in the financial market and aware of it.

Cluster 3 – «Medium level of financial literacy + extravagancy»

This cluster mainly consists of non-working young respondents aged 18-20 years. A remarkable feature of them is an increased propensity for extravagancy (with mean value 37.95, and median value 39.00). The literacy of these respondents is below the average established for the entire sample, but higher compared to the previous two clusters. The risk preference is slightly above the average. The level of credulity in this cluster turned out to be neutral.

For this cluster we can observe inverse dependence between the level of financial literacy and propensity for illegal activities. At the same time this cluster is characterized by a

positive relationship between literacy, on the one hand, and the level of credulity and risk preference, on the other hand. So far as the representatives of this cluster are keen to spend money, having improved their financial literacy, in future they might benefit from more lucrative market proposals and manage risks consciously, avoiding offences.

Cluster 4 – «High level of financial literacy + risk aversion + adherence to law and ethics»

This cluster incorporates the students demonstrating the highest level of literacy and an increased level of trust. They also showed low propensities for risk and extravagance as well as negative attitude towards illegal and unethical practices.

The fourth cluster is also characterized by a negative correlation between risk preference and extravagance. Apparently, the students aiming at consumption are more inclined to risk aversion. The students aiming at saving prefer relatively more risky behavioral practices and use of different methods of increasing capital. The correlation matrix for this cluster shows direct dependence between the level of financial literacy and the risk preference. Despite an advanced level of literacy among all respondents, these students are still inclined to refrain from financial activity. But further training and overcoming of excessive risk aversion might turn precisely this group of students into professionals at financial markets.

Cluster 5 – «High level of financial literacy + propensity for offence or unethical behavior»

This cluster is distinguished by a higher proportion of students aged 21-24 years. The lowest level of trust among all respondents and the highest propensity for illegal or unethical activities are unique features of the cluster. In addition, the respondents have a high degree of financial literacy (its median here is at the same level as in the 4th cluster, who demonstrated the highest level of financial literacy among the respondents).

The low level of extravagance is supported by their thrift and tendency to make rational decisions. In this cluster, growth in the level of financial literacy leads to decrease in the level of extravagance and increase in the risk preference, while the propensity to break formal or informal rules remains very high. Similar to students of the first cluster, these students require additional awareness-raising work. When the former (illiterate but risky) may be embroiled in violation of the rules, the latter (literate and risky) are capable of independent invention of grey business schemes.

Cluster 6 – «Slightly advanced level of financial literacy + ordinary/moderate behavior»

This cluster does not demonstrate pronounced features. All estimates are in the middle zone. However, it is distinguished by a higher proportion of employed persons (25%), and the majority of respondents (63.69%) live in smaller families. The correlation matrix indicates the positive relationship between the riskiness and the propensity for illegitimate or unethical actions in this cluster.

In this group, an increase in literacy level, as well as an increase in prodigality, is accompanied by a decrease in level of credulity. We assume that the respondents of this cluster are prone to work with financial instruments, but they will probably adhere to moderately risky strategies.

4 Conclusions

The paper puts forward and confirms the hypothesis stating that financial literacy along with other personal characteristics such as prodigality, credulity, risk preference and propensity for offence or unethical behavior influence expected financial behavior of young students. For testing this hypothesis we conducted a survey in Nizhny Novgorod State University of Russia and measured the characteristics explored, then clustered all

the respondents into groups with different combination of characteristics and computed their levels' correlations both for the entire sample and for the isolated clusters.

As a result of our study, we revealed direct correlation between prodigality, risk appetite and propensity for illegal or unethical activities for the entire sample. We singled out 6 clusters of students distinguished by the dominated characteristics and found pronounced but different by strength and sign interdependencies between them. Their description allowed us to suggest certain type of expected financial behavior for different clusters of students, find their vulnerabilities and outline the directions of awareness-raising work.

Nevertheless, we comprehend the limitations of the method used to obtain primary data. First of all, what people think, how they respond and how they behave in reality, do not always coincide. Secondly, the questions are not always understood by different respondents in the same way, the framework context influence their perception. Thirdly, it is necessary to make a reservation regarding the degree of sincerity of the respondents, their desire to answer the questions honestly. Stressing the similar issues, (Schmeiser and Seligman, 2011) warn researchers against haste while interpreting the data raised from the financial literacy surveys.

Further development of the research is expected by extension of the interviewed audience and inclusion to the survey of respondents with more advanced experience in the financial markets. We intend to complete the questionnaire by adding a block that directly explores financial behavior. This should allow us in the future to fulfill a comparative analysis for different population groups.

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Decomposition of spatial inequality in budget provision by income sources: case of modern Russia

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Abstract: *The research is aimed at assessment of contribution of various income sources to spatial inequality in budget revenues per capita in modern Russia. It is based on itemized data on various tax and non-tax revenues in consolidated budgets of Russian regions in 2012-2015. For assessment of interregional disparities in budget revenues per capita we employed three alternative measures: the population-weighted Gini coefficient, the coefficient of variation and the Theil index. The decomposition of spatial inequality by sources was made by means of the A. Shorrocks and R. Lerman – Sh. Yitzhaki techniques, as well as by the nested disintegration of the Theil index. As a result we obtained the structure of spatial inequality in budget provision per capita in Russian regions for four years and estimates of spatial inequality elasticity with respect to various budget revenue sources. We found that two most profitable taxes, i.e. corporate income tax and personal income tax, provided the lion share of inequality, although the elasticity of inequality with respect to corporate income tax was significantly higher than to personal tax. Non-tax revenues, such as incomes obtained from the use of public and municipal property and sale of tangible and intangible assets, provided relatively larger contribution to spatial disparities in budget provision compared to their share in total revenues, enhancing inequality even stronger. Inter-budgetary transfers, including grants, subsidies, subventions and other intergovernmental aid, proved to have the most smoothing effect on budget provision, although relative efficiency of different types of transfers in different years altered due to the changes in rules of their funding. The results obtained are applicable to management of spatial inequality in budget provision through adjusting budget revenues structure and transfer allocation.*

Keywords: budget revenues per capita, spatial inequality, indices, sources, decomposition

JEL codes: H 61, H 71, R 12

1 Introduction

The spatial inequality in economic performance is one of the main problems primarily concerning large and diverse states such as Russia. The problem has different aspects, one of which is unevenness in the regions' budgetary provision, which affects their ability to provide local population with public goods. It necessitates reallocation of financial resources throughout the budget system, resulting in change in interregional inequality and influencing the regions resources and incentives to develop their economic potential.

The current state of Russian budgetary system has certain distinctive features associated with allocation and distribution of public resources.

The first feature is establishment of specific rules for taxes distribution throughout the budget system partially allowing to reduce the level of interregional differences directly at the stage of taxes allocation. Indeed, the taxes most unevenly distributed among regions (such as value added tax - VAT and a large portion of the mineral extraction tax - MIT) are channeled to the federal budget. Simultaneously, two other profitable taxes, the personal income tax (PIT) and a substantial portion of the corporate income tax (CIT),

remain at the regional level. The PIT is characterized by noticeably lower degree of spatial inequality compared to the taxes allocated at the federal level, while the CIT tax yield rate demonstrates significant regional disparities (Malkina, 2016).

The second feature of Russian budget system is maintenance of its vertical imbalance. Thus, in 2006 the share of the regions' consolidated budgets in total revenues of the Russian budgetary system was 35.7%, then it had been growing up to 43.6% till 2009, followed by the drop to 33.4% in 2014, and in 2016 it amounted to 35.8%. The growing dependence of regional budgets on the federal center is manifested in decrease in the share of own revenues in the regional consolidated budgets, increase in the share of inter-budgetary assistance in their total revenues, and imbalance between revenue sources and spending obligations of subnational governments.

The third feature is the existence of so-called system of delegated mandates, when decisions of a higher level are descended to perform to the lower level supported by appropriate resources. This type of assistance mainly represented by subventions contradicts to the subsidiarity principle of budget federalism, according to which it is the lower level that should delegate authority and transmit resources to higher level. Moreover, economists are concerned about increase in unfunded mandates in Russian budget system (Oding et al., 2016). Their existence blurs the responsibility of the regional authorities for fulfillment of the obligations discharged from the top (Yushkov et al., 2016).

Fourthly, the inter-budgetary assistance in Russia is based on different types of transfers: grants (dotation), subsidies, subventions and so-called other transfers. Other transfers are also represented by subsidies and subventions distributed by federal off-budget funds among regional budgets. From all the types of inter-budgetary aid only grants are non-targeted. Moreover, they are distributed under the long-run rules taking into account the general condition of regional budgets. However, the share of grants in intergovernmental assistance in Russia has decreased from 69% in 2005 to 31% in 2012 (then it was stabilized and insignificantly increased), while the share of subsidies and subventions had grown over time. Increasing number of haphazard subsidies and subventions becoming more specified and less transparent, indicates the practice of manual control over regions (Zubarevich, 2014). In such a system, the regions suffer a shortage of resources to carry out their own economic policies based on internal goals and priorities. They have to cover budget deficit and finance their own investment programs through costly borrowing mainly from banks (Akindinova et al., 2016) having faced significant increase in their public debt in recent years (Zubarevich, 2014).

Fifthly, economists argue about the effectiveness of intergovernmental assistance in Russia both from the standpoint of its influence on reduction in regional disparities in budget provision and impact on incentives for regional development. They also emphasize the problem of opportunistic behavior of regions, prone to understate tax capacity and exaggerate the need for budgetary assistance (Yushkov et al., 2016).

Some researchers advocate the existing system of inter-budgetary aid in Russia. Thus, (Deryugin, 2016) calculated the compensation of outstripping economic growth in Russian regions with subsequent reduction in equalization grants distributed in line with the current regulations. He found that in all funded regions the compensation of economic growth would be less than 100%. Additionally, he revealed that the regions with pre-distribution budget provision level within 0.6-1 should benefit from economic growth considerably more compared to the regions with lower budget provision. Finally, the author concluded that the applied technique positively affected the stimuli to regional development. Another researcher (Yushkov, 2016) applying econometric modeling proved the positive influence of the share of inter-budgetary transfers on economic growth in the Russian regions.

A number of studies suggest specific measures to improve the effectiveness of intergovernmental assistance in Russia. They are: expanding of the block broad-based subsidies, reducing the number of subventions, rejection of subsidies for budget balancing, which are in a greater degree a tool for manual management, enlargement of the share of non-targeted transfers resulted in the extension of regions autonomy (Timushev, 2016), unification of subventions, shifting some underfinanced mandates to the federal level (Yushkov et al., 2016).

The purpose of our current study is to analyze the impact of different components of regional budget revenues, both own incomes and gratuitous assistance, on the ultimate interregional inequality in budget provision per capita based on last tendencies. We are particularly interested in measurement of elasticity of total spatial inequality with respect to different income sources in Russian budget system.

The main hypothesis of our research is that various taxes and non-tax revenues make a different relative contribution to interregional budget inequality, which depends on their interrelation with regional economic development and the degree of pro- or counter-cyclicality. At the same time, the impact of inter-budgetary transfers on interregional inequality depends on their built-in explicit and implicit goals.

2 Methodology and Data

Our research is based on the official data on 83 Russian regions in 2012-2015 provided by the Federal Treasury (FT) and Federal State Statistics Service (FSSS) of Russian Federation. The data embraces the regions' consolidated budget revenues detailed by sources and the average number of population in regions.

We apply three alternative techniques for evaluation of spatial budget inequality and its further decomposition by income sources. All of them allow to present total inequality in additive form, i.e. as a simple sum of the contributions made to it by different sources.

The first approach is based on *the population-weighted squared coefficient of variation* (CV) and the A. Shorrocks technique for its decomposition (Shorrocks, 1982). In this approach the relative contribution of each k-th source to total inequality ($CV(k)$) is calculated as follows:

$$CV(k) = \frac{Cov(y_k, y)}{Var(y)} = \sum_{i=1}^{m} \rho_i \cdot \left(y_{ik} - \bar{y}_k \right) \cdot \left(y_i - \bar{y} \right) \Big/ \sum_{i=1}^{m} \rho_i \cdot (y_i - \bar{y})^2 , \quad (1)$$

where $i = \overrightarrow{1,m}$ - serial number of the regions, ρ_i - the share of i-th region in total population of the country, y_{ik} - budget revenue per capita from k-th source in the i-th region, $\bar{y}_k = \sum_{i=1}^{n} \rho_i \cdot y_{ik}$ – average budget revenue per capita from k-th source in the country, y_i - budget revenue per capita from all sources in the i-th region, $\bar{y} = \sum_{i=1}^{n} \rho_i \cdot y_i$ - average budget revenue per capita in the country. Obviously, $\sum_{k=1}^{K} CV(k) = 1$.

The second technique of inequality decomposition by income sources related to *the Gini coefficient* was proposed by (Lerman and Yitzhaki, 1989). In this approach the absolute contribution of each k-th source to total inequality ($G(k)$) is assessed based on the covariance of relevant income with total distribution of population arranged in order of increase in total income per capita:

$$G(k) = \frac{2}{\bar{y}} \cdot Cov\left(y_k, F(y)\right) = \frac{2}{\bar{y}} \cdot \sum_{i=1}^{m} \rho_i \cdot \left(y_{ik} - \bar{y}_k \right) \cdot \left(\hat{F}_i - 0.5 \right), \quad (2)$$

where $i = \overrightarrow{1,m}$ - serial number of the regions ranked in order of increasing total budget revenues per capita, $F(y)$ – cumulative distribution of population among the regions ranked as stated above, $\hat{F}_i = \sum_{i=0}^{i-1} \rho_i + \rho_i / 2$ – a mid-interval of F-function for each i-ranked region, which population-weighted average equals 0.5. Eventually, the Gini coefficient for total budget revenues per capita equals: $G = \sum_{k=1}^{K} G(k)$.

The third approach to inequality evaluation and its additive decomposition is based on nested disintegration of *the Theil index*. In this technique the absolute contribution of each k-th source to total inequality ($Th(k)$) is computed as follows:

$$Th(k) = \alpha_k \cdot \sum_{i=1}^{m} \rho_i \cdot \left(y_{ik} / \bar{y}_k \right) \cdot \ln\left(y_i / \bar{y} \right) = \sum_{i=1}^{m} \rho_i \cdot \left(y_{ik} / \bar{y} \right) \cdot \ln\left(y_i / \bar{y} \right), \quad (3)$$

where $\alpha_k = \bar{y}_k / \bar{y}$ - the share of k-th source in total budget revenues. This approach is applicable only when all regional revenues are non-negative and national-wide average revenues are strongly positive. Evidently, the Theil index for total incomes inequality equals: $Th = \sum_{k=1}^{K} Th(k)$.

For the last two mentioned techniques the proportional contribution of each k-th source to total inequality is determined as its share in the total Gini and Theil indices.

According to (Yitzhaki and Schechtman, 2013) and some following research (Jurkatis and Strehl, 2014), the relative importance of each source in total inequality may be evaluated by means of *the Gini elasticity with respect to different incomes*:

$$\eta_k = G(k)/G - \alpha_k. \quad (4)$$

This elasticity shows how many percent of total inequality may be obtained due to increase in relevant income by 1%.

3 Results and Discussion

The table 1 generalizes the results of evaluation of contributions of different income sources to interregional inequality in budget provision in Russia in 2012 and in 2015 obtained by use of three alternative techniques. The sources' shares in inequality are compared with their shares in total budget revenues.

According to our estimations, the own regional budget revenues have provided 72.8% of total earnings of consolidated budgets of Russian regions in 2012 and 71.3% in 2015. At the same time these sources' contribution to spatial inequality in budget provision was noticeably higher compared to their contribution to total revenues. It varied between 90% and 110% over time measured by different coefficients of inequality. Comparison of two relevant shares indicates the growth of relative impact of own regional sources on total spatial inequality in budget provision.

In the group of own regional incomes the tax-based revenues proved to be the most influential. They provided 65.7% of total regional budget revenues and 78.9-93.5% of

total interregional inequality in 2012. By 2015 their contribution to budget revenues had dropped to 64.7%, while their contribution to inequality had grown up to 80.3-96.0%.

The personal income tax is the most profitable tax of Russian regions ensuring circa one third of total tax revenues. In 2013 its share in tax revenues was the highest over the period considered, 36.5%. This tax is fully allocated at the sub-federal level and after that it is shared between regional and municipal levels pursuant to the rule established by the law on the regional budget for the corresponding year. The personal income tax's absolute contribution to budget revenues inequality is also noticeable, although its relative contribution varies within 0.966 (CV_{2012}) – 1.466 ($Theil_{2013}$).

Table 1 The contribution of various budget sources to interregional inequality and to total revenues of consolidated budgets in Russian Federation in 2012 and 2015, %

	2012				2015			
	CV(k)	**G(k)**	**Th(k)**	**α_k**	**CV(k)**	**G(k)**	**Th(k)**	**α_k**
Corporate Income Tax	37.3	37.6	51.8	22.4	42.3	35.7	53.4	19.7
Personal Income tax	29.0	31.4	34.8	25.6	25.3	33.6	33.5	26.2
Property Taxes	10.3	8.9	9.7	8.9	9.4	10.7	10.2	10.0
Excise duties	-0.4	0.4	-4.7	5.0	-0.6	-0.2	-4.8	4.6
Special tax regimes	1.5	2.0	0.5	3.1	1.6	2.2	0.9	3.2
Other taxes	1.1	1.0	1.3	0.7	2.3	1.8	2.9	1.0
Non-tax revenues	10.8	10.3	13.7	7.0	10.8	10.4	14.1	6.6
Total tax and non-tax revenues	89.7	91.6	107.3	72.8	91.1	94.2	110.2	71.3
Grants (dotation)	3.7	1.1	-0.3	5.9	3.3	-1.1	-2.1	5.6
Subsidies	-0.1	0.9	-5.8	6.5	-0.6	-1.0	-4.8	3.6
Subventions	0.5	0.6	-1.9	3.2	0.2	0.3	-2.2	3.1
Other inter-budgetary transfers	4.1	4.9	-1.4	10.9	5.3	6.9	-1.9	15.9
Other receipts and refunds	2.1	0.9	2.1	0.6	0.7	0.7	0.8	0.5
Total gratuitous receipts	10.3	8.4	-7.3	27.2	8.9	5.8	-10.2	28.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: CV(k) – contribution of k-th source to the coefficient of variation; G(k) – it's contribution to the Gini coefficient; Th(k) – it's contribution to the Theil index; α_k – it's contribution to total revenues.

Source: author calculations based on the data provided by Russian Federal Treasury (FT) and Federal State Statistics Service (FSSS)

The second most profitable tax for Russian regions budgets is the corporate income tax, which rate was distributed among the federal and sub-federal levels in proportion 2% against 18% till 2017. For 2012-2015 the contribution of the corporate income tax to total tax revenues of consolidates regional budgets has dropped from 28.4% to 24.6%. However, the relative influence of this tax on inequality has enhanced over this period: according to the coefficient of variation - from 1.663 to 2.146, by the Gini coefficient - from 1.676 to 1.808, and by the Theil index – from 2.308 to 2.709. Apparently, recession in economy affected the relative influence of personal income tax and corporate income tax on interregional inequality in budget provision in opposite direction.

The property taxes given as a whole appeared the relatively enhancing inequality in 2012-2014, whereas in 2015 their share in interregional budget disparities occurred approximately the same as their share in budget revenue, i.e. about 10%. However, a more detailed analysis revealed significant differences within this group. The lion share of inequality was provided by the corporate property tax. Thus, its share in total inequality in 2012 amounted to 9.76% (according to CV), 7.72% (by the Gini), and 10.63% (by the

Theil), while its share in budget revenues was 6.08%. By 2015 its share in revenues has slightly increased (6.69%), while its share in inequality has changed ambiguously.

The absolute impacts of other property taxes on budget revenues and on spatial inequality were very small. Despite the flattening role in regional disparities, they could not noticeably affect them. Thus, personal property tax provided only 0.28% of total budget revenues and ensured 0.03-0.2% of total budget inequality in Russian regions in 2015. Simultaneously, transport tax ensured 1.32% of budget proceeds and 0.33-0.88% of total inequality, and land tax created 1.74% of income and -0.59-0.91% of inequality.

The special tax regimes, including the simplified taxation system for small and medium-size businesses, the unified tax on imputed income for certain types of activities, the unified agricultural tax and the patent system of taxation demonstrated relatively positive influence on reduction in spatial disparities in budget sphere. However, due to small share in total budget revenues (2-3% in various years) their contribution to total disparities and regional convergence in budget provision appeared to be very small.

Other own revenues of regional budgets include the mineral extraction tax and royalties paid under the so-called 'production sharing agreements'. A very small part of such taxes remains at the regional level, whilst a huge portion of these is allocated at the federal budget. Nevertheless, this source has relatively enhanced inequality.

The non-tax incomes generate another part of own regional budgets revenues. They brought about 6.5-7% of total revenues but made relatively higher contribution to total spatial inequality. The largest portion of them, about 3.4%, was generated by use of state and municipal property, which ensured 5.3-8.1% of total budget inequality in 2015. Compared to 2012, the share of this source in both revenues and inequality has increased. The next important source, sales of tangible and intangible assets, provided only 1.2% of total budget revenues in 2015 and has been relatively enlarging inequality.

The second group of regional budget revenues is formed by the gratuitous receipts, which provided about 27-29% of total budget incomes. Most of them are inter-budgetary transfers transmitted from the federal to regional levels of budget system. Obviously, they impose substantial smoothing effect on budget system spatial inequality.

The grants are unconditional transfers provided in two main forms. Overall they comprise less than $1/5^{th}$ of inter-budgetary aid. The grants for alignment of the budget provision per capita amounting to 64-76% of all grants have demonstrated considerable and stable leveling effect. The grants for balancing of regional budgets have ensured much less but increasing smoothing effect, which is better detected by their elasticity (table 2).

Table 2 Elasticity of spatial inequality in budget provision assessed by the Gini coefficient with respect to different income sources

	2012	2013	2014	2015
Corporate Income Tax	0.152	0.131	0.154	0.159
Personal Income tax	0.058	0.080	0.074	0.074
Property Taxes	0.000	0.005	0.004	0.007
- **personal property tax**	-0.001	-0.001	-0.001	-0.001
- **corporate property tax**	0.016	0.020	0.019	0.020
- **transport tax**	-0.003	-0.003	-0.003	-0.004
- **land tax**	-0.012	-0.012	-0.011	-0.008
Excise duties	-0.046	-0.050	-0.045	-0.048
Special tax regimes	-0.011	-0.010	-0.010	-0.011
Other taxes	0.003	0.004	0.006	0.008
- **mineral extraction tax**	0.004	0.005	0.006	0.010
Non-tax revenues	0.033	0.040	0.037	0.039
- **use of state and municipal property**	0.013	0.019	0.022	0.027
- **sales of tangible and intangible assets**	0.015	0.009	0.011	0.008
Total tax and non-tax revenues	0.189	0.201	0.219	0.229
Grants	-0.049	-0.064	-0.074	-0.067
- **for alignment of budget provision**	-0.053	-0.054	-0.051	-0.052
- **for support of budgets balancing**	0.005	-0.009	-0.023	-0.015
Subsidies	-0.056	-0.055	-0.048	-0.046
Subventions	-0.026	-0.022	-0.024	-0.028
Other inter-budgetary transfers	-0.060	-0.068	-0.081	-0.089
- **for Territorial Compulsory Medical Insurance Funds**	-0.060	-0.070	-0.079	-0.082
Other receipts and refunds	0.003	0.007	0.008	0.001
Total gratuitous receipts	-0.189	-0.201	-0.219	-0.229

Note: specification of some groups is incomplete, only main items are presented.

Source: authors calculations based on the data provided by Russian FT and FSSS

The subsidies are inter-budgetary transfers designed for co-financing of expenditure obligations of the lower budgets. They are strictly targeted and issued by decision of higher authorities for specific purposes, e.g. support to certain industries, events, activities or groups of population. The total share of subsidies in inter-budgetary aid has reduced almost twice from 2012 to 2015. Their leveling effect remains essential, albeit relatively decreasing.

The subventions comprise earmarked non-matching transfers aimed at financing expenditure obligations of regional governments following by corresponding regulations of federal level. According to our calculations, subventions demonstrate stable contribution to regional budget revenues and relatively moderate counteraction to inequality. This result is quite consistent with the findings by (Yushkov et al., 2016), showed that the proportion of subventions in inter-budgetary aid in 2014 was higher in more affluent Russian regions compared to backward ones.

The fourth part of federal aid called 'other inter-budgetary transfers and revenues from the budget system' consists of mixed type of assistance distributed for current purposes and changing from year to year. Now the main portion of this source belongs to transfers from Federal Compulsory Medical Insurance Fund to the regional medical insurance funds. The total share of other transfers in budget revenues has shown outstanding growth, by more than 45%, and their absolute contribution to inequality has been the greatest among all transfers. However, according to the elasticity calculation, these transfers precisely ensured the greatest equalizing effect.

Other receipts and refunds, including transfers from various organizations, had little effect on Russian regions budget provision whereas their impact on spatial inequality was rather inconsistent.

4 Conclusions

In this study, using the population-weighted indices of inequality, i.e. the coefficients of variation, Gini and Theil, and the methods of their additive decomposition, we obtained the contribution of various types of regional budget revenues to the overall interregional inequality in the level of budgetary provision per capita in Russia in 2012-2015. The absolute assessments of the sources' contribution to income and inequality were supplemented by calculations of relative indicators - the elasticity of the Gini coefficient of interregional inequality with respect to various types of income. The study confirmed the hypothesis of different absolute and relative contributions of various types of tax and non-tax revenues, as well as gratuitous assistance to interregional inequality in budget provision, withal sensitive to economic conditions.

In the group of own budget revenues, the greatest absolute contribution to inequality was made by tax revenues, especially by corporate income tax and personal income tax. However, the greatest relative contribution to inequality was provided by taxes from enterprises – corporate income tax and property income tax, as well as non-tax incomes, especially incomes from use of state and municipal property and from sales of tangible and intangible assets. Despite personal income tax has positively affected inequality, its relative impact was considerably less compared to corporate taxes. At the same time personal property tax, excise duties and special tax regimes demonstrated the negative relative influence on inequality.

Generally, intergovernmental transfers provided considerable reduction in regional budget provision disparities. Among the types of this aid, the grants for support of budgets balancing and subventions demonstrated the least relative smoothing effect. Grants for alignment of regional budget provision had a significant impact on reducing interregional differences, while subsidies moderately contributed to it. Meanwhile, the greatest relative impact on the reduction of interregional differences was provided by transfers from extra-budgetary funds, primarily Federal Compulsory Medical Insurance Fund, which in fact were also subsidies and subventions. This allows us to conclude about the implicit leveling function of absolutely all transfers, which in turn fits into the policy of manual management of regions. Apparently, the equalization power of transfers was restrained by manipulations undertaken by regional authorities claiming their needs and hiding potential and the federal center seeking for political and economic rent in cooperation with some regions.

We foresee further development of the issue of interregional inequality in budget provision in improving the decomposition methodology, as well as more thorough explanation of formal and informal institutions' impact on horizontal alignment in Russian budget system.

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Corporate Tax Revenues of Selected EU Countries Using Spatial Autocorrelation Approach

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Abstract: *The reason of state interventions in economic processes of countries is in the economic literature supported by the hypothesis of the failure of the market mechanism with the efficient allocation of economic resources in the context of social optimum. In terms of fiscal policy affecting the rate of growth of corporate income tax revenues, there are numbers of views expressed by experts in economic theory. During the process of increasing internationalization, it is important to monitor the economic, and spatial contexts that are influencing changes in corporate tax revenues in countries. The main goal of this study is to model spatial autocorrelation of corporate income tax revenues in the EU member countries of selected time periods. Authors analyse the spatial structure of corporate income tax revenues of selected EU member countries by using the Local Indicators of Spatial Association Method. The used method identifies the range of the relevant spatial clusters of selected indicator, while the partial aim of the contribution is to identify areas with negative spatial autocorrelation of selected EU member countries' corporate income tax revenues. The results of the analysis are compared by observing fiscal indicators in terms of the tax policies of individual countries.*

Keywords: corporate income tax revenues; spatial autocorrelation; local indicators of spatial association (LISA) method

JEL codes: H20, H61

1 Introduction

Corporate income tax includes a number of determinants of economic, political and social character that are often subject to multiple changes, and therefore it is important to monitor its development in national conditions as well as in an enlargement as part of international groupings (Tanzi, 1996; OECD, 2014; Schultzová, 2015). Corporate taxation is an important factor for business "when they decide where to invest, how much to invest, and which types of operations to locate in which countries. No longer can a country levy high taxes on business investment and activity without adversely affecting its economic performance" (Pomerleau and Cole, 2016). Investigation of the development, as well as differences in corporate taxation of individual countries, can be realized from the perspective of corporation, in relation to the effective taxation, capital costs, tax-deductible costs, FDI, provision of tax concessions and incentives, and other tax and legal institutions (Vartia, 2008; Barrios et al., 2009). The second important consideration is a survey of revenues to the state budget, from the perspective of public finances and tax policy, tax revenues and GDP, macroeconomic indicators of corporate sector, transfers of mobile bases, corporate sector expansion, and tax competitiveness (Lee and Gordon, 2005; Bayer, 2011; Macek, 2015; Zuluaga, 2016).

The aim of the paper is to model spatial autocorrelation of corporate income tax revenues in the EU member countries of selected time periods. The rest of the paper is organized as follows. The literature review is given in the second chapter, the

methodology is discussed in the third chapter and the fourth chapter provides the results. The fifth chapter is devoted to a conclusion.

2 Theoretical Background

Examining the development and comparison of corporate income tax in selected EU member countries is motivated by the recognition of the status of corporate income tax revenues and their mutual transfers between countries. In connection with tax theory, the existence of corporate income tax fulfills several tasks that affect macroeconomic developments (Kubátová and Říhová, 2009).

The structure of a country's tax code is an important determinant of its economic performance (Šoltés and Gavurová, 2014). In 2015, fiscal burden of corporate tax of selected European Union countries was 2.66% of GDP, from 1.47% of GDP in Slovenia to 4.53% of GDP in Norway (OECD, 2017). Different development stems from several factors shaping the tax system and fiscal policy preferences (Siničáková et al., 2017). The imbalance between corporate income tax revenues in selected member countries is considered to be the effect of tax competition resulting from the different macroeconomic situation of the countries as well as from the different tax legislation. In order to compare corporate income tax revenues between selected EU Member states, this part of the contribution is devoted to a possible ways of comparing the corporate tax reveues using the most frequently used tax indices, which are: standard tax rate, average tax rate, corporate income tax revenue ratios of the total tax revenues or tax quota II representing the share of corporate income tax revenues determinated with social and health insurance contributions to GDP.

The simplest determinant of corporate tax reveues that mainly affects the behavior of corporations and their investment activity in countries is considered to be the standard tax rate. Because the determinant does not reflect complex information about the corporate tax reveues, in particular, because of the possibility of reducing corporation profits by applying tax legislation to taxable income, there is a distortion in the interpretation of the results. The indicator is reliable in the case of limited opportunities for taxpayers to reduce their tax base. The interaction between standard tax rate and the corporate tax reveues suggests a negative relationship between the variables (Devereux, Griffith and Klemm, 2004; Kenny and Winer, 2006; Clausing, 2007). Correlation between standard tax rate and the corporate tax reveues analyse Mintz and Tulkens (1986) too. According these authors, when countries with high tax burden increase the standard tax rate, cross-border shoppers move to neighbouring countries with lower standard tax rate. Kanbur and Keen (1993) extended the research by including state revenue maximisation. The results suggest that smaller countries set lower tax rates than neighbouring countries, thus producing an increase in income from foreign consumers, hence increasing the loss of revenue from domestic individuals. The opposite is true for big economies.

Another determinant for international comparison of corporate tax reveues is average tax rate. Examining the corporate tax reveues only by taking into account the previous indicators is inadequate, because it does not reflect the tax deductions of corporations, although it takes into account many other factors that are considered to be important for investment and job opportunities, and may give misleading information about its effects on the tax system (MoFSR, 2001). Another way of international comparison of corporate tax reveues is to monitor ratio indicators, e.g. corporate tax reveues as a percentage of GDP (e.g. Castro and Camarillo, 2014). The authors recorded the positive relationship between the development of corporate tax reveues and GDP. The ratio indicator provides only limited tax information about the development of corporate tax reveues in the country. In order to capture the development, as well as changes in tax systems, tax bases and tax rates, Devereux, Griffith and Klemm (2004) are noticing a decline in the indicator in most countries for two reasons. The first reason is resulting from legislative

changes that are reducing the standard tax rate, which negatively affects corporate profits and returns on investment. The second reason is based on the criticism of the corporate tax reveues analysis method.

The development of corporate tax reveues in individual countries is often affected by volatility for reasons other than tax systems, for example, because of a relative corporate tax reveues in proportion to GDP. The factors that affect the height and the development of corporate tax reveues to GDP ratio include the extent to which economic assistance is provided through the tax expenditures, the relationship between tax base and GDP, GDP growth rate, tax evasion, time intervals between the creation and adoption of a change in a particular tax or corporate governance (Škare and Hasić, 2015; Temur et al., 2017). Another ratio indicator for international tax revenues comparison is tracking the rate of corporate tax revenue growth over the previous period. In this work it is this indicator that is used and is subsequently modified by the Local Indicators of Spatial Association Method.

3 Methodology and Data

The paper uses the Local Indicators of Spatial Association Method (LISA) to identify a group of countries that have the same or opposite pace of development of corporate tax revenues R. Spatial autocorrelation is defined as the presence of the spatial structure of mapped variables due to their geographical proximity (Gregory et al., 2009; Slavík et al., 2011). If similar values of the selected indicator are located in the area closer together, it is a positive spatial autocorrelation. If there is a grouping of significantly different values, it is a negative spatial autocorrelation. Most indicators and variables in social science disciplines have mainly slightly positive spatial autocorrelation. The spatial autocorrelation rate is most frequently quantified by Moran and Geary coefficient of spatial autocorrelation. The present analysis uses the method of Moran coefficient of spatial autocorrelation I, which is given as:

$$I = \frac{n}{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}} \times \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}(x_i - \bar{x})\left(x_j - \bar{x}\right)}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \tag{1}$$

where n is the number of spatial units, in this paper those are the selected European countries, x_{i_t} it is the value of the variable, in this paper it is the rate of change of R in a particular year, and $\bar{x}$ is the arithmetic mean of the variable. W_{ij} represents the spatial weight between the *i* and *j* country.

The analysis is carried out in selected 22 EU countries, namely Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, and the United Kingdom. It is important to note that the analysis does not follow data for Macedonia, Albania or Bulgaria, which are the direct European neighbors of Greece. For this reason, Greece is excluded from observation to determine spatial analysis using the spatial weight matrix. Data of R are taken from the Revenue Statistics published by the OECD each year, 2001, 2004, 2010, 2011, 2013, and 2015.

For each country, R is available in the domestic currency for the period 2000-2015. For each country, the rate of corporate tax revenue growth is determined by:

$$x_{i_t} = \frac{R_{i_t} - R_{i_{t-1}}}{R_{i_{t-1}}} \tag{2}$$

Where x_{i_t} is the growth of corporate tax revenues of the country i at time t and R_{i_t} is the amount of R in the domestic currency of the country i at time t.

The matrix of spatial weights W is intended for 22 countries using the method of the six closest neighbors. The number of 6 neighbors represents according to Gregory et al. (2009) an optimum number. The main objective of the contribution is to model spatial autocorrelation of R in the EU member countries of selected time periods. The analysis should point to the difference in dynamics of corporate tax revenue development in selected European countries at various times. The assumption is that the tax "increase" (or "decrease") of corporate tax revenues in a particular country may, in addition to other endogenous variables, also be caused by the exogenous variable "decrease" (or "increase") of CIT in the neighboring countries, similarly as in the study by Mintz and Tulkens (1986) and Kanbur and Keen (1993). For this reason, we expect a negative or no spatial autocorrelation in the Moran coefficient analysis.

The following hypothesis *H* was chosen based on the target of the post: "The decline in the growth of corporate tax revenue is affected by the change in tax and macroeconomic indicators of neighboring countries, where the growth of corporate tax revenues rises". In the analysis, we identify countries whose value of the indicator is high and their neighbors have a low value and vice versa. This information is provided by the LISA method, which, unlike the Moran coefficient, is finding the local clusters of spatial autocorrelation. The considerable heterogeneity of the analyzed European countries requires the use of a method of identifying local autocorrelated areas. Based on Anselin (1995), 5 situations are derived:

- Locations with high values and with similar neighbors (high-high): positive local spatial autocorrelation.
- Locations with low values and with similar neighbors (low-low): positive local spatial autocorrelation.
- Locations with high values and with neighbors with low values (high-low): negative local spatial autocorrelation.
- Locations with low values and with neighbors with high values (low-high): negative local spatial autocorrelation
- Locations where local spatial autocorrelation is not statistically significant.

The analytical part of this work is implemented in the environment of language R. Used are mainly libraries of econometric models for spatial panel data *splm*, linear models for panel data *plm*, bindings for the geospatial data abstraction library *rgdal* and SPArse Matrix *spam*.

4 Results and Discussion

The aim of the paper is to analyze and compare the differences in the development of selected indicator between countries EU and subsequently compare the results with selected traditional macroeconomic indicators. In this part of the contribution, we selected three groups to compare in the period between 2001 and 2004, 2010 and 2011, and 2013 and 2015 that shows significant changes. The paper focuses on the high-low and low-high categories. We identified countries with negative autocorrelation by using LISA method. In the following chapter we are listing mainly the most significant changes in the indicator's development that occurred especially under the influence of global changes, or changes in the tax systems of selected countries.

We selected the tax quota II from the traditional macroeconomic indicator. From 2000 to 2015, there is a significant fluctuating development in tax quota II recorded in selected countries. The average tax quota II in 2000-2015 was 2.99% of GDP, in the concrete between maximum 3.53% (2007) and minimum 2.55% (2014). The decline in the indicator was primarily caused by the global economic crises, changes in the economic activity of corporation, tax legislation and changes in GDP levels (Mikalauskiene et al., 2016). The highest tax quota II among selected countries was in Norway, at 12.59% of GDP (2006). According to OECD (2014), "corporate tax code complexity is quantified by

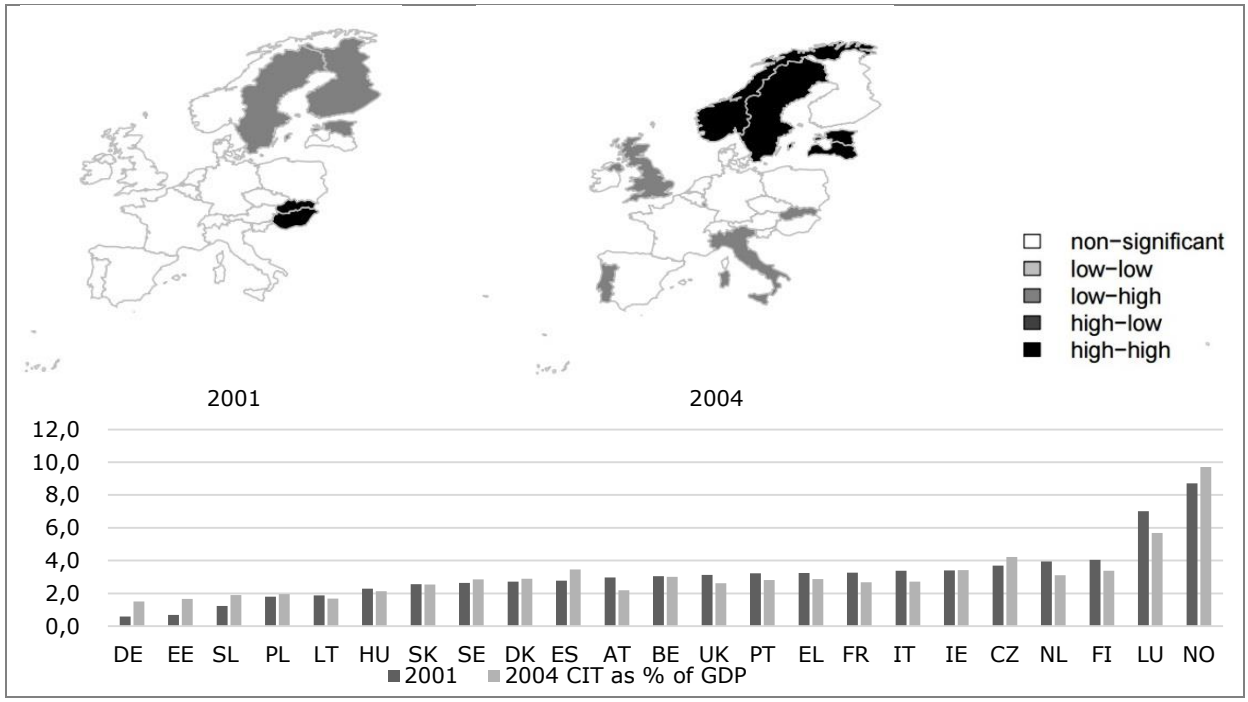
measuring the tax compliance burden placed on firms. These burdens are measured by the number of payments made for the corporate income tax, as well as the time needed to comply with the tax (measured in hours of compliance time per year)". Norway imposes the fewest number of payments with 3. The lowest tax quota II was recorded in Germany at 0.58% (2001), with a tax rate of 45% since 1999, then reduced to 25% (2001) and 15% (2008). It is necessary to add a trade tax and a solidarity tax to it. Countries with long-term above- tax quota II in the entire selected period are Cyprus, Luxemburg, Malta, Ireland, Romania and Czech Republic.

Period 2001 to 2004

At the beginning of the analysis (2003-2005), we monitor in the Nordic countries (Norway, Sweden) areas so-called high-high indicating that the corporate tax revenues of these countries and their neighbours (Finland, Denmark) have grown during this period. This result reflected the decrease in government spending, the elimination of double taxation of dividends in 2003, the growth in corporate profits and a decline in a tax rate of corporation. The share of the tax on GDP was reduced in percentage terms, but corporate tax revenues in absolute terms increased. The tax burden in Finland in monitored period was one of the highest among the other selected countries, but at the same time also the lowest among the northern only countries.

In addition, we identify areas such as Portugal, Slovakia, Italy, or the UK located in a low-high sector, which indicates that corporate tax revenues of these countries have declined over the period while this indicator have increased in their neighbours. In the case of Slovakia, in 2000, the tax rate for the legal entities decreased from 40% to 29% in the country. This change influenced the increase of tax revenues to the state budget as well as the growth of the submitted tax returns. The change took place in 2001, whereby Slovakia changed its position to high-high.

Figure 1 Autocorrelation of growth of corporate tax revenue by using LISA method and tax quota as % of GDP in 2001 and 2004



Source: Authors

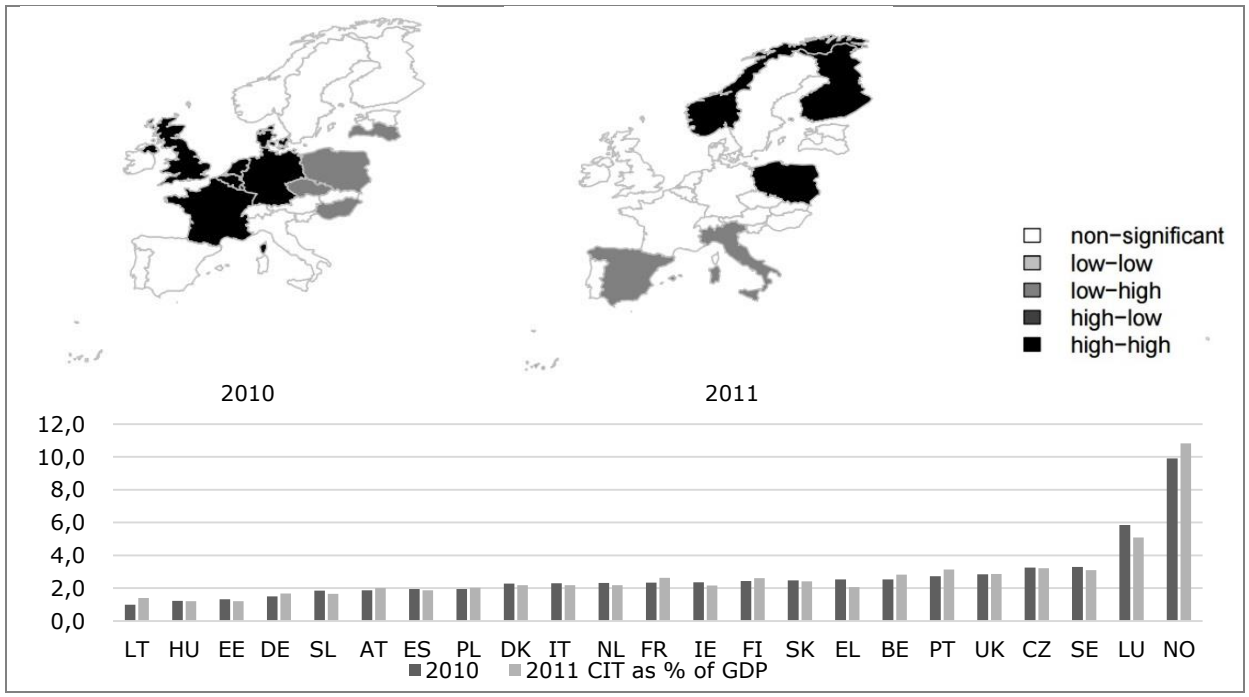
The analysis has shown that despite ongoing integration within the European countries, differences still remain between member states. These differences are both in the indicators of the countries´ maturity, but also in the economic policies of individual

governments. It is confirmed that the process of integrating and harmonizing policies is a long-term, dynamic and unique process.

Period 2010 to 2011

In 2009, corporate tax revenue, compared to 2008, declined as a result of the culminant financial crisis, with the exception of Luxembourg (a negligible increase of 3.59%). In general, Luxembourg regularly increases the revenue from income tax of legal entities despite the very small size of the territory. This is due to the existence of a large and highly developed financial sector and a highly internationalized tax base. This result was also reflected in the graphical representation. The number of decrease varied in countries (the highest in Latvia by 59.83% and the lowest in Slovenia 2.71%). These considerably heterogeneous values have resulted in statistically insignificant spatial autocorrelations in most locations. Years 2010 and 2011 represent a period of economic recovery, resulting in a growth in corporate tax revenue. As we can see, this rise was triggered in 2010 by the largest European economies (Germany, the United Kingdom, France), which have also positively influenced their neighbours. These countries have a long-term above-average tax rates (above the EU average for the year). Despite that the traditional indicator of the tax quota points to a slight change in shares of corporate tax on GDP in the years 2010 and 2011.The tax reform in 2008 in Germany brought significant changes in the taxation of legal entities, what immediately reflected in the revenues of the state budget. This change also affected the growth of corporate tax revenues, which improved the country's position on the high-high position, as well as in the neighboring countries of France, Netherland, Belgium, Luxemburg, and the Great Britain.

Figure 2 Autocorrelation of growth of corporate tax revenue by using LISA method and tax quota as % of GDP in 2010 and 2011



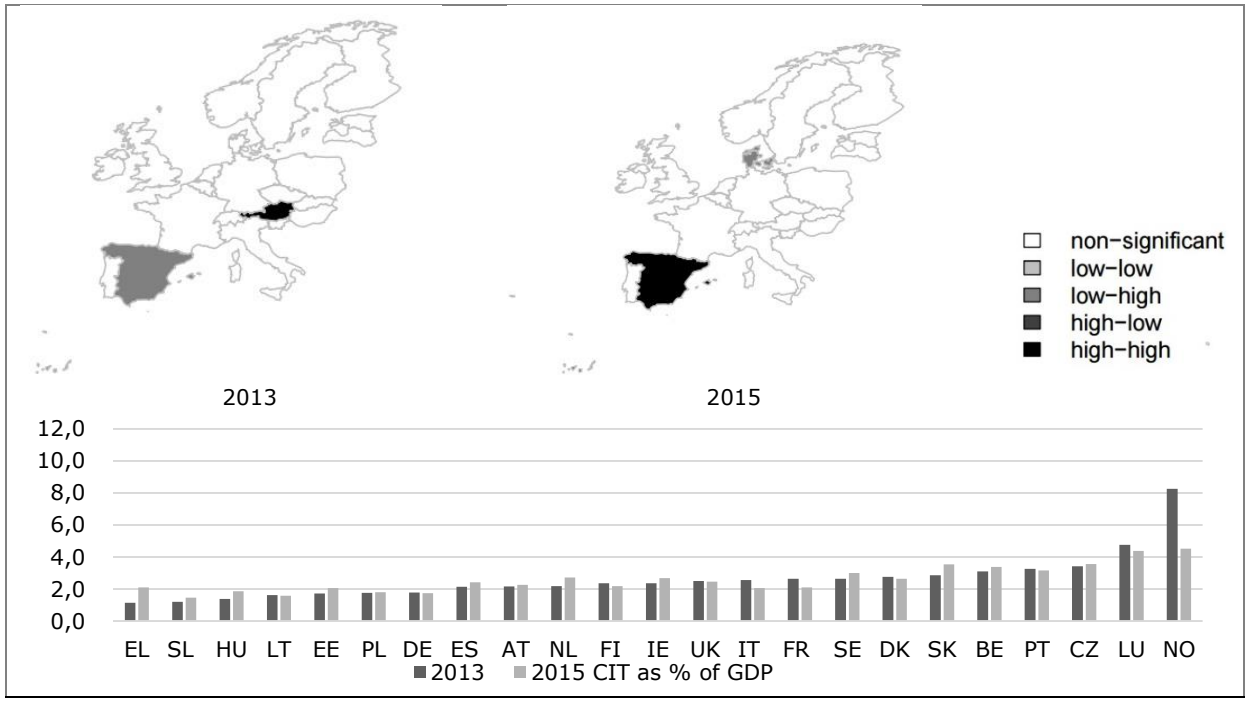
Source: Authors

In 2011, expansion has also shifted towards northeast of Europe, where it is possible to see the growth in corporate tax revenues of Norway and Finland and their neighbours, and Poland and its neighbours. Decline in corporate tax revenue has been seen in Spain and Italy as a result of the surge in this indicator of neighbouring countries.

Period 2013 to 2015

Between 2013 and 2015, a gradual harmonization of tax burden can be observed, resulting in the statistical non-significance of spatial autocorrelation in most locations. As we can see in the picture below, most of the observed countries hold the position of a non-significant impact of neighbours on changes in the growth of their corporate tax revenues. Significant changes are observed only in two countries; in 2013 in Spain, for which the low-high position is significant. Spain is one of the European states that was severely affected by the crisis and has not yet recovered. The bad state of public finances and the generally weakened health of the economy forced the Spanish government to make changes in the tax system as well. Spain, with the level of tax burden thus belongs to the group along with Greece, Ireland or Portugal. Applied changes in the tax system subsequently resulted in a change in the country's position in 2015.

Figure 3 Autocorrelation of growth of corporate tax revenue by using LISA method and tax quota as % of GDP in 2013 and 2015



Source: Authors

5 Conclusions

Examining the development of corporate tax is often complemented by a comparison of corporate tax revenues between selected countries by traditional or specific methods. Realized analysis confirm that the decline in the growth of corporate tax revenue is affected by the change in tax and macroeconomic indicators of neighbouring countries, where the growth of corporate tax revenues rises. In conclusion we interpret that within the selected EU countries, the imbalances in positions of individual countries were identified by using the LISA method. These imbalances are sequentially equalize within the integration group. The results of tax quota II show that the fall in the tax rate was not reflected in the decrease of tax revenues. This is due to the trend in the expansion of tax bases in individual countries, the granting of tax concessions and incentives to foreign investors and the improvement of the economic situation in all EU countries. Furthermore it is clear that despite ongoing integration within the EU countries and efforts to harmonize the tax system in the field of corporate taxation, there are still divergences between the member states.

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How are 1bis pension pillar funds performing? A cross-country analysis

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Abstract: *Private DC pension schemes implemented in CEE countries possess common features in the way how contributions are made, investment vehicles and investment management. As the investment risk and subsequent adequacy risk is effectively shifted onto savers, pension funds' performance net of fees and inflation is of utmost importance for the sustainability of the pension schemes and ability to deliver expected results from the view of replacement ratios. Understanding the investment returns and the impact of fees under the comparative analysis is therefore our main objective. Object of our research are the particular investment vehicles (pension funds) in three countries: Slovakia, Estonia and Latvia. Subject of our research is the risk adjusted returns of analyzed pension funds provided under the 1bis pillar pension scheme in these countries. We use conventional Sharpe and Sortino ratio to assess the performance and confirm that even if there are no major differences in investment policies, the risk adjusted performance is vastly different even when comparing similar pension funds based on their portfolio structure. We also suggest that these differences in risk adjusted performance may result in vastly different pension pots and thus replacement ratios.*

Keywords: 1bis pension pillar, pension funds, Sharpe ratio, Sortino ratio, performance

JEL codes: J26, J32, H55, O16, G11

1 Introduction

Over the past 20 years, several post-socialist countries have adopted World Bank recommendations and created a multi-pillar pension system by reforming pension systems. The traditional pay as you go (PAYG) system has been supplemented by the 1bis and third pillars, which are personal funded pension schemes, investing pension savings on the financial markets.

As the risks including the adequacy risk measured by replacement ratio are effectively shifted onto savers, ability to achieve targeted level of pension pot is of crucial importance. Two main determinants on the side of pension asset management companies influence the overall outcome: fees and performance.

In our article, we focus on three countries representing a pure DC private pension scheme (1bis pillar) – Slovakia, Estonia and Latvia. These countries have similar features of 1bis pillars and could be an object of comparative analysis. We focus on gross and net pension funds' performance in 1bis pillars in selected countries aggregated by fund category. According to the applicable law in these countries, by the term 1bis pillar we understand (Berthon et. al., 2016, Mavlutova, Titova and Fomins, 2016 or Malíček and Sokolová, 2016):

a) voluntary funded defined contribution (DC) scheme in Slovakia,
b) mandatory funded DC scheme in Estonia,

c) mandatory state funded pension scheme, which is financed partially by the social insurance contributions diverted from Pillar I in Latvia.

The aim of this paper is to analyze net and gross pension fund performance aggregated into categories based on portfolio structure. Using classic ratios as Sharpe ratio and Sortino ratio, we evaluate risk adjusted returns of pension funds and compare results of pension funds categories in selected countries.

2 Methodology and Data

In this paper, we work with monthly *m* and yearly *t* data about pension funds during the life of the 1bis pillar in selected countries. Table 1 below contains list of selected countries with data source and observed period.

Table 1 List of selected countries with source of data and observed period

	Acronym	Data Source	Observed period
Slovakia	SVK	NBS, www.manazeruspor.sk	2005 - 2016
Estonia	EST	www.pensionikeskus.ee	2003 - 2016
Latvia	LAT	www.manapensija.lv	2003 - 2016

Source: authors' elaboration

For valid evaluation of pension funds in selected countries we need to calculate yearly *t* gross returns *R* before inflation after fees for each pension funds *i* in every fund category *c* in pension system in country *j* as follows:

$$R_t^{i,c,j} = \frac{P_t^{i,c,j}}{P_{t-1}^{i,c,j}} - 1 \tag{1}$$

where $P_t^{i,c,j}$ is price of pension fund in category and country in time *t*, $P_{t-1}^{i,c,j}$ is price in previous period *t-1* and $t \in (1, \dots, T)$. Than we calculate weighted gross returns for each pension funds category $R_t^{c,j}$ as follows:

$$R_t^{c,j} = \frac{\sum R_t^{i,c,j} * AuM_t^{i,c,j}}{AuM_t^{c,j}} \tag{2}$$

where $AuM_t^{i,c,j}$ is value of asset under management of pension funds *i* in category *c* in country *j* at time *t* and $AuM_t^{c,j}$ is value of asset under management in category *c* in country *j* at time *t.* Than we calculate R_t^j as an overall gross profitability of whole pension system in country *j* in time *t* as follows:

$$R_t^j = \frac{\sum R_t^{c,j} * AuM_t^{c,j}}{AuM_t^j} \tag{3}$$

We indicate R_t^{*j} as an adjusted return after fees and inflation and calculate them as follows:

$$R_t^{*j} = R_t^j - I_t \tag{4}$$

where I_t is inflation rate valid for time *t.*

In order to evaluate pension funds' performance in selected countries, we apply two indicators which are widely used in financial practice. First is Sharpe ratio (SR) developed by Sharpe (1994, 2007). This ratio describes how much excess return investor receives for the extra volatility (risk) measure with different risk measures. SR is calculated as follow

$$SR_t^{c,j} = \frac{E[\mathrm{R}_t^{c,j} - \mathrm{R(f)}^j]}{\sigma[\mathrm{R}_t^{c,j} - \mathrm{R(f)}_t^j]} \tag{5}$$

where $SR_t^{c,j}$ is value of Sharpe ratio for pension fund category *c* in country *j* at time *t* and $\mathrm{R(f)}_t^j$ is risk free rate valid for country *j* in time *t*. In this paper, we use returns of 3 month treasury bills for selected countries from OECD database valid for observed period present in Table 1 as a risk free rate. Next ratio is Sortino ratio (*SoR).* This ratio was introduced by Frank Sortino in 1968 and described by Sortino and Van Der Meer (1991) and Sortino, Van Der Meer and Plantinga (1999). As the Sharpe or Treynor ratio, this ratio measure the risk-adjusted return of portfolio. The Sortino ratio is a variation of the Sharpe ratio that differentiates harmful volatility from total overall volatility by using the asset's standard deviation of negative asset returns, called downside deviation or target downside deviation (TDD). We used Sortino ratio providing by Pedersen and Ruddholm-Alfin (2003) or Pekar, Cickova and Brezina (2016) as follows:

$$SoR_t^{c,j} = \frac{E[\mathrm{R}_t^{c,j} - \mathrm{R(f)}_t^j]}{TDD_t^{c,j}} \tag{6}$$

where TDD can be calculated as follows:

$$TDD_t^{c,j} = \sqrt{\frac{1}{T}\sum_{t=1}^{T} \min(0, (\mathrm{R}_t^{c,j} - \mathrm{R(f)}_t^j))^2} \tag{7}$$

To calculate *SR* in (5) and *SoR* in (6) we use annualized returns of each pension funds category in each country for last 12 months.

In Table 2 we provide list of pension funds category with number of funds in each category used in our elaboration in this paper.

Table 2 Number of pension funds, fund category and country of origin

Fund category	Acronym	Country	Number of Funds
Stock pension funds	SPF	SVK, EST,LAT	6,5,8
Bond pension funds	BPF	SVK, EST,LAT	6,5,8
Mixed pension funds	MPF	SVK, EST,LAT	3,5,4
Index pension funds	IPF	SVK, EST	6,7,-

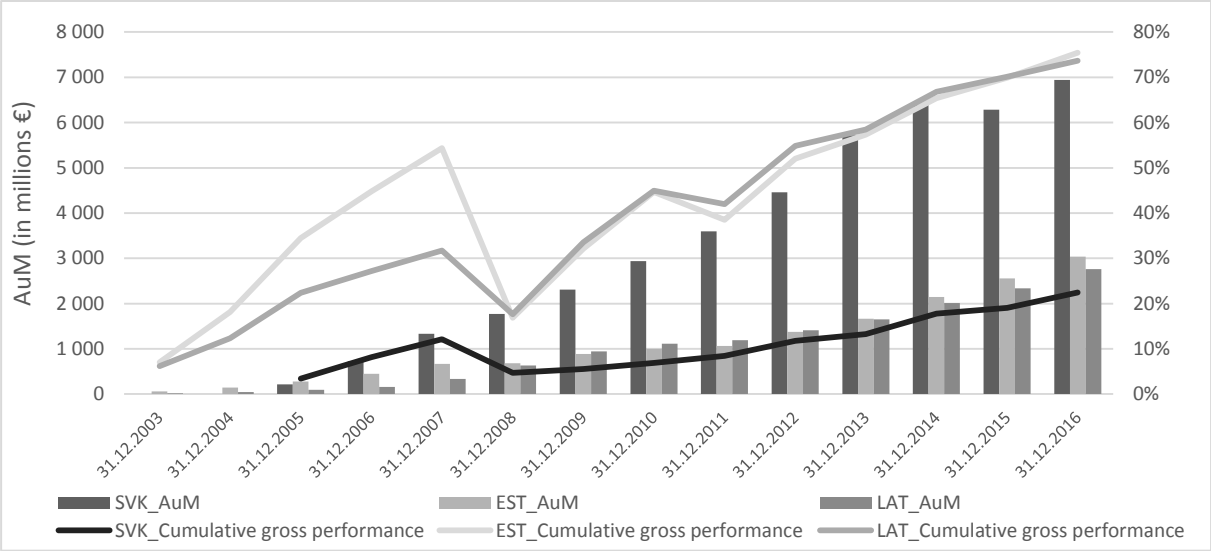
Source: authors' elaboration

All four categories of pension funds are provided by pension fund management companies only in Slovakia and Estonia. Only Latvia offers three type of pension funds (index pension fund category are missing).

3 Results and Discussion

In Figure 1 we could see very similar value of assets under management during following period in Estonia and Latvia with almost the same gross cumulative performance. Cumulative gross performance in these countries after 14 years of existence has reached 75,46 % in Estonia and 73,68 % in Latvia. In contrast, the volume of assets under management in Slovakia has grown significantly during the time and now stands at two to three times the amount of AuM in these two countries. Cumulative gross performance in Slovakia is significantly lower than in those countries, because of investment restriction in SPF´s and MPF´s from June 2009 till September 2012, large displacement of savers from risk pension funds to BPF´s in April 2013 till now (Šebo, Šebová and Virdzek, 2014) and mainly later inception of 1bis pillar than previous both Baltic countries. Different amount of AuM is due to the diversity of the national contributions and the amount of participants who contribute to this system (Berthon et. al., 2016).

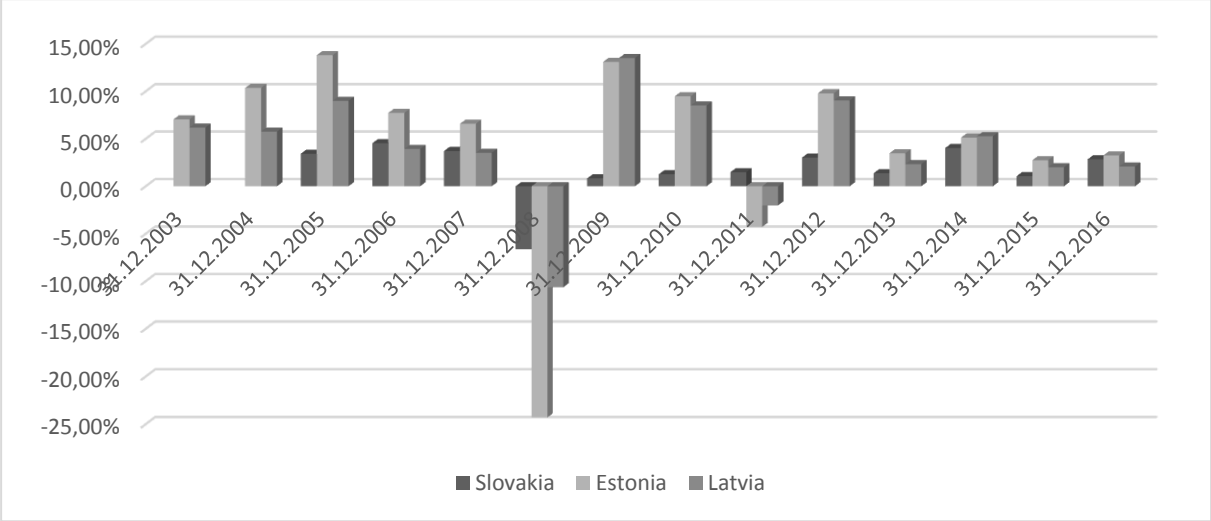
Figure 1 Assets under management gross cumulative performance in 1bis pillar in selected countries



Source: NBS, Manazeruspor.sk, Manapensija.lv, Pensionikeskus.ee, Money.net, 2017

In Figure 2, we see again very similar gross annual performance of pension system in Latvia and Estonia. This phenomenon is mainly due to almost identical investment policy in those countries (OECD, 2015). In Slovakia, gross annual performance is lower than in other countries for each year in following period due to later inception of 1bis pillar and investment restriction in the early years with huge amount of AuM in BPF´s after 2013. Further information about the share of each pension fund category in total assets in each country you can find in Berthon (2016).

Figure 2 Gross annual performance after fees before inflation in 1bis pillar in selected CEE countries



Source: NBS, Manazeruspor.sk, Manapensija.lv, Pensionikeskus.ee, 2017

According to Table 3, average annual gross return is the highest in Estonia, 4,56 % and Latvia 4,18 % p.a. In Slovakia, it is only 1,74 %. When we adjusted gross annual performance from inflation, we get net performance. Average net performance is below zero in Slovakia and Latvia, - 0,01 % and – 0,03 %. In Estonia, net performance is 1,16 % annually, which is better results than in previous countries. Another finding presented in the Table 3 is information about cumulative gross and net performance with

cumulative inflation. Estonia and Latvia has reached very interesting 75,46 % or 73,68 % cumulative performance from 2003 to 2016. This performance is significantly higher than Slovakia. In Slovakia, 1bis pillar has reached only 22,43 % cumulative performance from 2005 to 2016. This gross performance in Slovakia is significantly influenced by factors mentioned at the beginning of this chapter. When we adjust gross performance from inflation, we see real net cumulative performance which was provided by the 1bis pillar in each country. Big advantage of the 1bis pillar in Estonia and Latvia is their stable policy and minimal interference with the investment policies of pension fund management companies. Negative net cumulative performance is delivered by Slovakia (-0,87 %) and Latvia (-4,60 %) 1bis pillar. Estonia 1bis pillar delivers interesting net cumulative performance at the level of 7,37 %.

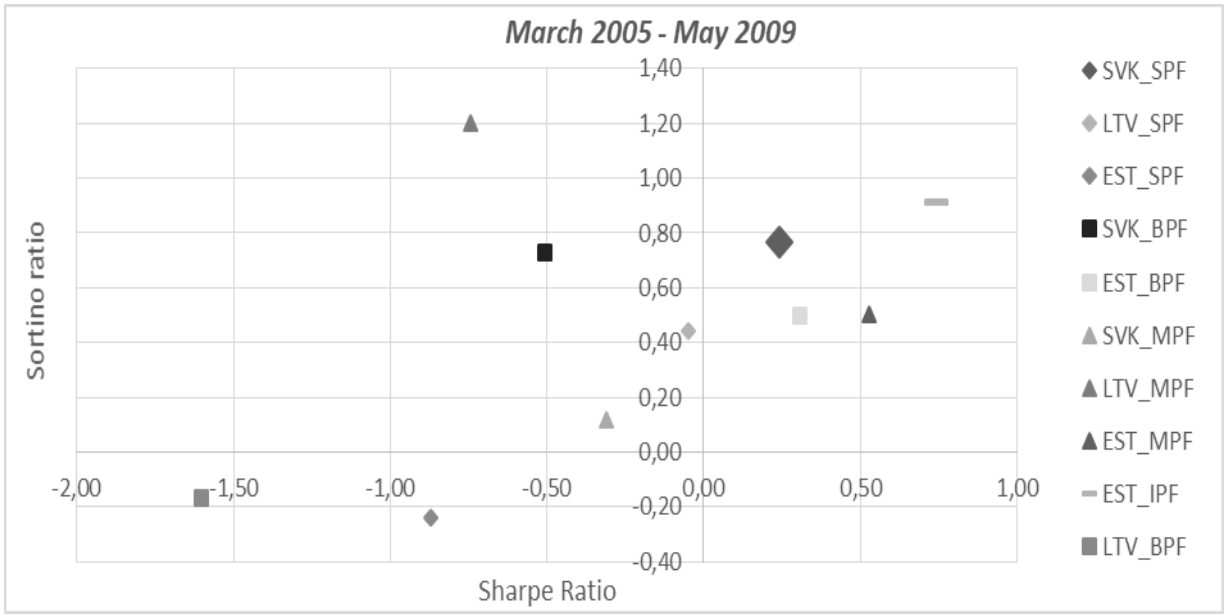
Table 3 Annual average and cumulative gross and net performance of pension system in selected countries from 2003 till 2016 (*in Slovakia from 2005)

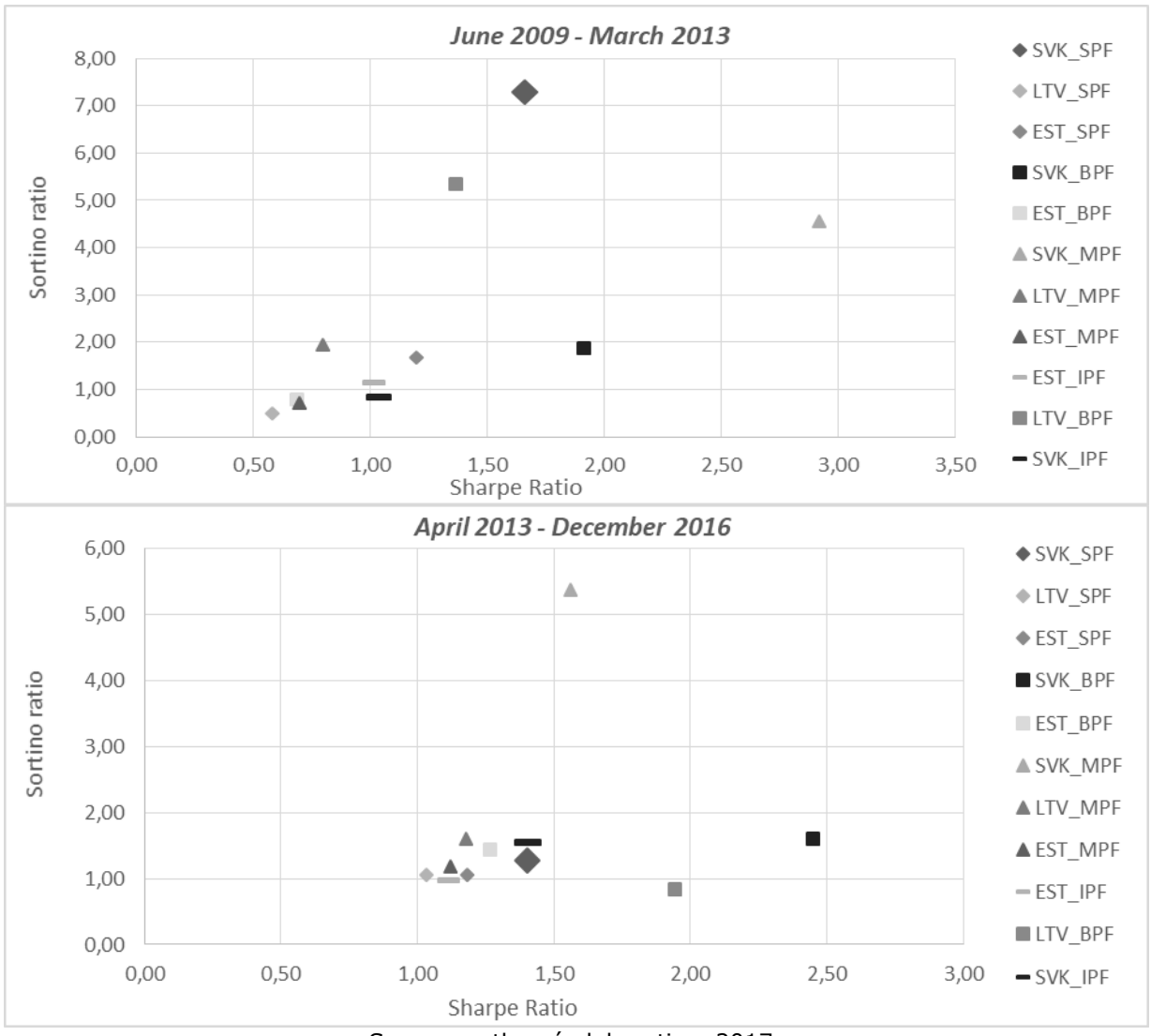
	Average performance			**Cumulative performance**		
	Gross	**Inflation**	**Net**	**Gross**	**Inflation**	**Net**
Slovakia*	1,74 %	1,75%	-0,01 %	22,43%	22,94%	-0,51 %
Estonia	4,56 %	3,40 %	1,16 %	75,46 %	58,74 %	16,71 %
Latvia	4,18 %	4,15 %	-0,03 %	73,68 %	74,64 %	-0,96 %

Source: authors' elaboration, 2017

In Figure 3, we provide comparison of average SR and SoR in three different time periods between 2005 and 2016 for each pension fund category in Slovakia, Estonia and Latvia. Selected time periods are based on essential interventions in the pension system in Slovakia (Šebo, Šebová and Virdzek, 2015) in June 2009 and 2013 which were mentioned at the beginning of this chapter(*).

Figure 3 Average monthly Sharpe and Sortino ratio in selected countries calculated for 3 periods





Source: authors´ elaboration, 2017

During the period from March 2005 till May 2009, we observed in all Estonian pension funds categories relatively low SR, but higher than SR observed in other countries. This period is characterized by big bull market from 2005 to 2007 and one of the biggest bear market in 2008 because of financial crises. In other countries, almost all pension funds categories had negative SR (below 0), except Slovakia SPF which is above 0. The lowest SR was provided by Latvia BPF and Estonia SPF. When we compare adjusted return and target downside deviation, we observed almost all pension funds categories above 0, except Latvia BPF and Estonia SPF again. In Latvia MPF fund category, we observed the highest excess returns per unit of target downside deviation. Estonia IPF and Slovakia BPF and SPF also had relatively higher SoR in the following period.

In the next period from June 2009 to March 2013, we can see significantly different results. No funds deliver negative average returns. In case of Slovakia, all non-guaranteed pension funds (SPF and MPF) were exposed to the 6 months of benchmarking to guarantee a minimum 0 % appreciation of assets in the fund. In this time PFMCs sold out a significant part of shares from the portfolio of SPF and MPF from June 2009 to September 2012 and by substituting it with less volatile bond instruments (Mešťan, Kubaška and Králik, 2016). Despite the fact, all Slovakia pension fund categories have higher SR than 1 and significantly higher SoR which indicates relatively good adjusted performance from risk free rate against risk measured by standard deviation or target

downside deviation in this funds categories. When we look at Figure 2, we can see lower pension fund performance in Slovakia than in others countries while Latvia and Estonia had SR and SoR worse than Slovakia. We can see significantly better performance in Latvia pension funds. A slight improvement can be observed even with pension funds in Estonia. When we compare their performance providing in Figure 2, we can see that their pension funds had relatively high standard deviation from excess returns. Latvia pension funds improved their results significantly compared to the previous period. Estonia and Slovakia IPF (in Slovakia was launched in April 2012) provide less excess return for one unit of risk than other pension funds category mainly due to higher risk and much more stocks in their portfolio.

Between April 2013 and December 2016, we observed very similar results of individual indicators in almost all PFs categories, with the exception of MPF in Slovakia and BPF in Slovakia and Latvia. In this period pension funds in following countries did not have any significant investment restriction in their investment policy in pension funds.

In table 4, we have differentiated the color values of the indicator in selected periods from the best (green color) to the worst (red color). In general, we cannot mark one pension fund category or country as the best perform during the time. In some period of time, according to SR or SoR, BPFs or MPFs are the best performing pension funds categories in some countries. On the other side, the worst performance is provided by SPF and IPF. Relatively low SR or SoR could indicate higher returns and volatility in SPFs and IPFs, and lower returns with lower volatility could be in MPFs and BPFs because of the portfolio structure in this category.

Table 4 Order of monthly average values of the Sharpe ratio and Sortino Ratio for each pension funds category in selected countries in reference periods.

	Sharpe ratio			Sortino ratio		
Fund type	**March 2005 - May 2009**	**June 2009 - March 2013**	**April 2013 - December 2016**	**March 2005 - May 2009**	**June 2009 - March 2013**	**April 2013 - December 2016**
SVK_SPF	0,07	0,48	0,40	0,77	7,28	1,27
LTV_SPF	-0,05	0,17	0,3	0,44	0,49	1,06
EST_SPF	-0,25	0,34	0,34	-0,24	1,67	1,06
SVK_BPF	-0,15	0,55	0,71	0,73	1,87	1,60
LTV_BPF	-0,46	0,39	0,56	-0,17	5,35	0,83
EST_BPF	0,09	0,20	0,37	0,50	0,80	1,44
SVK_MPF	-0,09	0,84	0,45	0,12	4,56	5,37
LTV_MPF	-0,22	0,23	0,34	1,20	1,95	1,61
EST_MPF	0,15	0,20	0,32	0,50	0,70	1,19
SVK_IPF	-	0,30	0,40	-	0,84	1,56
EST_IPF	0,21	0,29	0,32	0,91	1,13	0,97

Source: authors' elaboration

When we evaluate pension funds' performance, we need to look at structure of savers in this system – not risk profile of savers, but their age structure. Without these information we cannot mark pension fund with lower SR, SoR or lower returns as the worst pension funds because savers in this fund could be mainly above 50 years and they are very close to retirement age. Unfortunately, available data about pension system in selected countries do not provide this information publicly.

4 Conclusions

Pension funds' gross performance in Estonia and Latvia is much higher than in Slovakia, but net performance in Slovakia is higher than in Latvia but still less than in Estonia (due to investment restriction in SPF´s and MPF´s from June 2009 till September 2012 and large displacement of savers from risk pension funds to BPF´s in April 2013 till now). Slovak 1bis pillar has almost twice as much asset under management as Latvia and Estonia. In general, SPFs and IPFs provide higher gross and net return than BPFs and MPFs. Evaluation results of pension funds categories in selected countries based on SR and SoR, which compare returns against risk, are not so clear. In the pre-crisis period we observed higher ratios in Estonia IPF, MPF and BPF categories, but in the next period, these pension funds categories has much worse results.

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The structure of limited liability companies with low registered capital

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Abstract: *The extensive recodification of private law in the Czech Republic, which was actively taking place primarily from 2002 to 2012, was completed on January 1, 2014, when Act No. 89/2012 Coll., the Civil Code, and subsequent Act No. 90/2012 Coll., on Commercial Companies and Cooperatives (Business Corporations Act), came into effect. Since that date, besides other things, the amount of minimum registered capital necessary for setting up limited liability companies has changed. At present, the minimum member´s contribution is CZK 1. The paper aims to analyse the structure of limited liability companies with registered capital less than CZK 200,000. The first chapters will clarify the reasons that had led to the reduction of the minimum amount of registered capital, and also the advantages and disadvantages that this reduction has brought about. The next chapters will examine the distribution of companies with low registered capital by individual regions and industrial sectors in the Czech Republic. The paper will also answer the question of whether there is a relation between the amount of registered capital and the territorial, or more precisely sectoral structure of limited liability companies. A separate chapter will deal with the analysis of companies with registered capital from CZK 1 to CZK 1,000.*

Keywords: code on capital corporation, law capital, limited liability company, registered capital

JEL codes: G32, C12, K22

1 Introduction

The extensive recodification of private law in the Czech Republic, which was actively taking place primarily from 2002 to 2012, was completed on January 1, 2014, when Act No. 89/2012 Coll., the Civil Code, and subsequent Act No. 90/2012 Coll., on Commercial Companies and Cooperatives (Business Corporations Act), came into effect. The re-codification of private law returns the system of law to the continental legal conventions and a fundamental basis is therefore one basic code of private law (the Civil Code), which comprehensively regulates civil relations. Until then, the legal regulation of business corporations (formerly commercial companies) was contained almost exclusively in the Commercial Code, and the Civil Code was applied to business corporations only exceptionally. After the recodification, the Civil Code is a basic and general legal regulation. The Business Corporations Act contains only the legal regulation of some specifics of business corporations. Besides other things, it determines the minimum amount of each partner´s contribution to a symbolic CZK 1.

The paper aims to analyse the structure of limited liability companies with registered capital of less than CZK 200,000 (focusing on companies with their registered capital of CZK 1 – CZK 1,000), and in particular to assess the relationship between territorial/sectoral structure and the amount of registered capital.

2 Reasons, advantages and disadvantages of reducing the minimum amount of registered capital

The previous legal regulation stipulated CZK 100,000 to be the minimum amount of registered capital (until 31 December 2000) and later it was CZK 200,000 (until 31

December 2013). The determined minimum amount of registered capital was to ensure the fulfilment of its functions, which were attributable to the registered capital at that time. According to Dědič, Kunešová-Skálová (1999, p. 76), the functions of registered capital, besides other things, include the guarantee function and that of the partner´s share in the company. In terms of economics, the stipulation of a higher minimum value of registered capital may be considered as a certain barrier to the access of new companies on the market. The guarantee function of registered capital was indisputably crucial.

The purpose of registered capital was to replace the missing unlimited responsibility of partners for company´s liabilities and to provide creditors with a guarantee that the company had at least certain assets amounting to its registered capital. (Dědič, 2002) However, experts usually agree that registered capital did not fulfil its guarantee function well. That was the main reason for limiting the institute of registered capital. It has become a mere accounting record in the Commercial Register and did not practically secure the necessary guarantee for protecting the interests of company´s creditors. The law no longer required that companies maintained their assets in the same amount as well. (Hejda et al., 2014)

Under the Business Corporations Act, the guarantee function is secured by other ways, in particular by the so-called insolvency test (section 34 and section 40 of the Business Corporations Act) and stricter rules of administration. The liability of directors for damage caused to the company by their acts have been tightened and made more accurate. The new legal regulation has increased the protection of creditors. To put it simply, a limited liability company becomes a company with an unlimited liability in case that the Director or Directors fail to act in the interests of the company and the company will declare its bankruptcy by reason of their ill-considered decision-making.

Perhaps, the only advantage of a low registered capital is the lower cost to set up a limited liability company because the founder does not have to make a capital contribution of many thousands. There are groups of businessmen for whom this change will make their conduct of business easier. Entrepreneurs who are more likely to operate on local markets, have low start-up costs, and are able to cover their company´s operation by sales rank among them. For these small businessmen, the previously required registered capital of CZK 200,000 could have been the reason for not setting up a limited liability company, because they had to obtain funds for it by loan capital. There are also sectors where the amount of registered capital does not virtually matter. Typical examples are frequently converted doctors´ offices to limited liability companies, which usually have a registered capital of up to CZK 1,000.

However, the low value of registered capital may make the impression of non-credibility, especially in case of companies operating on the national or international market. Although the high value of registered capital does not guarantee solvency (as explained hereinbefore), it is perceived more positively in the eyes of business partners and other people than the Czech crown value.

The lack of funds, especially in the early stages of business, when it is not possible yet to finance business activities from profit, may be the disadvantage of a low registered capital. If the company uses a loan capital to cover operating costs, it may fast go into bankruptcy due to its overindebtedness, because the liabilities may quickly exceed the value of assets (see section 3 of Act No. 182/2006 Coll., the Insolvency Act).

3 Methodology and Data

The necessary data on the companies were obtained from the Bisnode Albertina database. The data file includes limited liability companies which were established between 2014 and 2016. The data were collected in the second and third months of 2017. Calculations were performed using MS Excel and SW Statistica.

To assess the relationship between the amount of registered capital and the sector in which the company operates, alternatively the amount of registered capital and the region in which the company was registered, the Chi-squared test of independence in contingency table was used. The Chi-squared test of independence is used to determine if there is a significant relationship between two nominal (categorical) variables. **Null hypothesis H_0** assumes that there is no association between the two variables. **Alternative hypothesis H_1 a**ssumes that there is an association between the two variables. Consider the null hypothesis that cell probabilities equal certain fixed values ϖ_{ij}. For a sample of size n with cell counts n_{ij}, the values $\mu_{ij} = n\varpi_{ij}$ are expected frequencies. They represent the value of the expectations when H_0 is true. To judge whether the data contradict H_0, we compare n_{ij} to μ_{ij}. If H_0 is true, n_{ij} should be close to μ_{ij} in each cell of contingency table. The larger the differences ($n_{ij} - \mu_{ij}$), the stronger evidence against H_0.

The Pearson chi-squared statistic for testing H_0 **is (Agresti, 2007):**

$$\chi^2 = \sum \frac{\left(n_{ij} - \mu_{ij}\right)^2}{\mu_{ij}} . \tag{1}$$

The χ^2 statistic has approximately a chi-squared distribution, for large n. Larger χ^2 values are more contradictory to H_0.

From the mentioned statistic 2, Cramer's coefficient V can be derived. It is a measure of association between two nominal variables and varies from 0 (corresponding to no association between the variables) to 1 (complete association). Cramer´s V is computed (Řezánková, 2011):

$$V = \sqrt{\frac{\frac{\chi^2}{n}}{\min\left(k-1, r-1\right)}} , \tag{2}$$

where n is the grand total of observation, k is the number of columns in contingency table and r is the number of rows in contingency table.

4 Results and Discussion

The structure of limited liability companies in the Czech Republic between 2014 and 2016

In 2014, when new legislation came into force, in total 24,266 new limited liability companies were established, 26,104 limited liability companies were established in 2015, and 27,946 in 2016. Of these nearly 60,000 companies were established with their registered capital lower than CZK 200,000, i.e. 76.5% of all newly registered limited liability companies. Therefore, it is evident that entrepreneurs have welcomed the possibility to set up a limited liability company with a minimum amount of registered capital.

Nearly one half of newly established companies in the period of 2014 - 2016 was registered in Prague. The Regions of South Moravia, Moravia-Silesia and Central Bohemia have an important position from the regional perspective. The fewest limited liability companies were registered in the Region of Karlovy Vary. This is a long-term trend, with the most companies being established in the vicinity of major cities where there are the most business opportunities. The situation is shown in Table 1.

Table 1 Distribution of limited liability companies established between 2014 and 2016 by the amount of registered capital and the registration region

Region	CZK 1	CZK 2 – CZK 1,000	CZK 1,001 – CZK 100,000	CZK 100,001 – CZK 199,999	CZK 200,000 and above	Total
South Bohemia	153	471	1,392	18	471	**2,505**
South Moravia	507	1,948	5,167	86	2,072	**9,780**
Karlovy Vary	80	312	616	7	192	**1,207**
Hradec Králové	130	469	1,175	21	353	**2,148**
Liberec	99	348	901	16	281	**1,645**
Moravia-Silesia	367	1,210	3,524	60	1,307	**6,468**
Olomouc	103	389	1,762	28	487	**2,769**
Pardubice	94	356	1,127	20	377	**1,974**
Plzeň	126	384	1,441	30	540	**2,521**
Prague	2,061	7,468	15,524	513	10,114	**35,680**
Central Bohemia	330	1,151	2,698	59	1,011	**5,249**
Ústí nad Labem	155	650	1,264	27	447	**2,543**
Vysočina	65	274	814	8	341	**1,502**
Zlín	119	499	1,261	30	416	**2,325**
Total	**4,389**	**15,929**	**38,666**	**923**	**18,409**	**78,316**

Source: author´s own processing according to the Bisnode database, 2017

Table 1 shows that the largest proportion of companies has a registered capital amounting to CZK 1,001 – CZK 100,000. In individual regions, these companies accounted for 49.7% (in the Region of Ústí nad Labem) up to 63.6% (in the Region of Olomouc) of all newly established companies. On the other hand, entrepreneurs do not prefer the registered capital of CZK 100,001 – CZK 199,999 and the proportion of companies established with this registered capital ranges from 0.53% (in the Region of Vysočina) to 1.44% in Prague. Overall, the highest proportion of companies with registered capital amounting up to CZK 200,000 was recorded in the Region of Karlovy Vary (84.1%). The lowest percentage of these companies is logically in Prague (71.7%), where a great number of large, often multinational companies, which have a high amount of capital, are registered.

The dependence between the amount of registered capital and the territorial structure of companies was confirmed using the chi-square test of independence. However, the value of Cramer´s *V* coefficient was very low, $V = 0.069$. This implies a very low contingency rate. The file size determines acceptance of an alternative hypothesis and thus confirmation of dependence. With a large number of observations, dependence is often confirmed even with very small deviations between empirical and expected frequencies. Thus, it may be concluded that the dependence between the amount of registered capital and the region where the companies were established has been statistically confirmed, but the contingency is very low, which means that this dependence is not significant in practical terms. Table 2 presents the values of individual statistics.

Table 2 Distribution of limited liability companies established between 2014 and 2016 by the amount of registered capital and the registration region - statistics

Pearson chi-squared statistic χ^2	p-level	Cramer's *V*
1,504.325	0.0000	0.069

Source: author´s own calculations, 2017

When reading the sectoral structure of newly established companies in the table, it is evident that the lowest proportion of companies with a low registered capital (up to CZK 200,000) in the observed period was recorded in the sectors of "Electricity, gas, heat and air conditioning supply" (56.3 %) and "Professional, scientific and technical activities" (68.4%). These are sectors for which a high input capital is typical.

Table 3 Distribution of limited liability companies established between 2014 and 2016 by the amount of registered capital and the main business activity (by CZ-NACE)

	CZK 1	CZK 2 – CZK 1,000	CZK 1,001 – CZK 100,000	CZK 100,001 – CZK 199,999	CZK 200,000 and above	Total
A Agriculture, forestry and fishery	143	567	1,452	32	598	**2,792**
B Mining and quarrying	5	5	20	0	9	**39**
C Manufacturing industry	376	1,328	4,073	98	1,599	**7,474**
D Electricity, gas, heat and air conditioning supply	3	4	37	0	34	**78**
E Water supply; activities related to waste water, waste and sanitation	29	122	321	5	199	**676**
F Construction	292	1,029	2,874	56	1,272	**5,523**
G Wholesale and retail trade; repairs and maintenance of motor vehicles	1,156	3,888	10,102	198	4,273	**19,617**
H Transport and storage	113	403	1,009	19	511	**2,055**
I Accommodation, food and beverage service activities	310	1,273	2,831	35	752	**5,201**
J Information and communication technologies	145	554	1,429	42	532	**2,702**
K Finance and insurance	24	74	191	1	73	**363**
L Real estate activities	477	1,458	3,782	101	2,088	**7,906**
M Professional, scientific and technical activities	831	3,515	6,720	278	5,237	**16,581**
N Administrative and supporting activities	97	332	877	19	323	**1,648**
O Public administration and defense; social security	50	157	374	7	83	**671**
P Education	164	658	1,413	11	398	**2,644**
Q Health and social care	46	189	396	7	94	**732**
R Cultural, entertainment and leisure activities	55	188	547	7	147	**944**
S Other activities	73	185	218	7	188	**671**
Total	**4,389**	**15,929**	**38,666**	**923**	**18,409**	**78,316**

Source: author´s own processing according to the Bisnode database, 2017

When assessing the dependence between the amount of registered capital and the business sector, we come to the same conclusion as in the case of the previous analysis (the amount of registered capital vs. the territorial structure). Thus, testing has proved the dependence between the amount of registered capital and the sector of limited liability companies, but the contingency rate, i.e. the dependence rate is very low. The Cramer´s *V* coefficient was $V = 0.108$. In practical terms, this low coefficient more likely indicates the independence of observed variables. Other calculated statistics are shown in Table 4.

Table 4 Distribution of limited liability companies established between 2014 and 2016 by the amount of registered capital and the main business activity (according to CZ-NACE) – statistics

Pearson chi-squared statistic χ^2	p-level	Cramer's *V*
3,099.581	0.0000	0.108

Source: author´s own calculations, 2017

Analysis of limited liability companies with their registered capital of CZK 1 – CZK 1,000

Between 2014 and 2016, 20,318 limited liability companies with their registered capital of CZK 1,000 maximum were established in the Czech Republic. 4,389 companies had their registered capital amounting to CZK 1 and 15,929 companies with their registered capital of CZK 2 – CZK 1,000 were established.

Table 5 shows the distribution of companies within individual regions in the Czech Republic. When comparing the values in columns B and F, it is possible to identify regions where the percentage of limited liability companies with their registered capital amounting up to CZK 1,000 is relatively low (compared to other regions). This situation occurs when the value in column F is lower than the value in column B. This applies to the Regions of South Bohemia, South Moravia, Olomouc, Pardubice, Plzeň and Vysočina. Interesting values are given in column G, where the percentages of newly established limited liability companies with registered capital of CZK 1 – CZK 1,000 to the total number of newly established companies in individual regions of the Czech Republic are recorded. The Region of Karlovy Vary, where the observed percentage is 32.48%, may be included in the regions with the highest proportion of low-capital companies. That implies that more than one third of the newly established limited liability companies in the Region of Karlovy Vary have their registered capital amounting to a CZK 1,000 maximum. The proportion is also high in the Region of Ústí nad Labem, namely 31.66%. It may be assumed that the proportion of low-capital companies may also reflect the overall economic position of the regions. Both Regions of Karlovy Vary and Ústí nad Labem have taken last places in the rankings of the regions for a long time. On the contrary, the proportion is lower than 20 % in the Region of Olomouc, as in the only region in the Czech Republic.

Table 5 Distribution of limited liability companies with a registered capital amounting to CZK 1 – CZK 1,000 by the individual regions in the CR between 2014 and 2016

	Number of newly established limited liability companies (irrespective of the amount of registered capital)	Percentage distribution of newly established limited liability companies in individual regions	Number of newly established limited liability companies with a registered capital of CZK 1	Number of newly established limited liability companies with a registered capital of CZK 2-CZK 1,000	Number of newly established limited liability companies with a registered capital of CZK 1,000 maximum	Percentage distribution of newly established limited liability companies with a registered capital of CZK 1,000 maximum in individual regions	Percentage share of new limited liability companies with their registered capital of CZK 1,000 max. to the total number of new l. l. companies in individual regions
	A	B=A/ΣA·100	C	D	E = C + D	F=E/ΣE·100	G=E/A·100
South Bohemia	2,505	3.20	153	471	624	3.07	24.91
South Moravia	9,780	12.49	507	1,948	2,455	12.08	25.10

Karlovy Vary	1,207	1.54	80	312	392	1.93	32.48
Hradec Králové	2,148	2.74	130	469	599	2.95	27.89
Liberec	1,645	2.10	99	348	447	2.20	27.17
Moravia-Silesia	6,468	8.26	367	1,210	1,577	7.76	24.38
Olomouc	2,769	3.54	103	389	492	2.42	17.77
Pardubice	1,974	2.52	94	356	450	2.21	22.80
Plzeň	2,521	3.22	126	384	510	2.51	20.23
Prague	35,680	45.56	2,061	7,468	9,529	46.90	26.71
Central Bohemia	5,249	6.70	330	1,151	1,481	7.29	28.21
Ústí nad Labem	2,543	3.25	155	650	805	3.96	31.66
Vysočina	1,502	1.92	65	274	339	1.67	22.57
Zlín	2,325	2.97	119	499	618	3.04	26.58
Total	**78,316**	**100.00**	**4,389**	**15,929**	**20,318**	**100.00**	**---**

Source: author´s own processing according to the Bisnode database, 2017

Table 6 shows the distribution of limited liability companies according to the CZ-NACE classification of economic activities. In terms of the analysis performed, it is important to compare the values in column B (the distribution of limited liability companies regardless of the amount of registered capital according to CZ-NACE) and column F (the distribution of limited liability companies with a registered capital of up to CZK 1,000 according to CZ-NACE). Only 7 companies in Section D "Electricity, gas, heat and air conditioning supply" with their registered capital amounting up to CZK 1,000 maximum were established in the observed period. The proportion of low-capital companies registered in this sector in the observed period is only 8.95%. Other companies established in this sector had their registered capital higher. It has been explained hereinbefore that this sector is associated with high input costs and therefore usually a higher registered capital. However, section D also includes companies engaged in electricity trade (class 35.14 according to CZ-NACE) and these companies often conduct business with a low registered capital. The mining and quarrying industry is also associated with high input costs, but this industry has an unexpectedly relatively high proportion of low-capital companies to the total number of newly registered companies in this sector, namely 25.94%. According to CZ-NACE, companies with a low registered capital operating in this sector are classified especially as class 08.09 (Other mining and quarrying n.e.c.). These companies are also often linked to other companies that already have a high registered capital. One may therefore believe that low-capital companies are set up to secure and perform certain supporting activities and are financially connected to other companies.

Table 6 Distribution of newly established limited liability companies by the sectoral classification CZ-NACE between 2014 and 2016

	Number of newly established limited liability companies (irrespective of the amount of registered capital)	**Percentage distribution of newly established limited liability companies in individual sectors**	**Number of newly established limited liability companies with a registered capital of CZK 1**	**Number of newly established limited liability companies with a registered capital of CZK 2-CZK 1,000**	**Number of newly established limited liability companies with a registered capital of CZK 1,000 maximum**	**Percentage distribution of newly established limited liability companies with a registered capital of CZK 1,000 maximum in individual**	**Percentage share of new limited liability companies with their registered capital of CZK 1,000 max. to the total number of new l. l. companie**

					sectors	s in individual sectors
	A	B=A/ΣA·100	C	D	E = C + D	F=E/ΣE·100	G=E/A·100
A Agriculture, forestry and fishery	2,792	3.57	143	567	710	3.49	25.43
B Mining and quarrying	39	0.05	5	5	10	0.05	25.94
C Manufacturing industry	7,474	9.54	376	1,328	1,704	8.39	22.80
D Electricity, gas, heat and air conditioning supply	78	0.10	3	4	7	0.03	8.95
E Water supply; activities related to waste water, waste and sanitation	676	0.86	29	122	151	0.74	22.34
F Construction	5,523	7.05	292	1,029	1,321	6.50	23.92
G Wholesale and retail trade; repairs and maintenance of motor vehicles	19,617	25.05	1,156	3,888	5,044	24.83	25.71
H Transport and storage	2,055	2.62	113	403	516	2.54	25.11
I Accommodation, food and beverage service activities	5,201	6.64	310	1,273	1,583	7.79	30.43
J Information and communication technologies	2,702	3.45	145	554	699	3.44	25.87
K Finance and insurance	363	0.46	24	74	98	0.48	27.02
L Real estate activities	7,906	10.10	477	1,458	1,935	9.52	24.47
M Professional, scientific and technical activities	16,581	21.17	831	3,515	4,346	21.39	26.21
N Administrative and supporting activities	1,648	2.10	97	332	429	2.11	26.04
O Public administration and defense; social security	671	0.86	50	157	207	1.02	30.83
P Education	2,644	3.38	164	658	822	4.05	31.09
Q Health and social care	732	0.93	46	189	235	1.16	32.10
R Cultural, entertainment and leisure activities	944	1.21	55	188	243	1.20	25.73
S Other activities	671	0.86	73	185	258	1.27	38.45
Total	**78,316**	**100.00**	**4,389**	**15,929**	**20,318**	**100.00**	

Source: author´s own processing according to the Bisnode database, 2017

5 Conclusions

The paper has presented some possible benefits but also risks associated with the legislative change of the minimum amount of registered capital necessary for limited liability companies. Currently, the minimum amount of registered capital is CZK 1. At the same time the liability of directors for business management has increased. Nevertheless, entrepreneurs have welcomed the opportunity to choose any amount of registered capital. The performed analysis has shown that 76.5% of companies established between 2014 and 2016 had their registered capital lower than CZK 200,000. More than a quarter of the companies had their registered capital lower than CZK 1,000. Most often, entrepreneurs in the Regions of Karlovy Vary and Ústí nad Labem choose the

low registered capital. Although the statistical dependence between the amount of registered capital and the sectoral/territorial structure of companies has been proved, the intensity of this dependence is very low and practically insignificant.

The new legislative amendment is effective since 2014 and only time will show how it will influence not only the business environment.

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Assessing and Managing Absenteeism with Bradford Factor Score Analysis

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Abstract: *Proper work with quantitative data is important for each segment of a company including Human Resource Management. People analytics represents a data-driven approach to HRM and implementation of quantitative models in decision processing about company´s workforce planning. Absenteeism is becoming an issue with high importance for all production companies. High costs following increasing absenteeism connected with decreased production or increased overtime work are at stake, and companies feel the necessity to set action steps and try to deal with it. This work aims to present the analysis of sick leave absenteeism based on information from five production companies with almost four thousand employees in total during 2016 and ways of managing and dealing with sick leave absenteeism. Focus groups are determined and their approach to absenteeism is discussed as well as HRM approach to this problem. Furtherly the analysis based on Bradford factor score is proposed. Bradford factor score represents a managerial tool to evaluate individuals according to the total length of their absenteeism and frequency of their absenteeism events. Rules and ways of possible active use of Bradford factor score analysis to manage the level of absenteeism are described and active action steps of HRM policies are discussed.*

Keywords: Absenteeism, Bradford Factor Score analysis, Human Resource Management (HRM), People Analytics

JEL codes: J11, M50

1 Introduction

Growing trend in employees' sick leave absenteeism in production companies is a very current issue. Sick leave absenteeism plays important role also in the organization of work and consequently in the costs of the company. This issue is discussed daily by company management and personalists. Growing trend is shown in Figure 1 presenting that sick leave absenteeism almost doubled between years 2013 and 2016. Increasing employee sick leave is currently the subject of many researches, such as Ala-Mursula, L., Vahtera, J., Linna, A., Pentti, J., & Kivimäki, M. (2005), Bakker, A. B., Demerouti, E., De Boer, E., Schaufeli, W. B. (2003) and Delgado, M. A. and Kniesner T. J. (1997) identifying and analyzing the reasons for increasing sick leave. Common feature of increasing absenteeism in an organization is that organizations often investigate the root causes and factors while being unable to deal with the consequences and being uninformed about any ways of active policy reducing the sick leave share on nominal work fund, Georges, D. and Benoit, D. (2007).

Dealing with sick leave absenteeism also represents a difficult task due to possible technical or moral problems. It is also challenging for employers to create conditions for effective monitoring and measuring. It is important for the organization to have or establish system of effective evidence such electronic attendance system supported by collecting written and confirmed document from a doctor. This way the organization also

avoids unauthorized and unnecessary absenteeism. On the other hand, it is important to maintain work-friendly environment and support the absenteeism when needed because the cost can multiply when a sick employee spread the sickness or when the employees' health gets even worse. All analyzed companies fulfill conditions of effective monitoring and comes from a productive area from Moravian-Silesian region, which allows us to combine gathered data in order to create large population of almost four thousand employees with enough empirical evidence about the sick leave oriented behavior of their employees.

In this study we present Bradford factor score analysis, which gives higher weight to the amount of absenteeism events rather than simply measuring the total length of absenteeism. Bradford factor score analysis is calculated with the data from calendar year 2016 and ways of application are described in chapter two. Use of Bradford factor analysis was described also in Hopkins, B., Dawson C. Veliziotis M. (2015) for tracking absenteeism of agency workers. We aim to analyze and describe ways to manage sick leave absenteeism and reduce unnecessary absenteeism events while keeping work-friendly policy toward employees. We propose to visualize the Bradford factor score also with amount employee's absenteeism events to secondarily sort employees according to their absenteeism frequency. Evaluation of application of Bradford factor score analysis with proposition of possible solutions to reduce unnecessary sick leave absenteeism is summarized in the conclusion.

Redistribution of kinds of absenteeism events was mentioned in Armstrong, M. and, Taylor, S. (2014), where they observed that generally absenteeism events are following:

- 60% are chronic illness, injuries or family emergencies,
- 20% are short-therm illness (for example flu), work-related accidents or personal problems,
- 10% are minor illness (such as cold),
- 10% are of other character.

Cost of absenteeism

Absenteeism costs companies large amount of money each year in lost productivity, wages, poor quality of goods/services and excess management time. In addition, the employees who do show up to work are often burdened with extra duties and responsibilities to fill in for absent employees, which can lead to feelings of frustration and a decline in morale. Study from Allen, S. G. (1983) is oriented on costs connected with absenteeism and their calculations.

Costs of absenteeism are direct and indirect, Cascio, W. F. and Boudreau, J. W. (2008). Czech legislation states that the company pays the wage compensation to employee for the first two weeks of sick leave and injury absenteeism with exception of first three days, which represents the direct costs. The regional social security administration as representation of public authority pays a sickness benefit from the fifteenth day of absenteeism. These conditions make a short term absenteeism (up to two weeks or also defined as up to one month) the most expensive. Indirect costs vary from costs for hiring a replacement, pay overtimes to present employees doing the job of the absent one, lower production etc. Employers have a possibility to hire a temporal replacement (agency worker, part time worker) covering for long term absenteeism to avoid the need for overtime work while it is not cost-effective (and sometimes impossible) to find a replacement for the short term absenteeism. Short term absenteeism thus brings costs including wage compensation for absent employee as well as expensive overtime hours of present employees. Overtime work costs at minimum 1,25 times of regular worktime, as stated in Czech Labor Code §114, and it already assumes a company has suitable employees to handle and finish a job instead of the absent employee. Study oriented to connection of absenteeism to overtimes was presented by Ehrenberg (1970).

2 Methodology and Data

There are many ways to look at company´s absenteeism. Absenteeism generally represents all situations in which an employee is not present in the workplace during agreed worktime, Whitaker, S. (2001). Workplace, work activities, starting workday and information are part of employment contract according to §34 of Czech Labor Code while it usually contains also information about a worktime according to §78 of Czech Labor Code, otherwise agreed separately. We can distinguish three types of absenteeism (excluding illegal or unexplained absenteeism which is not allowed and which is punished by termination of contract with an employee and thus not measured):

- holiday,
- sick leave and injuries,
- other absenteeism.

Holiday represents an official, planned and paid form of absenteeism. Holidays are unavoidable and also employees should be given a possibility to properly take a vacation during the year in full length. Minimum length of holidays per year is four weeks although many employers offer extra week to attract employees. We can express a holiday share on the net nominal work fund for the whole company, selected parts or even of an individual in a given time period as following:

$$\%\ holiday = \frac{total\ amount\ of\ holiday\ workdays}{net\ nominal\ workday\ fund}. \quad (1)$$

Net nominal workday fund is generally is equal to approximately 21,5 days per each month and it reflects average amount of workdays in a month (excluding bank holidays and weekends).

Sick leave and injuries is the main area of absenteeism, to which is this study solely dedicated. Some of the absenteeism events are unnecessary although occasional absences are inevitable because people are getting sick or injured. It is habitual sick leave or high frequency of absenteeism events that are preventable and that are very well highlighted by the Bradford factor score analysis. Important value is represented by the share of sick leave absenteeism on the net nominal workday fund, which is calculated as following:

$$\%\ sick\ leave\ absenteeism = \frac{total\ amount\ of\ sick\ leave\ absenteeism\ workdays}{net\ nominal\ workday\ fund}. \quad (2)$$

Other absenteeism includes events which are usually short term oriented, sometimes even just a part of the day. Some of them are planned, such as scheduled doctor visit, blood donations, compensatory time off for the holiday and compensations defined in Czech Labor Code (wedding, funeral etc.), or unplanned, such as emergency doctor visit, unexpected obstacles etc. A share of other absenteeism on net nominal work fund is expressed as:

$$\%\ other\ absenteeism = \frac{total\ amount\ of\ other\ absenteeism\ workdays}{net\ nominal\ workday\ fund}. \quad (3)$$

A sum of shares of each form of absenteeism on the net nominal workday shows which amount of worktime which is actually spend at work and which is spend legally outside a workplace.

Bradford factor score analysis

Bradford factor is represented by a simple formula that allows firms to apply a relative weighting to employee's unplanned absence (illness, doctor visit, childcare etc.). Many companies use this factor as a trigger point to alert them if an employee's absenteeism level is reach to worse or unacceptable level. Bradford factor score is well defined in People HR Blog online (cit. 2017). Bradford factor calculation is a combination of absence frequency and duration for giving and individual Bradford factor score. Bradford factor score is calculated as following

$$B = \left(\sum_{i=1}^{n} D_i \right) \cdot E^2, \tag{4}$$

where B represents Bradford factor score, D represents amount of absent work days in i^{th} absenteeism event and E represents an amount of sick leave absenteeism events during observed period.

Table 1 Bradford factor score examples for 10 days of absenteeism

absent work days x amount of sick leave events	Bradford factor score
10 x 1	10
5 x 2	40
4 x 2 + 2 x 1	90
3 x 3 +1 x 1	160
2 x 5	250
1 x 10	1000

Source: own research

Table 1 shows examples of final Bradford factor score for different amounts of sick leave events. Having the same length of sick leave gives significantly different results, which is even amplified for real observations. Action steps which triggers when a certain limit of Bradford factor score can be set to create a clear sick leave policy.

Table 2 Bradford factor score action steps

Bradford factor score	Action step
1-99	no action required
100-249	attention needed
250-499	consider issuing a verbal warning
500-999	consider issuing a written warning
1000+	consider dismissal

Source: own research

Online source of Employment law clinic (cit. 2017) presents certain action steps based on the level of Bradford factor score which were adjusted based on empirical evidence to set easier orientation. Flat limit levels set in Table 2 are easier to monitor and grasp while they still keep the value in identification of absenteeism risky employees.

Bradford factor score below 100 is acceptable and requires no action. This includes most of the employees, see Table 4. Bradford factor score 100-249 represents a group of employees which already have a few sick leave absenteeism events or long term illness and it is necessary to keep track of them to monitor whether they move up or down. Bradford factor score 250-499 already represents a potentially risky employee with necessity to issue a verbal warning. Bradford factor score 500-999 is very high and requires to be actively solved, we recommend to issue a written warning and discuss the situation of the employee with the supervisor. Bradford factor score over 1000 can be reached only by frequent repetitive absenteeism and employees with such score are recommended to be terminated if possible.

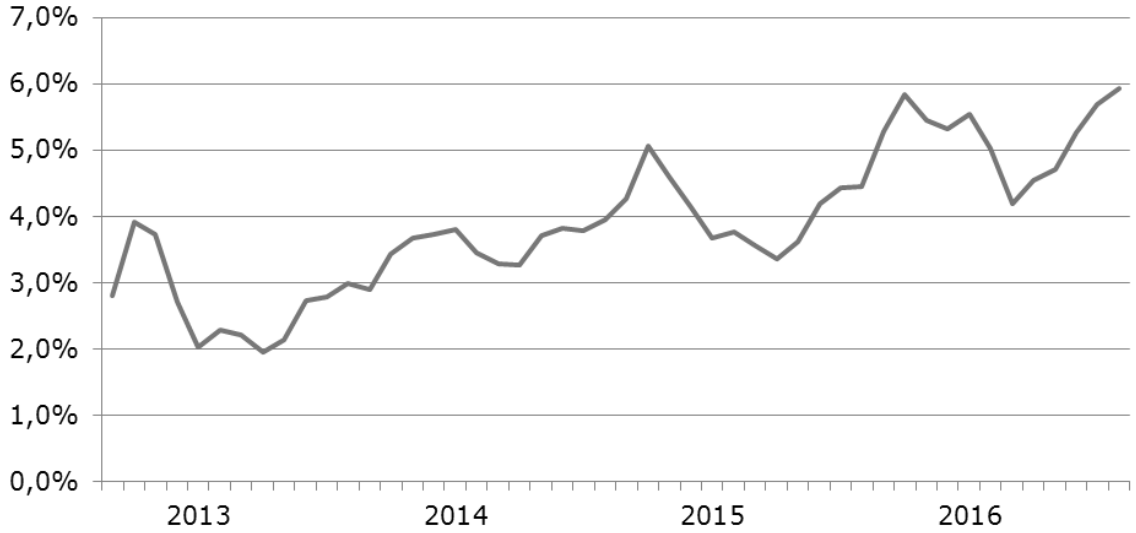
3 Results and Discussion

Following chapter is dedicated to Bradford factor score analysis and discussion. Data presented in Figure 1 represent average values of sick leave absenteeism of six

production companies considering their share on the total amount of employees of all six companies during period 2013-2016. Sick leave absenteeism rate was calculated according to (2). Growing trend of the sick leave absenteeism rate is clearly visible and cannot be explained by seasonal or temporal factors. Average rate is increasing each of the observed years, although seasonal effects are also visible: sick leave absenteeism higher during winter months and lower during summer months. This trend is dangerous and presents a great threat for organizations.

Bradford factor score analysis is calculated for twelve consecutive months from January to December 2016 only for sick leave absenteeism, which eliminates a possibility to unjustly highlight an employee with many holiday events instead of one or two longer ones or an employee with a few doctor visits during the year.

Figure 1 Sick leave absenteeism rate development 2013-2016



Source: own research

Table 3 presents us with the summary of analyzed employees. Total amount of observed employees is 3937, while 2466 representing 62,6% of the whole population had zero sick leave absenteeism events. Only around 6% of all employees were on a sick leave twice or more than twice leaving only 37 employees, which should be closely monitored. This way an organization can rapidly reduce the amount of possibly problematic employees to deal with. Interesting information is that only 1 employee out of 3937 has recorded 5 sick leave absenteeism events.

Table 3 Sick leave absenteeism frequency

Sick leave events	FTE amount	% Share	% Cumul
0	2466	62,64%	62,64%
1	1239	31,47%	94,11%
2	195	4,95%	99,06%
3	28	0,71%	99,77%
4	8	0,20%	99,97%
5	1	0,03%	100,00%

Source: own research

Table 4 shows the redistribution of employees in the Bradford factor score groups according to the amount of absenteeism events they had. Sick leave events work as a multiplication and so with the growing amount of events the Bradford factor is

exponentially growing. Primary focus should be to the 47 employees with Bradford factor score higher than 500 following the rules set in Table 2 while monitoring those with higher amount of absenteeism events.

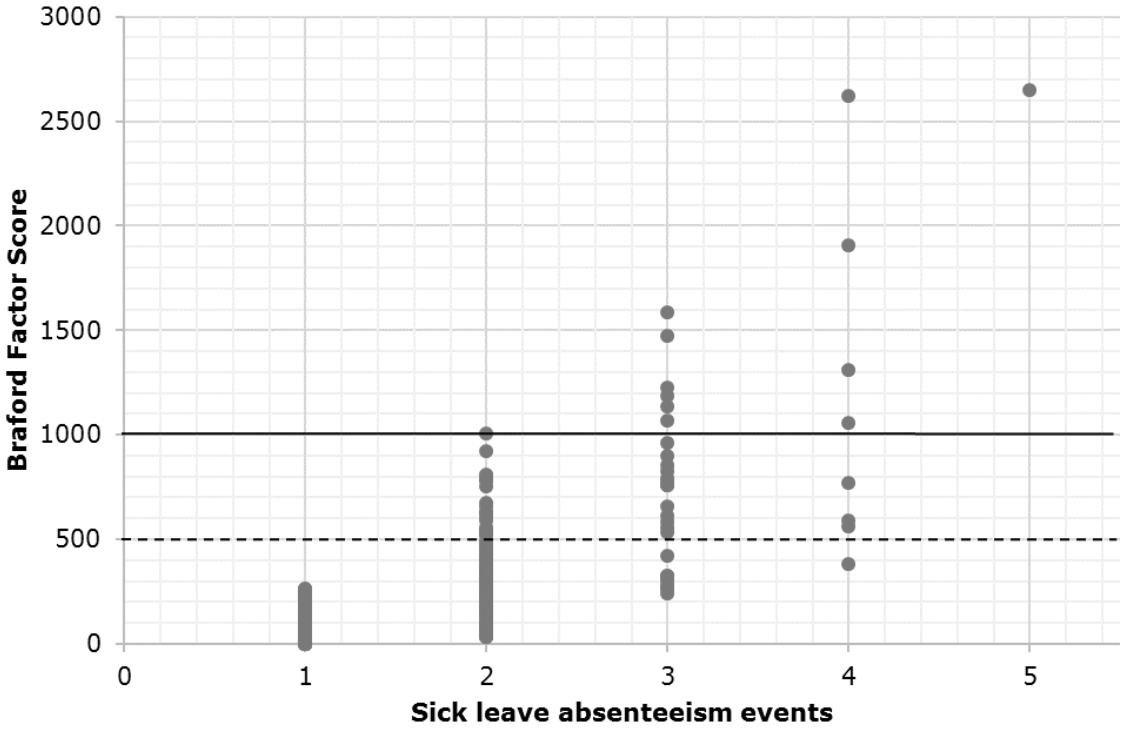
Table 4 Pivot table of Bradford factor score with amount absenteeism events

	BFS_group				
Sick leave events	**1-99**	**100-249**	**250-499**	**500-999**	**1000+**
1	1107	126	6		
2	39	87	50	18	1
3		1	8	13	6
4			1	3	4
5					1

Source: own research

We can visualize a pivot table combining the level of Bradford factor score and amount of absenteeism events using the scatter plot as shown in Figure 2 with marked limits defined in Table 2. This allows us to synoptically visualize the amount of employees in each group and above the limit. Primary focus should be given to 13 employees with Bradford factor score above 1000 and secondarily on those in the area between 500 and 1000, which is in total 34 employees. This way the company can monitor each of the absenteeism risky employees because by using Bradford factor score analysis we could reduce the amount of employees from over one thousand to a determined group.

Figure 2 Scatter plot Bradford factor score with amount of absenteeism events



Source: own research

4 Conclusions

This study investigated the topic of employees' absenteeism with focus on sick leave absenteeism. It is undeniable that the sick leave absenteeism is increasing and both

direct and indirect costs connected with this are increasing as well. This is the reason why companies are looking for any active solution which transforms them from a passive observer of the situation into active participant with a goal to reduce the absenteeism. We presented a Bradford factor score analysis which reflects not only the total length of employee's absence but also amount of absenteeism events. Bradford factor is designed to give higher weight for the amount of absenteeism events to avoid a false positive indication of absenteeism risky or problematic employees. Visualized results of Bradford factor score from Table 4 with projected amount of absenteeism events as in Figure 2 gives a selected sample to apply active solutions.s

Following the instructions described on Table 2 after an employee reaches a certain limit of Bradford factor score requires cooperation with a supervisor of an employee with high Bradford factor score to issue firstly a verbal warning and with Bradford factor score above 500 also a written warning. Three written warnings issued in less than 6 months allow an employer to terminate a contract with a given employee. Other solution is to terminate a contract by agreement or cancel the position of an employee. Last two mentioned solutions require a severance payment, which according to Czech Labor law § 67 is in maximum three times of average monthly wage. This can be a suitable solution considering the costs connected with keeping an employee with so high risk of frequent sick leave absenteeism. Described information is applicable directly not only to companies active in Czech Republic, but also internationally. The influence and perception of Human resource management policies is changing from supportive to strategic, supported by Harel, G. H., Tzafrir, S. S. (1999) and its role is becoming more important.

Acknowledgments

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The investment through bonus certificates

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Abstract: *If a potential investor makes a decision regarding the choice of an asset, he has still an option to invest in this asset direct or indirect. One of the options of an indirect investment is a bonus certificate. The aim of this paper is to examine the change in the investment characteristics, especially a change in the expected return and the risk of investment, provided that the investor will use the bonus certificate instead of a direct investment in the underlying asset. First will be selected an underlying asset. Then it will be modeled the development of the value of this asset by using Monte Carlo simulation. Next it will be discussed possible ways of construction of bonus certificates. Components from which is bonus certificate comprised will be priced and it will be modeled development of the value of bonus certificates on chosen underlying. Then it will be statistically evaluated and assessed the change in investment characteristics compared with investment characteristics of direct investment in the underlying asset. Finally, discussions will be carried out and formulated recommendations.*

Keywords: bonus certificate, risk, return, investment

JEL codes: G11, G12, G17

1 Introduction

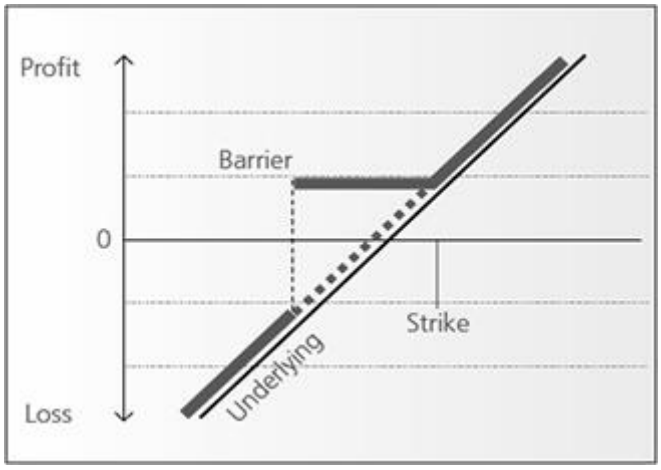
Modern structured products are presented as products that can optimize an investment of retail investor. If the investor is able to define his expectations regarding the development of the value of the underlying asset, his investment horizon and his propensity for risk, then you may find the structured product that is for these characteristics "tailored". This is possible thanks to the construction of these products and the use of derivative components in their structure. Two large groups of structured products consist of investment and leveraged products. This paper will focus on investment products. It is possible find many types of structured products among investment products. For example, Svoboda divides this segment into investment certificates and reverse convertibles and investment certificates further divides according guarantee of invested capital to certificate with full guarantee, certificates with partial guarantee and certificates without any guarantee of invested capital (Svoboda, 2005).

This paper deals with certificates with partial guarantee of investment capital, namely with bonus certificates.

The aim of this paper is to examine how to change the basic characteristics of the investment, if investor utilizes bonus certificate instead of direct investments in the underlying assets.

Bonus certificate offers conditional protection against downside losses to a pre-defined level (barrier) but allows an unlimited participation in upside movements of the underlying (in basic structure, but it is possible to create a product with limited participation too). The return-risk profile of bonus certificate is shown in the figure no. 1.

Figure 1 Return-risk profile of bonus certificate



Source: European structured investment products association

Bonus certificates have a risk buffer for price losses in the underlying; the bonus guarantees a minimum return above the risk level.

A bonus certificate represents an alternative to a direct investment in a share, an index or another underlying. Investors primarily use them if they believe that despite rising prices setbacks are still likely to occur. A bonus certificate is furnished with a bonus amount and an upper and lower price level. If the certificate expires with the price of the underlying ranging between these two levels, owners are paid out their bonuses. If the underlying was at or below the risk level during the certificate's lifetime, its price is that of the current value of the certificate at expiry. If the underlying is above the upper level at expiry, the investor fully participates in the price gains. Some bonus certificates have a profit cap. This is where the certificate stops participating in the price gains of the underlying (Börse Frankfurt, 2017).

2 Methodology and Data

This paper follows a study by Professor Ulrich Hommel and Professor Dirk Schiereck from European Business School (Hommel, Schiereck, 2004). The aim of this study was to examine the benefits of derivatives financial instruments compared to conventional investments such as stocks and bonds. Bonus certificate can also be considered as a derivative financial instrument, since its basic structure consists of two components (options):

- long underlying (LEPO option, zero-strike call option)
- long down-and-out put option

First, will be designed the structure of hypothetically bonus certificate issued on 28 April 2017. Under the given market conditions will be determined the specific characteristics of this product. Based on the historical development of the value of the underlying asset over the past 5 years (data were obtained from the Frankfurt Stock Exchange) will be counted necessary characteristics of direct investment in the underlying asset (the average annual rate of return, volatility, etc.). As an underlying asset was price index EURO STOXX 50 selected. Next, by using Monte Carlo will be simulated changes in the value of the underlying assets in the following year. This period corresponds approximately to the duration of the bonus certificates issued in practice. Since the development of the underlying shares will be derived also the development of the value of the bonus certificate.

By using Monte Carlo will be simulated changes in the value of the underlying assets according this formula:

$$dP / P = \mu\,\mathrm{dt} + \sigma\,\mathrm{dz} \quad (1)$$

where:

dP – change in the value of an asset

P – value of an asset (start value 3559,59)

μ - average return (8.91%)

dt – the shortest period of time for which the change occurs (1/252)

σ – volatility (19.43%)

dz – random component ($N(0,\sqrt{(1/252)})$

Optional component – barrier option will be priced according to Hull (2006). The price of down-and-out put option (P_{DO}) will calculate as difference between price of plain vanilla put option (P) and price of down-and-in put option (P_{DI}):

$$P_{DO} = P - P_{DI} \quad (2)$$

Price of down-and-in put option will calculate according following formula:

$$P_{DI} = -S_0 N(-x_1) e^{-qT} + K e^{-rT} N\left(-x_1 + \sigma\sqrt{T}\right) + S_0 e^{-qT} (H/S_0)^{2\lambda} [N(y) - N(y_1)] - K e^{-rT} (H/S_0)^{2\lambda-2} \left[N\left(y - \sigma\sqrt{T}\right) - N(y_1 - \sigma\sqrt{T})\right] \quad (3)$$

where:

$$\lambda = \frac{r - q + \frac{\sigma^2}{2}}{\sigma^2}; \quad y - \frac{ln\left(\frac{H^2}{S_0 K}\right)}{\sigma\sqrt{T}} + \lambda\sigma\sqrt{T}; \quad x_1 = \frac{\ln(\frac{S_0}{H})}{\sigma\sqrt{T}} + \lambda\sigma\sqrt{T}; \quad y_1 = \frac{\ln(\frac{H}{S_0})}{\sigma\sqrt{T}} + \lambda\sigma\sqrt{T}$$

and where:

S_0 – spot price of underlying

H – barrier level ($H<S_0$)

K – bonus level

q – dividend yield

r – risk-free interest rate

The results will be compared with each other and will evaluate their investment characteristics.

3 Results and Discussion

According to the structure of the bonus certificate, was created a new bonus certificate. The value of the underlying asset at the date of issuance amounted to 3559.59 points. After the pricing of relevant option component of bonus certificate under the given market conditions was founded that the certificate would be more expensive than a direct investment in the underlying asset. This situation can be solved by issuer in several ways. First, there is the assumption that the underlying asset pays a dividend yield. Investor waives dividend yield in favor of the issuer and the issuer uses it to finance the structure of the certificate. The second way is the possibility that the issue price of the certificate remains higher compared to direct investment in the underlying assets and the cost of certificate structure financing are thus transferred to the investor. A third way is to use the second option feature, namely the sold call option. The option premium from this sale is the difference between the price of the underlying asset and the current price

of the certificate. The strike price of such options then, however, limits the return potential of the product, which was previously unbounded.

First, it was selected a variant with higher price of certificate by issue compared to price of underlying.

Thus were formed bonus certificates, which parameters are summarized in table no. 1.

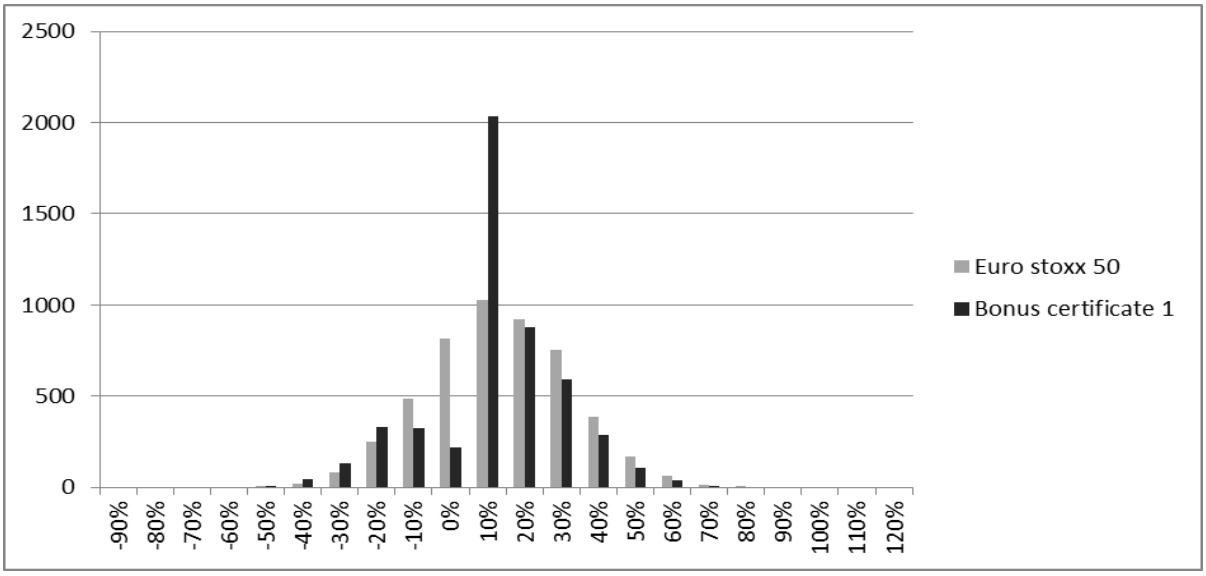
Table 1 Parameters of created bonus certificates (without dividends)

	Bonus certificate 1	**Bonus certificate 2**	**Bonus certificate 3**
Underlying	EURO STOXX 50	EURO STOXX 50	EURO STOXX 50
Date of issue	28.4.2017	28.4.2017	28.4.2017
Maturity	27.4.2018	27.4.2018	27.4.2018
Spot price of underlying asset	3559.59	3559.59	3559.59
Ratio	1:100	1:100	1:100
Issue price	37,07 EUR	37,11 EUR	37,14 EUR
Barrier level	3000.00	2800.00	3300.00
Bonus level	4000.00	3750.00	4700.00

Source: author´s construction

It was created histogram of differences of frequencies of returns of certificates and the underlying asset based on the simulation of 5000 time rows. The frequency of returns of direct investment in underlying asset and frequency of returns of certificates and their differences are shown in the figures below.

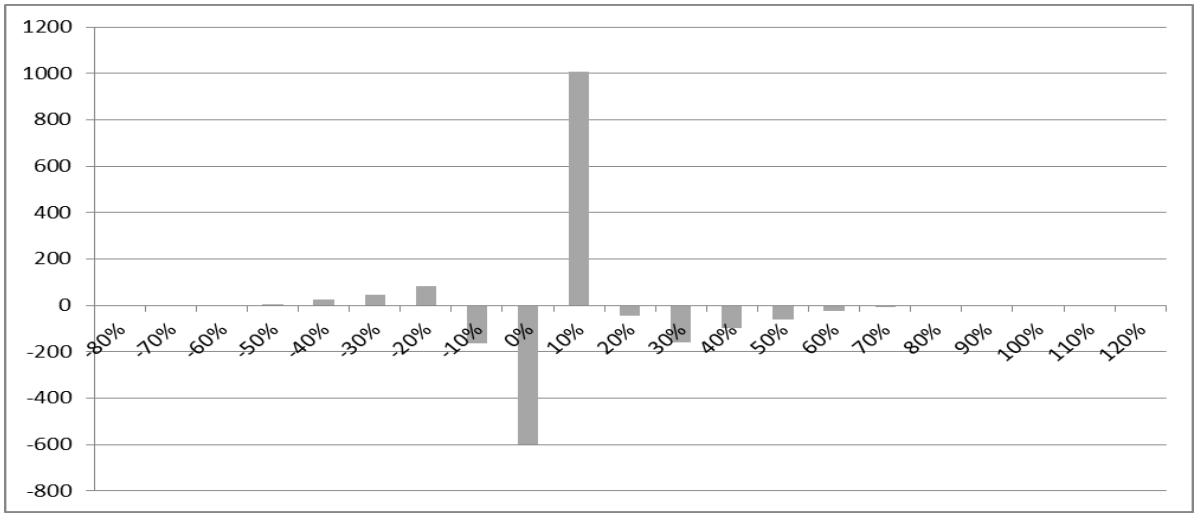
Figure 2 Frequencies of returns of bonus certificate 1 and returns of underlying asset



Source: author´s construction

By including a barrier option to structure of bonus certificate is significantly changed the probability distribution of returns compared to the distribution of returns of underlying asset. Differences in absolute frequencies of returns are by way of illustration shown in figure 3.

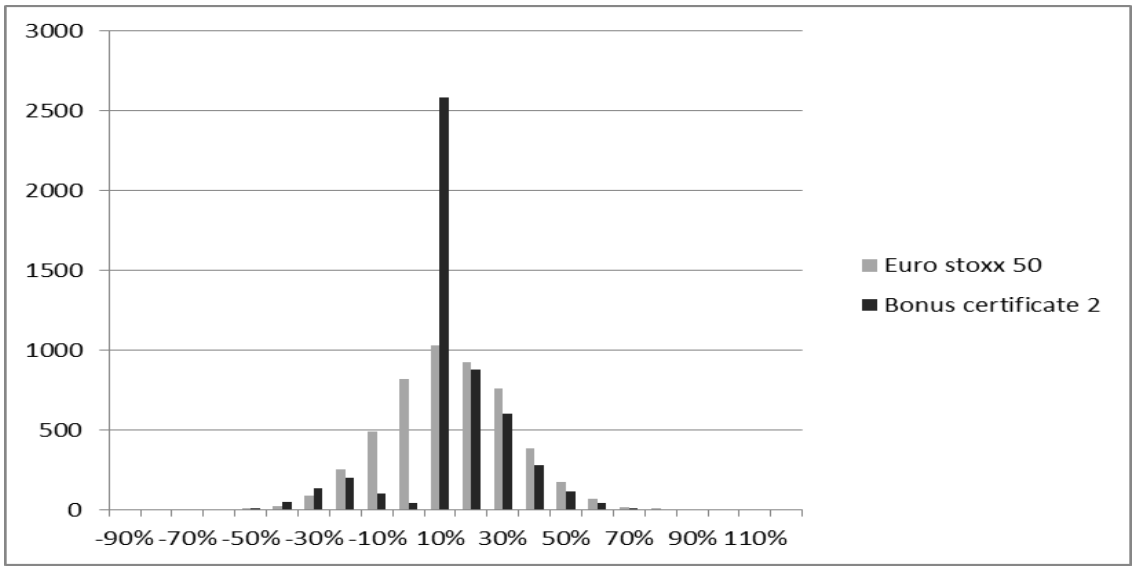
Figure 3 Differences in the frequency of returns (bonus certificate 1 and underlying)



Source: author´s construction

Bonus certificate 2 is considered as more conservative investment. It offers protection against the loss in amount of 21.34% of the initial value of the underlying asset (the value of underlying asset at the date of certificate issue). Probability distribution of return frequencies is similar to a bonus certificate 1, as shown by figure 4 below.

Figure 4 Frequencies of returns of bonus certificate 2 and returns of underlying asset



Source: author´s construction

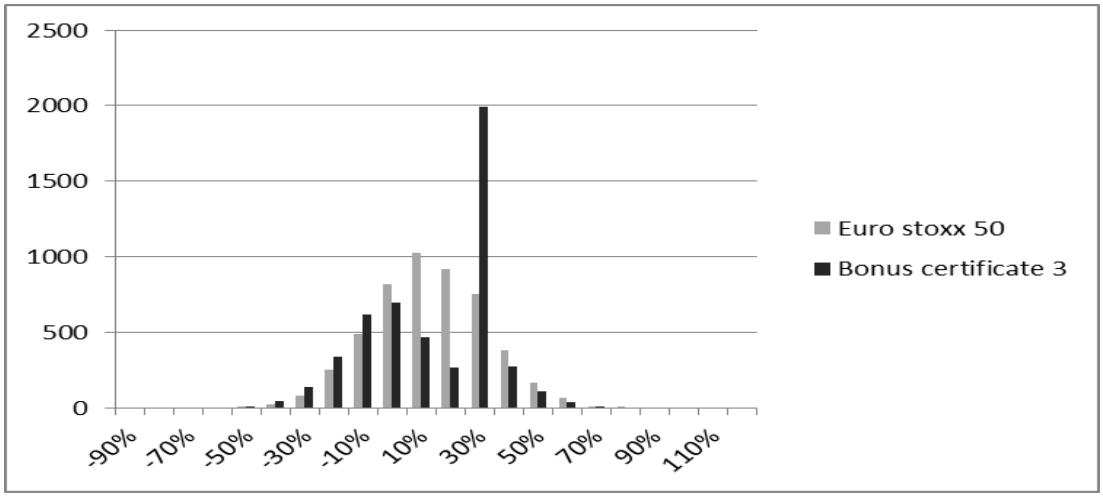
With regard to a bonus return of both examined certificates (1 and 2) fall return of most cases of 5000 cases examined to the interval 0 -10%.

Bonus certificate 2 offer lower bonus return than bonus certificate 1 (consider bonus level and issue price of certificates from table 1), but this bonus return was achieved in 2583 cases in comparison to 2034 cases by bonus certificate 1.

Bonus certificate 3 is considered as most aggressive investment. It offers conditional capital protection only in amount of 7.29% of the initial value of the underlying asset. It offers but the higher bonus return if the barrier was not breached. Probability distribution

of return frequencies is rather different from distribution of certificates n. 1 and 2, as shown by figure 5 below.

Figure 5 Frequencies of returns of bonus certificate 3 and returns of underlying asset



Source: author´s construction

The number of cases in which investor ended in a loss was increased as a result of lower capital protection, but the return in the band 20% - 30% (that also includes a bonus return) was still reached in 1995 cases of 5000 cases examined.

Table no. 2 below provides information on the characteristics of compared investments.

Table 2 The characteristics of the examined investments (without dividends)

	EURO STOXX 50	**Bonus certificate 1**	**Bonus certificate 2**	**Bonus certificate 3**
Excepted (average) return	8.33%	7.83%	7.51%	8.62%
Standard deviation	19.07%	17.94%	16.80%	20.79%
VaR (5 %)	23%	22%	20%	26%
Median of returns	8.21%	7.61%	4.03%	17.12%
Skewness	0.02	-0.49	-0.27	-0.43
Kurtosis	-0.13	0.73	1.35	-0.68

Source: author´s construction

Then it was considered second way of creating of bonus certificate. In this case the purchase of a barrier option is funded from the dividend yields (discounted) of the underlying asset. It was anticipated a dividend yield 3.58% and in table no. 3 are summarized parameters of bonus certificates after taking dividend yields into account. All parameters remained basically the same, only the price of the certificate changed. A potential investor would buy all three of the certificates cheaper at the issue, which naturally influences the characteristics of his investment because the return potential remains the same.

Table 3 Parameters of created bonus certificates (with dividends)

	Bonus certificate 1	Bonus certificate 2	Bonus certificate 3
Underlying	EURO STOXX 50	EURO STOXX 50	EURO STOXX 50
Date of issue	28.4.2017	28.4.2017	28.4.2017
Maturity	27.4.2018	27.4.2018	27.4.2018
Spot price of underlying asset	3559.59	3559.59	3559.59
Ratio	1:100	1:100	1:100
Issue price	35,81 EUR	35,84 EUR	35,88 EUR
Barrier level	3000.00	2800.00	3300.00
Bonus level	4000.00	3750.00	4700.00

Source: author´s construction

It is highly probable that the potential bonus certificate issuer will prefer this method of issuing of the bonus certificate. Issuer can easily duplicate the underlying price index and still ensure that he receives the dividend yields from the underlying asset. Table no. 4 below provides information on the characteristics of compared investments after taking dividend yields into account.

Table 4 The characteristics of the examined investments (with dividends)

	EURO STOXX 50	Bonus certificate 1	Bonus certificate 2	Bonus certificate 3
Excepted (average) return	8.33%	11.87%	11.34%	12.60%
Standard deviation	19.07%	18.09%	17.13%	21.01%
VaR (5 %)	23%	18%	17%	22%
Median of returns	8.21%	11.07%	7.95%	21.93%
Skewness	0.02	-0.44	-0.19	-0.41
Kurtosis	-0.13	1.05	1.57	-0.52

Source: author´s construction

4 Conclusions

Bonus certificates are structured products which offer a modified return-risk profile of investment to retail investors (compared to direct investment in underlying asset). Based on the research it was found that it is possible to issue a bonus certificate only on condition that his underlying asset brings dividend yields, which can be used to finance the product structure. Another option is limited return potential of the investment due to selling a call option and bring parameter cap into being. This article was working with bonus certificates that were issued to higher price than was a value of underlying asset too. Researched bonus certificates offer an alternative investment with a partial guarantee on invested capital.

By selecting a bonus certificate with various parameters, the investor can influence the basic characteristics of the investment, such as expected return and investment risk. By choosing parameters like barrier and bonus return, the investor could realize different investment strategies, more conservative or more aggressive than direct investment in the underlying asset.

Bonus certificates evince (compared to direct investment in the underlying asset) higher negative skewness; bonus certificates 1 and 2 evince higher positive kurtosis, bonus certificate 3 lower negative kurtosis.

It is more rational for issuers to finance the purchase of the barrier option contained in the certificate from dividend yields they can obtain from the underlying asset than to transfer the cost of financing to the investor. In essence, the investor renounces the dividend yields (by choosing the price variant of the index instead of the performance variant) in favor of the construction of the bonus certificate.

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Tax Rate Changes Impact on Mineral Oils Taxes Yields in the Czech Republic

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Abstract: *The study identifies the importance of mineral oils tax rates and other relevant factors for the mineral oil taxes yields amount. The study is focused on the unleaded fuel and diesel because of the yields importance. The correlation was confirmed by the Pearson coefficients, which reached the value above of 0.8. Moreover, the tax rate was surprisingly identified as highly important factor for mineral oils taxes yields using the econometric modeling, together with factors as the net income per capita and number of registered vehicles. On the other side GDP, transport performance (freight and passenger transport), consumer retail price of petrol and diesel, and price of petrol were identified as not statistically important for the unleaded petrol and diesel tax yields amount in the condition of the Czech Republic within the analyzed period.*

Key words: consumption taxes, tax burden, tax rate, tax yield, mineral oil taxes

JEL codes: H23, H26, E62, C51

1 Introduction

The fiscal policy means a group of instruments used by the state to influence the economy through changes of state expenses and state incomes (Klíma, 2006). Some economists declared that the aggregate supply can be supported by low taxes (Laffer, 2004). But Laffer (2004) said that it cannot be understood as a general principle meaning that lowering taxes leads to increasing or decreasing of tax yields comparing to the starting point of changes. Moreover, there are discussions about the shape of the curve proposed by Laffer (Samuelson, 2010). Most studies of tax incidence aim at the tax rate influence on the final price or consumer demand as the study targeted to the VAT (Široký at al., 2012) or to the cigarette taxation (Zimmermannová and Široký, 2016). The general tax incidence impact of consumption taxes in the Czech Republic was presented by Zápal (2014): The higher consumption tax rates lead to the higher price of the taxed commodities; but the prices do not follow the decreasing of the tax rates. Nevertheless, the tax incidence of mineral oils taxes cannot be described unambiguously as the amount of the mineral oils taxes shifted by distributors to consumers is highly variable in different periods (David, 2007), which influence the amount of tax yields. In some period, the tax burden can be nearly fully shifted to consumers (David, 2012). The changes in the price, caused by any reasons including mineral oils taxes, did not significantly influence the level of consumption in the period of 1999-2005 (David, 2007). Viren (2009) mentioned that in case of general taxation of consumption about half of the new tax burden is shifted to the consumers. Nevertheless, the impact of changed tax rates on tax yields remains hardly predictable based on the potentially high influence of the traders´ reaction, the related grey economy influence and potentially other factors.

The aim of this paper is to estimate the elasticities of the mineral oils taxes yields to the selected group of factors, particularly the tax rate, based on the correlation analysis using the parametric Pearson's correlation and the econometric modeling. The current article targets to the period 1993-2011. The paper is a part of the study testing the practical tax incidence in different periods, as the amount of the tax burden shifted from trades to consumer is highly volatile in time (David, 2007).

There are pending discussions about the function of consumption taxes rates and the impact of the rates on tax yields. Generally declared purpose of the consumption taxes is to discourage the taxpayers from consumption of the taxed commodities. It means that increased taxes might lead to decrease of tax yields (Klíma, 2006). But this function of consumption taxes applied to harmful commodities consumption could be retreated sometimes (Kubátová, 2010).

As the issue of consumption taxes is attractive for politicians and media many different opinions are reproduced by media but purely they are supported by some relevant study. One of the studies presented by the Ministry of Finance of the Czech Republic declared the consumption taxes, particularly taxes on mineral oils, were not sensitive to the tax rate and increased rates man increased tax yields (Jareš, 2008). Consequently, after increasing the mineral oils taxes in the year 2010 there was published a study Ševčík and Rod (2010) declaring another opinion that the demand on mineral oils is highly sensitive to the tax rates. The study was realized on data from the year 2010 published by the Ministry of Finance but later demented as based on false data (Táborský, 2013).

The unsatisfactory development of consumption taxes yields in 2010 was explained by the factors outside the Czech Republic, particularly the changes in the Slovak Republic, as mentioned in declaration of the Ministry of Finance (Minčič, 2011). Contrary approach can be find in declaration of DSV - Global Transport & Logistic experts (2012) which estimates that implementing special tax rate for mineral oils used in industry in the Czech Republic (such an option is enabled by Energy Taxation Directive 2003/96/EC) can lead to the increased tax yields about CZK 8 billion. It is a fact that such an approach was successfully implemented in France, Spain and Slovenia for example (Roškanin, 2011). The group of private car owners seems to be highly sensitive to mineral oils prices, particularly in the border regions (Michaelis, 2004; Banfi et al., 2005).

The EU tends to harmonize the principles and also rates of the consumption taxes nevertheless it was not possible to eliminate the historical and political backgrounds of different states fiscal policy, so some harmonized minimal tax rates remained at the level of zero tax rate (Kubátová, 2010) nevertheless it is not the case of the mineral oils taxes with relatively high rates. It is necessary to consider carefully the changes in consumption taxes rate as increasing of consumption taxes might be contra-productive and it might lead to shifted demand towards the black market with negative impact on tax yields (Koubová, 2014). Moreover consumption taxes frauds effects can be multiplied potentially influencing the VAT yields (Miroslav, 2013).

The purpose of its paper is to confirm the importance of tax rates for mineral oils tax yields within last decade in the Czech Republic and identify the influence of the tax rate and other relevant factors on the yields relating taxes mineral oils.

2 Methodology and Data

The study uses the analyses of the time series describing the development of rates and revenues of excise duties in the Czech Republic. The officially published data of the period 1993 – 2011 were collected and evaluated using the sources as Ministry of Finance of the Czech Republic, the Czech Statistical Office and the European Commission. The variables were tested for multicollinearity and heteroscedasticity while entering the econometric models. There are two basic analytical approach applied, the correlation analyses and the econometric modeling using the principles of the regression analyses.

This study targets to the mineral oils tax rates importance particularly. The importance of the mineral oils tax yields can be confirmed by the structure of yields in 2011, in the Table 1.

Table 1 Consumption Taxes Yields – case of the year 2011

Taxable commodities	Tax yield, mil. CZK	Share, %	Tax yield to GDP, %
Mineral oils	83,391	59.60	2.18
Alcohol	6,767	4.84	0.18
Beer	4,488	3.21	0.12
Wine	313	0.22	0.01
Tobacco products	44,958	32.13	1.18
Total	139,917	100.00	3.66

Source: Ministry of Finance of the Czech Republic (2012)

The following Table 2 includes the two most important products from mineral oils, which bring by far the highest tax revenue (more than 99% among the other mineral oil products taxed) - unleaded petrol and diesel.

Table 2 Overview of excise duties on mineral oils in the Czech Republic (1993-2011)

Year	Unleaded petrol, CZK/ 1000 l	Diesel, CZK/ 1000 l	Rate change, %	Tax yield, mil. CZK	Tax yield change, %	GDP change, %	Consump-tion tax quote, %	Infla-tion rate, %
2000	10,840	8,150	0	47,286	3.75	5.62	2.08	3.9
2001	10,840	8,150	0	54,835	15.96	7.88	2,24	4.7
2002	10,840	8,150	0	55,370	0.98	4.86	2.16	1.8
2003	10,840	8,150	0	58,411	5.49	4.70	2.17	0.1
2004	11,840	9,950	31.31	67,191	15.03	8.97	2.29	2.8
2005	11,840	9,950	0	77,676	15.60	6.38	2.49	1.9
2006	11,840	9,950	0	78,840	1.50	7.59	2.35	2.5
2007	11,840	9,950	0	82,901	5.15	9.25	2.26	2.8
2008	11,840	9,950	0	84,224	1.60	5.07	2.19	6.3
2009	11,840	9,950	0	81,600	-3.12	-2.32	2.17	1.0
2010	12,840	10,950	18.50	83,722	2.60	0.85	2.21	1.5
2011	12,840	10,950	0	83,391	-0.40	0.86	2.18	1.9

Source: European Commission, 2012a, 2012b; Ministry of Finance of the Czech Republic, 2011

For measuring of the correlation between tax rates and tax yields the Pearson coefficient was applied for the data of the period 2000 – 2011. The reason for this data set restriction was the change in determination of the tax base starting in the half of the year 1999.

In the column "Tax yield change" of the Table 2 the calculation of summary increase /decrease of the tax rate on unleaded petrol and diesel fuel is carried out and compared to the previous year, expressed as a percentage. The most general rate increase occurred in 2004, when the rates were increased for both products (petrol by 1,000 CZK, even on diesel by 1,800 CZK). The highest income tax on motor oils was recorded in 2008 in the amount of 84,224 million CZK. In the subsequent years, the tax collection was lower by 3.12%, probably also due to the economic recession. The most massive

year-on-year increases in tax revenues from mineral oils produced growth of rates in 2004, when the next two following years annually raised the collection of more than 15%. The highest level of the share of tax revenue to GDP was recorded in 2005 (2.49%) while the lowest was reached in 1998 (1.97%).

The correlation analysis and econometric modeling is based on data from the period of 2000 – 2011 as the data from the previous period before 2000 were evaluated as the inconsistent set of data.

The model estimates the tax revenues of taxes on unleaded petrol and diesel as the explained variables. Due to the nature of the economic principles expected, the linear regression model was built as the most suitable one. The models are built on the economic principles and the group of potentially important factors was included in the model and the stress was put on the tax rates. Number of variables, which should not absent in the model, according to previous general economic assumptions, progressively assessed as unfit during the models testing in the software GRETL and IBM SPPS Statistics. High Correlations between some explanatory variables were identified and some explanatory variables did not meet the statistical significance criteria. Due to this above mentioned reasons the following variables were not included in the model - GDP, transport performance (freight and passenger transport), consumer retail price (petrol and diesel), and the price of petrol. Their importance test and the correlation verification in a different period will be the object of the deeper consequent analysis as the changes in their role and mutual relationships may be expected.

The explanatory variable "tax rate" had to be an indispensable part of the final form of the model, since the aim of this research, and therefore this econometric modeling, is particularly to measure the dependence between the rates of excise duties and the resultant effect of a choice of relevant taxes. The considered tax rate was formulated as the average rate since the involvement of both rates in the model caused unwanted high correlation between these two predetermined variables.

The following factors were chosen as the entering variables into the model: an average tax rate of mineral oils, the change of net income per capita per year (as a factor indicating the purchasing power of the population), the change of number of registered motor vehicles in a given year (for verification whether the fact of more cars means automatically higher tax yields as some cars might not be used at the same time, by families for example).

Generally formulated econometric model:

$$y = F(x1, x2, x3) \quad (1)$$

Formulation of the stochastic model:

$$Y1 = \alpha + \beta 1\, x1t + \beta 2 x2t + \beta 3 x3t + u1t \quad (2)$$

Table 3 Overview of selected variables

Variable	Description	Mark	Units
explained	Mineral oils tax yields	y_{1t}	mil. CZK
explanatory	Average tax rate of unleaded fuel and diesel tax rates	x_{1t}	CZK/1000 litres
	Change in net income per capita	x_{2t}	CZK
	Change of registered motor vehicles	x_{3t}	thousand pieces
stochastic		u_{1t}	

Source: own elaboration

Due to the change in determining the tax base from 1,000 kg to 1,000 liters in 1999, the period 2000 - 2011 was chosen to build the model (Table 4). The reason was the incompatibility of rates values before 1999 and after.

Table 4 Overview of data entering the model

Year	Tax yield, mil CZK y_{1t}	Average tax rate, CZK/1000 l x_{1t}	Net income per capita, CZK x_{2t}	Registered motor vehicles, thousand pieces x_{3t}
2000	4,286	9,495	2,651	-59.1
2001	54,835	9,495	6,745	117.6
2002	55,370	9,495	2,986	171.8
2003	58,411	9,495	4,949	65.9
2004	67,191	10,895	5,889	113.1
2005	77,676	10,895	5,068	220.6
2006	78,840	10,895	8,968	227.8
2007	82,901	10,895	9,929	270.9
2008	84,224	10,895	11,777	225.4
2009	81,600	10,895	3,385	11.8
2010	83,722	11,895	1,479	75.4
2011	83,391	11,895	2,859	102.7

Source: Czech Statistical Office, 2013a, 2013b; Ministry of Finance of the Czech Republic, 2011

During modeling the GRETL and the IBM SPSS Statistics software was used.

3 Results and Discussion

Analyses covering the data from the Table 2 show, that the correlation coefficient for the relationship between the tax rate on petrol and tax yield is represented by the coefficient value of r = 0.8617. This relationship can be described as a very strong positive correlation. Relating the correlation of the tax rate on diesel fuel and the tax revenues the correlation coefficient is 0.9154, so it is a nearly perfect correlation relationship. Assuming a causal impact of the tax rate to the tax revenue (not vice versa), the correlation coefficients between these variables can be interpreted that the variability (r2) of the tax collections can be explained from 74% for petrol and from 84% for diesel by the tax rate variability based on the realized analyses.

The aim of the constructed econometric model for excise duty on mineral oils in the Czech Republic is to identify factors, which participate on the final level of tax revenue. Another key task is to define the force which the tax rate enters this algorithm; therefore, it is the prerequisite for participation of the tax rate in the model. The construction of a correlation matrix allows assessing the strength of correlations between different variables included into the model. Undesirable high multicollinearity, with coefficient value higher than 0.8, was not identified between any pair of explained variables as shown in Table 5.

Table 5 Multicollinearity test

	X1	X2	X3
X1	1.0000	0.0513	0.2346
X2		1.0000	0.2391
X3			1.0000

Source: own elaboration, Gretl, SPSS

The Method of Ordinary Least Square Regression was used for estimation of the structural parameters value of the model. The analysis outputs can be formulated the following way:

$$y1t = -75{,}830.3 + 12.915x1t + 1.153x2t + 28.819x3t + u1t \quad (3)$$

Test of the model confirmed the result reached:

$$71{,}287.25 = 75{,}830.30 + 136{,}829.13 + 6{,}409.43 + 3{,}708.09 + u1t \quad (4)$$

y1t calculated by the model = 71,116.34

The test confirmed that y1t of real value 71,287.25 (average) is approximately equal to y1t interpolated by the model to 71,116.34. Difference 170.9 (0.24%) is defined by a random component u1t.

The statistical model verification

P-values of all parameters in the model indicate statistical significance at the level of 95% as can be seen in Table 6.

Table 6 P-value

Variable	P-value
constant	0.00080
X1	0.00001
X2	0.01890
X3	0.05595

Source: own elaboration, GRETL, SPSS Statistics

For variable X3 the P-value tends to the threshold, but with regard to possible distortion of rounding and other positive results of model testing, this variable was kept in the model.

The model's coefficient of determination R2 reaches the level of 94%. So, it can be declared that the 94% of tax revenues of mineral oils can be explained by the explanatory variables included in the model.

The econometric model verification

The Durbin-Watson test shows the f value of 3.09. Such a value does not clearly identify the presence or absence of autocorrelation of residuals. Therefore, further analysis was realized. The Breusch-Godfrey test was carried out for further identification of autocorrelation of the first order. The result identified the P-value of 0.0517388, which was above the chosen level of significance α = 0.05, so we can conclude that the model is not burdened with model autocorrelation of the first order.

Testing the normality of residues was carried out by Jargue-Bera test. The aim was to test the null hypothesis that residuals are normally distributed. Evaluation of the test was obtained from the graph during the assumed normal distribution of residues compared to the actual distribution of the residue through a p-value of Chi-square. The results show the Chi-square result of 2.22368 with the p-value of 0.328953. We can conclude that residues are derived from a normal distribution.

The White's test excluded the heteroskedascity of the model (testing criteria LM = 9.54298 vs. P-value = 0.388732).

4 Conclusions

The study aimed at the factors influencing the tax yields identification; in fact it jumped the usually applied approach targeted to the relationship between the tax rates and prices or consumptions. It avoided using the GDP as the indisputable factor, the standardly expressed demand on mineral oils, tax competition among the EU states enabled by the EU legislation and expressed by different countries´ mineral oils tax rates and tax reliefs' amount. And the hardly estimated amount of mineral oils tax fraud in the Czech Republic was not also involved in the study.

The logical and economic assumptions about the positive effects of the explanatory variables can be seen and confirmed in the model results. The intensity of the parameters also corresponds to the general assumptions; therefore the entire estimated model can be described as a real simplified view of the investigated economic phenomenon.

The results of the correlation between the tax rate of mineral oils and relevant tax yields are confirming the opinion that under current condition in the concrete period the increase of tax rates could lead to higher tax revenues relating the unleaded petrol and diesel based on the data of the analyzed period in the Czech Republic. The net income level potentially influences the behavior of the mineral tax buyers which led to the increased tax yields in the analyzed period. Moreover the better net income may lead to ignoring the grey economy by the consumers. The increased number of registered cars means higher mineral oils taxes yields which is not surprising, moreover it may be derived from the fact, that most the newly registered cars were immediately used, which might has consequences not only in the field of taxation. On the other hand the above mentioned conclusion cannot be fully generalized due to the Laffer curve behavior vs. the concrete mineral oils taxes policy and automatically applied to any period. This is going to be a object of the planned future research.

The outputs of the model confirm the dependency of mineral oils taxes yields on their tax rates in the analyzed period. As the rates have been continuously increasing for decades we can say that the model describes the situation when tax rates increase at the concrete state of our economy. Moreover the model describes only the taxation of mineral oils so the conclusion cannot be without further verification transferred and applied to other period or generally to the consumption and environmental taxes without any additional analysis and comparison.

The data set consists of twelve years. The standardly required tests were realized, particularly the normality test, nevertheless the conclusion should be applied only to the period analyzed. We can express the conclusion, valid for the period of 2000 – 2011 based on the correlation and regression analysis, the increase of the average tax rate of unleaded petrol and diesel of 1 CZK/ 1.000 l could lead to the tax revenues increase of 12.9 mil. CZK. Any increase of household net incomes per capita compared to the previous year by 1 CZK tends to increase the mineral oil taxes yields of 1.15 mil. CZK. An additional thousand newly registered motor vehicles, in relation to the previous year, could cause the tax revenues increase of 28.8 mil. CZK.

The strong correlation between the mineral oils tax rates and tax yields was confirmed by the Pearson coefficient as it reached the value of 0.8617 for unleaded fuel and 0.9154 for diesel. Moreover the tax rate was identified as the statistically important factor for mineral oils taxes yields using the econometric modeling for the unleaded fuel and diesel in the Czech Republic in the concrete period.

The factors as the net income per capita and the number of registered vehicles were identified as statistically important factors in the analyzed period in the Czech Republic too. The coefficient of determination of the whole model reaches the high level of 94%.

Contrary to the statistically important variables the transport performance (the freight and passenger transport), the consumer retail price of petrol and diesel, and the price of petrol, were identified as factors being not statistically significant at the chosen level of statistical significance ($\alpha = 0.05$) in the analyzed period.

The next consecutive analysis should follow the results of this paper and evaluate the relationship between the tax rates and the tax yields of different consumption taxes targeted to variable importance of the tax rates in different stages of the economy development using the data of the period 2004 – 2016.

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Evaluating the Implementation Level of Management and Control Principles of the Public Finances

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Abstract: *The article deals with evaluating the level of application of management and control principles of public finances in selected public administration entities. Standards for this evaluation, valid principles of management and control of public finances and the rules for their application have been established between 2000 and 2001. They are applicable in activities during the acquisition and operation of property. The article focuses on the current status and monitoring 3E concept – effectiveness, economy and efficiency and the use of the term accuracy. These should be part of common public administration management during their decision-making procedures. The management of public administration entities uses internal regulations for their internal activities, which determine the procedures and methods for ensuring the management and controlling public finances. The article's results of principles application in the management and control of public finances in selected public administration entities can subsequently be the basis for changing the internal standards in order to improve these activities of management not only for the analysed public administration entities.*

Keywords: Efficiency, Effectiveness, Economy, Internal Regulations, Public Administration Entity

JEL code: H83

1 Introduction

The basic standards for the evaluation the level of application of management and control principles of public finances are the statutory standards and regulations issued by the Ministry of Finance of the Czech Republic (CR), as well as regulations and norms in order to conduct the management and activities of public administration entities (PAE). For each activity of the economic entity are crucial principles relating to the management and control of the financial system in the appropriate organization.

Preparation for the entry and subsequent involvement of the CR into the structures of the European Union (EU, in 2004) meant to learn in PAE to respect and apply the principles of the management and control of public finances (the principles).

Existing principles: accuracy, efficiency, economy and effectiveness applied in relation to public finance has become, along with other related activities as control and audit, basis for all activities in public administration. The principles are related to the various activities which public administration carries out. These activities include for example financial management, employee compensation or property management: during acquisition and purchase of products and services, usage and operation of property, its maintenance etc.

The principles are contained in laws, which focus on the activity of public administration. The basic legal standard in terms of these principles is Act No. 320/2001 Coll., on

Financial control in the public administration (2001) (the Financial Control Act). In connection with this was adopted Decree No. 416/2004 Coll. (2004), which implements the Financial Control Act (the Financial Control Decree). Some of the principles are also contained in other acts of law (in the current legal text), as for example: Act No. 219/2000 Coll., on Property of the Czech Republic (2000) (the Property Act); Act No. 128/2000 Coll., on Municipalities (2000) (the Municipal establishment Act); Act No. 129/2000 Coll., on Regions (2000) (the Regional Settlement Act); Act No. 218/2000 Coll., on Budgetary Rules and on Amendments to Certain Related Acts (2000) (Budgetary Rules Act); Act No. 250/2000 Coll., on Budgetary Rules of Territorial Budgets (2000) (the Territorial Budgetary Rules Act) and others.

In relation to these principles, PAE is required to adopt procedures for establishing and maintaining an internal control system. That creates the conditions for the economical, efficient and effective performance of the relevant PAE. The system should be able to identify, evaluate and minimize operational, financial, legal and other risks arising in connection with meeting the agreed intention and targets. It should also include procedures for timely information reporting to relevant levels of management and about the occurrence of serious deficiencies and the actions, which are taken and implemented to fix them.

The Financial Control Act, come into force in 2001. How important are the principles included in here for the activity of PAE, is the question in here. This fact can be assessing from the audit findings and the annual reports of the Supreme Audit Office (SAO) for the period since year 2001. The annual SAO reports for individual years point out to the persistent problems of keeping the principles and their application to the activities of individual evaluated PAE (Supreme Audit Office, 2016).

In its annual 2016 report, the SAO identified the key factors which reduce the impact of individual principles on state expenditure policies. These include, for example: poor strategic and conceptual management, leak control of the costs substation and the effectiveness of the incurred funds. The annual report notes (according to identified weaknesses), that institutional management has wide scope for improving its own performance by implementation of the principles (Supreme Audit Office, 2016).

Currently, the Ministry of Finance of the CR, the Government of the CR and the Chamber of Deputies are preparing the amendment to the Financial Control Act. The guideline for change is Regulation (EU, EURATOM) No. 966/2012 Coll., on the financial rules applicable to the general budget of the Union (the Regulation), applicable to the general budget of the EU. The Regulation sets out a series of principles regarding the control and management of public finances. Specifically, Article 30 deals with the principles of proper financial management. These rules will introduce (through amendment) a new concept of these principles into the Czech environment.

The existence of the amendment will also mean a reassessment of existing procedures of PAE. It will be necessary to take measures that will put these principles into practice. There is the premise that new setting of powers and responsibilities of employees - including top management will occur.

The internal standards, rules and procedures are the source for the level of assessment of the principles application.

The underlying problem is to determine what the current level of implementation of existing principles is within selected PAE. The aim of the contribution is to get the answer from the selected PAE to the question: At what level are currently being respected principles and related economic tools within internal regulations (IR)? Based on the results and evaluation of achieved levels will be then suggest recommendations. These could be implemented in relation with the introduction of the amendment to the Financial Control Act into practice at various PAE.

2 Methodology and Data

Different methods of scientific work were used during processing the above-mentioned problems; the Grounded Theory method was the basic one. This qualitative method has allowed us to narrow the research problem through research questions and deal with individual data areas and then addressing them with supplementary questions. Further methods used for the examination and evaluation the research was: analysis and synthesis, comparison and induction.

The data collection and analysis process was based on the examination of the acquired IR of selected PAE. The cost-utility analysis (CUA) has become a tool for evaluatiing the surveyed data. The rating scale was used for the CUA implementation. The evaluation in chosen individual areas (via the rating scale) was based on the measurement of the utility on the base of the subjective expression of the evaluator's satisfaction (Ochrana, 2001). Research questions were: At what level is fulfilled the diction of legislative norms in the examined areas in their specific use within IR? How are in IR applied principles for the management and control of public finances and related activities?

A rating scale from 1 to 5 was used for the assessment of individual areas. The value 1 indicates the most preferred state and value 5 indicates the least preferred state. Table 1 shows the qualitative assessment of the individual points in relation to the selected areas. The wording for the assessment of individual areas created possibility to specify the state in which the evaluated phenomenon is currently set. The follow-up description of the results allowed accepting the formulation of the proposals for the measures, which are related to the evaluated area.

Table 1 Description of rating scale for assessing the evaluated areas

Value	The area is meeting in terms of requirements:
1	Without defects. The area is clearly expressed in the internal documents. The procedures of the process implementing are described in relation to the persons responsible. The realisation of the principles allows measurability of the area and direct application in decision-making and control processes.
2	Minor defects. The area is expressed in internal documents. The procedures of the process implementing are described in relation to the persons responsible. The principles are used in decision-making and control processes.
3	Major defects. The area is expressed in internal documents. The procedures of the process implementing are not described. There are missing bindings, rights and responsibilities for applying the principles in decision-making and control processes.
4	Serious defects. The area is expressed in internal documents, but only referring to the higher legal standard. It has no informative value in relation to the responsible persons. The procedure for applying the principles in decision-making and control processes is not clearly described.
5	Crucial defects. The evaluated area is not included in internal regulations

Source: author's own research

IR of selected PAE were used as the basis for the option of evaluation.

PAE were selected by a stratified selection, so different groups of public administration organizations were represented:

- organizational component of the state (ministry) – obtained IR is from 1 subject out of 14, p_1 = 0,0714, (Government of Czech Republic, 2017);
- higher local authority units (regions) – obtained IR are from 3 subjects out of 14, p_2 = 0.2143, (Czech Statistical Office, 2017);
- local authority units (districts of municipalities with extended competence) – obtained IR are from 12 entities out of 206, p_3 = 0.0582 (Czech Statistical Office, 2017).

At the level of confidence (α = 0.03), it can be stated that the levels of reliability of individual groups of public administration organizations (p_1, p_2, p_3)> α. The number of IR received from each group of entities is relevant for evaluation.

The management of the above-mentioned PAE mostly uses, during their operations, management by objectives. In this management, it is implemented a process where top management sets goals and other employees meet the objectives with their daily basis activities. The management uses for implementation of management by objectives IR for its internal activities.

The purpose of IR is to apply legal norms into specific conditions of PAE. The IR includes the rules, procedures and methods for securing the management and control processes of public finances in its own conditions of each PAE. For this reason, we were acceding to the solution of solving this area by classifying the level of observance and respect of selected areas resulted from the IR.

The IR were obtained via the websites of the individual entities and further through the application of the relevant legislative standard – obtained on request.

Table 2 Examined areas of internal regulations

	Areas of IR in relation to the principles for management and control of public finances
1	Determining the responsibilities of departments and persons in the organizational structure.
2	Definition of terms efficiency, economy, effectiveness and accuracy.
3	Usage of procedures under the Financial Control Decree.
4	Usage of planning under the Financial Control Act
5	Acquisition of property, public contract and acquisitions processes under the Financial Control Act.
6	Usage of processes of risk management.

Source: author's own research

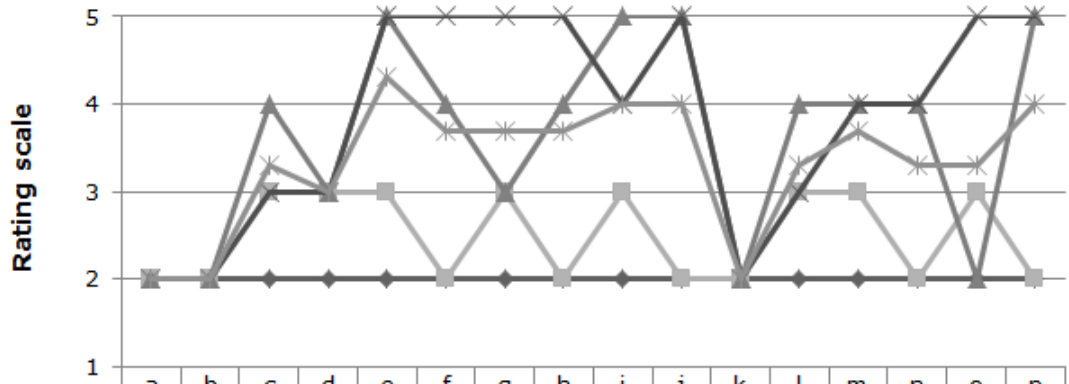
3 Results and Discussion

The results of the examinations within the individual areas 1–6 are shown in the following Figures:

Figure 1 "The results for selected subjects in the range of areas 1 to 3" indicate the individual PAE on the X axis, the Y axis specifies evaluated rating scale (1 to 5). The figure also shows a table with achieved value for individual entities of public administration and examined areas (according to table 2 "Examined areas of internal regulations") and the arithmetic average for three mentioned areas.

Figure 2 "The results for selected subjects in the range of areas 4 to 6" indicate the individual PAE on the X axis, the Y axis specifies evaluated rating scale (1 to 5). The figure also shows a table with achieved value for individual entities of public administration and examined areas (according to table 2 "Examined areas of internal regulations") and the arithmetic average for three mentioned areas.

Figure 1 The results for selected subjects in the range of areas 1 to 3



	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
optimum level	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1 area	2	2	3	3	3	2	3	2	3	2	2	3	3	2	3	2
2 area	2	2	4	3	5	4	3	4	5	5	2	4	4	4	2	5
3 area	2	2	3	3	5	5	5	5	4	5	2	3	4	4	5	5
average 1-3	2,0	2,0	3,3	3,0	4,3	3,7	3,7	3,7	4,0	4,0	2,0	3,3	3,7	3,3	3,3	4,0

Source: Author's own research

Legend: PAE are identified in alphabetical order; the investigation fields are identified numerically and graphically; PAE: a – government department (ministry); b–d higher local authority units (regions); e–p local authority units (districts of municipalities with extended competence).

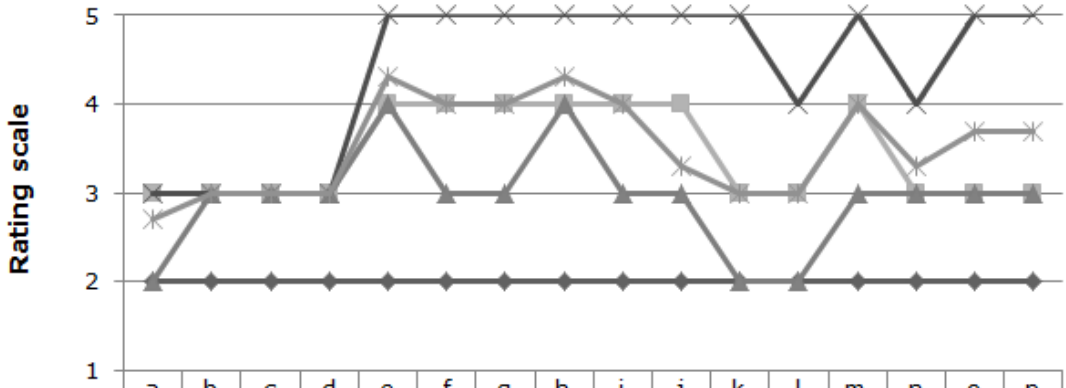
The obtained results on Figure 1 "The results for selected subjects in the range of areas 1 to 3" show that the possible expected optimum (as average for all evaluated areas) at recommended point 2 (minor defects) was achieved only by 3 entities.

In the evaluated area 1 (Determining the responsibilities of departments and persons in the organizational structure) only minor defects (8 entities) and major defects (8 entities) were identified. No other values were observed.

In the evaluated area 2 (Definition of terms efficiency, economy, effectiveness and accuracy), defects with a value 5 (crucial defects) were identified. This fact was found in 4 out of the 16 entities. Finding (25 % of PAE was rated in this area by value 5) shows that the approach of management identified by IR does not allow measurability of the area and the direct application of principles in decision-making and control processes of these entities. Responsible employees do not decide on the basis of measurable results. Principles are not identified in usable form for the management. This means that the use of budgeted PAE funds cannot be substantiated in an evaluable way. The required option necessary for the management: "If we want to manage, we need to know, and if we should know and not only to assume, we must be able to measure" (Bazala, 2006), is not fulfilled.

In the evaluated area 3 (Usage of procedures under the Financial Control Decree), none of the evaluated PAE achieved value 1 (without defects) and only 3 subjects could be rated by value 2 (minor defects). In most cases (7 out of 16 respondents), the score reached value 5 (crucial defects). This result point out that PAE with rating 5 did not introduce or describe procedures for the implementation of the Financial Control Decree in addiction to responsible persons.

Figure 2 The results for selected subjects in the range of areas 4 to 6



	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
optimum level	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4 area	3	3	3	3	4	4	4	4	4	4	3	3	4	3	3	3
5 area	2	3	3	3	4	3	3	4	3	3	2	2	3	3	3	3
6 area	3	3	3	3	5	5	5	5	5	5	5	4	5	4	5	5
average 4-6	2,7	3,0	3,0	3,0	4,3	4,0	4,0	4,3	4,0	3,3	3,0	3,0	4,0	3,3	3,7	3,7

Source: Author's own research

Legend: PAE are identified in alphabetical order; the investigation fields are identified numerically and graphically; PAE: a – government department (ministry); b–d higher local authority units (regions); e–p local authority units (districts of municipalities with extended competence).

The results demonstrated on Figure 2 "The results for selected subjects in the range of areas 4 to 6" show that the possible expected optimum (as average for all evaluated areas) at recommended point 2 (minor defects) was achieved only at 2 entities.

In the evaluated area 4 (usage of planning under the Financial Control Act), is insufficiently treated area in IR of PAE. This fact is confirmed by the results, because none of the analysed PAE reached the optimal levels. Out of 16 analysed PAE – 9 reached level 3 (major defects), the remaining 8 PAE reached level 4 (serious defects).

In the evaluated area 5 (acquisition of property, public contract and acquisitions processes under the Financial Control Act.), there is possible to find better results for individual entities. Eleven Subjects – that means most of the analysed PAE reached a score of 3 (major defects). This means that most entities have description of the process of acquiring property in their own IR (the Directive). These IR are characterized by a high degree of inaccuracy in relation to the specific procedures of PAE in the realization of a public contract. Therefore, it leads to inefficiencies of this area.

It is possible to evaluate that the area 6 (usage of processes of risk management), is characterized by the worst results among all the analysed areas. The status of the evaluation was at 10 subjects with value 5. The area of risks is by PAE over time underestimated discipline. PAE employees in the decision-making process do not take risks associated with management and leading. This fact negatively affects the economic performance and results of PAE.

What position and opinion to take to the introductory question: At what level are currently being respected principles and related economic tools within internal regulations?

From the Figure 1 " The results for selected subjects in the range of areas 1 to 3" and from the Figure 2 " The results for selected subjects in the range of areas 4 to 6" it is obvious that, in average, each of the areas only rarely achieved predicted value 2 (corresponding with minor defects).

IR report, in the evaluated areas, a number of different types of defects. The median of the point values for each area (1 to 6) of evaluated PAE is 3.5. It means the median reached value between 3 (major defects) and 4 (serious defects).

What are the characteristic defects in the implementation of principles and of other related tools to the management and control of public finances?

In the case that identification of principles and other instruments (control, risk assessment) exists, the content of IR is not specific in these evaluated areas. It is stated that they "should" take place, but there are no specific instructions for how to proceed it. Procedures for process implementation, performed by individual process participants, are not described. In context with this, bindings, rights and responsibilities for individual employees are not identified.

Existing simplified elaboration of the principles in IR automatically assumes execution capabilities of all employees (including management). According to the results of control findings – implementing capabilities of employees (even management) cannot meet the needs and obligations of PAE.

This fact indicates the PAE management necessity to pursue IR more consistently. PAE management should understand that their IR helps in management on various levels of the organization structure. The proper IR range and formulation can contribute to fulfilling of the required principles and, in particular, to improve management itself.

Based on the assessment in individual areas, PAE management should take a number of measures to remedy that would help to solve the evaluated current state. For each PAE management functions and for PAE individual activities, which they deal with, it is necessary to set up process procedures through IR.

The proposed measures should be aimed at adjustment changing and amending the IR.

According to the seriousness, these changes should focus on the processing and completion of the IR at least in the range of:

1 Methodology for the principles implementation.
2 Methodologies for identifying, eliminating, mitigating or preventing risks.

In both the above-mentioned cases, it is a more consistent elaboration of the obligations set by the Financial Control Act on its individual provisions. In preparing amendments of the IR, is however necessary to focus on issues arising from the forthcoming amendment of the Financial Control Act. Fulfilment of obligations under other Acts of law mentioned in the introduction of this paper could be even ensured in connection with this.

With the adjustment and amendment of IR (according to points 1 and 2), it is necessary to ensure even adjustment of a competency framework for the performance of all participating employees. PAE top management should plan and develop, in the interest of PAE, a competency profile for both sides: its own and its employees as well. The aim would be to increase their eligibility to use and implement the principles related to the management and control of public finances. Regular training and courses should become a part of the concretization of individual IR areas.

4 Conclusions

The article dealt with the issue, which has constant problems in the Czech Republic and its PAE. As previously stated under the preceding chapters – The cause of the current state lies in the deficiencies and defects resulted from the erroneous, defective, insufficient elaboration of the legislative standards into the conditions of the competent PAE through their IR.

The rights and obligations are in legal norms referenced to the PAE top management. Only on them depends the ability of individual PAE to deal with the obligations related to the management and control of public finances.

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Outsourcing in the public sector in the Czech Republic: case studies

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Abstract: *The relevant literature suggests that if, and only if, outsourcing is properly implemented, then it may, but might not, improve cost effectiveness and deliver the necessary quality. In this paper, we present two cases describing the processes and results of outsourcing by public sector bodies in the Czech Republic. Data are based on an in-depth audit delivered by students preparing their master's degree theses under the supervision of one of authors of this paper. Compared to our previous in-depth audits in Slovakia, we did not find very visible cases of inefficiency connected with in-house versus outsourcing decisions. However, our data confirm that the core problematic service in our public administration conditions is transportation. The 'habit' of public bodies having company cars or even in-house drivers is usually a very expensive practice. If such cars and the time capacity of the drivers are underutilised, the costs of taxi services can actually be much cheaper. The data also show that even with only a few competing bidders, public organisations can receive very low-cost offers for cleaning and security services, much below the minimum costs of internal production. Suppliers can achieve this by 'manipulating' the labour costs or the costs of the quality of the delivered service.*

Keywords: outsourcing, Czech Republic, process, results

JEL codes: D29, H11, H80

1 Introduction

Outsourcing the production of internal services to private suppliers is a very common type of alternative service-delivery arrangement. The decision to outsource should be based on the answer to the question: 'Produce in house or buy?' (Prager, 1994).

The growth of the number of externally produced internal services (such as cleaning) is very much connected with the New Public Management (NPM) ideology. Reform steps at the end of the 20th century focused on increased efficiency via de-monopolisation, decentralisation, deregulation, externalisation, and privatisation (Lacasse, 1992; Péteri and Horváth, 1997; Sclar, 2000; Smith, 1996; Walsh, 1995). The result was a massive increase in the use of Alternative Service Delivery Arrangements (ASDA) in the public sector (Digler, Moffet and Struyk, 1997; Donahue, 1989; Green, 2002; Hefetz and Warner, 2004; Hirsch, 1991; Miranda and Andersen, 1994; Alford and O'Flynn, 2012; Nemec, Vries and Potier, 2017).

The expected benefits from outsourcing are especially connected with potential cost savings and increased transparency in public expenditures (Savas, 1987; Siegel, 1999; Green, 2002; Digler, Moffett and Struyk, 1997; Osborne, Radnor and Nasi, 2013; Sarapuu and Lember, 2015). However, these benefits can be offset by increased transaction costs (inevitable extra costs to manage the contract) and decreased quality (if the contract is imperfect and/or contract monitoring fails); see, for example, Pratt and Zeckhauser (1986) and Arrow (1985).

In this situation, the relevant literature suggests that if, and only if, the outsourcing is properly implemented, then it may, but might not, improve cost effectiveness and deliver the necessary quality. Because of this, it is of utmost importance to know what the core factors and barriers of successful outsourcing are.

The goal of this text is to present two cases describing the processes and results of outsourcing in public sector bodies in the Czech Republic. The importance of this study is mainly in that similar in-depth studies are almost entirely absent from the existing economic literature about outsourcing.

2 Methodology

The study uses a rather simple methodology. Detailed data about all aspects of the outsourcing processes and outsourcing results in two selected public organisations were collected via in-depth audits conducted by students preparing their master's degree theses (Kufova, 2016 and Mrazkova, 2016) under the supervision of an author of this paper. Additional information was collected in interviews with the economic directors of the investigated organisations. Two bodies were selected – the municipal office in a medium-size city and a theatre of national importance. The organisations are unnamed, at their request.

3 Case Study 1: Municipal Office

In the selected municipal office, two outsourced services (cleaning and part of IT services) and two in-house produced services (maintenance and transport) are analysed.

Cleaning

This service was produced in house before 2010, but the office decided to outsource it. The service costs in 2014 were 5607.6 CZK per employee and 138.1 CZK per sqm (1 EUR ≈ 27 CZK). The first tender for an external supplier was conducted in 2010/2011; three firms submitted proposals:

- Vidocq s.r.o., Pardubice,
- Technické služby Moravská Třebová s.r.o., Moravská Třebová,
- ALFA – BETA servis s.r.o., Zábřeh.

The selection criterion was the lowest price bid (may be not so wise decision for this service). The winner of the tender was ALFA-BETA servis, offering a price of 34 788 CZK (Vidocq offered 37 747 CZK and Technické služby Moravská Třebová offered 46 800 CZK). However, a few days after the contract was signed, the contract price was amended and increased by 1 800 CZK (without VAT), with a new total monthly price of 36 948 CZK. This is still below the second-lowest bid, but not exactly in line with existing legal regulations. In 2013, the contract price was increased to 37 255.9 CZK. The firm proposed a further increase to 40 018.4 CZK, but this proposal was not accepted by the municipality.

The cleaning costs invoiced by the winner were, for most months of service delivery, higher than the contract price (the municipality explains that it ordered extra services), which may, but might not, be legally correct (lowest 36 948.00; highest 60 595.10).

In 2015, the municipality repeated the tender, as the municipality was not willing to accept the price increases proposed by the supplier. Again, the municipality received three bids, and the criterion was the lowest price. The results were as follows:

1. JASPA Servis s. r. o., Opava: 38 528.21 CZK
2. Kamil Effenberger, Zábřeh: 35 077.90 CZK
3. SECCON s. r. o., Litomyšl: 36 295.16 CZK

The winner, JASPA s. r. o., Opava, did not offer the lowest price, but it received a special 'discount' because more than 50% of its employees are disabled; for this reason, its price was formally the lowest. Taking into account that such results would increase cleaning

costs, the municipality cancelled the tender and started a new one – with the same group of suppliers (legally problematic solution). The results from the new tender were as follows:

1. JASPA Servis s. r. o., Opava: 29 982.19 CZK
2. SECCON s. r. o., Litomyšl: 32 668.55 CZK
3. Kamil Effenberger, Zábřeh: 34 109.90 CZK

The tender results show that the proposed service prices are significantly decreasing. We tried to determine if such a low price had an impact on quality by surveying the municipal staff. The results were not conclusive: some staff were happy, and some were not. It seems that this significant decrease in cost was not noticeably offset by a decrease in quality (in a short-term perspective).

We also tried to test the 'efficiency' of the new price to determine if outsourcing is a good decision. The first benchmark is data from the benchmarking system of Czech municipalities (Table 1). Because full cost accrual accounting is not used, the data are imperfect. Normally only direct costs are included, and thereby in-house production costs are underestimated. Because this municipality has 83 employees and monthly costs of approximately 30 000 CZK, its relative costs for externalised production are comparatively very low.

Table 1 Cleaning costs in Czech municipalities per employee (benchmarking initiative members with internal cleaning), CZK

	2010	2011	2012	2013	2014
5	10 855.85	11 334.48	11 770.90	11 536.58	12 174.54
10	8 666.66	9 703.70	10 657.71	10 935.64	10 734.21
18	9 152.04	8 845.23	8 458.82	7 080.92	7 977.40
23	7 769.69	6 540.69	7 552.79	7 697.53	7 615.85
26	9 834.58	9 967.30	11 280.70	11 008.77	10 872.88
28	10 444.68	10 994.38	10 407.40	11 876.47	11 605.71
34	13 905.45	11 796.06	10 410.62	12 393.93	11 411.76
39	5 410.83	6 126.31	6 111.11	6 059.52	6 234.73
41	18 938.97	8 855.26	9 093.33	9 066.66	8 824.05
42	8 817.82	8 010.89	9 121.05	8 572.02	9 060.08

Source: municipal office (data are not public)

Another benchmark is the 'virtual' offer of existing companies offering cleaning services. We received two virtual bids for the conditions of the municipal office. The first bid, by HESTIA úklidová s.r.o., was an unrealistic 238 550 CZK without VAT for one month. The second bid, by BRUCO, was 42 315 CZK without VAT per month. Despite the fact that a real competition could decrease the offered prices, our 'virtual tender' indicates that the winning bid by JASPA servis was really inexpensive.

Information technologies

The municipality decided to outsource part of its IT needs, connected with the obtainment of an EU grant (Technologické centrum pro ORP Moravská Třebová). In this case, the selection criterion was the most economically advantageous bid (price for part I, price for part 2, and technical parameters of the offer (problematic choice). The winner was OR-CZ s.r.o with 99.64 points and monthly service costs on the level of 18 162 CZK (this sum was invoiced monthly for the whole investigated period).

It is difficult to assess the efficiency of this solution, because only one part of the IT services is covered. If the municipal office needed to employ one more specialist in order to obtain this service, the costs for outsourcing seem to be comparatively low (the monthly labour costs for one IT specialist in the Czech Republic are at least 50 000 CZK;

the yearly direct salary costs of two IT specialists employed by the municipality are almost one million CZK).

The negative aspect of this service is the fact that the contract was signed for an unlimited period and the contract provided the supplier with the right to increase the price (based on inflation) without consulting with the municipality.

Maintenance of buildings

The regular and irregular minor building maintenance is delivered by one internal full-time employee. The direct costs of this service were approximately 200 000 CZK yearly. Because the sum is very small, we decided not to check the efficiency of this service.

Transportation

The municipality does not have in-house drivers, but it does have six passenger cars, and employees who have passed a prescribed examination are allowed to drive the office cars. The list of cars, with their purchase prices, is as follows:

- ŠKODA SUPERB: 689 300 CZK (2014 mileage 19 513 km)
- ŠKODA OCTAVIA: 436 590 CZK (2014 mileage 18 645 km)
- ŠKODA OCTAVIA COMBI: 476 599.99 CZK (2014 mileage 1 899 km)
- ŠKODA FABIA: 332 996.10 CZK (2014 mileage 20 166 km)
- ŠKODA FABIA: 318 857,50 CZK (2014 mileage 9 520 km)
- ŠKODA FABIA: 314 733.50 CZK (2014 mileage 5 599 km)

In 2015, the municipality purchased (by the direct award method – rather problematic solution) a new SKODA OCTAVIA for 479 300 CZK. This price included a discount for an old SKODA FABIA that was sold to the supplier. The sum paid seems to be 20% higher than standard market price.

The data above show that the existing system (six previously owned cars plus one new one) is inefficient. The very visible indicator is that the mileage for some cars is too low – the effectiveness principle is not respected. Concerning economy, we compared the existing situation with two alternative scenarios.

The first possible option for replacing/reducing an owned fleet of vehicles is to rent cars as needed. A local rental company has the following 'set' price - Skoda Octavia: daily lump sum 290 CZK plus 2.90 CZK per km. The second option is to use a taxi service. A local taxi service price is 10 CZK/km for long-term customers. Comparisons are shown in Tables 2 and 3.

Table 2 Transport characteristics municipal office in 2015

Car	km	Fuel costs CZK	Repair costs CZK
ŠKODA SUPERB	19 176	38 561	18 825
ŠKODA OCTAVIA	18 020	24 290	107 366
ŠKODA FABIA	19 989	46 928	25 999
ŠKODA FABIA	5 411	14 483	341
ŠKODA FABIA	9 517	22 140	31 312
Total	72 113	146 402	183 843

Source: own research

Table 3 Comparative data (CZK)

	In-house direct costs	Rental cars (including fuel costs)	TAXI
Costs	330 245	341 458	723 350

Source: own research

The calculations in Table 3 clearly suggest that owning a large fleet of cars is an ineffective solution (the costs for petrol and repairs alone are fully comparable with the cost of using rental cars).

4 Case Study 2: Theatre

The theatre uses outsourcing for the following internal services – security, maintenance of the theatre property greens, and cleaning in some of its buildings. Most cleaning is delivered in house, as the theatre was not successful with its last tender aimed at switching to fully externalised production of this service.

Security

This service has been outsourced for more than ten years, but with frequent changes in suppliers. The firm LEMESSIANA s.r.o. delivered the service until the end of 2014, when the firm itself cancelled the contract by its own initiative. The firm Forcorp Group then delivered the service until 31 March 2016 (selected only for one year by a simplified procurement method, because of insufficient time to conduct an open tender for service delivery). Since 1 April 2016, the service has been delivered by the firm BARTOŇ A PARTNER, s.r.o. In 2015, the yearly service costs were 1 574 385 CZK.

The most recent tender for the service was organised in 2016, with the tender process outsourced to a specialised firm. The selection criterion was 'best bid' with the following elements:

1. Price: 80%
2. Complexity and quality of offer: 20 %

The tender included two slots. Eight bids were submitted for both slots, four of them were excluded. The proposed prices for the first slot were (without VAT):

- BARTOŇ A PARTNER, s.r.o.: 54 168.00 CZK
- OP Security, s.r.o.: 66 900.00 CZK
- PPH s.r.o.: 51 100.00 CZK
- IPO – Star, s.r.o.: 73 689.85 CZK

The proposed prices for the second slot were:

- BARTOŇ A PARTNER, s.r.o.: 296.00 CZK
- OP Security, s.r.o.: 370.00 CZK
- PPH s.r.o.: 310.00 CZK
- IPO – Star, s.r.o.: 379.60 CZK

The final winner for both slots was the firm BARTOŇ A PARTNER, s.r.o. The contract was signed for an unlimited period (should not be done so) on 22 February 2016. The price for this service is really low, as the invoiced labour costs are below the minimum wage in the Czech Republic. The perceived quality of the service is partly problematic – the theatre is evaluating the option to switch to a mixed model, with an in-house night security staff. The supplier hires pensioners for this position, which enables the supplier to invoice such low sums, but raises the risk of such staff being unable to act in case of a real emergency.

One specific issue is connected with the contract for security services. The yearly total costs calculated on the basis of the contract should be 1 697 708 CZK, but the 2016 reality was 2 347 724 CZK (the management provided no explanation for this difference). This price is still an economically effective solution, as the minimum direct labour costs for delivering the service in house (for the same workload) would be approximately 2 358 650 CZK. The issue is the limited quality of the night security service, as mentioned above.

Maintenance of greens

This service has been outsourced for more than ten years. The most recent tender was organised (small scale procurement procedure) in 2014, and the municipal company Veřejná zeleň města Brna was selected. The 2015 costs for the service were 388 760 CZK.

The 2014 tender selection criterion was lowest price (with a voluntary option of accepting bartered payment for parts of the invoices with tickets for theatre performances or other services – rather problematic aspect). The following bids were received (without VAT):

- Veřejná zeleň města Brna, p.o.: 394 305 CZK
- Bartoň a Partner, s.r.o.: 419 956 CZK
- DVOŘÁK comte, a.s.: 657 196 CZK

The theatre management is satisfied with the quality of service provided by the winner. The minimum level of direct labour costs for in-house production of this service (at the same volume) would be about 500 000 CZK. This means that in-house production would be a more expensive solution.

Outsourced cleaning

For most of the theatre buildings, the cleaning is provided in house (only the directorate building, a small administrative building, and two flats are cleaned by the firm selected by a direct award (should not be so) in 2004 (formally, the yearly costs at the time of selection were on a level allowing for direct purchase). In 2015, the cost for cleaning the above-mentioned buildings were 667 282.79 CZK without VAT (above the maximum limit for a direct purchase today), but the old contract is valid and was signed for an unlimited period (should not be so). The minimum direct costs for in-house production of this service would be slightly higher – we calculated them at 685 820 CZK.

We tried to benchmark the contract prices to virtual bids from selected potential suppliers. From the ten firms contacted, only one submitted a virtual offer – on a level of 648 480 CZK, marginally less than the current contract.

The perceived quality of contracted cleaning services is positive, with some but not very crucial negative comments. The willingness of the firm to communicate about problems was appreciated.

In-house cleaning

The theatre announced a tender for outsourcing cleaning for all its other buildings in January 2014. It used an external body to manage the tender. This tender was eventually cancelled due to different complaints from the bidders. In this situation, cleaning of the main theatre buildings is produced in house by theatre employees – a twenty-member cleaning staff. The direct (labour) costs for internal cleaning in 2015 were 2 348 368 CZK.

To benchmark the costs of in-house production, we again contacted ten firms with a request for virtual bids. Only one complex virtual bid was received, with a contract price of 2 532 000 CZK. Because the in-house 'price' for cleaning does not include any indirect costs (not even social contributions), outsourcing, supposing that virtual bid is realistic, could be a better option for the future.

The management is fully satisfied with the work of the in-house cleaning staff.

Transport

Most of the transport is carried out by company cars. The theatre has four full-time employed drivers (!). The theatre was not willing to provide any more detailed information about transportation costs, only the fleet structure: Škoda Superb – 2 cars, Ford Transit, Škoda Superb Combi, Škoda Octavia Combi, Renault Mascott, Fiat Scudo and Mann tractor trailers. The fleet is a combination of older and almost new cars.

From accounting, we were able to determine that the total transportation costs in 2015 were 1 464 850.91 CZK. Fuel represents 699 733.33 CZK and ticket costs are 400 082 CZK. The rest is probably service costs – full costs (including depreciations) are not calculated. In any case, owning a fleet (except for specific cars) and especially having in-house drivers, whose time capacity is not used sufficiently, is proven to be an ineffective solution.

5 Discussion and conclusions

In this paper, we provide detailed information about the in-house versus outsourcing decisions of two public bodies in the Czech Republic. The data presented are fully reliable, because the data were collected through direct research in the selected organisations and were verified with representatives of the selected organisations. This guarantees that our analysis is an accurate reflection of the situation – but only of the situation in these two selected bodies, not necessarily of the general situation in the Czech public sector.

The data reveal examples of effective outsourcing, thereby indicating the potential value of externalisation, if it is properly implemented, but also examples of ineffective decisions. We can compare our results with only a few similar studies – this kind of in-depth audit is rather rare. Moreover, the results of case studies are not representative and cannot be used for generalisation. If we compare our findings with similar in-depth audits in Slovakia (Merickova et al, 2010), our cases studies indicate a much better quality of decisions. We did not find very clear cases of inefficiencies connected with in-house versus outsourcing decisions (in Slovakia, ten out of ten decisions were 'wrong'). On the other hand, as in the Slovak case studies, major deficiencies are connected with procurement processes.

Our data confirm that the core problematic service in our public administration conditions is transportation. The 'habit' of public employees having their own cars or even in-house drivers is usually a very expensive solution. If such cars and time capacity of drivers are underutilised, the costs of taxi services can actually be much cheaper. The source of this problem is the non-existence of full costs accrual accounting – depreciations and other indirect costs are not followed and the ownership of cars may therefore appear to be a low-cost choice.

The data also show that even with only a few competing bidders, public organisations can receive very low-cost offers for cleaning and security services, much below the minimum costs of in-house internal production. Suppliers can achieve these low-cost offers by 'manipulating' labour costs or the costs of the quality of delivered services. Effective and systematic contract management is a 'must' in these areas.

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Stabilization Programs of the International Monetary Fund in the Course of Time

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Abstract: *Since starting its business in 1947, the IMF also began to support member countries with balance of payments problems by giving them credits. This process was accompanying by design of the respective stabilization (financial) program. In the early 50th, a specific approach in the form of a simple model as well as accompanying set of conditions for ensuring financial stability was developed as the base of the IMF´s approach. Afterwards, the methodology of the program design has been changing in accordance with changing conditions. The aim of the paper is by method of historic analysis to find out how the IMF has been changing the way of construction of its stabilization programs from the side of theory and methodology and how it complies with stabilization mandate of the IMF. There are some criticisms that claim the IMF fails to fulfill its aims also for unsound methodological framework of stabilization programs. Our analysis shows that thanks to the flexibility of the IMF´s approach that allows to prepare country tailored programs, this institution have succeeded in the course of time in creating of the reliable framework for preparing of the stabilization programs.*

Keywords: financial crises, financial stability, International monetary fund, stabilization programs

JEL classification: E32, E63, F33, F34

1 Introduction

After the end of World War II, it was the Bretton Woods´ agreement in 1944 that governed the international monetary relations. Under this agreement, each member country undertook to maintain the par value of its currency in terms of gold or the U.S. dollar. In other words this established fixed exchange rates system. Since its starting business in 1947, the IMF also began to support member countries with balance of payments problems by giving them credits. In the early 50th, a specific approach in the form of a simple model as well as accompanying set of conditions for ensuring financial stability was developed mainly by Polak (1957, 1997) and Robichek (1967). Also findings of Fleming (1962) and Mundell (1963) were incorporated into the the stabilization (financial, adjustment) programs that accompanied the loans. Process of developing these programs was called financial programming.

After the collapse of Bretton-Woods in the early 1970s, the methodology changed. The main challenge was the change of the fixed exchange rates of the world major currencies into flexible ones, while the original approach addressed the situation with fixed rates. Central banks started to use monetary policy regime based on inflation targeting, which brought about the change to evaluation of monetary targets (e.g. Bléjer et al., 2001). To the methodological and technical aspects of the financial programs are devoted e.g. the papers Barth and Hemphill (2000), Martin et al. (1996.) which had summarized the knowledge originated from ongoing programs and Mikkelsen (1998) examining the posibilities of utilization of computer model for preparation of program design.

With the outbreak of global and financial crises in 2007, it turned out that the previously preferred framework of inflation targeting in the form of pre crises configuration is not

suitable to stabilization needs and had to be modified. It had also consequences for stabilization programs, when minimally it turned out that there is a need to incorporate in stabilization programs not only monetary (and inflation) targets but also target concerning financial stability (Blanchard et al., 2010 and 2013).

Generally, there are extensive literature sources which deals with various sides of the IMF´s financial programming activities, the policy issues in particular e.g. Agenor and Montiel (2008), Laurens and de la Piedra (1998), Bleaney (1999), Borghijs and Kuijs (2004), Clark and MacDonald (1998), Lipschitz et al. (2002) and IMF (1987, 2001, 2016) and many others.

Some sources (especially that sprung from IMF) present positive explanation of IMF´s theoretical and methodological approach to the stabilization program design, others bring criticism (e.g. Nowzad, 1982, Easterly, 2005, Guice, 2015 and others).

Having analyzed these sources (and much more to make it possible to mention them in contribution of limited extent), the aim of this contribution is with method of historic analysis to evaluate if the IMF has established and has been changing the way of construction of its stabilization programs from the side of theory and methodology in that way which would comply with stabilization mandate of the IMF.

The remainder of the contribution is organized as follows: Part 2 is description of the IMF´s monetary model within the Bretton-Woods system, part 3 deals with IMF´s operational approaches under free exchange rates and part 4 with IMF´s activities in the period of financial crises. Each of these parts is followed by discussion. Part 5 Conclusions follows.

2 IMF´s monetary model within the Bretton-Woods system

The analytical basis of the programs negotiated between the IMF and individual member countries in the beginning of the IMF activities in the area of providing the financial help was formalized in a number of papers by the Fund staff. It was Polak (1957, 1998) and in some respects Robichek (1967) who mainly contributed to the building of IMF monetary model which remained as basic approach for all Fund supported financial programs. There were used also deductions of other economists among others of Fleming (1962) and Mundell (1963).

IMF monetary model elaborated mostly by Polak extends the classical quantity theory of money to the open economy. The model consists of the following four equations (Polak, 1998):

$$\Delta M = (1/v)\,\Delta Y \tag{1}$$

$$IM = mY \tag{2}$$

$$\Delta M = \Delta D + \Delta R \tag{3}$$

$$\Delta R = X - IM + \Delta FI \tag{4}$$

M - money stock
v - velocity of circulation of money
IM - imports
m - propensity to import
R - change of net foreign assets (foreign reserves)
D - stock of net domestic assets (domestic credit) of the banking system
X - exports,
FI - net capital inflow
Δ - first difference operator

Model contains two behavioral (1,2) and two definitional (3,4) equations. Equation (1) represents demand for money function, equation (2) import function, equation (3) is an

identity relating money supply to two sources of monetary expansion - domestic and external (coming out from the consolidated balance of the banking sector) and (4) is an equation of the balance of payments. It is pressuposed that net capital inflows and exports are exogenously determined, so as the parameters v and m.

Characteristic sign of the model is its simplicity. There were good reasons for that (IMF, 1987) because of absence of statistical data in some areas for many of the Fund´s member countries and also due to the almost total absence of econometric models describing their economies. Generally, two sets of data were available – banking and trade data. There was further factor of great importance – the focus of the model on the key variable that the authorities could control – domestic credit creation. This variable was seen as crucial for correction of the balance of payments problems for which the Fund assistance was assigned. This was characteristic of the Fund´s use of the monetary approach to the balance of payments.

The model was designed to illustrate the effects of two most important exogenous variables - autonomous changes in exports and the creation of bank credit, on both income formation and the balance of payments.

The model is dynamic in character – it contains both Y (in equation 2) and ΔY (in equation 1) (Polak, 1998).

A stable demand for money function was assumed, with the economy in equilibrium when money supply growth equals the rate of growth in the demand for money. This means there is supposed to be the mandate of the central bank which takes care about money supply so that it should be exactly the same as predicted demand of money. There are two sources of monetary creation - domestic bank credit and the monetization of foreign exchange inflows.

Equations (1) – (4) constitute the base for elaboration of financial programs ("financial programming") countries applying for the Fund´s financial assistance. At the same time it is also the base for conditionality, when IMF is requesting countries to fulfill agreed indicators as the condition for the access to credit from the Fund. Projected numerical values for individual variables are not a result of solving a set of equations (although there were later attempts to do so – see Mikkelsen, 1998) but rather result of iterative calculations. Polak stated that valuable byproduct of this approach is that it forces the analysts to construct a set of consistent data across the individual sectors of the economy (Polak, 1998).

The original financial programming methodology was designed for use in countries with fixed exchange rate. After 1971, more and more countries started to implement monetary policy within a flexible exchange rate regime, which meant either implicit or explicit orientation of monetary policy to inflation target. This development meant also the need of some analytical as well as practical changes in operational procedures related to financial relations with the IMF and member countries. The problem was conditionality which ties the provision of financial resources with the fulfillment of certain criteria, which are usually built in respective financial program. In the area of monetary policy, these were usually targets for the change of net foreign assets (foreign reserves - ΔR) and limits on the development of net domestic assets (domestic credit - ΔD).

The mechanism of setting criteria for ΔR and ΔD worked in practice as follows: First the target for the level of foreign exchange reserves (ΔR) was determined. While setting a limit for the ΔD, which was compatible with the development of NFA, there was a need of taking into account the expected development in velocity of money. Once the real values of ΔR began to approach the limited level, the growth of ΔD limits inhibited the expansion of the monetary base, which prevents monetary policy to exert additional pressure on the balance of payments or inflation. This mechanism has proved to be functional until the break- down of the Bretton-Woods system and many programs were executed with it.

The IMF is often criticized for its theoretical approach to programs design which is said to have been neo-liberal or monetaristic. These critics question the validity and universality of the economic theory which provides the rationale for the Fund's policy instruments and program implementation. Allegedly these free market policies were not always suitable for the situation of the country. In fact, the IMF´s approach is eclectic as is indicated already in IMF (1987), i.e. not based on on a particular view of the economy or on the convictions of a single school of economic thought. In the program, there could be incorporated any theory that seems reasonable in specific situation. It is evident for example from the Figure 1 which incorporates absorption (CA = Y – A) and monetary (ΔR = ΔM – ΔD) approaches to the balance of payments. There is to say that IMF does not use a uniform, rigid framework for assessing macroeconomic policies of its members. The emphasis in Fund programs varies considerably depending on the circumstances of the country in question.

3 IMF´s operational approaches under free exchange rates

After the break-down of Bretton-Woods in the early 1970s, the conception and the structure of adjustment programs changed. The main challenge was the change of the fixed exchange rates of the world major currencies into flexible ones. Furthermore, several events in the 1970s such as large fluctuations in world prices of commodities, sharp increases in real interest rates in international credit markets, and an extended period of slow growth in major economics, aggravated the adjustment problems of developing countries and seriously complicated the task of economic management IMF member countries. There were also modifications in thinking about these programs which had arisen from institutional and structural developments in the economies that the Fund had been called on to assist. Finally, the design of Fund supported adjustment programs has gradually absorbed many of the developments that have taken place in the macroeconomics and international economics (IMF, 1987). Last but not least, there were important changes in technical progress of elaboration financial programs related with introduction of computers as well as econometric techniques.

As a result system of identities has been developed as illustrated in Figure 1. Within the figure there are number of additional equations that cover structure of the economy. Starting from savings – investment balance which results in external current account, current account as a result of subtraction of absorption from product, through balance of payments equation (CA + ∆FI = ∆R) and finally to the consolidated balance of the banking sector. This figure has the advantage that shows interrelations of the individual sectors of the economy. The only exeption is the general government sector which is included in the figure implicitly through domestic credit and net capital inflow.

Figure 1 Basic macroeconomic framework for financial program design

	[(S – I)g	**+**	**(S – I)p]**	
	=		=	
	CA	**=**	**Y – A**	
	+		+	
		∆FI		
	=		=	
	∆R	**=**	**∆M – ∆D**	

Source: IMF (2001)

(S - I) – savings-investment balance, g/p – government/private, CA – current account balance, A – domestic absorption

Traditional approach to the setting limits on ΔR and ΔD was challenged in these new conditions (monetary policy was oriented towards the inflation target) and became more complicated. Therefore it was desirable to modify traditional monetary conditionality (Blejer et al. 2002).

Development of the ΔD might not be directly linked with the development of inflation, so that any targets for the ΔD might be wrong markers. It could happen that actual ΔD exceeds targeted and at the same time might not be a threat to the inflation target. This means that while in terms of financial objectives of the program monetary policy should be tightened, in terms of the inflation targeting it was not necessary.

Coming out from the abovementioned it can be inferred that in countries where monetary policy is conducted under an explicit inflation target, it is necessary to modify traditional practices of the financial programming exclusively based on monetary indicators. This allows improvements to the whole course of realization of the program, in particular the formation of a clearer link between the program objectives and the objectives of the central bank but also facilitates the use of appropriate tools to achieve the objectives. At the same time there is better communication with the central bank's economic entities and markets.

From the practical point of view, there is important for the financial programs in an inflation targeting context, to specify an inflation path more comprehensively with e.g. quaterly intermediate inflation targets as opposite to usual annual one. These are subject to regular IMF program reviews and on the base of that respective tranches of the IMF´s credit is paid. There is also important that inflation targets are forward-looking oriented (Bléjer et al., 2001). We can conclude that the IMF has also succeeded in solution of inflation vs. monetary target dilemma.

Operational framework (Figure 1) is composed of definitional equations which include real, external, monetary and fiscal (implicitly) sectors of the entire economy and allows great variability of eventual use of various mathematical models for identification of each variable in the form of behavioural equations.

However, the key restrictions of financial programming are assumptions about exogeneity of some components of identities with respect to others, and the assumption of stable and "reasonable" parameters for some very simple behavioral relationships (Easterly, 2005). This is the real problem. For example, the use of the monetary identity (bottom line of the Figure 1) is based on the condition that money demand (ΔM) is independent on domestic credit (ΔD) which is generally problem in modern economies (concerning some developing countries it could be still the case). In ideal circumstances real program exercise could looks like: there is an exogenous estimation of ΔM, there is a target for foreign reserves and endogeneous variable ΔD is a residual of the equation. This is the case if the condition about independency is fulfilled, if not, the exercise must continue under simplified procedure. There is also a problem with estimation of demand for money function. In recent decades which are characterized by financial inovations, the estimation of money demand function is usually not possible at all. And there are similar situations with attempts to estimate any other behavioural equation from the operational framework (e.g. demand for exports function, consumption function etc.).

Taken into account all abovementioned troubles, the operational framework is still leading guidline to set up the design of stabilization programs. It contains identities which have to hold by definition. The limiting side of using identities are the data. Either the data miss at all or there are some degree of their faultiness. This is typical for developing countries but in some sorts of data also in countries with advanced statistical system. An example can be mentioned in the area of monetary statistics („other items net") but also in the balance of payments („errors and omissions"). However serious the related problems may be it can be stated that this is not specific problem of financial programming but problem of any areas of economic analyses.

4 IMF in the period of financial crises

The global financial crisis that´s consequencies the world economy is still facing, is a big challenge for the IMF. This most influential international financial institution developed activities designed to help member countries to overcome the consequences of the crises. This was also reflected in the amount of aid. General scope and seriousness of the current crisis provoked the need for some way to modify the standard activities of the IMF.

IMF by virtue of his position appeared to be a useful element to coordinate the reconstruction of the international financial system. Practically it is done in the form of the Fund´s assistance to G20 groop, which took possession as coordinator in the agenda of the financial crisis. Within the framework of the G20 summit, which took place in April 2009 in London, it was agreed a substantial increase in resources to support members of the IMF (IMF, 2016).

At the same time it came to sharpening IMF analysis and policy advice. The IMF provided risk analysis and policy advice to help member countries to overcome the challenges and spillovers from the global economic crisis. It also implemented several major initiatives to strengthen and adapt surveillance in conditions of more globalized and interconnected world.

In order to reflect the increasing importance of emerging market countries there were done in 2008 and 2010 respective reforms which ensured that smaller developing countries would retain their influence in the IMF**.** IMF also reformed its lending framework to be more suitable to various circumstances which countries had to face.

There was also increased emphasis on social protection. The IMF helped governments protect and even increase social spending*.* In particular, the IMF promoted measures to increase spending on, and improve the targeting of social safety net programs that can mitigate the impact of the crisis on the most vulnerable members of society. Social aspect was emphasized also by improving conditions of helping the world's poorest countries when it was agreed that concessional loans to the poorest countries will be quadrupled. As a result, IMF programs are now more flexible and tailored to the individual needs of low-income countries.

From the point of view of the methodology it is important that it came to reforms of terms for the IMF lending (conditionality), reworking of conditions for lending. Traditional framework of financial support, based on the gradual provision of individual tranches of loans under strict terms of the objectives of the financial program has been modified by introducing new flexible forms of lending. These are intended for countries with normally functioning economies, with the ability to adhere to the agreed policy measures. In this case, the credit is granted immediately if necessary financial resources - unlike traditional support programs linked to the performance of the financial program agreed objectives. This approach allows more flexibility to respond to the specific needs of each country and the nature and extent of their problems. Performance criteria were loosed, in fact they were discontinued for all IMF loans, including for programs with low-income countries. Structural reforms continue to be part of IMF-supported programs, but they have become more focused on areas critical to a country's recovery. It is in a way the reflection of the IMF on criticism of governments and civil society organizations that "a significant number of structural conditions are very detailed, and often felt to be intrusive and to undermine domestic ownership of programs." (IMF, 2016).

All that means the shift of the emphasis from the narrowly understood monetary and inflation targets to more widely comprehension of the development targets. As for the demand policies (monetary and fiscal) which were traditionally the key part of the stabilisation programs, the crisis has caused the Fund to acknowledge the limits of monetary policy and bring fiscal policy more to the center stage as an important countercyclical tool (Guice, 2015). This was very important change in views of the IMF on

macroeconomic policy consistent with general advance in this area of economic thinking (Blanchard et al., 2010, 2013).

Under current circumstances there is of key importance that analytical framework of the financial programs described in parts 2 and 3 of this contribution has basically remained unaffected. Their flexible framework make it possible to absorb all these new tendencies in theory and praxis.

5 Conclusions and policy implications

The IMF has based its policies on a theoretical and methodological framework developed over about sixty years. Their models were based on a set of assumptions that do not reflect inevitably the economic realities of the whole scale from developing to advanced countries. However, the framework is flexible and has been reflecting developments in the world economy, advances in the theory and policy and also improvement in econometric analysis.

The system started in the early 50th when a specific approach in the form of a simple model as well as accompanying set of conditions for ensuring financial stability in economies with fixed exchange rate were developed. Later - after breaking down of Bretton-Woods system - there was a need to adjust the IMF approach to the new circumstances. They were represented namely by prevailing use of flexible exchange rates but also by stressing medium-term economic growth and concerns about inflation. Crucial challenge for the IMF activities has however arisen by outbreak of global and financial crises in 2007. It has become apparent that the previously preferred framework of monetary (and inflation) targeting in the form of pre-crises configuration is not suitable to stabilization needs and has to be modified. It had also consequences for stabilization programs, when minimally it turned out that there is need to incorporate in stabilization programs not only monetary (and inflation) targets but also targets concerning financial stability in a broader sense and the same concerning general development targets. The original IMF primary mandate - to ensure the stability of the international monetary system - was updated to include all macroeconomic and financial sector issues that bear on global stability.

Despite of the whole range of limits related to the IMF´s approach, our analysis has come to conclusion that current system of financial programming is prepared to absorb all needs which stem from fulfilling the stabilization mandate of the IMF. There is enough space for use of any sophisticated tool(s) which possibly emerge in further advances in theory and praxis.

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Financial Literacy: Study of the Financial Literacy Level

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Abstract: *Financial literacy is usually interpreted as a set of knowledge which is necessary to have for being able to make proper and correct decisions concerning personal investments, debts and other ones related to personal finance. Such type of education has become an important part of every educational system, since its importance has increased within previous years. As a consequence of this, financial literacy needs to be measured and regularly tested. The goal of the study is to measure if there is a difference between objective level of financial literacy and between subjective self-assessment. The study focuses on differences among various age groups. The results of the study help to target further proposal for formal and informal education system amendments. The study is based on data collected through an electronic questionnaire. As for methods, the study is based on comparison of average values across various groups of respondents, therefore, t-test is employed. Consequently, the study also includes various descriptive statistics.*

Keywords: financial literacy, financial education, subjective assessment, comparison

JEL codes: I22, I31

1 Introduction

Financial literacy represents a set of knowledge which is necessary for a correct and appropriate decision in terms of one's investments, debts and other financially orientated issues. It consists of three parts – money, price and budget literacy.

Financial literacy according to National strategy for Financial Education in the Czech Republic consists of:

- Money literacy
- Price literacy
- Budget literacy

Each of the groups is characterized by different set of knowledge which belongs to the particular group. Generally speaking, price literacy factors knowledge related to price mechanisms, inflation and other macroeconomic and microeconomic indicators. Money literacy includes knowledge related to banking products, loans, banking investments and similar ones. The last group, budget literacy, factors ability to administer own budget and issues related to personal finance in general.

Financial literacy has become an important part of educational system in the Czech Republic and other countries around the Europe and the whole world. As the role of it is increasing, the whole society starts to be exposed to financial literacy more than ever. It goes for financial literacy related to insurance products and the insurance market as well.

The goal of the article is to verify whether there is a link between objective level of financial literacy and subjective assessment of the financial literacy. In other words, the respondents in the study were asked questions and tasks related to the financial literacy (all its parts, meaning price, budget and money literacy). Such answers provided an assessment of objective financial literacy level. On the top of that, respondents were asked questions revealing their confidence in the area of financial literacy. Those answers provide the author with a tool for objective and subjective assessment comparison.

Further to the set goal, there are following research questions set:

- Research question no. 1: Is the objective level of financial literacy equal to the subjective assessment of the financial literacy among adults in the Czech Republic?
- Research question no. 2: In relation to the previous research question (research question no. 1), for which age groups is there the highest discrepancy between the objective level of financial literacy and between the subjective assessment of the financial literacy level?

The main contribution of the study is to revel whether the population can objectively assess their strengths and weaknesses when it comes to the financial literacy. Such findings can help the author of the study when preparing other studies and recommendations related to the financial literacy and financial education.

2 Methodology and Data

The study is based on data file collected via an electronic questionnaire. The questionnaire consists of three parts:

- The first part is devoted to questions which enable to measure the objective level of financial literacy. In other words, respondents are asked questions concerning decision on different situations related to personal finance, financial debt, financial terminology, products, etc. The gained score is afterwards transferred to the standardized scale ranging from zero points (for total ignorance) to ten points.
- In the second part of the questionnaire, respondents are asked to measure their own level of financial literacy using the scale from zero points (total ignorance according to the subjective assessment) to ten points (standing for complete understanding of financial literacy; again, based on subjective assessment)
- The third part has been devoted to demographic factors of the involved respondents

The whole data set consists of 294 valid observations. With regard to the set research questions, descriptive statistics have been employed particularly average and standard deviation. Consequently, in order to verify possible gaps between objective and subjective evaluation of financial literacy, t-tests have been used. As both of the variables are dependent each other (subjective and objective assessment of financial literacy), dependent t-test for paired samples have been used.

3 Results and Discussion

The following section is devoted to results and consequent discussion. When it comes to the tests, the following two research questions (specified above) have been taken into consideration:

- Research question no. 1: Is the objective level of financial literacy equal to the subjective assessment of the financial literacy among adults in the Czech Republic?
- Research question no. 2: In relation to the previous research question (research question no. 1), for which age groups is there the highest discrepancy between the objective level of financial literacy and between the subjective assessment of the financial literacy level?

Research question no. 1

For the purposes of the first research question, dependent t-test for paired samples has been applied as both of the variables are dependent each other. The difference between them is derived from normal statistical distribution. Before proceeding to the test, the

following table (Table 1) summarizes average values and standard deviation of both of the groups.

Table 1 Descriptive statistics

	Objective assessment	Subjective assessment
Average	6.77	7.06
Standard deviation	2.00	1.84
Number of valid observations	294	294

Source: author's own computation, processed in STATISTICA

Looking at the Table 1, it is obvious that there is a difference between the objective and subjective assessment of both of the groups. However, the difference amounts to only approximately 0.3 points (out of ten). Taking into account the scale (ten points) and the number of observations (294), it is difficult to state if such a difference proves to be significant.

To verify such significance (or insignificance), dependent t-test for paired samples has been run to verify whether there is a gap between the objective and subjective assessment of financial literacy level. The results of the test are stated in the following table, Table 2.

Table 2 Results of t-test

Test statistics	p-value
2.639	**0.008772**

Source: author's own computation; processed in STATISTICA

The result of the test confirms that there is a proven difference between subjective and objective assessment of financial literacy among adults in the Czech Republic. The low p-value rejects the null hypothesis of the test, which indicates a discrepancy between both of the variables (subjective and objective assessment of financial literacy). However, this result does not provide any particular information about age groups that might possibly cause the difference.

Research question no. 2

To elaborate on such evidence, it has been necessary to divide the whole dataset into several ones. Particularly, this study divides the respondents into the following groups, based on their age:

- Group no. 1 – respondents who reached 18 years but have not exceeded 26 years
- Group no. 2 – respondents who are between 27 a 40 years old
- Group no. 3 – respondents older than 40 years

The following table, Table 3, summarizes average values for all of the mentioned groups. Looking at the table, it seems to be likely that there is a gap between subjective and objective assessment of financial literacy when it comes to the first age group (respondents between 18 and 26 years). Their subjective assessment is 7.23 points out of ten on average, while the objective knowledge is represented by approximately 6.74 points out of ten. In other words, the subjective assessment is approximately 0.5 points higher than the objective assessment.

For the second and third age group there are also differences. However, they are less significant comparing to the first age group. For the second group the difference amounts

to less than 0.1 points (in favor of subjective assessment as well), and for the last age group, it has been measured that people who are older than 40 years are less confident than their real knowledge is. They evaluated themselves 5.67 on average, while their real knowledge corresponds to 6.07 points out of ten. Moreover, it is worth mentioning that they assess themselves with lower score comparing to both of the previous age groups.

Table 3 Descriptive statistics with focus on particular age groups

	18 - 26	**27 - 40**	**41+**
Subjective assessment of financial literacy	7.23	7.21	5.67
Objective assessment of financial literacy	6.74	7.12	6.07

Source: author's own computation, processed in STATISTICA

In order to verify if this difference is statistically significant, the same test has been run (dependent t-test for paired samples). Nevertheless, three independent tests have been conducted this time, as there are three age groups.

With regard to the results, it has been confirmed that only for the first age group (respondents between 18 and 26 years), there is a statically significant difference between the subjective and objective assessment of financial literacy level. When it comes to the second and third age groups, no significant gap has been confirmed according to the data.

Table 4 Results of t-tests (according to the set age groups)

	18 - 26	**27 - 40**	**41+**
Test statistics	3.168	0.579	-1.137
P-value	**0.001795**	0.564243	0.188518

Source: author's own computation, processed in STATISTICA

Discussion

The conducted study brings an important finding in area of the financial literacy in the Czech Republic. Such finding is crucial to be taken into consideration when dealing with disparities among young people related to the financial literacy, especially the finding that young people tend to overvalue their skills.

On the top of the contribution of the study, it is also important to be aware of obstacles and constraints of it. One of them is the fact that the study consists of only approximately 300 observations, which is far away from the ideal state.

Consequently, this study lacks a comparison with other countries. Such output is planned for the following study conducted by the same author. Last but not least, whenever dealing with financial literacy testing, it can never be ensured that such study depicts the real level of financial literacy or, at least, of all participants/respondents. It might have happened that for some respondents the questions were more demanding or the other way round. Needless to say that failing to succeed in this particular test of financial literacy does not have to mean that such respondent is not financially literate.

4 Conclusions

This paper focuses on financial literacy among various age groups and with focus on subjective and objective assessment of financial literacy. The main goal of the article has been to verify whether there is a link between objective level of financial literacy and

subjective assessment of the financial literacy. To verify such goal, the following research questions have been dealt with:

- Is the objective level of financial literacy equal to the subjective assessment of the financial literacy among adults in the Czech Republic?
- In relation to the previous research question, for which age groups is there the highest discrepancy between the objective level of financial literacy and the subjective assessment of the financial literacy level?

It has been revealed that there exists a gap between subjective and objective level of financial literacy among adult population in the Czech Republic. To elaborate on this finding, the dataset has been divided into three groups according to the age of involved respondents. Furthermore, it has been unveiled that the most significant gap between subjective and objective level of financial literacy exists in case of young adults, in the age between 18 and 26. This age group tends to overestimate their skills related to financial literacy. Particularly, using 10 point scale, respondents assess themselves with 7.23 points out of ten on average, while their real skills equals to approximately 6.74 points out of ten on average.

When it comes to the second and third age group, it has not been verified that there is a difference between subjective and objective level of financial literacy is statistically significant despite the fact that the values are not completely equal either.

Acknowledgments

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Internet shopping in the Czech Republic with the focus on the internet shopping frequency of consumers

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Abstract: *The internet shopping has been developing not only all over the world but in the Czech Republic too in the last years and it is possible to expect a future expansion. The aim of this paper is to describe the development of the internet shopping in the Czech Republic with the focus on the internet shopping frequency of consumers and introduce and interpret results of own quantitative research focused on knowledge, skills and behaviour in the internet shopping of consumers. On the basis of data gained by the questionnaire research the hypothesis "The internet shopping frequency of a consumer is connected with the literacy in the internet shopping field of a consumer shopping on the internet." is verifying with using statistical methods. The aim of this hypothesis is to verify whether and how the internet shopping frequency of a consumer and the literacy in the internet shopping field of a consumer shopping on the internet are related together.*

Keywords: e-commerce, e-shops, internet, internet shopping, internet shopping frequency

JEL codes: D100, L810

1 Introduction

The internet shopping has been developing not only all over the world but in the Czech Republic too in the last years and it is possible to expect a future expansion. In 2016 sales of internet shops in the Czech Republic were 98 billion CZK, it is 17 billion CZK more than in 2015. According to APEK – Association of E-commerce the turnover of internet shops will break out the level of 100 billion CZK this year. (Czech News Agency – CTK, 2017) According to results of the research of the agency Mediaresearch for the Association of E-commerce (APEK) in the field of internet shopping 96 % respondents – internet users have already done shopping on the internet. 5 % respondents (who mentioned they do shopping on the internet) do shopping on the internet at least once a week and 46 % respondentst at least once a quarter (Mediaresearch, 2011).

The aim of this paper is to describe the development of the internet shopping in the Czech Republic with the focus on the internet shopping frequency of consumers and introduce and interpret results of own quantitative research focused on knowledge, skills and behaviour in the internet shopping of consumers. On the basis of data gained by the questionnaire research the hypothesis "The internet shopping frequency of a consumer is connected with the literacy in the internet shopping field of a consumer shopping on the internet." is verifying with using statistical methods. The aim of this hypothesis is to verify whether and how the internet shopping frequency of a consumer and the literacy in the internet shopping field of a consumer shopping on the internet are related together.

2 Methodology and Data

Data for own quantitative research (focused on the internet shopping) were collected electronically in 2012. The target group were people studying at Faculty of Economics and Administration of Masaryk University, number of respondents was 910. It is important to note on the definition of the target group, that formulated conclusions can

be generalized to the population of people studying at economic colleges in the Czech Republic, for them the research sample is representative. A part of the realized and here presented research was focused on the internet shopping frequency. Respondents should answer the question "Have you already ordered goods and/or a service on the internet?" and if the answer was positive they should mark their internet shopping frequency. Collected data are evaluated by methods of descriptive statistics, especially by the statistic:

- number of respondents who have already ordered goods and/or a service on the internet/number of respondents,
- number of respondents who have not ordered goods and/or a service on the internet yet/number of respondents and than
- number of respondents who do shopping on the internet at least once a week/number of respondents who mentioned they do shopping on the internet,
- number of respondents who do shopping on the internet at least once a month/number of respondents who mentioned they do shopping on the internet,
- number of respondents who do shopping on the internet at least once a quarter/number of respondents who mentioned they do shopping on the internet,
- number of respondents who do shopping on the internet at least once a half a year/number of respondents who mentioned they do shopping on the internet and
- number of respondents who do shopping on the internet less often than once a half a year/number of respondents who mentioned they do shopping on the internet.

The formulated hypothesis "The *internet shopping frequency* of a consumer is connected with the *literacy in the internet shopping field* of a consumer shopping on the internet." is verified using the rank correlation test.

To data processing and their evaluation (including verifying the formulated hypothesis) the software Microsoft Office Excel and STATISTICA were used.

Normative and positivist methodologies have been employed to reach the aim. The positivist methodology is used in parts, when researched issues are described only, not evaluated. The normative methodology is used, when it is not possible or desirable to avoid evaluating researched facts. The paper's aim is reached by using of general science methods, primarily description, analysis, comparison, synthesis and deduction, and by using statistics methods (methods of descriptive statistics and the rank correlation test).

3 Results and Discussion

In 2016 sales of internet shops in the Czech Republic were 98 billion CZK, it is 17 billion CZK more than in 2015, which is the year-on-year increase of 20,99 %. The e-commerce share in the total retail sales increased to 9,5 %. (Czech News Agency – CTK, 2017) According to APEK – Association of E-commerce (Czech News Agency – CTK, 2017) the turnover of internet shops will break out the level of 100 billion CZK this year. In the following Table 1 and Figure 1 we can see the development of the turnover of internet shops in the Czech Republic in years 2001 - 2016. These data confirm, that the turnover of internet shops in the Czech Republic has been increasing for a long time.

According to Czech Statistical Office (Czech Statistical Office, 2017) and its published data about use of ICT (information and communication technologies) in households and by individuals in year 2016 in the Czech Republic more than 41 % individuals have not done shopping on the internet yet. 58,6 % individuals have already done shopping on the internet, in the last 12 months it was 57 % respondents. As we can see in Figure 2 the population of the Czech Republic with an experience in internet shopping is relatively stable in last years.

According to results of the research of the agency Mediaresearch for the Association of E-commerce (APEK) in the field of internet shopping which we can see in Figure 3 96 % respondents – internet users have already done shopping on the internet and only 4 %

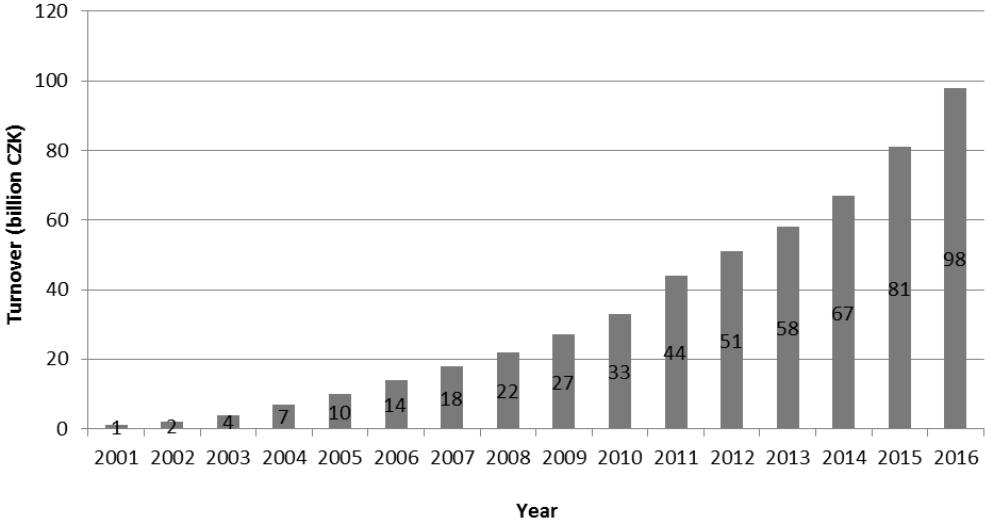
respondents – internet users have not done shopping on the internet yet. As we can see below too, the most mentioned internet shopping frequency is at least once a quarter (46 % respondents who mentioned they do shopping on the internet). The second often mentioned answer is frequency less often than once a half a year (26 % respondents who mentioned they do shopping on the internet) and the third often mentioned answer is frequency at least once a half a year (23 % respondents who mentioned they do shopping on the internet). Fewest respondents of the researched sample answered, that they do shopping on the internet at least once a week (only 5 % respondents who mentioned they do shopping on the internet). (Mediaresearch, 2011)

Table 1 Turnover of internet shops in the Czech Republic (2001 – 2016)

Year	Turnover (billion CZK)	Change per year (billion CZK)	Change per year (%)
2001	1	-	-
2002	2	1	100,00
2003	4	2	100,00
2004	7	3	75,00
2005	10	3	42,86
2006	14	4	40,00
2007	18	4	28,57
2008	22	4	22,22
2009	27	5	22,73
2010	33	6	22,22
2011	44	4	12,12
2012	51	7	15,91
2013	58	7	13,73
2014	67	9	15,52
2015	81	14	20,90
2016	98	17	20,99

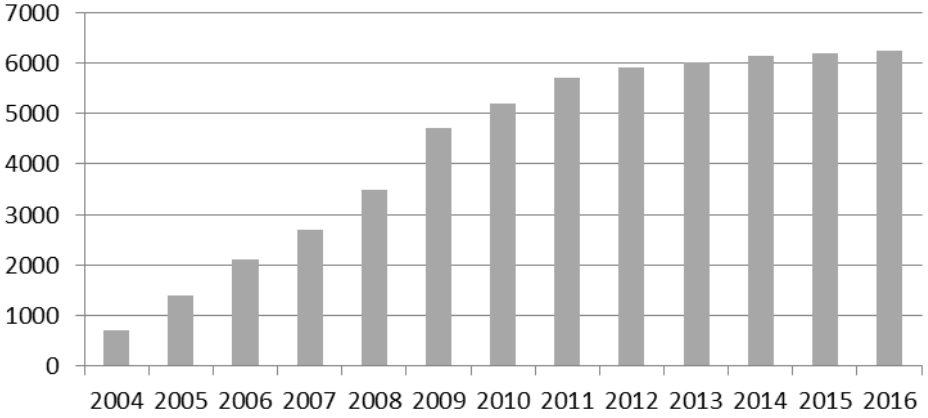
Source: author's processing according to Financninoviny.cz (2011). APEK: Last year internet shops earned record 33 billion CZK (in Czech). *Finance.cz*. Retrieved from: http://www.finance.cz/zpravy/finance/293445-apek-internetove-obchody-loni-utrzily-rekordnich-33-mld-kc/; Czech News Agency – CTK (2017). This year e-shops sales will break the level of 100 billion. But carriers are missing drivers (in Czech). *Aktuálně.cz*. Retrieved from: https://zpravy.aktualne.cz/ekonomika/trzby-e-shopu-letos-prolomi-hranici-100-miliard-dopravcum-al/r~8a7570aed1b811e6a78c002590604f2e/?redirected=1495194613.

Figure 1 Turnover of internet shops in the Czech Republic (2001 – 2016)



Source: Author's processing according to Financninoviny.cz (2011). APEK: Last year internet shops earned record 33 billion CZK (in Czech). Finance.cz. Retrieved from: http://www.finance.cz/zpravy/finance/293445-apek-internetove-obchody-loni-utrzily-rekordnich-33-mld-kc/; Czech News Agency – CTK (2017). This year e-shops sales will break the level of 100 billion. But carriers are missing drivers (in Czech). Aktuálně.cz. Retrieved from: https://zpravy.aktualne.cz/ekonomika/trzby-e-shopu-letos-prolomi-hranici-100-miliard-dopravcum-al/r~8a7570aed1b811e6a78c002590604f2e/?redirected=1495194613.

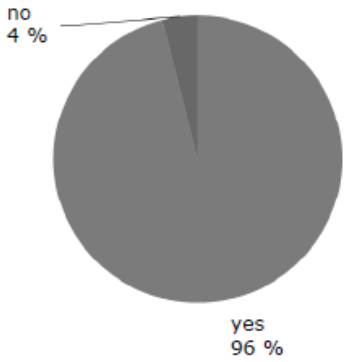
Figure 2 Population of the Czech Republic with an experience in internet shopping (in thousands)



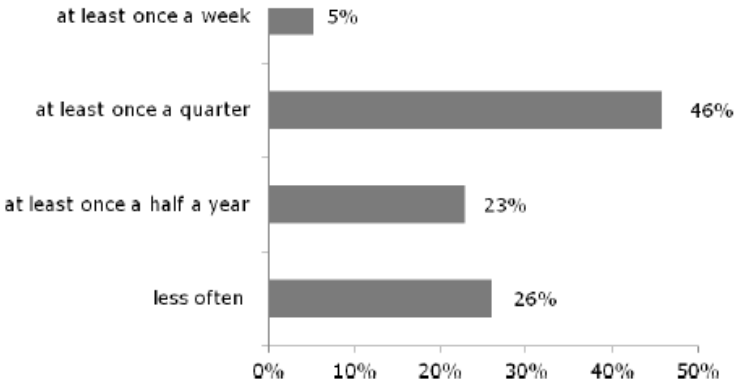
Source: Association of E-commerce (2017). Population of the Czech Republic with an experience in internet shopping (in Czech). Association of E-commerce. Retrieved from: https://www.apek.cz/download/file2/374f624e36422f6b52615961334d73616e68764d6659742f627645364a75696c7a35492f6b3346617173453d.

Figure 3 Internet shopping frequency in the Czech Republic

Have you already ordered goods and/or a service on the internet?



How often do you do shopping on the internet?
Basis: Respondents who mentioned they do shopping on the internet

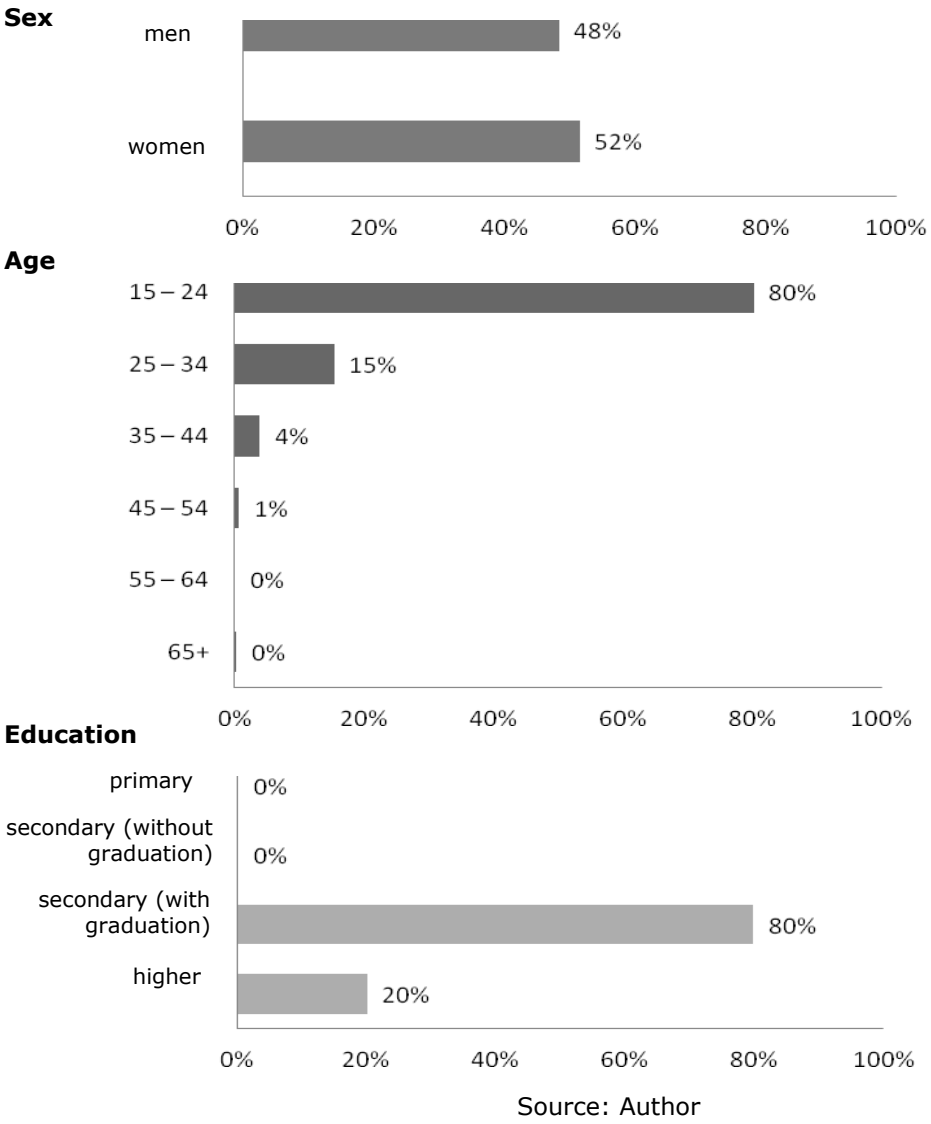


Source: Author's processing according to Mediaresearch (2011). Every second user does shopping already on the internet (in Czech). Mediaresearch. Retrieved from: http://www.mediaresearch.cz/aktualita/tz-na-internetu-jiz-nakupuje-kazdy-druhy-uzivatel.

In the following section the results of own quantitative research are presented, focused on the internet shopping frequency of consumers and their knowledge, skills and behaviour in the internet shopping field. The target group were people studying at Faculty of Economics and Administration of Masaryk University, number of respondents was 910. The structure of the sample is represented in Figure 4 (by sex, age and education). It is important to note on the definition of the target group, that formulated conclusions can be generalized to the population of people studying at economic colleges in the Czech Republic, for them the research sample is representative. More information about this research is in Oškrdalová (2013).

Figure 4 Structure of the sample

Basis: All respondents, n = 910



Source: Author

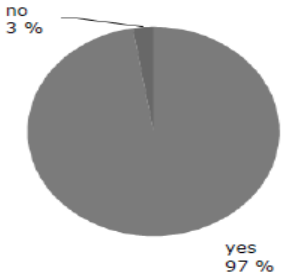
Internet shopping frequency of consumers - descriptive statistics

A part of the research was focused on internet shopping and its frequency. Respondents should answer the question "Have you already ordered goods and/or a service on the internet?" and if the answer was positive they should answer the question "How often do you do shopping on the internet?" too. As we can see in Figure 5, 97 % respondents have already ordered goods and/or a service on the internet and only 3 % respondents have not ordered goods and/or a service on the internet yet. As we can see below, the most mentioned internet shopping frequency is at least once a quarter (35 % respondents who mentioned they do shopping on the internet). The second often mentioned answer is frequency at least once a month (27 % respondents who mentioned they do shopping on the internet) and the third often mentioned answer is frequency at least once a half a year (20 % respondents who mentioned they do shopping on the internet). 14 % respondents (who mentioned they do shopping on the internet) do shopping on the internet less often than once a half a year. Fewest respondents of the

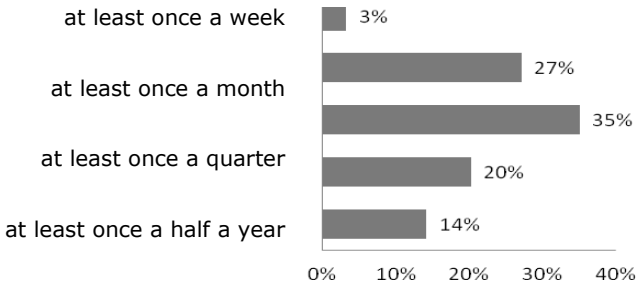
researched sample answered, that they do shopping on the internet at least once a week (only 3 % respondents who mentioned they do shopping on the internet).

Figure 5 Internet shopping frequency of consumers – descriptive statistics

Have you already ordered goods and/or a service on the internet?
Basis: All respondents, n = 910



How often do you do shopping on the internet?
Basis: Respondents who mentioned they do shopping on the internet, n = 886



Source*:* Author

When compared to the results of the research of the agency Mediaresearch for the Association of E-commerce (APEK) in the field of internet shopping which we could see in Figure 3 the number of respondents who have already ordered goods and/or a service on the internet is in both researches similar (96 % and 97 %). As to the internet shopping frequency of respondents we can observe that respondents of own research do shopping on the internet in general more often (the exception is the frequency at least once a week 3 % versus 5 %, but 27 % respondents who mentioned they do shopping on the internet mentioned they do shopping on the internet at least once a month and 35 % respondents do shopping at least once a quarter versus 46 % of respondents of the research of the agency Mediaresearch who do shopping on the internet at least once a quarter (the monthly internet shopping frequency was not used in the Mediaresearch's research)).

Internet shopping frequency of consumers and the literacy in the internet shopping field of consumers shopping on the internet – verifying of the formulated hypothesis

The hypothesis "The *internet shopping frequency* of a consumer is connected with the *literacy in the internet shopping field* of a consumer shopping on the internet." has been formulated. The aim of this hypothesis is to verify whether and how the *internet shopping frequency* of a consumer (link to the question number 4 of the questionnaire) and the *literacy in the internet shopping field* of a consumer shopping on the internet are related together. The *literacy in the internet shopping field* is defined to the goal of this paper as a quantitative variable its values are derived from knowledge, skills and behaviour of consumers shopping on the internet. The values of this variable were calculated using respondents' answers to 14 questions of the questionnaire – 8 questions

focused on knowledge, skills and behaviour of respondents – consumers shopping on the internet in the internet shopping field and 6 questions focused on knowledge and behaviour of respondents – consumers shopping on the internet in the internet and computers field (detailed information to this variable is in Oškrdalová (2013, p. 203 – 204)).

To verify the hypothesis the rank correlation test has been used:

Null hypothesis H_0:

The *internet shopping frequency* of a consumer is not connected with the *literacy in the internet shopping field* of a consumer shopping on the internet.

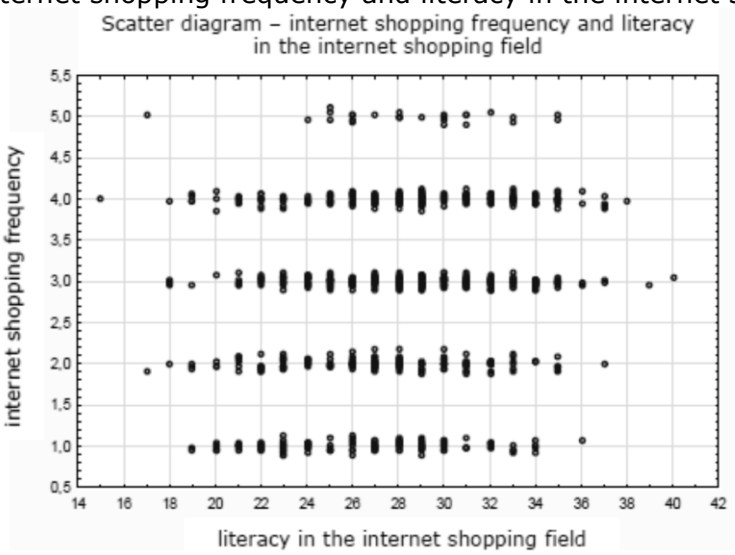
Alternative hypothesis H_1:

The *internet shopping frequency* of a consumer is connected with the *literacy in the internet shopping field* of a consumer shopping on the internet.

Assumptions: The number of measurements for the asymptotic variant is sufficient; the equivalences correction has been made.

In the following scatter diagram (Figure 6) we can see the *internet shopping frequency* and the *literacy in the internet shopping field* of a consumer shopping on the internet.

Figure 6 Internet shopping frequency and literacy in the internet shopping field



Source: Author

As we can see in Table 2 , p-value is 0 and rejects the null hypothesis H_0 "The *internet shopping frequency* of a consumer is not connected with the *literacy in the internet shopping field* of a consumer shopping on the internet.". In favour of alternative hypothesis H_1. This means, that it is possible to state the *internet shopping frequency* of a consumer is connected with the *literacy in the internet shopping field* of a consumer shopping on the internet (for significance level 5 %). The sample Spearman's correlation coefficient is 0,20 (rounded to two decimal places) and it means the positive dependence of researched variables in the sample. So we can state the *internet shopping frequency* of a consumer grows with the growing *literacy in the internet shopping field* of a consumer too.

Table 2 Internet shopping frequency and literacy in the internet shopping field – correlation

	Spearman's correlations			
	Missing data are left out in pairs			
	Correlations are significant for significance level <,05000			
Pair of variables	Count	Spearman R	t(N-2)	p-value
Internet shopping frequency & literacy in the internet shopping field	870	0,200132	6,018009	0,000000

Source: author

4 Conclusions

In 2015 sales of internet shops in the Czech Republic were 81 billion CZK, in 2016 98 billion CZK and according to APEK – Association of E-commerce the turnover of internet shops will break out the level of 100 billion CZK this year (Czech News Agency – CTK, 2017). According to results of the research of the agency Mediaresearch for the Association of E-commerce (APEK) in the field of internet shopping 96 % respondents – internet users have already done shopping on the internet. 5 % respondents (who mentioned they do shopping on the internet) do shopping on the internet at least once a week and 46 % respondentst at least once a quarter (Mediaresearch, 2011).

On the basis of data gained by the questionnaire research the hypothesis "The internet shopping frequency of a consumer is connected with the literacy in the internet shopping field of a consumer shopping on the internet." was verifying and it is possible to state the *internet shopping frequency* of a consumer is connected with the *literacy in the internet shopping field* of a consumer shopping on the internet (for significance level 5 %). According to the value of the Spearman's correlation coefficient there is the positive dependence of the researched variables in the sample. So we can state the *internet shopping frequency* of a consumer grows with the growing *literacy in the internet shopping field* of a consumer. These formulated conclusions can be generalized to the population of people studying at economic colleges in the Czech Republic, for them the research sample is representative.

Acknowledgments

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The impact of foreign exchange intervention in the balance sheet of the Czech National Bank

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Abstract: *The aim of the text is an analysis of the manifestations of the foreign exchange intervention of the Czech National Bank in the central bank's balance sheets and their connections in the banking sector. The motivation of the text is the manifestation of the interventions in the central bank's balance sheets and the resulting possible manifestations after their termination. The analysis of the manifestations of foreign exchange intervention in the central bank's balance sheets was conducted from the data for the years 2010 – 2016. The data include the period before the use of this instrument and in the course of its application. The text characterizes the effects of the active and passive sides of the balance sheet of the central bank and assesses the achievement of the objectives set. Analysis of selected items of the balance of the central bank was carried out on the basis of the theoretical background of the used resources and the practical knowledge of the author. In conclusion, the author presents his views on the use of this instrument of monetary policy and pronounced his prediction. In the text were used methods description of the theoretical and practical parts, methods of comparison, analysis and prediction in the part of monitoring the evolution of balance sheet items and their context*

Keywords: Central bank, non-standard monetary policy instrument, exchange rate intervention, the balance of the central bank, the banking sector, the reserve banks, foreign exchange reserves

JEL code: G 28

1 Introduction

The main objective of the monetary policy of the Czech national bank is to maintain price stability. The inflation target is set at 2 %. The basic standard instruments of monetary policy of the national bank are interest rates, open market operations, automatic facilities and reserve requirements. The main standard tools of monetary policy are open market operations. The aim of operations is to influence the development of interest rates in the economy.

Non-standard monetary policy instruments used was by the Czech national bank in the two cases. In the year 2008 used the central bank for the delivery repo operations with a maturity of two weeks and later three months for precautionary liquidity support for the banking sector.

The second non-standard measures were foreign exchange intervention announced in November 2013. The bank board of the central bank decided to use the exchange rate of the domestic currency as the main tool for monetary easing. The reason was the depreciation of the exchange rate of the domestic currency with the aim of curbing deflationary pressures in the economy. These tendencies it was not possible to suppress the lowering of interest rates.

The aim of the text is an analysis of the manifestations of the non-standard monetary-policy measures in the central bank's balance sheets in the period 2010 to 2016. To achieve the objectives of the text are used the methods of description, comparison,

development of selected items of the balance of payments, analysis of the relationships between the selected items and the prediction of the on-balance sheet items after the termination of the intervention in April of this year.

2 The balance sheet of the central bank

The balance of the central bank differs from the balance of commercial banks. *Assets of the balance sheet of the central bank represent the ways of the money-issuing central bank and the liabilities represent certain kinds of money in the economy (Revenda, 2012).* A specific feature of the balance of the central bank is the high proportion of foreign exchange reserves in the assets and reserves of commercial banks and money in circulation on the liabilities.

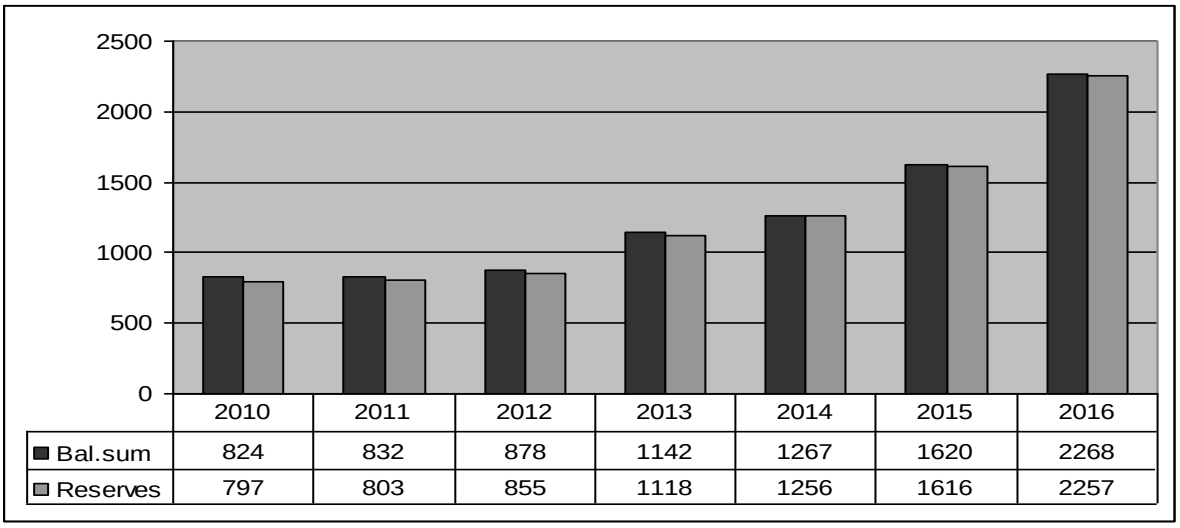
The use of the exchange rate of the domestic currency as a tool of monetary policy easing illustrated the Czech national bank as averting the threat of deflation and the related adverse accompanying phenomena in the economy. The central bank announced the commitment of the depreciation of the exchange rate of the domestic currency 27 CZK/EUR.

For the analysis of the influence of non-standard monetary policy instruments on the balance sheet of the central bank is an important development level and structure of the monetary base on the liabilities, foreign exchange reserves and lending to commercial banks on the assets and income of the central bank. The policy of monetary easing, the launch of foreign exchange interventions over the period in question, changed the form of the balance of the Czech national bank.

In the years 2010-2016 there was a gradual increase of the balance sheet of the central bank. Changing the main monetary policy instruments on exchange rate intervention there was an increase in the balance sheet from the year 2013 occurred twice.

Assets of balance sheet of the central bank
On the active side of the balance sheet of the central bank we pay attention to the movement of the value of foreign exchange reserves and their context with currency interventions of the central bank. The assets of the Czech national bank primarily consist of foreign exchange reserves (over 90%). The structure of the reserve consists of deposits in foreign banks, securities, gold and reserves with the IMF. Foreign exchange reserves make up a substantial part of the assets of the balance sheet of the central bank, their value in the long term corresponds to the recommended amount in proportion to the import of goods and services from the IMF. The movements of the exchange rate of the domestic currency significantly affect the economic result of the central bank

Figure 1 The sum of the balance sheet and foreign reserves 2010-2016 (bn. CZK)



	2010	2011	2012	2013	2014	2015	2016
Bal.sum	824	832	878	1142	1267	1620	2268
Reserves	797	803	855	1118	1256	1616	2257

Source: compiled by the author according to the Annual reports of the Czech National Bank

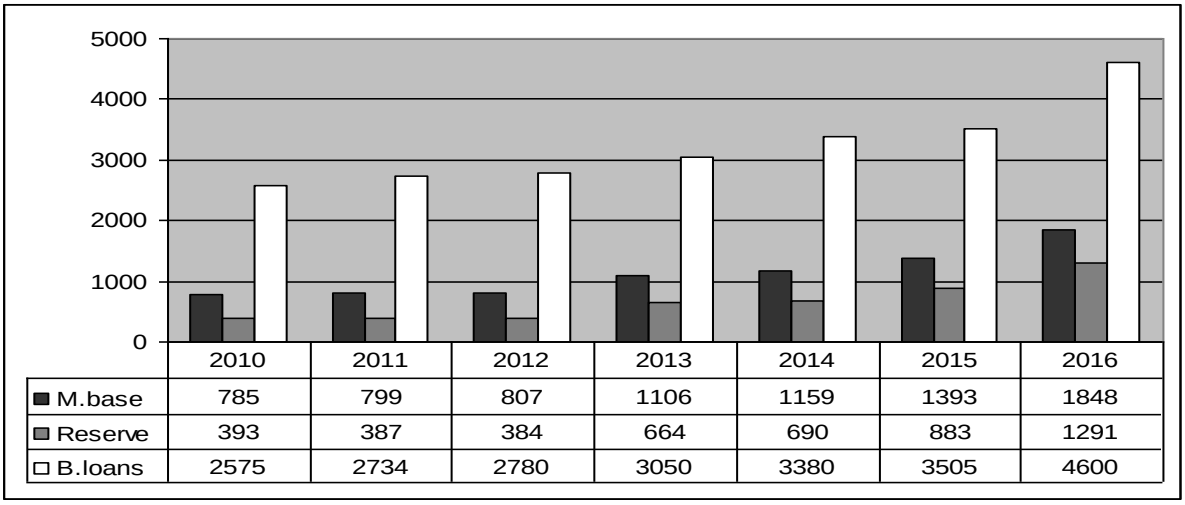
The decline in the exchange rate of the domestic currency increases the volume of foreign exchange reserves and reported profit, also increases the value of foreign claims. Returns from invested reserves to further enhance their value. The movements of the value of the foreign exchange reserves are caused mainly by foreign exchange interventions of the central bank.

In the active item claims to banks is reflected long-term systemic excess liquidity of commercial banks. It takes a low demand for loans from the commercial banks item in the balance sheet of the central bank has a zero value.

Liabilities of balance sheet of the central bank

On the passive side of the balance sheet of the central bank we follow the evolution of the monetary base involving the item banknotes and coins in circulation, required and free reserves of commercial banks at the central bank. These items form a significant part (90%) of the liabilities of the central bank.

Figure 2 The monetary base, reserve of banks and bank loans 2010-2016 (bn. CZK)



	2010	2011	2012	2013	2014	2015	2016
M.base	785	799	807	1106	1159	1393	1848
Reserve	393	387	384	664	690	883	1291
B.loans	2575	2734	2780	3050	3380	3505	4600

Source: compiled by the author according to the Annual reports of the Czech National Bank

Liabilities of the central bank to the domestic banks most grew after 2013, as the effect of the inflow of the domestic currency into the banking sector the influence of foreign

exchange intervention. There was an increase in the crown of the reserves of domestic commercial banks. Structurally there has been an increase in particular voluntary reserve banks influence monetary easing. The remuneration of the voluntary reserves of banks is lower than the interest provided by bank loans the banks so in the area of interest limit the potential returns.

Related to the influence of increasing the monetary base is the growth of banknotes and coins in circulation, the value of the currency has reached 557 billion CZK in 2016.

The sharp increase in the liquidity of commercial banks after the launch of foreign exchange interventions had the goal of increasing credit activity of banks. This goal was only partially achieved. The volume of bank loans has been curbed partially delay the growth of lending for the growth of bank reserves and also the lack of creditworthy clients and effective business plans. The consequence of this is the restriction of financial flows to households and businesses, and in effect limits the performance of the economy and a failure to fulfill the inflation target. Currently there is a growth of credit activity of banks the influence of an increase in the financial resources of banks and the improvement of the condition of the economy of the EU countries (GDP of 1.5% in 2016).

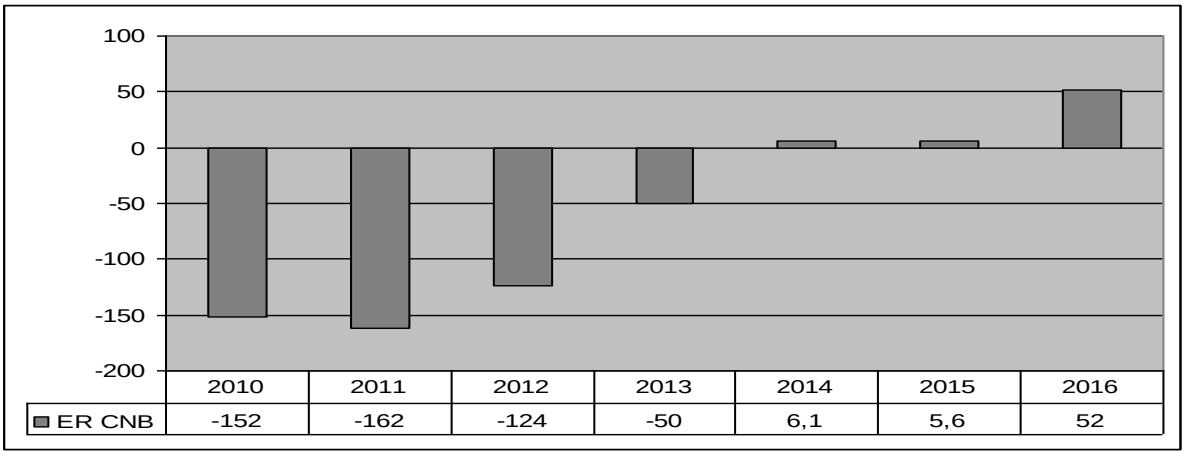
3 The result of the management of the central bank

Making a profit is not the priority activities of the Czech national bank. According to economic theory the central banks show a profit. The negative result created by the central bank is a normal situation and does not have any substantial influence on activities of the central bank.

Long-term increased demand for domestic currency due to capital inflows into the Czech Republic caused an appreciation of the domestic currency, reducing value of foreign exchange reserves and creating a loss in economic result of the central bank.

During the years 2010 to 2016 recorded the results of operations of the central bank to considerable fluctuations. The highest cumulative loss in the reference period has reached the central bank in the year 2011 in the amount of 162 billion CZK. The results of the management of the Czech national bank fundamentally affect the foreign exchange differences of the domestic currency and the related change in value of foreign exchange reserves.

Figure 3 The cumulative economic result of the CNB 2010-2016 (bn. CZK)



Source: compiled by the author according to the Annual reports of the Czech National Bank

Exchange rate intervention to weaken the domestic currency commenced in 2013 had a significant impact on the financial result of the central bank. The Czech national bank reported in 2013, the influence of the depreciation of the domestic currency, high profit in the amount of 73 billion CZK, in the year 2014 made a profit of 56 billion CZK. Created

financial resources were used to cover the losses of the previous period. The effect of exchange rate differences on the financial result of the central bank will strongly manifest itself in the non-participation of the Czech Republic in the euro area.

The economic result of the central bank even after termination of the foreign exchange interventions further influenced by the exchange rate of the domestic currency, the related value of foreign exchange reserves and interest reserves of the banks deposited with the central bank.

4 Conclusions

In the balance of the central banks are the dominant item on the asset side foreign exchange reserves, on the liabilities side, bank reserves and money in circulation. In the period of years 2010 – 2016 balance sheet of the central bank rose sharply. The important influence of the increase in the balance of payments was the release of the monetary policy of the central bank with the aim of kick-starting the domestic economy and the achievement of the inflation target.

Use the exchange rate of the domestic currency as an instrument of monetary policy and the takeover of the exchange rate commitment caused a rise in foreign exchange reserves on the assets and the increase in bank reserves and money in circulation on the liabilities. There was an increase in the share of bank reserves on the monetary base. The Czech banking sector in the long term shows a surplus of liquidity. These facts are indicative of the impact of the interventions in large part only to the banking sector.

Foreign exchange interventions have affected substantially the results of operations of the central bank. Their launch in 2013 achieved coverage of the entire accumulated losses of the central bank of the past years the influence of the increase in the value of foreign exchange reserves.

In the period after the termination of the foreign exchange interventions of the Czech national bank (April 2017) will further lead to the movement of items in the balance sheet of the central bank. The main impact on the financial result will have the exchange rate of the domestic currency, the related value of foreign exchange reserves, the returns from foreign exchange reserves and interest on bank deposits at the central bank.

Assuming a gradual appreciation of the domestic currency will be the premise of losses, the central bank partially offset by the proceeds from the foreign exchange reserves. The growth of interest rates of the domestic currency will cause higher remuneration on the reserves of commercial banks with an adverse influence on the management of the central bank. The increase in the disbursement of loans of banks from the central bank cannot be expected, while the abundance of their financial resources.

Return to the managed floating exchange rate of the domestic currency can mean higher volatility of the exchange rate of the domestic currency, supportable estimates of the development cannot be accurately determined. By assumption, the central bank will not be the termination of the foreign exchange interventions indicate a strengthening of the exchange rate of the domestic currency above the level before the interventions. The result of the management of the central bank may be negatively affected, its value, however, is not a significant macroeconomic variable.

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Blockchain-Applications in Banking & Payment Transactions: Results of a Survey

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Abstract: *We examine different opportunities to implement the blockchain technology into online payment and sales transaction systems with a focus on the financial sector of the German speaking area in Europe. To this end, we conduct a literature review and conduct a questionnaire survey among payment transaction experts. In addition the advantages and disadvantages are pointed out as well as other applications. Results from the survey suggest that many experts are investigating the new technology, but the efforts made at Austrian, German and Swiss banks are low since there are still many open issues pending. Especially setting up a legal framework for the international treatment of payment transactions based on the blockchain would be an important step.*

Keywords: blockchain, payment transaction service, cybercrime, electronic banking

JEL codes: E42, E50, F23, F55, G21, J33, K23, L22

1 Introduction

When payment systems were first computerized, the underlying processes were not significantly changed. While records and ledgers have been converted from paper to electronic form, the basic structure of centralized payment systems remained. At the core of these conventional payment systems lies a central "clearing bank" serving as ledger, with settlement taking place across the books of this central authority. The so-called "blockchain" or "distributed ledger" technology (DLT) introduces a fundamentally different, decentralized structure into payment systems, with cryptography rather than a central clearing institution as its very basis, and without intermediaries such as banks. Blockchain technology is an innovative way of ensuring that money cannot be "double spent", thus providing for a highly secure payment structure and possibly preventing fraud (Böhme et al, 2014; Bohannon, 2016; Martins et al, 2013). This is a key issue in systems that rely on digital records where it is simple to copy and edit entries.

Various efforts by banks and other market participants are under way to investigate the possibilities of the DLT technology for financial transactions such as instant payments. If adopted, DLT will influence banking and commerce at large. Opportunities and effects of its implementation are an important issue for financial sector participants and beyond.

We will investigate several areas: For one, how could DLT make payment transactions and banking services safer, what are possible advantages and disadvantages according to current literature? For two, what current efforts are under way among German and Austrian banks? To answer this question, we collected responses from 22 experts in information technology (IT)- and payment transaction from banks, financial institutions such as credit card providers and other parties, which are involved in the payment transaction process (e.g. FinTechs, auditors, stock exchanges…) in the German speaking area of Europe. We find that many financial institutions are currently examining DLT, while only few tried to implement it yet. Banks are investigating, but don´t want to invest too much money in a potentially hyped technology. Most conventional institutions don´t know much about it yet. Developments to date suggest that the blockchain technology bears promise but that there is still a long way to go for implementation.

Since digital banking is continuously gaining importance, the safety is of core concern. Cases like of the Bangladesh National Banks theft could be prevented if security

standards would be improved (FAZ, 2016). However, not only security would be improved by implementing the blockchain technology but also costs and the duration of processes would be reduced (Schreiber, 2015).

This study is of interest to those who want to get an overview of the ongoing efforts and intentions of financial institutions to adopt the blockchain technology, including market participants, regulators and auditors. It similarly is interesting for people who care about new technologies and future trends like IT-experts who are interested in the current movement by market participants.

The remainder of the paper is structured as follows. Chapter two explains the concept of the distributed ledger technology. Chapter three discusses DLT usage among financial institutions and reports the findings from our empirical investigation among German-speaking financial institutions. The final section concludes.

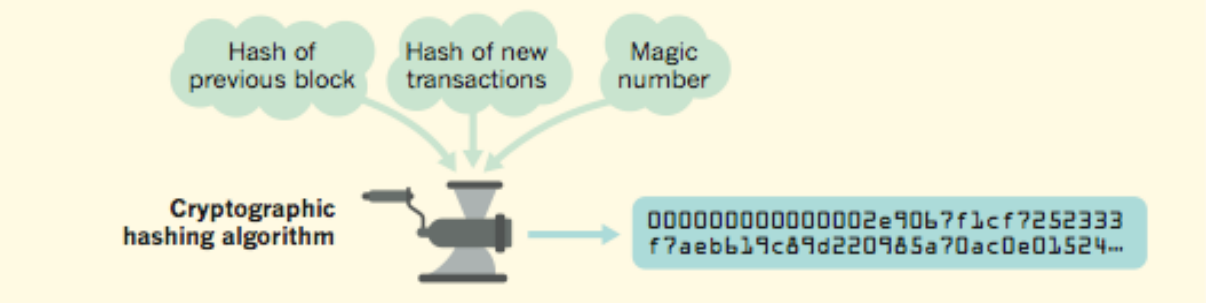
2 The Blockchain Technology

According to Mei (2015), the blockchain technology is a mix of "*cryptography, game theory and peer-to-peer networking without central co-ordination*". The following section will discuss the technical rationale in more detail.

Technical Background

The main idea behind the blockchain technology is already in its name. It is basically a chain of blocks. These blocks consist of transactions realized during a particular time and are created at cost (Nakamoto, 2008). For example, when Bernd pays 2 coins to Albert, the transaction is sent to the so-called "peer-to-peer network". All transactions received during that particular period are collected in those blocks. Each collection of transactions then creates a new "hash". Such a transaction hash is dependent from the users involved in the transaction, since every participant of this system has a public and a private key. The public one can be compared to an address while the private one is similar to something like a signature (Bohannon, 2016). To avoid double spending of a coin, a hash of the private key from the sender (Bernd) and the public key from the receiver (Albert) are added to the coin's end in the case of bitcoins (Extance, 2015).

Figure 1 Creation of a new Hash



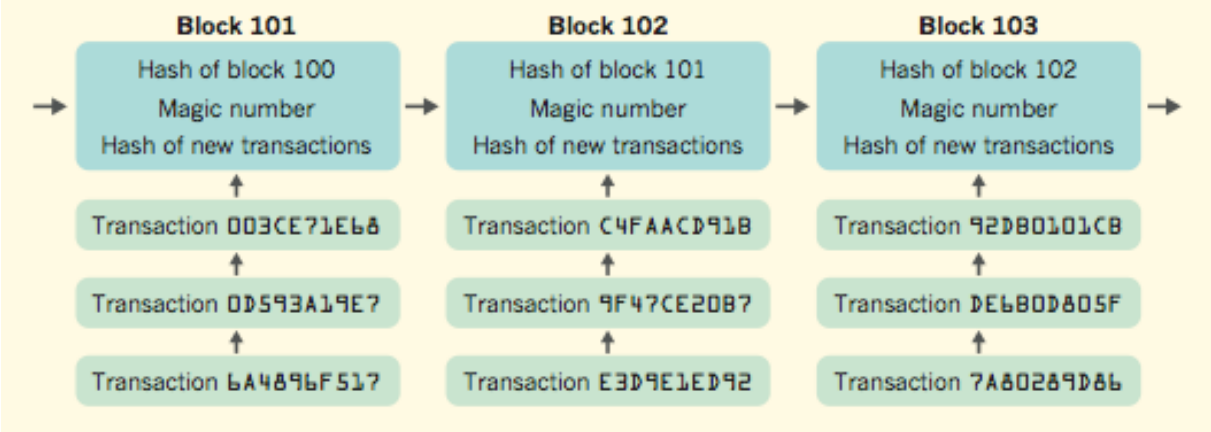
Source: Extance (2015)

These keys are necessary for a user to make his own encrypted transaction activity valid. The new added hash to the coin's end is the same thing as a new block. From a more general point of view, the hash for the new block is selected as a combination of the hash of the previous block and a so-called "magic number". That magic number can be seen as a puzzle based on the transactions (see figure 1). To verify the correctness of them, so-called "miners" calculate the magic number. This system is also called "proof-of-work" (Extance, 2015).

Once a solution is found, the other miners can quickly confirm the solution and the winner gets rewarded with bitcoins (in our example). In the end a precisely determinable new block was created. It is also important that the activities are sorted chronologically

using a timestamp and the first one received is valid. In addition, all transactions made were added to the blockchain and are therefore visible to every user (see figure 2). Of course the participants do not use their real names, but pseudonyms. So the system is pretty anonymous. According to Bloomberg (2016) the blockchain technology can be categorized into private and public blockchains. While the former ones are rather used by companies to process equities and stakes in private companies, the latter ones are under investigation by independent startups among others (Bloomberg, 2016). According to Gerber (2015), experts fear private blockchains, since they are under control of a single company and as a result do not correspond to the independence principle of the blockchain.

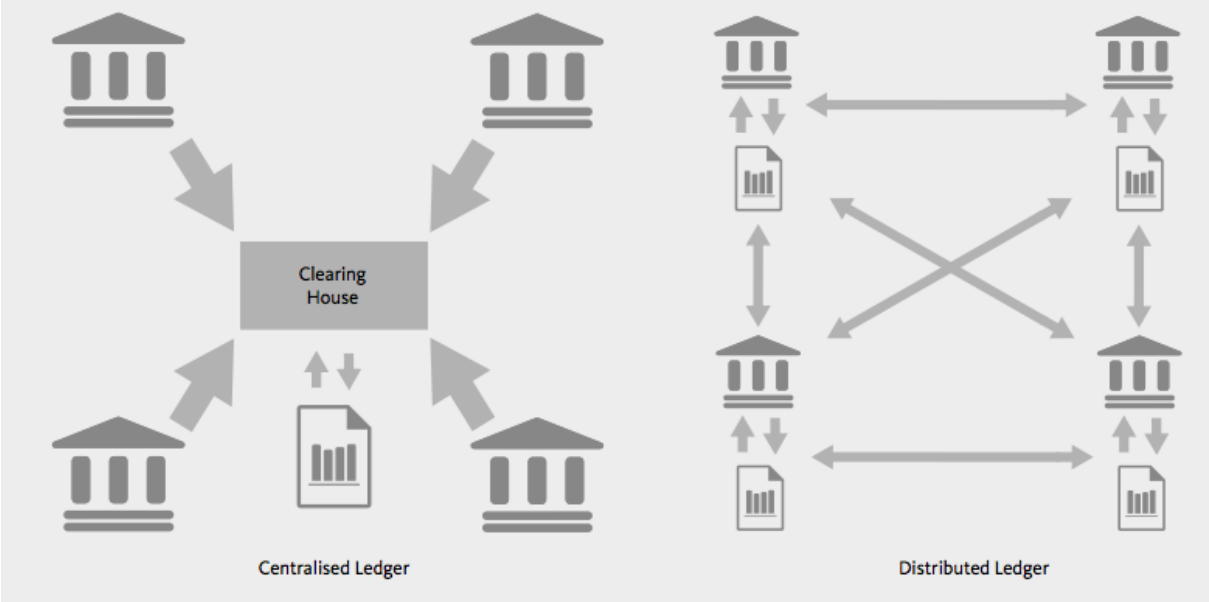
Figure 2 Illustration of a Blockchain



Source: Extance (2015)

The blockchain uses also elements from cryptography and game theory. The former can be described as highly secure encoding that may be also used for safe communication (Mei, 2015). In this fully decentralized payment system, copies of the ledger are shared between all participants and a process is created by which participants agree on changes to the ledger (i.e. which transactions are valid. The need for a controlling central authority is removed as everybody can check proposed transactions against the ledger at a certain conditions, providing confidence in the integrity of other participating entities (Barrdear, Clews and Southgate, 2014; Knibbs, 2015).

Figure 3 Centralized and decentralized ledgers



Source: Santander (2015)

The blockchain technology enables to save crypted personal information in a decentralized network that makes it nearly impossible to hack the system and steal such information. The users are highly anonymous and the chance that an error occurs is close to zero. Intermediaries are not necessary in such a network, which eliminates a weak point of current systems. The main disadvantages at this time are the slowness, irreversibility, the need for high calculation power and weaknesses in the proof-of-work technology.

3 Usage and Empirical Findings on Implementation

DLT is already used by digital currencies, with bitcoin as most famous example. In the following we eview selected literature on its application and then report our own findings.

Literature Review

According to the EU Commission (2017), potential applications of DLT might include international (non SEPA) payments, syndicated lending, post-trade clearing, settlement & custody, primary issuance of securities, to track and manage asset re-hypothecation, automated reporting both to investors and regulators (EU Commission, 2017). Dapp (2016) reports DLT is investigated by so-called innovation labs run by several banks. According to Dapp and Karollus (2015) clearing houses, insurance companies, stock exchanges and credit card firms are examining it, though there are no implementations yet. New challenges are also arising for governments, since a new legal framework to treat systems without a central ledger or to avoid tax fraud and other illegal activities is needed.

According to Schreiber (2015), 50 international bank institutions are currently concentrating on an US-based FinTech called R3. Members are for example: Goldman Sachs, Credit Suisse, JP Morgan, Deutsche Bank, and Commerzbank (Allison, 2016; Schreiber, 2015). This group is engaged in setting standards for decentralized network applications and classifying assets (Börsen-Zeitung, 2015a). Schreiber counted more than 700 Start-ups specializing in the blockchain technology. The Spanish bank Santander already estimated an imaginable reduction in cost of USD 15 to 20 billion annually until 2023 that could derive from an implementation of the blockchain

technology (Schreiber, 2015). According to Weiguny (2016) people have already invested USD 450 million in start-ups that investigate the blockchain technology. The European Securities and Market Authority (ESMA) started to investigate the purposes of European banks, which make efforts to implement Blockchain. Relating to FAZ (2015), they are concerned about the increasing anonymity of customers due to the already known misuse of the Bitcoin for criminal activities. According to Börsen-Zeitung (2016a), the ECB has made some efforts to analyze the potential of DLT (technology used for bitcoin) for applications too.

Business Wire (2016) reports that the State Street Corporation ran a survey among 50 investment funds. Interestingly, not even every second asset manager believes that the blockchain technology will reach the scale necessary. Only 13% of asset owners are convinced that this technology is going to be used by the broad public. 90% of respondents were worried if the blockchain is going to fulfil future safety standards (Business Wire, 2016). In addition, Börsen-Zeitung (2016b) mentioned that institutional investors believe that this new technology is just hyped. According to McLannahan (2016), 7 banks announced that they have successfully transferred money across boundaries using the blockchain. They did so with support from Ripple, a FinTech specialised in digital settlement. Approximately around 80 banks are doing research with that platform. The U.S. Financial Stability Oversight Council (FSOC) emphasized the potential reduction in cost which comes with the usage of systems like provided by Ripple, though they also find that banks have only little experience with that topic.

Not only banks could improve the duration of their transaction processes. According to an article of Börsen-Zeitung (2016c) an insurance company in the German speaking area of Europe is currently evaluating the usage of blockchains for compensation payments, similar to smart contracts. According to FAZ (2015), the New-York based stock exchange NASDAQ is already experimenting with the adoption of the blockchain for certain trading sectors. Deutsche Bank is experimenting with the blockchain technology to use it for smart contracts in bond issuance (Börsen-Zeitung, 2015a).

Survey

Since the literature provided only general information of the situation, we asked transaction experts of financial institutions directly. We sent questionnaires to 110 contacts from banks, 10 from stock exchanges, 7 to credit card providers, 23 to FinTechs and 17 to related consulting firms. As a final step we tried to get in touch with 15 experts from federal governmental and EU institutions. The questions were as follows:

- Is your institution currently thinking about implementing the blockchain technology for payment transaction systems?
- What are the its advantages over other prior technologies in your specific case?
- Are there still issues that have to be solved prior to implementation?
- Where do you see the future of digital payment transactions?
- Have you heard about other financial institutions plans to introduce DLT?
- Are you aware of other interesting applications based on that technology?

In the end, we received 22 answers of which 12 fully completed the questionnaire. The rest stated their intentions relating to the blockchain or sent us extra material to imply the answers, e.g. press releases. All of these institutions are based in Austria, Germany or Switzerland. Thus, we answered the survey based on the information obtained.

The answers of banks were widely spread. They had only one thing in common: none has currently the intention to implement the blockchain technology. Only one mentioned that they have already used a system based on the blockchain, namely Ripple. But they did not continue the tests. At the same time, they mentioned to start some tests again in the future. Three of them not even have started to evaluate the new technology. One stated that he does not believe that any bank or one of the TOP 100 FinTechs in his particular country has made big efforts to investigate that topic. Furthermore he explained that

banks are too conservative concerning new technologies. This may seem legit if we look at the opinion from another payment transaction expert: he emphasized the already good working payment transaction system. It would make sense to use the blockchain for classical foreign trade transactions, however demand seems to be too low. In addition two of the experts mentioned that a joint implementation from all banks is needed. If one would remain the old system, there would be no reduction in cost. Possible advantages for nearly all of the experts interviewed would be a reduction in cost and time, an improvement in privacy and security and slimmer procedures. Other experts stated that customers are not willing to trust an unknown technology. Also it still has to be decided if private or public blockchains should be used. Again only one claimed that the new technology will lead to a decrease of importance of banks and that this could promote illegal activities like money laundering and financing of terrorism. Besides trust issues that were also enforced because of the criminal activities operated with the bitcoin, one mentioned that system is too complex at the moment. Two of them criticized the lacking legal framework.

Concerning the future, the opinions were widely spread once again. It is clear for all that it is going to change. While one predicts the end of payments by cards, another one sees higher demand for online payments and three even stated that the blockchain and p2p-systems will determine the future. Two of them also amended that instant payment are going to be a big thing soon, however by using another technology supported by a clearer. Relating to that topic, one explained that there is going to be a new legal framework in the EU regulating instant payments. Furthermore transaction service providers like Paypal, Google and Sofort will be covered by new regulations in 2018. Another expert mentioned that the blockchain is only one possibility to change the payment transaction system among others. One expert also argued that intermediaries would not be required anymore in the future. Only one expert admitted that he has heard of another bank of his country that is currently evaluating the blockchain technology. Other experts only mentioned banks outside the German speaking area of Europe. The other named institutions like the ECB, the European Commission, the FMA, the ASI, a taskforce of the European Banking Federation and the ESMA that are currently doing research on the new technology. Also the R3 banks, IT-companies, FinTechs, an insurance group, several international banks and two credit card providers were mentioned.

Some respondents expected the use for documentary business in foreign trade finance, credit card processing and other digital payments and trade, for stock trading, settlement, payment transactions and the treatment of financial information, though legal concerns remain high. Another bank is even investigating the implementation for their core banking system. The main advantages of DLT foreseen are lower levels of risk when talking about information reachability and errors when making transactions. In addition, the instant processing and the lacking central authority was mentioned.

Many referred to the early stage of the development. Current barriers are lacking legal frameworks and the difficult implementation into current systems among others. Only several responding FinTechs are already using the blockchain technology or adoptions of it. They also declared the main advantages as follows: the elimination of central authorities, an increase in speed, reduction in cost, distribution of risk, global application, tampering protection and public access. Besides too high calculation effort and costs, the slowness and scalability issues were mentioned. Compliance and regulations are going to play an important role too. The perceived slowness of the blockchain was emphasized by providing a comparison between the bitcoin that can operate five transactions in a second to a credit card provider that can operate 2.000 transactions in a second.

Table 1 Overview of findings

Questions	Banks	FinTechs	Credit Card providers & Stock exchanges	Other experts
Implementation of blockchain technology	• 7 made no efforts for an implementation • 1 tested a DLT based system • 3 had not evaluated DLT	• 2 out of 5 already implemented the blockchain	• No efforts for an implementation made yet	-
Advantages of DLT	• Reduction in cost/time • Security/ privacy improvements • Slimmer procedures • Easier data management	• Elimination of central authorities • Increase in speed • Lower costs, distribution of risk, global application	• No advantages for credit card provider	• Lower risk, instant processing, no central authority • Disclaim legal system by using a decentralized network
Issues to be solved before an implementation	• Lacking legal framework • All banks would need to adopt the new system • Difficult to trust new technologies	• Uncertainty about scalability • Slowness • High calculation costs	• Too slow for credit card payments	• Early stage of development, treatment of depreciating assets, high costs • Lacking legal framework
Future of digital payments	• DLT will drive the future • Importance of instant payments • No intermediary services needed	• Very competitive only a few providers survive • Coexistence of several digital currencies	• Growth of digital payments	• Medium term: new products • Long term: low chances for blockchain for payment transactions
Other institutions investigating DLT	• ECB, FMA, ASI, ESMA, R3, FinTechs, ECB, BIS	• Several banks • IT-companies • R3 consortium • Energy companies	• No information available	• 1 heard only from banks • R3 consortium
Other possible applications	• Documental transfer • Storage of digital media • Smart contracts • Core banking system	• Smart contracts: registration systems, asset treatment, voting • Combination of asset storage and transactions	• Stock trading, settlement, financial information • Combination with existing technologies	• Smart contracts • Treatment of ownership rights

4 Conclusion

Many institutions are currently examining the distributed ledger (blockchain) technology (DLT), however only few tried to implement it or even use it. The literature review and the survey we conducted in German-speaking financial markets pointed out the great possibilities of this technology. The answers from the survey varied widely and overlapped with issues covered by previous research and media. Traditional financial institutions´ efforts to implement the blockchain technology seem limited currently. The uncertainty about this new technology is obvious. While they do not want to stay behind, neither bank wants to invest too much money in a potentially hyped technology. This may have led to rather speculative answers than a clear trend. Perceived advantages of DLT are a reduction in cost and duration and slimmer procedures. Disadvantages are especially relating to slowness and the lacking legal framework. According to the EU Commission (2017), most DLT applications would require first solving various technological, operational and regulatory challenges in terms of scalability, interoperability, standards and governance, personal data protection and digital identity management to ensure fair and secure access to data stored on a distributed ledger.

Our survey revealed that DLT is not yet common industry knowledge, only the large global players that can afford costly basic research have a good understanding of the concept and opportunities at hand. On the diffusion curve, DLT has yet only reached the resourceful innovators, not even the early adopters. In that respect an information campaign e.g. by supervisory or regulatory bodies to disseminate proper innovation technology into regional banks might greatly help

A trend could be that the blockchain is going to be used in combination with other technologies. Smart contracts using the blockchain make contracts possible where the parties involved do not have to trust each other. This may change the process of taking out a loan massively. They could make loan payments safer and faster, because they take action when conditions are met and therefore reduce the risk of errors. Prerequisite for efficient and financial stability-supporting DLT solutions is, however, the establishment of platform solutions and solving pending legal prerequisites.

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Forecasting of Crisis Phenomena in Emerging Financial Market: Real-Time Monitoring of Demand and Supply Anomalies in the Stock Exchange

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Abstract: *The aim of the paper is to examine "anomalies" of instantaneous demand and supply in the stock exchange that was detected as alarm signals of a financial crisis in authors' investigations. The authors proposed to record and to analyze online information on bid-ask quotations in the stock exchange to monitor how the large investors' sentiment varies in real time. The original theoretical model of share pricing developed in the previous authors' papers plays a key role for such analysis. The model is based on the concept of time-varying Walrasian equilibrium under exchange processes in the stock exchange. Many observations for emerging stock market in Russia between 2008 and 2017 show that if capital holdings of traders on the side of demand is systematically higher than the ones on the side of supply, in most cases the uptrend will take place for share price later on; similar statement is also valid for downtrend forecasting. However, this regularity is violated in rare conditions that may be specified as "anomalies" of demand and supply. The result of the analysis carried out is that the anomalies are the specific features of drastic and protracted crises, such as stock market crash in Russia in 2008-2009. The hypothesis that investigating the anomalies of demand and supply one can foresee the beginning of protracted crisis as well as its finish was successfully verified: an investment strategy based on the idea has shown a statistically significant "abnormal" return over the period of the crisis.*

Keywords: financial crisis forecasting, asset pricing theory, demand and supply in the stock exchange, emerging markets, bid-ask quotations in the stock exchange

JEL codes: C-12, C-61, G-01, G-12, G-17

1 Introduction

In recent decades a lot of researchers looked into the possibilities of financial crises forecasting. As a result a number of successful techniques known as Early Warning Systems were developed. Examinations of several financial cycles (Mendoza and Quadrini, 2010; Reinhartand and Rogoff, 2014) lead to a conclusion that crises usually follow the periods of credit expansion and sustainable growth in asset prices (Kindleberger and Aliber, 2005; Misina and Tkacz, 2009; Mili et al., 2012; Arouri et al., 2013).

The first forecasting technique designated as "signaling approach" was proposed by Kaminsky et al. (1998). It claims that the triggering of financial crisis occurs when some indicators (developed in the model) exceed the certain threshold values. Many authors (Borio and Lowe, 2002; Sorge, 2004; Virolainen, 2004) developed and improved either general principles of Early Warning Systems or their implementation in the context of financial crises in different countries. Further examinations have shown (see, for example, Bussiere and Fratzscher, 2006) that an accommodation of an Early Warning System requires choosing between its sensitivity and false alarm rate.

Simultaneously, the phenomena of boom and ensuing crash of the stock market were analyzed in a number of papers on speculative asset pricing (Shiller, 2003), which found that asset prices producing a speculative bubble (either "positive" or "negative", see

Shiller, 2003) substantially enhance the financial stress in the national economy. In this context the progress of the asset pricing theory in modeling share price movements (including the models for market volatility forecasting, see (Engle, 2001; Poon and Granger, 2003; Jawadi and Ureche-Rangau, 2013)) is of great importance for predicting the financial crises.

The present paper extends an alternative approach to treat the share price variations (Petrov et al., 2013). The approach describes share pricing phenomena in stock exchange trading using Walrasian concept of market equilibrium. The model permits to link online dependences of demand and supply with aggregated combinations of instantaneous "micro-parameters" of market exchange; these combinations were termed in (Petrov et al., 2013) "the effective holding of free capital" and "the effective holding of shares" owned by participants of stock trading. Empirical investigations, fulfilled by authors, have shown that the new model is capable of forecasting the reversals of share price trend based on the monitoring of dynamics of the "effective free capital" for demand compared to that for supply in emerging market of Russia.

The present paper purposes to study "anomalies" in investors' behavior detected few months shy of the crisis of the Russian stock exchange in 2008-2009 and during it (Petrov et al., 2016). There are good grounds for believing that keeping track of similar anomalies gives a chance to forecast financial crises and to expand a repertoire of Early Warning Systems.

2 Methodology and Data

Suppose an economy including shares of N issuers that are traded in a stock market (Petrov et al., 2013). Evidently orders to buy appear when investors aim to exchange "cash" (we regard cash, most notably, as risk-free asset maintaining its value; the other motives for investor's interest in cash are possible also) for stock; in contrast, orders to sell reflect investors' seeking to exchange stock for cash. Consider an investor (let's "*k*" is his or her number) who trades the i^{th} share ($i = 1,..,N$) at some instant; in general investor's portfolio includes both a variety of shares and cash. Let $q_i^{(k)}$ is investor's current holding of the i^{th} share (it has meaning of a number of shares); $M^{(k)}$ is his or her current holding of cash, p_i is current price for the share "*i*".

Investor's efforts to trade stock signify that he or she is not satisfied with his or her portfolio structure. Let us assume that the investor aims the relative amount of the i^{th} share in his or her portfolio at the moment would be equal to $x_i^{(k)}$ (certainly, within the limits of budget constraint). In this case one can express an appropriate holding of the share $\tilde{q}_i^{(k)}$ (that is interpreted as investor's "demand to hold") from the relation

$$p_i \tilde{q}_i^{(k)} = x_i^{(k)} \left(M^{(k)} + \sum_{j=1}^{N} p_j q_j^{(k)} \right), \qquad (1)$$

where all share prices p_j are considered as exogenous variables. Investor's behavior in market trading is determined by his or her instantaneous "net demand"

$$\delta q_i^{(k)} = \tilde{q}_i^{(k)} - q_i^{(k)} \qquad (2)$$

– the amount of the i^{th} share the investor wish to buy at this price; obviously, negative values of $\delta q_i^{(k)}$ means the investor inclines to sell. We can express investor's net demand ("individual net demand") using relations (1), (2); in such a manner we obtain

$$\delta q_i^{(k)} = \frac{\delta F_i^{(k)}}{p_i} - \delta C_i^{(k)}, \tag{3}$$

where the following notations were introduced:

$$\delta F_i^{(k)} = x_i^{(k)} \cdot \left(M^{(k)} + \sum_{\substack{j=1 \\ j \neq i}}^{N} p_j q_i^{(k)} \right), \tag{4}$$

$$\delta C_i^{(k)} = q_i^{(k)} (1 - x_i^{(k)}). \tag{5}$$

The summing in the expression (4) includes all securities *j* except for the selected one *i*. In general, the parameter $x_i^{(k)}$, characterizing investor's expectations and appearing in the relations (4) and (5), depends on a share price p_i. However, we consider market exchange phenomena in the short run; so we can ignore this dependence in the sequel. In such a manner combinations $\delta F_i^{(k)}$ and $\delta C_i^{(k)}$ become independent of a share price p_i also. Aggregating expressions (3) over the groups of "buyers" and "sellers" one can obtain analytic representations of instantaneous net demand functions Δq_i^+ and Δq_i^- for the both parties of market exchange (superscripts (+) and (-) relate to demand and supply respectively):

$$\Delta q_i^+ = \sum_{k}^{over\ buyers} \delta q_i^{(k)} = \frac{F_i^+}{p_i} - C_i^+ \tag{6}$$

$$\Delta q_i^- = \sum_{k}^{over\ sellers} \delta q_i^{(k)} = \frac{F_i^-}{p_i} - C_i^- \quad . \tag{7}$$

Coefficients F_i^+, F_i^- and C_i^+, C_i^- of the functions (6), (7) (the "effective free capital" and the "effective capacity" respectively, see Petrov et al., 2013) can be found by aggregating the combinations (4) and (5) of the "micro-parameters" $M^{(k)}$, $q_i^{(k)}$, $x_i^{(k)}$:

$$F_i^{+/-} = \sum_{k}^{over\ buyers/\ sellers} \delta F_i^{(k)} \tag{8}$$

$$C_i^{+/-} = \sum_{k}^{over\ buyers/\ sellers} \delta C_i^{(k)}, \tag{9}$$

Note that net demand functions (6), (7) are suitable for relating to the measurements. First, at $\Delta q_i^+ > 0$ the relation (6) describes a snapshot of the modeled price dependence for market demand. Similarly, at $\Delta q_i^- < 0$ the relation (7) (being multiplied by -1) characterizes a snapshot of the modeled price dependence for market supply. Second, using the relations (4)-(9), one can analyze some important market phenomena (e.g. an activity and sentiment of shareholders and owners of free capital) on the basis of the observed demand and supply patterns. Third, Walrasian equilibrium share price can be naturally expressed based on the functions (6), (7). Forming the *total* net demand function $\Delta q_i(p_i) \equiv \Delta q_i^+ + \Delta q_i^-$, we obtain

$$\Delta q_i(p_i) = \frac{\left(F_i^+ + F_i^-\right)}{p_i} - \left(C_i^+ + C_i^-\right). \quad (10)$$

The function (10) has clear economic meaning; its positive (negative) values reflect an excess (deficiency) of demand over supply at a given price p_i. The price P_i fulfilling a condition $\Delta q_i(p_i) = 0$ is of special interest: it characterizes the Walrasian equilibrium by equalizing the opposite flows of orders to buy versus orders to sell. It is worth noting that the Walrasian concept of equilibrium corresponds to the actual mechanism of the stock market pricing. This observation makes it possible to measure the "effective free capital" and "effective capacity" appearing on the demand and supply side. At the same time, their micro-representations (4), (8) and (5), (9) provide insight into the aggregated portfolio structure on the both sides of exchange. We have developed and realized an experimental procedure of the determination of the instantaneous values of the coefficients F_i^+, C_i^+ and F_i^-, C_i^- appearing in the course of trade of particular securities. This procedure is based on the online-registration of the information on the limit orders and instantaneous share prices translated by the trading system of the Moscow Exchange. The picture of limit orders, represented by the trade blotter, is subject to significant fluctuations. In such a case it is necessary to smooth out the noise of the corresponding instantaneous values of the coefficients F_i^+, C_i^+ and F_i^-, C_i^-. In most of our studies the averaging time was taken as a half of a daily trading session.

In order to monitor the changes in the traders' sentiment, it was proposed to analyze time series of indicators α_+ and α_-, which are equal to the time-averaged values of the effective free capital F_i^+ and F_i^-, appearing on the demand and supply side, correspondingly:

$$\alpha_+ = \overline{F_i^+}, \quad (11)$$

$$\alpha_- = \overline{F_i^-}. \quad (12)$$

Petrov and Kashina (2013) were interested in the perspectives of the methods of portfolio management, based on the quantitative analysis of the interrelation of the "free capitals", appearing on the demand and supply sides. To characterize this interrelation the authors used the following parameter

$$q = \ln \alpha_+ / \alpha_-. \quad (13)$$

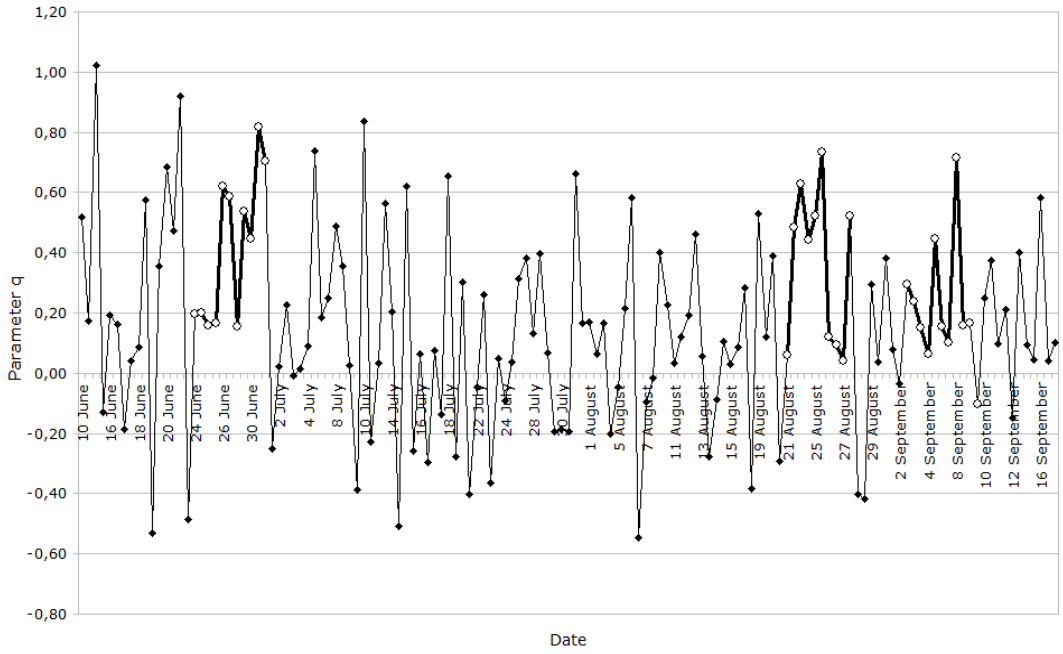
The procedure of building time series of the half-day values of the parameter *q* for shares of the Sberbank of Russia Corporation, Gazprom Corporation and LUCOIL Corporation is described in (Petrov and Kashina, 2013). It covers the period of 14.03.2008 – 19.05.2009 that is especially interesting for studying by reason of financial crisis 2008.

Accurate comparing of the time series of the parameter *q* and prices of the corresponding shares made it possible to reveal general regularities, valid for all securities, which was laid in the basis of the strategy, aiming to forecast the break-points of the price trend (Petrov and Kashina, 2013). If *q* persistently (at the minimum of one and a half trading days in a row) obtains positive values (i.e. demonstrates systematic excess of the effective free capital on the side of asset buyers), then there is a high possibility of an immediate (instantaneous or several halves of the day lagged) increase in the share price. This serves as a signal for opening a position on assets (provided it has not been opened before). Contrarily, the stable overbalance of the free capital on the supply side, which is validated by the systematically repeated negative values of the parameter *q*, as

a rule, precedes the downtrend and serves as a signal for closing position on assets (provided they has been already present in the investment portfolio).

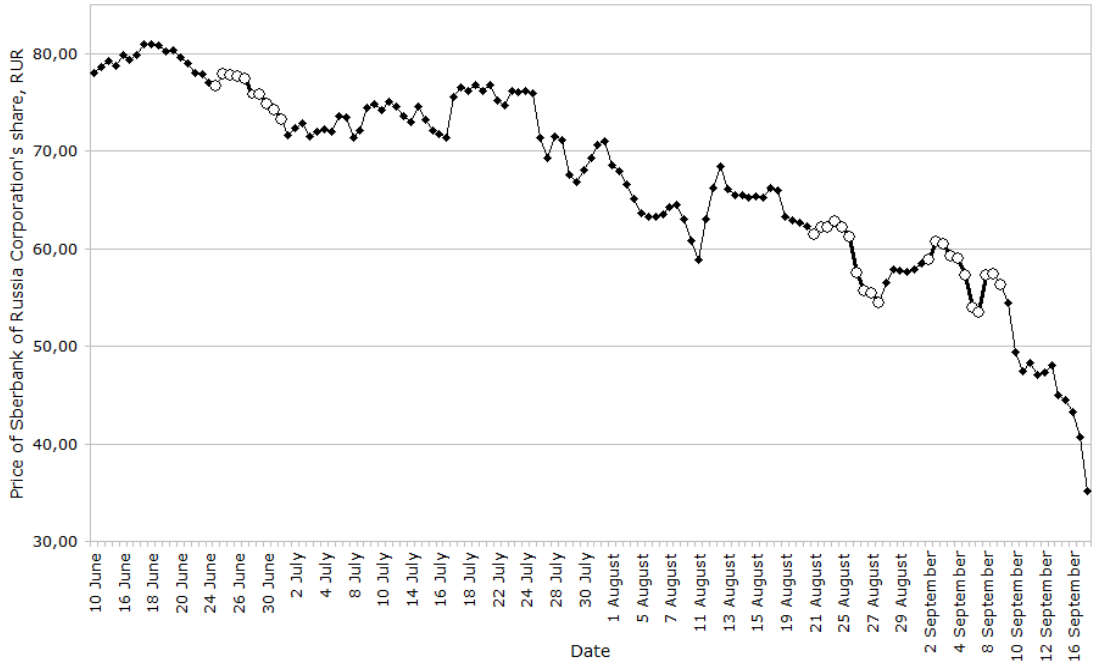
The authors of the present paper carried out similar effects for Russian stock between 2008 and 2017. The careful investigation enabled us to reveal the phenomenon valid for most of the analyzed securities, which was never observed neither before the crash in 2008 nor after the revitalization of the market in 2009 (Petrov et al., 2016). These were the "long half-waves" of the positive values of the *q* parameter (i.e. the long-term sustainable prevalence of capital on the demand side), which were not correlated with the price trend. The examples of these half-waves observed in the period of the oncoming 2008 stock market crisis, are shown in Figure 1 and Figure 2 for the shares of Sberbank of Russia.

Figure 1 Dynamics of the *q* parameter for the shares of Sberbank of Russia Corporation within the period from 10 June to 17 September, 2008



Source: author's calculations based on the data from website: http://moex.com/

Figure 2 Dynamics of share price for Sberbank of Russia Corporation within the period from 10 June to 17 September, 2008



Source: author's calculations based on the data from website: http://moex.com/

In the Figure 1, demonstrating dynamics of the *q* parameter, we observe three distinct "half-waves" within the period from 10 June until 17 September, 2008:

1. From 24 June (the first half of the trade session) till 1 July (the first half of the trade session); duration of this half-wave is 11 "macroscopic intervals" (every interval is equal to a half of the trading day).
2. From 21 August (the first half of the trade session) till 27 August (the second half of the trade session); duration of this "half-wave" is 11 macroscopic intervals.
3. From 2 September (the second half of the trade session) till 9 September (the first half of the trade session); duration of this "half-wave" is 10 macroscopic intervals.

Contrary to the experimental observations described above, the general price trend in all three discussed cases remains downward (see. Figure 2); so we identify such special cases as "anomalies". Five anomalies were revealed for Sberbank of Russia shares in 2008; the last one (which duration was equal to 17 macroscopic intervals) was observed starting from 26 November (first half of the trading session) till 8 December (first half of the trading session). In the very beginning of 2009 there were additionally observed two half-waves of this kind:

1. From 11 January (the second half of the trade session) till 23 January (the second half of the trade session); the half-wave lasted 20 macroscopic intervals.

2. From 29 January (the first half of the trading session) till 6 February (the first half of the trading session); the half-wave lasted 13 macroscopic intervals.

The periods of "abnormally sustainable" investors' interest in buying "falling" shares against the background of an impending crisis also took place for all stock under study.

3 Results and Discussion

The anomalies of shareholders' behavior were observed for all shares under consideration in approximately the same periods of time. For example, the first harbinger of the upcoming financial crisis (unusually prolonged predominance of capital on the demand

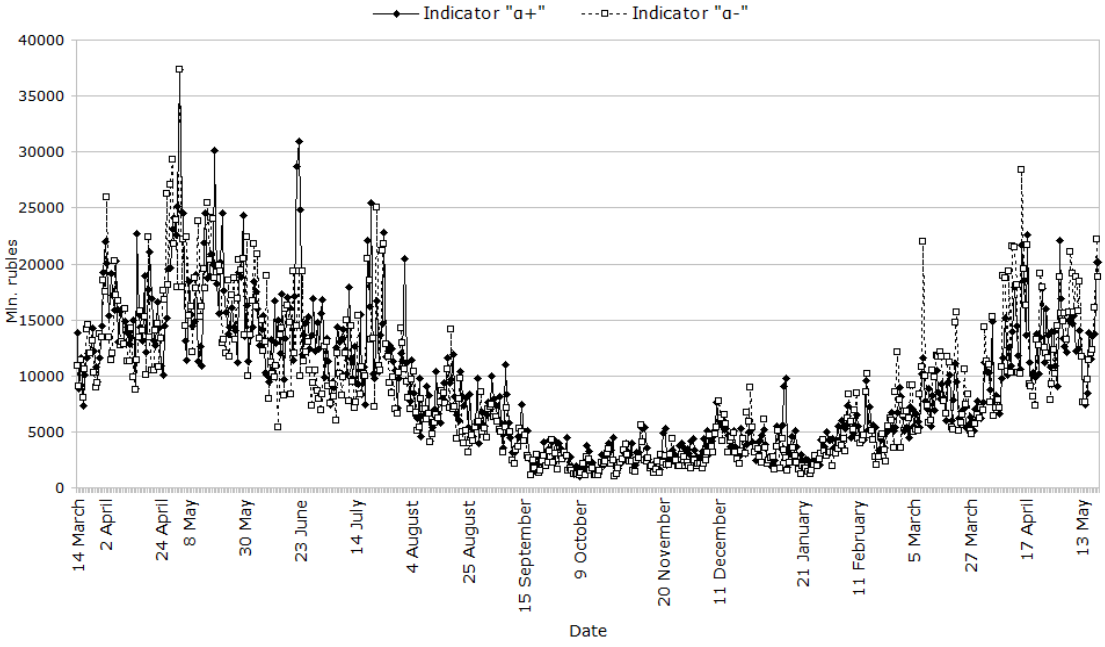
side) for each analyzed securities was observed approximately by July 2008; the second harbinger was registered at the beginning of September 2008, etc. Note also, that the first signs of a crash for each of the shares under consideration were detected a few months before the majority of traders realized that financial crisis had begun.

These observations suggest the idea of a "deliberate game" of large stockholders against downward price trend in "special" periods of time. The detailed analysis of the dynamics of effective free capital on the sides of supply and demand shows that the main cause of the anomalies is associated with the fact that large stockholders are refraining from selling of shares. It is likely that the large traders, being aware of the insider information, know in advance the inevitability of financial crisis and try to prevent prices of certain shares from sharp decrease. The very fact that almost always large stockholders "support" stock prices both at the beginning and at the end of the period of "long-term positive half-waves" (see Figure 2) testifies in favor of such interpretation of causes of the anomalies.

The investigation also shows that the anomalies usually occur against the background of downtrends of indicators α_+ and α_- or against the background of their minimum values. Accounting for the economic meaning of these indicators (see the relations (4), (8), (11) and (12)) one can conclude that the anomalies are inherent for the periods of the lower market activity of large traders. This is illustrated by Figure 3, which shows the dynamics of indicators α_+ and α_- for shares of "Sberbank of Russia" Corporation. Evidently, starting from the middle of May 2008 trends of both indicators were declining; however, share prices were still growing for a while.

On the contrary, from the end of February 2009 the indicators α_+ and α_- started to increase and the anomalies ceased to be observed: large investors were returning to trading; obviously, they knew that the "bottom" of the crisis had been passed away. Similar phenomena were observed for the shares of other issuers during the period of financial crisis.

Figure 3 Dynamics of indicators α_+ and α_- (mln. rubles) for shares of "Sberbank of Russia" within the period from 14.03.2008 to 19.05.2009



Source: author's calculations based on the data from website: http://moex.com/

Thus, it seems quite plausible that anomalies of large stockholders' behavior described above can be considered as the "harbingers" of the financial crisis (share price shocks) in the stock exchange.

4 Conclusions

The examination of empirical data on the demand and supply in the stock exchange showed that the anomalies in the behavior of large investors during the financial crisis of 2008-2009 are the essential feature of Russian stock market. The "bands" of persistent tendency of large investors to buy stock against falling price trend can be presumably considered as the regularity that characterizes periods of "dramatic events" in the stock exchange. This pattern may be due to the insider dealing and can be dictated by insiders' specific interests; the fact that insider trading activities significantly increase during the years of financial crises was described and investigated in a number of papers (Geyt et al., 2011; Abumustafa and Nusair, 2011). This is particularly true for emerging markets with weak corporate governance and investor protection (IMF, 2016).

Our investigations have shown that the hypothesis on the perspectives of forecasting financial crises by using information on early "harbingers" ("bands" of the anomalous behavior of large investors) received confirmation. The monitoring of anomalies of demand and supply in the stock exchange can be applied for the active portfolio management during financial crisis and can sufficiently enhance the effectiveness of portfolio investment. Besides, it is very likely that the results of the current research can be used for the analysis of insiders' activity in the stock market.

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Duration analysis in forecasting internal capital adequacy in banks

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Abstract: *The duration analysis as a dynamic method can constitute an effective tool in the internal system of measurement and control of interest rate risk in bank book. In this article, the author outlines the practical application of the duration analysis in the management of the bank balance when it comes to the interest rate risk. The key objective of this article is to show the use of duration method in estimating internal capital budget to cover the interest rate risk by the bank. Duration analysis is a sophisticated method of measuring interest rate risk used by Polish banks, with traditional banking practice, for single financial instruments. The originality of the article stems from its author's proposition to use the duration method to manage the entire portfolio of fixed income instruments in the banks' balance. The study of interest rate risk was conducted based on financial reports from a selected cooperative bank.*

Keywords: debt financial instruments, interest rate risk, duration analysis

JEL codes:G110, G120, G170

1 Introduction

The topic of risk is particularly important for business entities, which invest in various financial instruments and markets. The fluctuation of prices, exchange rates and indices in the market creates necessity to effectively manage risk.

A high level of investment in debt instruments with fixed interest made it necessary for investors to limit the risk of interest rate, which accompanies not only investments with variable interest. On one hand, changing interest rates alter investment conditions of received financial benefits, and on the other they change market value of these benefits.

The banking sector, banks and other financial institutions have an important influence on the debt market development. Particularly important for these economic entities is the problem of adequate measurement of interest rate risk. In case of a bank interest rate risk constitutes - next to credit risk, liquidity risk or currency risk – the key element of banking risk. The measurement of this type of risk is usually conducted through a classic analysis method of mismatch of terms of maturity of assets and liabilities (gap analysis). This thesis particularly refers to Polish banks, leading a traditional banking activity such as cooperative banks that do not use a sophisticated and advanced methods of analysis and evaluation of this type of risk. Other methods - if applied by these entities are usually used in limited ways - such as to assess single financial instruments or their portfolios. They are not used to evaluate the entire balance of the bank.

In this article, practical applications of the duration analysis in the management of the bank's balance were shown when considering the interest rate risk in debt instruments with fixed income. The duration analysis was used to forecast the internal capital[1] of the bank budgeted to cover the risk of the interest rate in the book of this bank. The author takes into consideration the imperfections of the tool analysed in this article but nevertheless argues that the usage of the duration method in the examination of interest rate risk could significantly support the management of this risk. More importantly it

[1] The internal capital constitutes an estimated by this bank amount, necessary to cover all identified, significant types of risk featuring in the banking activity and changes in the economic environment in a set timeframe.

could also create basis for a more precise assessment of the vulnerability of the financial result and capital of the entity with a large portfolio of fixed income financial instruments to the change of the interest rate.

The risk of investment in a financial instrument is discussed when there is a possibility that the difference between the estimated rate of the financial instrument's return and actual return rate will be positive. In terms of factors, which could lead to this kind of situation, there are usually the following types of risk associated with investing in fixed income instruments:[2]

- risk of interest rate change,
- risk of change in purchasing power (inflation risk),
- risk of early redemption of the instrument,
- currency risk,
- risk of insolvency.

Amongst market risk types, certainly of importance is the risk of interest rate. This risk is rooted in the change of interest rates in the market and is closely related to the financial instruments, which value is dependent on the shaping of interest rates over time.

The interest rate risk leading to achieving a financial result different to the intended one should be considered a threat. The deciding factor, in singling out the interest rate risk as an individual risk is the possibility of different shaping of level and visibility of real structures of future interest rates relative to investor's expectations. And where there are no expectations – in relation to current level and state of the structures of interest rates (Jackowicz, 1999, p. 38).

According to Canadian Deposit Insurance Corporation (Gup and Brooks, 1997, p. 3) the risk of interest rate is understood as the possible influence of interest rates on the revenues and net value of the unit. According to this institution- the risk of interest rate risk appears when the basic capital and interest rates cash flows – balance and off-balance ones, have different terms of measurement. Therefore, the size of the risk constitutes the function of the level and direction of the interest rate change and the size and terms of maturity of the mismatched positions. This definition particularly points out the interest rate risk for the entire balance of the institution rather than individual instruments or their portfolios. This definition underlines the importance of the adequate shaping of the portfolio of assets and liabilities in order, to protect against interest rate risk. A similar definition is offered by the Basel Committee on Banking Supervision, which points out the negative impact from change of interest rates and how it could influence the financial condition of the bank.

Through the risk of interest rate, both the negative and positive effect of interest rate change on the financial situation is understood, particularly when a bank is considered. In result, an adverse shaping of interest rates could decrease the financial result and equity capital of the entity.

The basis of the duration analysis is the indicator expressing time dimension, which is worked out using the following formula:[3]

[2] The names used to call the types of risk of investing in debt instruments vary in literature (see Francis, 2000, p. 3-10; Fabozzi, 2000, p. 6-10; Fabozzi, Fong, 2000, p. 30-34).

[3] More broadly on the topic of deriving the formula for *D* in both single debt instruments and their portfolios could be found in (Pielichaty, 2012, p. 69-83).

$$D = \frac{cA\sum_{t=1}^{m} t(1+r_0)^{-t} + Am(1+r_0)^{-m}}{cA\sum_{t=1}^{m} (1+r_0)^{-t} + A(1+r_0)^{-m}} \quad (1)$$

where:

A - nominal value of the debt instrument,

c - fixed nominal interest of the financial instrument (for all $t = 1, ..., m$),

m - the duration of the financial instrument,

r_0 - market interest rate.

From a formal point of view the indicator constitutes weighted average of terms of receiving payments from the ownership of debt investment, which weights are the current values of benefits. Based on this formula, key determinants of duration for debt instruments include:

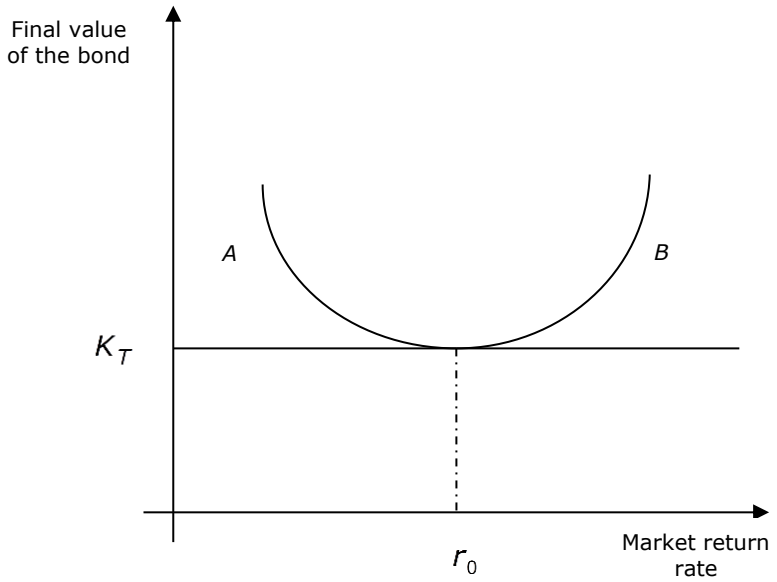
- payment schedule- interest and resulting from the buy-out of financial instrument,
- the duration of the financial instrument until maturity,
- the coupon rate,
- the market interest rate.

So that an investor could limit the interest rate risk, he needs to according to the duration strategy, precisely assess the individual factors shaping the average length of the investment in such way so that the duration of investment matched the term of its conclusion (*T*) as planned by this investor. The investment strategy based on the indicator *D* says therefore that an investor, in order, to reduce the interest rate risk, should select such a debt investment, where *D* will be aligned with the assumed investment horizon. In such a situation, when interest rates change, he will receive a payment (*K*) of at least what he calculated when making such investment: $K_T(r_0) = K_D(r_0)$.

An illustration of the convex nature of function of the final investment value in a debt instrument is seen in picture 1. Curve *AB* in the picture shows the shaping of the value of investment when *T=D*, with different level of interest rates. As seen in the picture, the function reaches minimum only when the market interest rate does not change.

The measure *D* determined by the above formula was for the first time set out as duration in American literature by R.F. Macaulay (Macaulay, 1938, p. 44) and this term is contemporarily used.

Figure 1 The shaping of final value of the bond dependent on the changes in market return rate



Source: (Jackowicz, 1996, p. 79-88)

2 Methodology and Data

The research was conducted on the example of a selected cooperative bank X[4]. In the research, data deriving from the balance and the account of profits and losses was used for a selected balance day as well as other parameters calculated for the bank, on the basis, of analytical record.

The data used in the calculations concerned the following balance positons with fixed interest:

- on the side of assets:

1) current accounts in the central bank amounting to PLN 1,707,569.58,
2) interbank deposits in the amount of 37, which balance on the balance day was PLN 55,850,000. Calculated, for the purpose, of this research weighted average amount of deposits with fixed interest was PLN 1,711,324.98;
3) Bank credits loaned to 5 262 clients, which combined balance on the balance day was PLN 129,717,501.32, including the portfolio of normal (non-endangered) credits with fixed interest in the amount of PLN 35,177,448.35, consisting of credits repaid in a single instalment (PLN 5,663,591.18) and repaid in multiple instalments (PLN 29,513,857.13);
4) 5-year Polish Treasury bonds with a nominal value of PLN 5,000,000.

- on the side of liabilities:

1) client budget account in the number of 19,794, which balance on the balance day was PLN 77,742,340.87;
2) term deposits accepted from 8,862 clients, which balance on the balance day was PLN 7,509,044.94.

[4] Due to a lack of suitable authorization, the author is unable to quote the real, full name of the bank.

Calculating duration gap was conducted in the following way: after working out the weighted averages of the maturity terms and nominal interest rates in the given group of loans and deposits with defined cash flows, an internal rate of return was calculated for the group. Next a weighted average return rate for the entire portfolio of assets and liabilities was calculated using fixed interest rate. For a purpose of calculating gap of duration, it was assumed that changes in revenues and costs are closely connected with market changes of interest rates, understood as weighted averages of the return rate to maturity of assets and liabilities offered by the bank.

When a duration gap was calculated in order, to assess the influence of interest rates change on the value of the bank's capital, then a Hicks' formula was used (Hicks,1939, p. 185-186). The entry point was the identity equation that the initial market value of the bank equity (*KW*) is equal:

$$KW = PV_A - PV_P \tag{2}$$

where:

PV_A – market value (current) of assets,

PV_P – market value (current) of liabilities.

After assuming, that a common interest rate (discount rate) for assets r_a and liabilities r_p exists, the following equation, which illustrates the change of initial value of the banks' equity is derived:

$$\frac{dKW}{dr_a} = -\frac{PV_A(r_a)}{1+r_a} L_D \ , \tag{3}$$

where L_D means: duration gap calculated with the formula:

$$L_D = D_a - D_p \frac{PV_P}{PV_A} \ . \tag{4}$$

Macaulay's duration was used in order, to calculate the impact of changing interest rates on the equity capital of the cooperative bank. The author argues that the results presented in literature show the effectiveness of this measure in the analysis of interest rate risk. Moreover, it is an easier and cheaper method to apply.

3 Results and Discussion

In accordance with The New Basel Capital Accord (Basel II), banks should maintain certain level of capital in relation to risk they take. Among the key types of risk, which are not taken into consideration when calculating the regulatory capital reserves, is the interest rate risk for the entire book of the bank. In the area, of the forecasting process of internal capital, bank should assess the amount of capital needed to cover the impact of interest rate risk on its book, when it has deemed it to be important.

If the banks' commitment to instruments influenced by interest rate risk was too risky, the supervisory authorities should oblige it to reduce the risk or to maintain a special additional amount of capital, as a certain buffer for increased appetite for interest rate risk (or both requirements where appropriate).

Regulatory guidelines do not impose methods which banks ought to use to estimate the internal capital. The duration analysis as a dynamic method could be an effective tool in

an internal system of measurement and control of interest rate risk in the bank's book and estimating internal capital to cover the risk.

The research conducted to date in this area shows the possibilities to practically control interest rate risk in the bank book in accordance with the postulates of Basel II and the Basel Committee on Banking Supervision. The author assessed the impact of parallel increases/decreases of interest rates by 200 basis points on internal capitals of banks. Simultaneously, when conducting a stress test in an area of interest rate change, additional factors were taken into consideration including:

- lack of possibility to transact by closing a position – reduced the share of temporary deposits with a fixed interest in total deposits from 9.6% to 2% on the side of liabilities,
- change of credit portfolio quality - changed the frequency of capital repayment and interest for credits with fixed interest rate and instalment repayment from 26 days to 90 days.

From the calculations presented in table 1, it is clear, that a shock interest rate change, with the structure of assets and liabilities with a fixed interest in the analyzed bank, would lead to a significant change of its capital. Interest rate increase, would lead to a decrease of PLN 2,866,932 or an increase of PLN 3,984,322 in case of a fall in interest rates. This will in turn result in a drop of economic value of capital by 17% if interest rates rose by 200 basis points. Despite the indicator does not yet reach the level of 20%, the shaping of the indicator above 15% is in practice considered to be of high risk. The bank should therefore gradually restructure its assets and liabilities of fixed interest in relation to the structure of balance positions with variable interest. Simultaneously such bank should maintain the internal capital to cover the interest rate risk in the bank's portfolio.

Table 1 The analysis of duration gap of assets and liabilities with fixed interest where shock interest rates and other changes were applied - stress test

Interest rate change	Duration of assets	Duration of liabilities	k[5]	Duration gap	The impact of interest rate change and other parameters on the value of capital in the bank (PLN)
2 percentage points	2.85 year	0.01 year	1.44	2.84 year	–2,866,932
–2 percentage points	3.5 year	0.01 year	1.27	3.49 year	3,984,322

Source: own work, on the basis, of data from bank X

An adequate change in the structure of assets and liabilities with fixed interest rate virtually allow to reduce the risk of interest rates to a zero level. In result, irrespective of the level and direction of interest rates change, the value of internal capital will not be significantly altered - as table 2 shows.

[5] Coefficient *k* means the ratio of the current value of liabilities with fixed interest to current level of assets with fixed interest.

Table 2 The gap duration analysis of assets and liabilities with fixed interest fully hedged against the risk of interest rates

Interest rate change	Duration of assets	Duration of liabilities	*k*	Duration gap	The impact of interest rate change and other parameters on the value of capital in the bank (PLN)
1 percentage points	0.92 year	0.45 year	2.02	0.01 year	-5,445
–1 percentage points	0.95 year	0.45 year	1.99	0.05 year	30,728
2 percentage points	0.91 year	0.45 year	2.04	-0.01 year	8,281
–2 percentage points	0.97 year	0.45 year	1.97	0.08 year	93,094

Source: own work on the basis, of data from bank X

The simulation encompassed, in addition to the change of interest rates, adequate:

- the reduction of repayments of capital and interest (from 76 to 38 instalments) and the frequency of repayments and interest (from 26 to 21 days) in case of credits with fixed interest rate and multiple repayment of the capital,
- the reduction of frequency of capital-interest repayments from term deposits with fixed interest (from 120 days to 480 days),
- an increase in share of deposits with fixed interest in term deposits, as a whole, (from 9.6% to 51.5%).

4 Conclusions

It is important to point out that a complete elimination of interest rate risk with the use of the duration strategy does not always constitute the best policy. This is because a bank could achieve certain benefits through appropriate management of the duration gap in the event of expected changes to interest rates. In the bank analyzed in this paper, a significant decrease in interest rates in the upcoming reporting periods would cause, assuming current balance structure for positions with fixed interest was maintained, the bank to enjoy additional financial benefits.

It is therefore imperative to adequately match expected market related change in interest to the nature of maintained gap, which could be either negative or positive. It appears that a complete reduction of risk of interest rate isn't possible in practice mainly due to varying sensitivity of financial instruments to changing interest rates as well as practical difficulties related to transacting in terms of both deposits and credits with fixed interest. Therefore, the shaping of the portfolios of assets and liabilities in time so that a balance was achieved in terms of duration of both assets and liabilities is hard to achieve and constitutes a long - term process. Thanks to the duration analysis it is however currently possible to manage the duration gap of positions with fixed interest and effectively manage the interest rate risk. It is important to remember that closing positions at fixed interest rate could mean that interest rate risk is fully eliminated. The elimination of risk could only feature in situations when the values of assets and liabilities positions based on variable interest rate are balanced.

The objective of managing interest rate risk should therefore be the reduction of the size of risk to maximum allowed, a not an attempt to eliminate it completely. Such an attempt to limit the risk could lead to reducing of chances to earn additional income

resulting from market change of interest rate. A natural element of banking activity is the lack of asset-liability matching until the mismatch isn't a threat to the bank.

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Gender differences in saving for retirement

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Abstract: *As the level of pension security offered by the state has been decreasing, it is necessary to save additionally for retirement. These savings determine financial condition of households, particularly in the period of limited income after finishing one's professional activity. The results of numerous research indicate that financial behaviours, motives and willingness to save among men and women differ significantly. Also, the willingness to save for retirement is determined by many factors, including gender.*
The objective of the article is to evaluate to what degree gender determines saving, including saving for retirement by households, as compared with other individual socio-demographic personality traits. The article presents the data of representative research "Social Diagnosis 2015". This research comprised of individual interviews conducted in 11,740 households with 35,279 members. The main conclusion which may be drawn from the research is that the chances of a household to save, including saving for retirement, decrease when a woman plays the role of household head.

Key words: gender differences, saving, retirement, Social Diagnosis

JEL codes: D14, D31, H31, H55, J32

1 Introduction

Saving behaviours of individuals and households as well as their preferences regarding the choice of form of saving, including saving for retirement, are determined by numerous factors. These have economic as well as non-economic character (Kolasa and Liberda, 2014; van Erp et al., 2013; Sass, 2016; Pieńkowska-Kamieniecka and Walczak, 2016). Numerous research indicate that economic well-being and behaviours on financial market are determined by gender (Fisher, 2010). In spite of the fact that women historically have been dependent on men for financial security (Schmidt and Sevak, 2006), it needs to observed that in recent years their role in this respect along with their position in the labour market and participation in creating household budget have changed significantly. It particularly impacts the role women play in households' financial decision-making, including saving and retirement saving decision-making (Hui et al., 2011). The gender of a household head greatly determines the amount of financial resources they accumulate. This results mainly from the fact that men and women differ in terms of their risk attitude. Low risk tolerance impacts negatively on the willingness to save and invest. It occurs that female-headed households have less wealth than others (Conley and Ryvicker, 2005; Chang, 2010). As women are usually characterised by a greater aversion to risk and are more conservative in their investment decisions (Fisher, 2010; Stendardi et al., 2006; Rietjens, 2011), they rarely opt for long-term investments related to retirement (Sung, Hanna, 1996). Although men are generally more prone to risks than women, other research allow to draw another important conclusion. Likitapiwad et al. (2013) conclude that females have a more positive attitude towards saving than males, nonetheless, they more often spend money excessively (on, for instance, clothes or cosmetic) with respect to their needs so that their savings accumulate more slowly.

It needs to be stressed that apart from gender and different attitude towards risk among men and women, also other socio-demographic traits of household head may have impact on the amount of savings accumulated by a particular household. These traits may interact with gender to a various degree, i.e. they might determine the willingness

to save for retirement among men and women (Fisher, 2010). As a matter of fact, saving might be affected by age, level of education and income (Fisher, 2010; Sabri, 2014), social-professional status, total number of children (Fisher and Anong, 2012), marital status or place of residence (Lusardi, 2003).

Elderly people save and think of retirement more frequently (Czapiński and Góra, 2016) than young people who are also characterised by a lower retirement awareness. The degree of retirement awareness is, in turn, positively correlated with the level of education (van Raaij, 2011).

Results of numerous research indicate that the willingness to save is shaped by financial knowledge which also depends on one's level of education (Lusardi, Mitchell, 2011; Bucher-Koenen and Lusardi, 2011; Kowalczyk-Rólczyńska and Rólczyński, 2016). Individuals with low level of education are likely to have lower income and wealth. Simultaneously, well-educated individuals are more likely to report income from retirement savings (Cole and Shastry, 2007). Also, the level of financial competence is determined by gender. It turns out that women are characterised by lower knowledge and financial literacy (Xu and Zia, 2012; Volpe et al., 2002; Lusardi and Mitchell, 2011b; Fornero and Monticone, 2011; Klapper et al., 2015). Men generally deal better with such financial issues as taxes, investments or savings (Clarke et al., 2005). Since there is a significant relation between the level of financial competence and participation in the financial market (Lusardi and Mitchell, 2011b), it well justifies women's low willingness to additional saving for retirement. Moreover, it is still men who are mainly responsible for making financial investment and planning decisions on behalf of the family (Hui et al., 2011).

Also, the income impacts on the possibilities and willingness to save. Lower income has a negative impact on owning savings (Munnell et al., 2011), especially among women who have smaller savings, lower income and are less wealthy as compared to men (Fisher, 2010; Gottschalck, 2008).

Of importance is also the marital status of a household head. Research conducted by Topoleski (2013) shows that the amount of household wealth is higher for married households than for single or divorced households. Additionally, Schmidt and Svak (2006) found no difference in wealth and owned savings between single female- and male-headed households. This concerns also savings for retirement. Therefore, it may be concluded that people who are married demonstrate better saving behaviours (Marital Status…, 2011).

Another variable which affects the level of savings is the number of household members, particularly the number of children, though this impact does not seem unequivocal. Scholz and Seshadri (2007) point out that households with children hold less average wealth than childless households. On the other hand, research of Mahdzan and Tabiani (2013) show that having children correlates positively with owning savings aimed at children's future education. This happens at the expense of retirement savings as households with children by rule undersave for retirement compared to similar childless households (Scholz and Seshadr, 2007). This concerns mainly households headed by females who are more likely to contain children (Fisher, 2010).

The aim of the study is to evaluate to what degree gender determines saving, including saving for retirement by households, as compared with other individual socio-demographic personality traits of household head.

2 Methodology

The article presents the data of representative research "Social Diagnosis" conducted in Poland in 2015. This research comprised of individual interviews conducted in 11,740

households with 35,279 members[6]. For the needs of this article, a head of each household was identified (with division into women and men) in order to evaluate how the gender of household head, including interactions with other variables, impacts a broadly understood household saving, particularly saving for retirement.

To realize the research task, the method of logistic regression was used. All calculations were performed with the use of IBM SPSS Statistics 24.0 program. While constructing particular logit models the following dependent variables were used: Y_1 – Do you own any savings? (M1 and M3); Y_2 – Do you own any savings for retirement? (M2 and M4).

The above variables took the following form:

$$Y = \begin{cases} 1, \text{if the event occured} \\ 0, \text{if the event did not occur} \end{cases}$$

Models M1 and M2 do not include the effects of interaction between independent variables whereas interaction effects occur in models M3 and M4.

Control variables, constituting socio-demographic traits of respondents (household heads) assumed in each model are presented in Table 1.

Table 1 Descriptive statistics for the independent variables

Variable	Variant of variable
Gender	0 – Women, 1 – Men
Age	Aged 24 and under, aged 25-34, aged 35-44, aged 54-59, aged 60-64, aged 65 and more (reference group)
Level of education	Primary and lower, lower secondary and basic vocational, secondary, Higher and post secondary (reference group)
Social and professional status	Public sector employees, private sector employees, entrepreneurs, farmers, pensioners and retirees, pupils and students, unemployed (reference group)
Place of residence	0 - Rural areas, 1 - Urban areas
Marital status	Single, married, widowed, divorced/separated (reference group)
Wealth (as the condition of well-being)	0 - Yes, 1 – No
Income (monthly net income from 3 previous months, in 1 thousand PLN)	Continuous variable
People (number of	Continuous variable

[6] The research is of a panel character. Its concept and logistics were designed by the Council for Social Monitoring. For more see http://www.diagnoza.com/index.html.

household members)	
Reading press (number of hours weekly spent on reading press)	Continuous variable
Material status (the level of satisfaction from financial situation)	Continuous variable presented in the following scale: very satisfied - 1, satisfied - 2, quite satisfied- 3, quite unsatisfied - 4, unsatisfied – 5, and very unsatisfied - 6

Source: own study based on Social Diagnosis 2015.

3 Results and Discussion

The results of the research indicate that gender has a statistically significant impact on saving, including saving for retirement. Not analysing interaction effects, the chances of male-headed households for owning savings are by 23% (M1) higher, and in the case of savings for retirement by 29% (M2) when compared to female-headed. It needs to be stressed that saving can be also affected by other individual traits of household heads, some of them interact with the variable, i.e. gender.

Chances for saving grow with age, though until 60 years of age households, irrespectively of their head's gender, do not consider financial security for old age to a great extent. Households headed by people aged 25-34 have 2-times (M1) and 4-times (M2) lower chances for savings than those headed by people aged 65 and more. This may indicate that irrespectively of gender (models M3 and M4 did not display interaction with the age of household head) young households, when able to save, usually save for other goals than additional retirement security.

In the case of saving in general as well as saving for retirement, chances for savings increase with the level of education. However, the impact of education is more visible in reference to saving in general. People with lowest level of education have 70% lower chances for savings than those with higher education (in the model without interaction - M1, as well as in the one with interactions - M3), whereas in the case of saving for retirement, these chances are smaller only by 33% (M2). Above all, the results have shown that the willingness to save for retirement among men and women is determined by their level of education (M4). Particularly in the case of primary and lower education, the chances of households for additional retirement savings, if headed by male, are by 42% lower as compared to female-headed households. Therefore, it may be claimed that with all education levels below higher, women are more likely to have old age savings than men.

Considering social and professional status, one may observe that the biggest chances for saving (M1) have farmers (by 71% higher than the unemployed). Analysing gender impact (M4) in majority of socio-professional groups, if male-headed, households are more likely to accumulate additional savings for retirement. This effect is noticeable particularly among farmers, where the chances of saving for retirement among men are 2.12 times higher than among women, and among private entrepreneurs.

Moreover, it was concluded that gender impact may be observed in the category of place of residence (what confirm also for example Krupa and Walczak (2016)). Rural households have 99.3% greater chances for saving if male-headed as compared to women, whereas in urban areas this difference is even greater and amounts to 150.7%

(M3). The situation is similar in the case of saving for retirement. Urban households have greater chances for owning such savings when male-headed (by 151.3%)(M4).

No difference has been observed between men and women with respect to saving, including saving for retirement, when taking into account the number of household members or hours spent on reading press. Yet it may be stated that these are statistically significant variables. It turns out that increasing the number of household members by one person reduced the chances of saving for retirement by approximately 9% (M2), whereas every additional hour spent on reading press improved the chances of saving in general as well as for retirement equally by 0.02%. This confirms already observed impact of education (and knowledge) on owning household savings.

The results of the research also indicate that in both male and female-headed households the chances for savings increase with income growth by 1 thousand PLN, i.e. savings in general by 17.0% (M1) and savings for retirement by 13.6% (M4). As a result, one obvious conclusion can be drawn: higher income has impact on a greater willingness to save.

Nevertheless, if one considers attitude to wealth as the condition of well-being and level of satisfaction from household material status, different observations can be made. Apparently, men and women differ in this respect. If one assumes wealth does not guarantee happiness (M3), chances of owning savings by male-headed households are greater than among women (by 51%). When female-headed households do not condition well-being on wealth, they tend to more seldom as compared to men.

Moreover, a decrease in the level of satisfaction from household material status lowers the chances for savings by approximately 32% (M1). No gender differences were noticed in the case of saving decisions oriented towards retirement. A decrease in the level of satisfaction from material status by one degree reduces the chances of saving for retirement among men and women by approximately 20% (M4).

Table 2 Estimates of logistic regression model – the analysed dependence: savings savings and savings for retirement

Variable	Variant of variable	Savings Exp(B)	Savings for retireme-nt Exp(B)	Savings Exp(B)	Savings for retireme-nt Exp(B)
		M1	M2	M3	M4
Gender		1.226**	1.286***	1.993***	-
Age	**Aged 65 and more (reference group)**	***	***	***	***
	Aged 24 and under	.784	.112**	.791	.103**
	Aged 25-34	.518***	.272***	.519***	.241***
	Aged 35-44	.678***	.427***	.681***	.386***
	Aged 45-59	.737**	.653***	.738**	.596***

	Aged 60-64	.762**	.803*	.767**	.776*
Level of education	**Higher and post secondary (reference group)**	***	***	***	-
	Primary and lower	.298***	.663***	.297***	-
	Lower secondary, basic vocational	.370***	.639***	.368***	-
	Secondary	.540***	.725***	.540***	-
Social and professional status	**Unemployed (reference group)**	***	***	***	-
	Employees of public sector	1.421*	.846	1.423*	-
	Employees of private sector	1.404*	.920	1.410*	-
	Entrepreneurs	1.219***	1.401	2.222***	-
	Farmers	1.707**	1.540	1.718**	-
	Pensioners and retirees	1.480*	1.342	1.490*	-
	Pupils and students	1.034	.552	1.016	-
Place of residence		1.258***	1.170*	-	-
Marital status	**Divorced/separated (reference group)**	***	-	***	-
	Single	-	-	1.625***	-
	Married	-	-	1.870***	-
	Widowed	-	-	1.310*	-
Wealth		1.178**	-	1.428***	-
Income		1.170***	-	1.169***	1.136***
People		-	.911***	-	.909***
Reading press		1.016*	1.016*	1.015*	1.018*
Material status		.681***	.802***	.718***	.796***

Gender * Primary and lower	-	-	-	.576***
Gender * Lower secondary and basic vocational	-	-	-	.619***
Gender * Secondary	-	-	-	.631***
Gender * Place of residence	-	-	1.258***	1.261*
Gender * Employees of public sector	-	-	-	.945
Gender * Employees of private sector	-	-	-	1.288
Gender * Entrepreneurs	-	-	-	1.785***
Gender * Farmers	-	-	-	2.121***
Gender * Pensioners and retirees	-	-	-	1.699***
Gender * Pupils and students	-	-	-	.000
Gender * Wealth	-	-	.760*	-
Gender * Material status	-	-	.918*	-
Const.	1.308	1.033	.942	1.127
Cox–Snell's R-squared	.167	.091	.168	.092
Nagelkerke's R-squared	.225	.128	.226	.128
Hosmer-Lemeshow (p-value)	.711	.404	.654	.251
Log likelihood	9,664.563	5,976.579	9,656.229	5,975.293
N	8,170	5,165	8,170	5,165

Note: *** p<0.001; ** p<0.01; * p<0.05
Source: own study based on *Social Diagnosis 2015*.

4 Conclusions

Saving behaviours of men and women differ. Gender has a significant impact on owned savings, including savings for retirement. Households headed by men are wealthier. Nonetheless, it needs to be stressed that men and women have different attitude towards risk and differ in their knowledge and awareness of financial matters.

Chances for owning savings increase with age and level of education. People who are young and not well-educated are the less likely to save. This fact justifies the need to undertake actions with respect to financial and retirement education of society, particularly women. As pointed out previously, on the one hand they are less active on the financial market and save less for retirement (OECD, 2013), but on the other hand they have greater longevity and spend more years than men in retirement (Brown and

Finkelstein, 2009). Consequently, women are not prepared financially for retirement as well as men. Moreover, women usually have lower income and this, as research shows, constitutes another key factor which determines their willingness to save, also for retirement.

Chances for savings of households headed by women as compared with men also decrease when they are conducted in rural areas and when women do not condition well-being with material status. Apparently women who associate wealth with happiness have greater chances for saving.

Concluding, one needs to state that the gender of a household head is a significant factor affecting saving. Moreover, it occurs to be correlated with other socio-demographic variables. As women are becoming more interested in financial matters and are more active on the labour market, we should aim at levelling financial knowledge, lowering risk aversion among women and increasing their financial awareness. The need to save for retirement is increasingly recognized with greater knowledge and retirement awareness among both men and women.

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Comparison of relative efficiency of Czech and Slovak cultural heritage institutions

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Abstract: *This paper deals with a comparative analysis of the relative efficiency of museums founded by the central authorities in the Czech and Slovak Republics. Through the DEA method, we evaluate data for all 22 Czech and 42 Slovak institutions for 2015. For these purposes, we chose a group of indicators that are available in both countries and where museums have a duty to report. For inputs, there are the founder's contributions and the number of employees. For outputs, there are the number of visitors, the number of exhibitions and expositions. The results revealed the differences between the Czech and Slovak institutions, which relied especially on the use of inputs and potential to achieve returns of scale.*

Keywords: Museums, public sector, efficiency

JEL codes: H73, H76, H79

1 Introduction

With regards to the fact that the contribution focuses on the economy of cultural heritage – which is a very specific value – the authors decided to define the idea of effectivity in a broader sense using the public value concept. The public value concept as a boundary for strategic control in the public sector was introduced to the scientific literature by (Moore and Khargam, 2004). It is their understanding that it is a strategic triangle which contains value (in sense of being aimed at creating something substantively valuable), legitimacy, and support (attract sufficient ongoing support—and concomitant resources—from the authorizing environment), and is operationally and administratively feasible (doable with the available organizational and external capabilities needed to be produced) (Alford and O´Flynn, 2009). This concept is connected with a profound discussion between normative understanding which says what the managers should do and empiricism which describes what, in fact, managers in the public sector do (Alford and O´Flynn, 2009). According to (Alford and O´Flynn, 2009), public value focuses on a wider range of value than public goods and outputs; and what has meaning for people, rather than what a public-sector decision-maker might presume is best for them. Commentators on this topic offer lists of values: equity, efficiency, fairness, justice, prudence, transparency, social cohesion, user orientation, political accountability, regime stability (Thomson and Rizova, 2015). According to (Thomson and Rizova 2015), many practitioners and some scholars appear to believe that government enterprises create public value in the same way business does – by increasing productivity, efficiency, and effectiveness. This view is nowadays associated with the New Public Management (NPM) (Thomson and Rizova, 2015). (Mazouz et al., 2016) confirm that effectiveness is a significant part of public value. An important function of public value concept is also the fact that it creates a boundary for measurement of effectiveness. Authors (Thomson and Rizova, 2015) claim that the public service value methodology measures how well an organization, or series of organizations, achieve outcomes and cost-effectiveness year after year. The methodology gives public managers a way to evaluate performance of an organization in relationship to the organization's average performance over a series of years.

Efficiency in the area of cultural heritage

As with other public sections within the public sector, the cultural heritage sector does exhibit resistance to performance measurement. The most frequent argument is the specificity of the sector (Herrero-Prieto, 2013), the lack of relevant data, and the difficulty of quantifying the social impact. On the other hand, there is a strong argument regarding scarce resources (Herrero-Prieto, 2013). Barrio and Herrero (2014), in their literature search, confirm the lack of empirical evidence regarding the evaluation of efficiency of cultural heritage institutions and claim that the first studies focused on the efficiency of cultural institutions normally arise within a few years of studies in other fields. Herrero-Prieto (2013) argues that museums are the most frequently analyzed subjects in the area of culture and this is precisely due to their characteristics.

Based on the research about the current state of research in this area provided by (Herrero-Prieto, 2013) and (Barrio and Herrero, 2014), the technical approach to assessing the efficiency of cultural heritage institutions is evolving. For the first phase, benchmarking models were composed of quantitative and qualitative indicators often linked to the Balanced Scorecard. These approaches were followed by an efficiency score using a specific production function, which merges a range of inputs in order to obtain goods and services (Herrero-Prieto, 2013). „Based on this approach, the goal is to estimate an optimal frontier in this transformation process, and to gauge the level of efficiency of the various study units as a distance from said optimal efficiency frontier. The problem lies in determining where this frontier lies, a hurdle which may be overcome by applying parametric or non-parametric models." (Herrero – Prieto, 2013, pp.5). Of these models, the non-parametric DEA (data envelopment analysis) is currently the most frequently used. It was first applied to cultural heritage in the Jackson study (1988) on North American museums. Applications were followed on institutions such as in Great Britain, Italy, Belgium, France. Herrero-Prieto (2013) states that most of the studies were focused on Western Europe because of its utility for public policy in terms of the efficient allocation of resources in the area of culture.

Most current applications are struggling with the absence of relevant data, so data are mostly obtained through questionnaire surveys among museums, and studies are limited to specific geographic areas. From the technical point of view, input-oriented DEA models are mainly used. It is much more appropriate to use an input-oriented model, as in (Barrio et al., 2009) and (Herrero - Prieto, 2013), and interpret the results as indicators of efficiency, i.e. given an output, the scores show how far a museum is from the most similar unit using the least resources to reach that output. Another important factor is the identification of suitable indicators on the input and output side, (Mairesse and Vanden Eeckaut 2002) e.g. a set of inputs employment, various budget items and infrastructure. In a study (Tahery and Ansari, 2012, pp. 435) inputs include all the resources required by the organization for its activities, such as, for example, the number of square meters of exhibition area, the number of custodians and number of other workers. Outputs may take into consideration the services provided by the museums at all levels. Some measures of services provided by museums include the total number of visitors, the number of schoolchildren visiting the museum, the number of special temporary exhibitions organized by the museum, the number of congresses organized, and the number of research projects undertaken. Barrio and Herrero (2013) use three inputs (employment, size, and museum facilities), and four outputs (visitors, temporary exhibitions, the museum's social impact, and the impact of the art collection). Other studies synthesize inputs describing the size of the institution by the number of employees, infrastructure, and the number of m2 compared with the population (Herrero - Prieto, 2013). Determining the appropriate inputs and outputs has a major impact on the results achieved.

The latest trend in this area is the attempt to describe the issue of technical change and the evolution of efficiency ratios over time (Barrio and Herrero, 2013) as well as the use of a so-called two stage DEA, i.e. DEA analysis combined with regression analysis. With

the help of this, we endeavor to describe other factors that have an impact on the efficiency achieved. As for external control variables, they utilize: an institutional approach to management, distinguish between museums governed by regional authorities and other founders, and another variable which distinguishes among museums located in the capitals of provinces and among museums located in rural areas. In their conclusion, the greater relative efficiency is achieved by museums located in urban areas and those managed by regional governments.

In the Czech Republic, analyzes focusing on the efficiency of cultural heritage are still outside the focus of the mainstream of research, which focuses on DEA's application in the banking sector, healthcare, and higher education. In the field of museums, we have identified only two studies in our research. The first study (Půček et al., 2015) deals with benchmarking in the field of culture, specifically in museums, where the authors describe current practices in benchmarking in this sector. This benchmarking was designed for museums established by municipalities or regions. The data collection covers 21 performance indicators, which are divided into three groups: conditions and prerequisites for museum activity; performance; and public services, financing, spending, and efficiency. The results are primarily for the museums themselves and have yet to be published. Another study (Plaček at al., 2016) deals with the application of the DEA method for evaluating the effectiveness of museums set up by central government bodies. In their analysis, the authors used data from 2011-2013. They used inputs such as the number of branches, the area in m2 for permanent exhibitions, and the budget of the organization. The input indicators therefore describe the resources that are available to the surveyed institutions. The output variables are as follows: the number of organized exhibitions, the number of cultural and educational events for the public, the number of visitors, economic autonomy (own revenues / expenses). According to the author's conclusions, the system delivers very good results on the whole, with the average dual function for the sector being 0.7681, while 61% of the institutions can be classified, according to the dual function value, as ideal museums. However, this study also encountered some problems such as the difficulty in obtaining data and the problem of finding an optimal set of indicators.

This article builds on the above-mentioned study (Plaček et al., 2016) and introduces a more precise methodology and a new element of foreign comparisons. The purpose of this article is to apply the DEA method to evaluate the relative efficiency of museums established by the central authorities of the Czech and Slovak Republics in 2015 and compare the respective results.

2 Methodology and Data

The main method used is data envelopment analysis (DEA*). "This method is suitable for evaluating the efficiency, performance, or productivity of homogeneous production units - i.e., units that produce identical or equivalent effects, which we will label as the outputs of this unit. Outputs are by their nature maximizing, meaning the higher their values, the higher the performance of the monitored unit. To produce effects, the production unit consumes inputs that are, by their very nature, minimizing, and whose value leads to higher performance of the monitored unit"* (Borůvková and Kuncová, 2012, pp. 75). *"The DEA method estimates the so-called production units whose input / output combination lies on the efficiency boundary. These are efficient units as one could not actually conceive of a unit that achieves the same outputs with lower inputs or higher outputs with lower inputs"* (Borůvková and Kuncová, 2012, pp. 75).

Although the units surveyed belong among the homogeneous types especially when dealing with the region of large museums which have a wide range of functions, one can find internal heterogeneity among them, in which lies the possibility of achieving returns of scale. For this reason, we will use two model variants.

The first model calculates constant yields from a range: the Charnes Cooper and Rhodes Model called CCR. This model was first introduced in 1978 and assumes constant returns of scale. Regarding the CCR input-oriented model, we assume a constant yield from the range. Using this model, it is possible to determine the number of inputs needed to make the inefficient unit efficient. The technical efficiency coefficient is defined as the ratio of weighted sum of outputs and weighted sums of inputs. The scales must be set so that the technical efficiency factor is from 1: 0. The unit with a technical efficiency coefficient equal to 1 is effective, a coefficient less than 1 points to an inefficient unit, and determines the amount of input reduction needed to ensure unit efficiency. For simple cases, the CCR can be represented graphically. The CCR model determines the input and output weights for each unit so that the unit maximizes its technical efficiency coefficient and meets the conditions: the balance must not be negative. When using this set of weights, no technical efficiency coefficient can be greater than one.

The second model calculates variable yields from a range. The Banker, Charnes, and Cooper Model called BCC. This model was first introduced in 1984 to introduce variable returns to scale (the CCR model only assumed constant returns of scale). The only difference with the CCR model is the convexity constraint e*Lambdas = 1 corresponding to the weight in the multiplier form.

In our model, we use the following set of variables. We take the input to be the number of employees as well as the contributions of the founder, which we express as the difference between the total costs and the museum's own revenues. Outputs include the number of visitors to the museum, the number of exhibitions, and the number of expositions.

One of the important factors for the selection of input and output indicators was, besides the ability to describe the complexity of the museum's work, the availability of data for international comparisons. For our analysis, data for 2015 was used. For the Czech Republic, data was provided by NIPOS (National Information and Counseling Center for Culture), which is a contributory organization of the Ministry of Culture, which deals with the collection of statistical information on culture. Unfortunately, the organization refused to provide information on the financial performance of individual institutions, so we had to obtain this information using datamining techniques from the official portal of the Ministry of Finance http://monitor.statnipokladna.cz. For the Czech Republic, total of 22 institutions were included.

The data for Slovakia was obtained from the National Education Center, which is a contributory organization of the Slovak Ministry of Culture and also has competence in the field of culture. For Slovakia, a total of 42 institutions was included.

The model is calculated for each country separately, and we consider the number of efficient units in each country to be the criterion of efficiency.

3 Results and Discussion

In this section, we present the results of the DEA analysis of the Czech and Slovak museums which were established by the state. The first table presents the results of the CCR model, a model that works with constant yields from a range.

Table 1 Results of the DEA CCR application with constant yields from the range

	Czech Republic	**Slovak Republic**
Number of institutions	22	42
Avg. efficiency	0.589229	0.532429
Median	0.553553	0.489449
Standard deviation	0.292201	0.323082
Number of efficient units	5	8

Proportion of efficient institutions	22.72%	19.04%

Source: authors

It is clear from the results that if we consider constant yields on the scale, there is no significant differences between the two countries. The average and median efficiency is, however, higher in the Czech Republic than in Slovakia. The Czech Republic also has a relatively higher proportion of fully efficient units, i.e. units that have achieved an efficiency value of 1. Institutions in both countries only manage to achieve average efficiency values. Thus, we can say that there is room for improving the use of inputs, i.e. in the area of human resources, but also other costs such as building maintenance.

A very important view of the problem is provided by the second model, which works with the opportunity to achieve returns of scale. The following table shows the results of the second model.

Table 2 Results of DEA BCC application with constant yields from the range

	Czech Republic	**Slovak Republic**
Number of institutions	22	42
Avg. efficiency	0.789065	0.653059
Median	0.983209	0.796781
Standard deviation	0.295638	0.346185
Number of efficient units	11	15
Proportion of efficient institutions	50%	35.71%

Source: authors

If we take into account the ability to achieve variable yields from a range, institutions of both countries achieve better results, with those of the Czech Republic being significantly higher. This interpretation is entirely logical. In the Czech Republic, there is a significantly lower number of museums than in Slovakia. The Czech institutions are larger, so they have a higher potential for achieving returns of scale, which also affects their resulting relative efficiency. The institutions of the Czech Republic achieve very good results.

It is clear from the results that large museums are highly dependent on choosing a model that expresses the potential to reach returns of scale. The results of the models are partly confirmed by the results of the study (Plaček, et al., 2016), which states that most state museums achieve high relative efficiency values. On the other hand, there is still room for improvement. An ideal approach could be linked to mandatory benchmarking or centralizing and outsourcing some of the activities suggested by (Shoup et al., 2014), which demonstrate the effects of outsourcing souvenir sales and tickets based on the example of Turkish museums.

4 Conclusions

The article deals with the comparison of efficiency of Czech and Slovak museums established by the state. The DEA method is used for the analysis with models with constant returns of scale and variable yields from the range. The constant yield scale model showed very small differences between the two countries. In contrast, the variable yield model describes a markedly higher performance by the Czech institutions, which is explained by a significantly lower number of Czech museums than the Slovak ones, which increases their potential to achieve returns of scale.

Despite relatively **s**atisfactory relative effectiveness, there is room for both institutions to improve the efficiency of inputs which can be achieved by outsourcing selected activities and implementing benchmarking.

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Bankruptcy Prediction Models in Relation to SME Segment in the Czech Republic

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Abstract: *Financial analysis is an essential tool for those interested in assessing the economic situation of enterprises and subsequent decision making to predict the bankruptcy. Relating credit risk of a bank is a permanent subject of many scientific researches. We focus on small and medium sized enterprises (SMEs) because they are significantly different from large corporates from credit risk point of view. Our motivation is to show the importance of modeling credit risk for SMEs separately moreover we delimit medium sized, small sized and micro sized enterprises. The aim of this article is the comparison of the real predicting abilities of several bankruptcy models to each segment. There exist several popular bankruptcy models, that are often applied, namely the Altman Z-score, the Ohlson O-score, the Zmijewski's model, the Taffler's model, and the IN05 model. The basic form of the models is used as proposed by their authors. The results are compared using the contingency table and ROC curve.*

Keywords: Credit risk, bankruptcy prediction, SME, bankruptcy model, insolvency, probability of default

JEL codes: C52, C53, G31, G33

1 Introduction

The importance of credit risk management cannot be overemphasized, and it is well recognized by the banking industry. The introduction of the Third Basel Capital Accord (Basel III), financial crisis triggered in 2008 and other changes in the global financial market have accelerated the need to validate and improve current credit risk management systems. Financial institution are facing the problem of bad debts (outstanding loans), so they must therefore make effort to improve their credit risk management system and find new, more effective ways to face credit risk.

The issue of modeling and quantification of credit risk is the subject of interest of many studies, scientific articles and publications. Academics and practitioners have focused their research to improve the performance of existing bankruptcy models by the reason of the former financial crisis when bankruptcy risk models and rating systems failed to adequately estimate the risk in the corporate sector (Diakomihalis 2012).

The aim of this contribution is the comparison of the real predicting abilities of several bankruptcy models in relation to small and medium sized enterprises in the Czech Republic. We compare results within each sub-segment of SMEs, medium sized, small sized and micro sized enterprises. We have chosen the bankruptcy models which are used very often in many scientific papers. We compare models of the Altman Z-score, the Ohlson O-score, the Zmijewski's model, the Taffler's model, and the IN05 model.

We focus on SMEs because they are reasonably considered as the backbone of the economy many countries. Over the past decade, we have witnessed intensity in the studies of their financial health, particularly after the introduction of Basel III. Recent studies show that, SMEs demonstrate capacity to drive economic development at domestic and international levels (Gupta et al., 2014). Thanks to their simple structure, they can respond quickly to changing economic conditions and meet local customers´

needs, growing sometimes into large and powerful corporations or failing within a short time of the firm´s inception. For OECD members, the percentage of SMEs out of the total number of firms is higher than 97%. SMEs employ approximately two third of employees and create more than half of added value in EU-28 (Eurostat, 2017). From a credit risk point of view, SMEs are different form large corporates for many reasons. For example, Dietch and Petey (2004) analyse a set of German and French SMEs and conclude that they are riskier but have a lower asset correlation with each other than large businesses (Altman and Sabato, 2007). Another motivation is to show the significant importance of modeling credit risk for SMEs separately from large corporates.

2 Literature review

There is extensive empirical literature on default prediction methodologies. Many authors during the last fifty years have examined several possibilities to predict default or business failure. The seminal works in this field were Beaver (1967) and Altman (1968). The researcher William Beaver was the first to apply a number of ratios, which could discriminate between failed and non-failed companies up to five years prior to bankruptcy. Altman improved Beaver´s method, applying a discriminant analysis using financial ratios concerning to liquidity, profitability, financial leverage, activity and solvency. Being the first person to successfully develop multiple discriminate analysis (MDA) prediction model with a degree of 95.0% rate of accuracy, he is considered the pioneer of insolvency predictors. Altman´s model has been applied successfully in many studies worldwide concerning the subjects of capital structure and strategic management, investment decisions, asset and credit risk estimation and financial failure of publicly traded companies (Lifschutz and Jacobi, 2010).

Other model based on the MDA principle and very often cited in research literature is Taffler model developed in Great Britain in 1977 (Taffler, Tishaw, 1977).

Another MDA model has been developed by Inka and Ivan Neumaier in 1995 known as IN95. This model was constructed especially for the Czech market and was updated in next years. We use the last version - IN05 model which was developed in 2005 (Inka and Ivan Neumaier, 2005).

For many years thereafter, MDA was the prevalent statistical technique applied to the default prediction models. However, in most of these studies authors pointed out that two basic assumptions of MDA are often violated when applied to the default prediction models. Considering these MDAs´ problems, Ohlson (1980), for the first time, applied the conditional logit model to the default prediction´s study. The practical benefits of logit methodology are that they do not require the restrictive assumptions of MDA and allow working with disproportional samples. Next, very often cited model, which uses conditional probability, is model by Mark E. Zmijewski (1984). He was the pioneer in applying probit analysis to predict default. A probit approach is the same as in logit approach different is only distribution of random variables.

We witness a substantial increase in the number and complexity of default prediction studies due to the rapid advancement in technology and methodology. Above all, we can mention artificial neuron networks used by Angelini et al. (2007), decision trees method used by Gulnur and Fikret (2011) and hazard models used by Shumway (2001). Recent empirical literature also shows momentum in understanding the credit risk behavior of small firms. Altman and Sabato (2007) studied a panel of over 2000 SMEs and developed a distress prediction model using logistic regression technique. However they acknowledge the need to employ qualitative information to improve the predictive performance of their model. Empirical literature also highlights the significance of qualitative information such as business type, industrial sector, location, age, etc. in understanding of firms´ credit risk behavior. (Grunert et al., 2005) Altman et al. (2010) took account this issue and studied about 5.8 million SMEs and reported that the

prediction performance of Altman and Sabato (2007) model improved by about 13% when qualitative information is added.

3 Methodology and Data

We have chosen the bankruptcy models, which are used very often in many scientific papers. We compare models of the Altman´s Z-score, the Ohlson´s O-score, the Zmijewski's model, the Taffler's model, and the IN05 model. Many different versions of these models exist; we use the following form of the models.

Altman´s Z-score:

$$Z_{1983} = (0{,}717\,x\,X_1) + (0{,}847\,x\,X_2) + (3{,}107\,x\,X_3) + (0{,}42\,x\,X_4) + (0{,}998\,x\,X_5) \quad (1)$$

$$x_1 = \frac{working\ capital}{total\ assets}$$

$$x_2 = \frac{retained\ earnings}{total\ assets}$$

$$x_3 = \frac{EBIT}{total\ assets}$$

$$x_4 = \frac{equity}{liabilities}$$

$$x_5 = \frac{sales}{total\ assets}$$

Distress zone ... Z<1.23

Taffler´s model:

$$Taffler = (0{,}53\,x\,X_1) + (0{,}13\,x\,X_2) + (0{,}18\,x\,X_3) + (0{,}16\,x\,X_4) \quad (2)$$

$$x_1 = \frac{EBT}{short - term\ payables}$$

$$x_2 = \frac{current\ assets}{liabilities}$$

$$x_3 = \frac{short - term\ payables}{total\ assets}$$

$$x_4 = \frac{sales}{total\ assets}$$

Distress zone ... Taffler<0.2

Model of Inka and Ivan Neumaier:

$$IN05 = (0{,}13\,x\,X_1) + (0{,}04\,x\,X_2) + (3{,}97\,x\,X_3) + (0{,}21\,x\,X_4) + (0{,}09\,x\,X_5) \quad (3)$$

$$x_1 = \frac{total\ assets}{liabilities}$$

$$x_2 = \frac{EBIT}{interest\ cost}$$

$$x_3 = \frac{EBIT}{total\ assets}$$

$$x_4 = \frac{total\ revenues}{total\ assets}$$

$$x_5 = \frac{current\ assets}{short-term\ liabilities + short-term\ bank\ loans}$$

Distress zone ... IN05<0.9

Ohlson´s O-score:

O-score = -1,32 - (0,407 x X_1) + (6,03 x X_2) - (1,43 x X_3) + (0,0757 x X_4) - (1,72 x X_5) + (2,37 x X_6) - (1,83 x X_7) + (0,285 x X_8) - (0,521 x X_9) (4)

$$x_1 = \log\left(\frac{total\ assets}{GNP\ index\ of\ price\ level}\right)$$

$$x_2 = \frac{liabilities}{total\ assets}$$

$$x_3 = \frac{working\ capital}{total\ assets}$$

$$x_4 = \frac{short-term\ liabilities}{current\ assets}$$

$$x_5 = 1\ in\ case, that\ total\ liabilities\ are\ higher\ than\ assets, otherwise\ 0$$

$$x_6 = \frac{net\ income}{total\ assets}$$

$$x_7 = \frac{operating\ cash\ flow}{total\ liabilities}$$

$$x_8 = 1\ if\ net\ income\ was\ negative\ last\ two\ years, otherwise\ 0$$

$$x_9 = \frac{netincome_t - netincome_{t-1}}{|(netincome_t)| + |(netincome_{t-1})|}$$

Distress zone ... O-score>0.5

Zmijewski´s model:

$$Zmijewski = -4{,}336 - (4{,}513\,x\,X_1) + (5{,}679\,x\,X_2) + (0{,}004\,x\,X_3) \quad (5)$$

$$x_1 = \frac{net\ income}{total\ assets}$$

$$x_2 = \frac{liabilities}{total\ assets}$$

$$x_3 = \frac{current\ assets}{short-term\ liabilities}$$

Distress zone ... Zmijewski>0.5

We used data for the Czech SME companies from Bisnode database for the years from 2008 to 2014. The models are used for predicting bankruptcy within two years.

For the quality assessment of the models, we applied one of the most commonly used methods for evaluating models based on binary output, namely the ROC curve and the classification table. In tested models we used the original estimated coefficients by their authors. We did not use our data for estimating coefficients in the models; therefore we are able to use the whole dataset as a validation sample for the verification of these models.

Quality evaluation of bankruptcy models is also dependent on the determination of the so-called 'cut-off' points. This is the value above (or below) which the firm will be regarded as bankrupt. The optimal cut-off point is the value that minimizes errors of type I and II. However, although everything depends on the purpose for which the model will be used. Therefore, for example, we may choose higher cut-off limit if the request is to better characterize the companies that are going to bankrupt at the expense that there will be higher number of healthy ones wrongly ranked.

ROC (Receiver Operating Characteristic) curve is a graphical method, which is based on a square showing the relationship between true positive rate (TPR – also called sensitivity) and false positive rate (FPR – also called fall-out). TPR measures the proportion of positives that are correctly identified as such. FPR is also known as probability of false alarm, and it is calculated as the ratio between the numbers of negatives that are wrongly identified as positives. TPR is applied to the y-axis and FPR on the x-axis. ROC curve combines the values of TPR and FPR.

There are two possible extreme cases. The first case occurs when the predicted values are absolutely similar as real values. In this case the curve copies the border of the graph beginning in down left corner through upper left corner and ends in upper right corner. The second case is the exact opposite and describes the model with no predictive power. The curve in this case is a diagonal from down left corner to upper right corner of the graph. Thus, the closer the curve is to the upper left corner, the better predictive power of the model.

ROC curve is closely related to AUC (Area Under Curve) indicator that numerically represents the graph and helps with comparison of two or more models. This indicator quantifies the area under the curve and is useful for comparing two or more curves, because they are transformed into one measure and easily comparable. AUC ranges from 0.5 to 1, where a higher value indicates a better prediction model.

Other method is to use classification table. Classification table is very simple and intuitive method of assessing binary prediction models. As the name suggests, its principle is to assess the correct and incorrect classification of the individual observations and consequently the whole model. Prediction model is assessed by the proportion of correctly classified observations to the total number of observations. As it was discussed above the total percentage is dependent on the determination of the cut-off value. From the classification table we are also able to identify type I and II errors for a given cut-off boundaries.

4 Results

The first step was to calculate some important descriptive statistics that characterize our data in each sector. The following tables 1, 2, and 3 contain this information for medium, small, and micro enterprises respectively. There are significantly less observations for Ohlson model. This model requires longer time periods, which decreases number of usable observations.

From our whole dataset roughly 10 % consists of medium-sized enterprises, 27 % are small enterprises, and the last 63 % remains for micro enterprises. Bankruptcy rate in

each segment steadily decreases as we moved to smaller companies. The most important part of these tables is the last columns which comprise AUC values. AUC stands for "area under curve". It represents area under ROC (receiver operating characteristic) and higher AUC means better performing model.

Table 1 Basic characteristics and AUC for medium enterprises

	Observations	Non-Bankrupt	Bankrupt	Bankrupt (%)	AUC
Altman	10 364	10 232	132	1.27	0.61
Taffler	10 364	10 232	132	1.27	0.57
IN05	10 364	10 232	132	1.27	0.61
Zmijewski	10 364	10 232	132	1.27	0.66
Ohlson	3 423	3 382	41	1.20	0.66

Source: author's calculations

Table 2 Basic characteristics and AUC for small enterprises

	Observations	Non-Bankrupt	Bankrupt	Bankrupt (%)	AUC
Altman	30 573	30 311	262	0.86	0.65
Taffler	30 573	30 311	262	0.86	0.60
IN05	30 573	30 311	262	0.86	0.64
Zmijewski	30 573	30 311	262	0.86	0.69
Ohlson	8 624	8 587	37	0.43	0.63

Source: author's calculations

Table 3 Basic characteristics and AUC for micro enterprises

	Observations	Non-Bankrupt	Bankrupt	Bankrupt (%)	AUC
Altman	72 780	72 445	335	0.46	0.58
Taffler	72 780	72 445	335	0.46	0.55
IN05	72 780	72 445	335	0.46	0.61
Zmijewski	72 780	72 445	335	0.46	0.62
Ohlson	18 868	18 837	31	0.16	0.66

Source: author's calculations

As we can see from previous tables, the best models according to AUC are usually Ohlson and Zmijewski. These models use probit and logit methodologies and according to our analysis, they are the preferable choice for medium and micro enterprises. In case of small enterprises other models based on discriminant analysis beat Ohlson models, but they are still not as good as Zmijewski's model.

Each model has different cut-off boundaries which determine if the company is considered as bankrupt or healthy. The classification table is usually used for comparison in this situation. Following tables 4, 5, and 6 contain standard statistics used in classification table.

Table 4 Classification table for medium enterprises

	Correct	Incorrect	Type I error	Type II error	Non-Bankrupt correct	Bankrupt correct	TPR	FPR
Altman	84.26	15.74	97.77	1.10	85.01	26.52	0.85	0.73
Taffler	90.04	9.96	98.49	1.25	91.07	10.61	0.91	0.89
IN05	41.08	58.92	98.38	0.76	40.64	75.76	0.41	0.24
Zmijewski	25.07	74.93	99.06	2.28	24.68	55.30	0.25	0.45
Ohlson	6.08	93.92	98.86	2.29	5.06	90.24	0.05	0.10

Source: author's calculations

Table 5 Classification table for small enterprises

	Correct	Incorrect	Type I error	Type II error	Non-Bankrupt correct	Bankrupt correct	TPR	FPR
Altman	83.11	16.89	98.59	0.75	83.59	27.10	0.84	0.73
Taffler	90.88	9.12	99.11	0.85	91.59	8.78	0.92	0.91
IN05	34.59	65.41	98.91	0.40	34.16	83.97	0.34	0.16
Zmijewski	32.54	67.46	99.50	1.60	32.49	38.93	0.32	0.61
Ohlson	9.80	90.20	99.60	0.73	9.48	83.78	0.09	0.16

Source: author's calculations

Table 6 Classification table for micro enterprises

	Correct	Incorrect	Type I error	Type II error	Non-Bankrupt correct	Bankrupt correct	TPR	FPR
Altman	67.96	32.04	99.43	0.41	68.09	39.40	0.68	0.61
Taffler	86.04	13.96	99.52	0.46	86.37	14.33	0.86	0.86
IN05	27.11	72.89	99.45	0.21	26.83	87.76	0.27	0.12
Zmijewski	46.33	53.67	99.73	0.68	46.40	31.64	0.46	0.68
Ohlson	28.54	71.46	99.83	0.15	28.47	74.19	0.28	0.26

Source: author's calculations

We can observe similar trend in all segments. Cut-off boundaries in Altman and Taffler models seem to be very low, especially for medium and small enterprises. These models have high accuracy in predicting healthy companies, but their success rate is very low in case of identifying bankrupt companies. The exactly opposite situation occurs for Ohlson model. The rest of the models lie in between these two cases.

These results in classification tables do not tell us which model is better, as AUC did. But they evaluate sensitivity of their cut-off boundaries. Setting the right cut-off boundary depends on our goals and needs. In general, it is more preferred to mark a healthy company as bankrupt than vice versa.

5 Discussion and Conclusions

This study analyzed the most popular bankruptcy models and their performance for Czech SMEs. The whole dataset were divided into three segments, namely medium, small, and micro sized enterprises. The analyses were done separately for each segment to capture different characteristics of companies with various sizes.

The aim was to evaluate the original forms of the models and recommend preferable approach for Czech SMEs. Our results suggest using probit and logit methodologies

rather than discriminant analysis. Beacuse according to AUC measure, the best performing models were Ohlson or Zmijewski model.

From the second part of our analysis, we got the idea about the cut-off boundaries in each model. The results in classification tables show that results are similar for each segment. Models like Taffler and Altman used too low boundary, Ohlson did the opposite, and the rest is somewhere in between these two extremes.

In this study we did not found any significant differences between individual segments of Czech SMEs. For anyone interested in this topic, we recommend to use Ohlson or Zmijewski model and set cut-off boundaries according to the aim of the study. For even better results we suggest to re-estimate coefficients for analyzed companies. This process should provide the best possible results.

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Evaluation of Bancassurance Functioning in Selected Countries of the Financial Group KBC Group

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Abstract**:** *This paper will evaluate the level of internal integration among bancassurance products and financial institutions belonging to the financial group KBC Group in selected countries of Europe. There shall be selected four countries which are located in Central and Eastern Europe: the Czech Republic, Slovak Republic, Hungary and Bulgaria. The research was conducted as of December, 2016. This paper aims at determining whether similarities in how the financial group KBC Group is organized correspond to similarities in how bancassurance in the selected countries functions. To make this possible, a critical analysis of bancassurance-related literature shall be conducted and a hypothetical basis for the practical evaluation shall be formulated. Characteristics for evaluation of the level of integration inside the financial group and also a bancassurance product will also be set. To evaluate how bancassurance functions in practice, a qualitative research based on data available on web sites and also financial and annual reports shall be used. The qualitative research is to contain a detailed analysis, sorting and a comparison of the set characteristics. Finally, it shall be determined which attributes are identical and which are different in the integration of financial groups and bancassurance products.*

Keywords: financial group, insurance group, bancassurance, assurfinance

JEL codes: G21, G22

1 Introduction

„Bancassurance, bank insurance, bancassurance product, assurfinance" have all become very common in the world of financial practice. Complex packages of services are frequently offered in the financial market and bancassurance products are no exceptions. It would be incorrect to reduce the definition of bancassurance to a mere combination of a banking and insurance product. Bancassurance is primarily about internal integration of a banking and insurance product. This means that an insurance product becomes a part of a banking product. The bancassurance product is specific for its extent; it is aimed at satisfying the bank's client primarily, for instance a client who is applying for a mortgage loan with his bank.

The most prevalent reasons for creation of bancassurance structures are yield growth, diversification of income streams and costs saving, which is linked not only to a higher efficiency of branches and employees, but also to the opportunity to use distributional canals of a partner institution. Some bancassurance structures have also begun to consistently use co-marketing which means that both companies present themselves as one subject using one trade name. (ČNB, 2004)

The theory of bancassurance is dealt with by many authors. When studying these theories, it is necessary to distinguish between those approaching bancassurance from the product perspective and those doing so from the operation (product sales) perspective. Both approaches have something in common, however, and that is the internal integration from the perspective of the bank and insurance product and from the perspective of the bank and insurance operations. From the product perspective, bancassurance is often debated about with the term neither being unequivocally defined nor really accepted. Bancassurance from the operation perspective is related to how banks and insurance companies cooperate and how this cooperation develops; it is also

related to the creation of variously integrated financial institutions. Authors offer different theoretical perspectives as well as different ways of sorting these kinds of integration.

For these reasons, it seems to be essential, before it is possible to proceed to conduct the research, to introduce a relevant theory of bancassurance and consequently set the theoretical base for the qualitative research evaluation of the financial practice. The crucial part of the qualitative research will be comparing theory and practice. The analysis of bancassurance functioning in practice requires that information and data is collected from the financial institutions which is extremely demanding and difficult. Neither banks nor insurance companies publish information about bancassurance, as a distribution channel, in an extent that might be anticipated supposing how much theory knows about this issue.

In this paper, it shall be determined whether similarities in how the financial group KBC Group is organized also mean similarities in how bancassurance in the selected countries functions. This paper wants to discover more about the level of integration of financial institutions (bank and insurance company) and also financial products (bank and insurance product). The research will be conducted evaluating the financial group KBC Group (hereinafter referred to as KBCG). The research is primarily focused on the region of Central and Eastern Europe (CEE). The research will evaluate countries located in the CEE region in which the financial group EG operates: the Czech Republic (CZ), Slovak Republic (SK), Hungary (HU) and Bulgaria (BG).

The bancassurance phenomenon that is unquestionably one of the most important trends in the evolution of the European financial services industry can be considered as a consequence of the progressive deregulation of the regulatory barriers to financial conglomerates (Clipici and Bolovan, 2012). Daňhel, Ducháčková and Radová (2008) consider creation of financial groups in the Czech Republic as a trend which shall not be a bank-insurance strategy in the pure form. Daňhel, Ducháčková and Radová (2007) point out that bancassurance is a significant factor stabilizing business risks of both sectors. On the other hand, they also mention that bancassurance is a very specific hinderer of further integration and further development of bancassurance products may be dependent on increasing number of wealthier clients who prefer more sophisticated "tailored" products.

Bancassurance is a relatively new type of services and operations which will probably further develop in the future. From the clients' vantage point, a big development in bancassurance may be a step backwards. The main disadvantages may be found in simplifying and unification of insurance products. Bancassurance is present in every developed economy and it opens up an immense space for a non-price competition among banks. (Čejková, Martinovičová and Nečas, 2011)

According to Ricci (2012) *"It is not possible to identify an ideal form of bancassurance, because the success of cooperation between banks and insurance companies depends upon many factors, both market-based and strategic or operational. Bancassurance can experience alternate fortunes across time and countries, but remains a central current phenomenon of the modern financial service industry."*

The common denominator of all available definitions of bancassurance is the structured sale of combined financial products to targeted groups of clients. A very high effectiveness can be found in internally interconnected bancassurance product which represents an additional utility value for the end user of such a product as it is tailored for him based on what this end user needs. (Daňhel, Ducháčková and Radová, 2007)

According to Řezáč (2009) bancassurance can be defined as *"effective creation and distribution of bank and insurance products for the common group of clients".* When selling bancassurance products, the more the insurance products is rooted into the pillar product of a financial institution, the more it will become its organic part and the better sales it will achieve. (Lím, 2012)

Illetško (2003) also warns that the term of bancassurance is often defined and understood incorrectly. According to him, bancassurance cannot be confused with what should be referred to as cross-selling. The sale channel of bancassurance can be understood as a channel of selling the financial product which is internally integrated with the financial product and it brings an addition utility value for the end client of the financial institution. The insurance product is sold as a collective policy. An insurance company and a financial institution conclude a collective policy agreement which directly specifies conditions of the policy including insurance conditions.

The conclusion (Stracia, 2012) about the actual areas of the bancassurance products is: "The actual areas concern the life insurance, the payment protection insurance and the home insurance whereas the new areas are represented by the car insurance, the travel insurance, the pet insurance and the health insurance."

Integration of financial institutions can be in the form of a total integration, a partial integration with a parent universal bank, an integration with a banking or insurance parent company or a holding structure. The total integration is the highest form of integration. It means an integration of various financial services within one company. All activities are then financed using one capital. This form of integration is more or less constructed by theory. A partial integration with a parent universal bank leads to an organization of financial conglomerates in which the universal bank covers commercial and also investment banking. Utilizing daughter companies, this conglomerates offer other financial services including insurance policies. Integration with a banking or insurance parent company is a type of organization in which the parent company owns, either completely or partially, its daughter companies and through these it provides clients with financial services (investment banking, insurance policies, other financial services). Finally, a holding structure is a type of organization in which an independent parent company owns all or most shares in independent daughter companies and each of them offers independent financial services. (Ducháčková and Daňhel, 2010)

2 Methodology and Data

This paper aims at determining whether similarities in how the financial group KBC Group is organized correspond to similarities in how bancassurance in the selected countries functions. To be able to do this, a qualitative research will be performed and an effort will be made to answer the following research questions: What kind of integration can we find in each examined country? What kind of internal integration have the banking and insurance products achieved in examined countries?

In order to be able to evaluate the integration of the financial group, the sorting method created by Ducháčková and Daňhel (2010) shall be used. This paper will focus on and evaluate bancassurance (not assurfinance) from the perspective of internal integration as defined by Illetško (2003). The internal integration (Illetško, 2003) is evaluated based on these characteristics: Is there a general contract for the bancassurance contract? Does arranging an insurance policy depend on arranging of the insurance product? Are there discounts on insurance products granted for clients of the bank? To answer these questions the following will be performed:

Firstly, basic characteristics of KBCG in the selected countries will be evaluated, an analysis will be performed, then sorting and comparison. Banks will be specified and this paper shall also look into their ownership structure, branches, number of clients, market share of bank products, market share of life insurance and market share of non-life insurance. Data available on KBCG's website and also in annual reports of KBCG as of 2015 will be used (annual report of KBC Group).

In the second part, an analysis and comparison according to property structure of insurance companies cooperating with KBCG will be performed. Also, there will be assessed what type the financial group's integration is and whether there exists a

strategic cooperation between an insurance company and a bank. Information was found on insurers' and banks' websites and annual reports as of 2015.

The third part of the research will analyze bancassurance products offered by KBCG. Their range and most importantly the level of their internal integration will be evaluated. Data available on each insurer's website will be used. There is no relevant data to be found in annual reports of these insurers. Finally, all ascertained results will be analyzed and the research questions will be answered.

3 Results and Discussion

Characteristic of KBC Bank belonging to the financial group KBCG

KBCG was formed in 1998 after the merger of two Belgian banks (Kredietbank and CERA Bank) and a Belgian insurance company (ABB Insurance). In 1999 the group embarks upon its policy of expansion in CEE with the acquisition of CSOB (in the Czech Republic and Slovakia). The group continues to expand its position in the banking and insurance markets of CEE by acquiring banks and insurance companies in Poland, Hungary, the Czech Republic and Slovakia, becoming one of the top three players in the region's financial sector (2000 - 2005). The bancassurance model is gradually introduced to the home markets in CEE. The KBC Bank and Insurance Holding Company merges with its parent company (Almanij) to create KBC Group NV (2005). KBCG sold the activity in Poland in 2013. KBCG is essentially structured around three business units, which focus on the local business and are expected to contribute to sustainable earnings and growth. The business units are Belgium, the Czech Republic and International Markets. KBC Group controls two underlying companies: KBC Bank and KBC Insurance. KBC GROUP NV and its daughter companies form an integrated bank and insurance group providing services mainly to clients of retail and private banking, as well as to medium-sized enterprises and to mid-cap companies.

KBCG is an integrated banking and insurance group that focuses particularly on clients in the following areas: individuals, private banking, SMEs and mid-sized corporations. Geographically the group operates in its home markets in Belgium, the Czech Republic, Slovakia, Bulgaria and Hungary, while also being active in Ireland and to a certain degree in other countries around the world (in support of corporate clients of primary markets). As of the end of 2015, the KBC group served approximately 10 million clients in its five home markets and Ireland and employed approximately 38,000 employees, roughly half of which in Central and Eastern Europe.

Table 1 Main characteristics of KBC bank in 2015

Coun-try	Name of bank	Share-holder	Bran-ches	Number of clients	Share of market Bank products	Share of market Life insur.	Share of market Non-life insur.
CZ	Československá obchodní banka, a.s. (CSOB CZ)	KBC Bank (100 %)	316	4 000 000	19 %	7 %	7 %
SK	Československá obchodní banka, a.s. (CSOB SK)	KBC Bank (100 %)	125	600 000	11 %	4 %	3 %
HU	K&H Bank, Zrt. (K&H HU)	KBC Bank (100 %)	209	1 600 000	10 %	4 %	5 %
BG	CITIBANK JSC (CITIBANK BG)	KBC Bank (100 %)	100	600 000	3 %	12 %	10 %

Source: summarized by authors based on website and annual report of financial institutions

Table 1 presents banks operating within the KBCG in selected countries. Table 1 shows information about shareholder, numbers of branches, numbers of clients, share of market

bank products, share of market life insurance and share of market non-life insurance. The table lets us conclude that KBC has a highest market share in banking products and also highest number of branches and clients in the Czech Republic. On the contrary, KBC has the lowest market share in banking products and also the least branches in Bulgaria. KBC operates as a bancassurance institution; its annual record allows us to find also life and non-life insurance shares of cooperating insurance companies. The highest share in the insurance market was achieved in Bulgaria, followed by the Czech Republic, Hungary and the Slovak Republic.

Integration of the financial group KBC Group

The Table 2 shows banks and cooperating insurance companies in individual countries from the viewpoint of ownership. In every country, there is only one cooperating insurance company which is a daughter company of KBCG (KBC Insurance is completely owned by KBCG). The financial group KBCG operates as an integrated bank and insurance company.

Table 2 Insurance companies cooperating with KBCG and their shareholders structure

Country	Bank	Insurance Company and Sharaholders	
CZ	CSOB CZ	ČSOB pojišťovna, a.s. (CSOBP CZ)	CSOB CZ (0,245 %) KBC Insurance NV (99,755 %) Since 2007
SK	CSOB SK	ČSOB poisťovňa, a.s. (CSOBP SK)	KBC Insurance NV (100 %) Since 2008
HU	K&H HU	**K&H Biztosító Zrt. (K&HB HU)**	KBC Insurance NV Since 2006
BG	CITIBANK BG	DZI insurance plc (DZI BG)	KBC Insurance NV Since 2007

Source: summarized by authors based on website and annual report of financial institutions

Integration of bancassurance products

Table 3 offers an overview of insurance products offered by banks within KBCG. These products are offered as bancassurance products and are intended for bank clients. The following table no. 4 presents the level of integration of bancassurance products.

Table 3 Bancassurance products offered by financial group KBCG

Coun-try	Life Insur.	Travel Insur.	Income Shortfall Insur. / Mortgage Indemnity Guarantee	Card Abuse Insur.	Real Estate Insur. / Household Insur.	Motor Vehicle Insur.	Third Party Liability Insur.	Legal Expenses Insur.
CZ	YES	YES	YES	YES	YES	YES	YES	YES
SK	YES	YES				YES	YES	
HU	YES	YES	YES		YES	YES		
BG	YES	YES	YES		YES			

Source: summarized by authors based on website of financial institutions

In Table 4, there are presented bancassurance products within KBCG and selected countries. Bancassurance products are evaluated based on their range (number), availability of insurance products for bank's clients, availability of general contracts as well as availability of discounts and other benefits for clients of the bank.

Table 4 Integration of bancassurance products offered by the financial group KBCG

Country	Number of insur. product	Insur. product for client of bank	General contract	Discounts and other advantages
CZ	8	YES		YES
SK	4	YES	YES	
HU	5	YES		YES
BG	4			

Source: summarized by authors based on website of financial institutions

Insurance products offered by banks within KBCG can be described as integrated bancassurance products. The countries Hungary (HU) and Bulgaria (BG) offer insurance products only with relation to bank products. The Czech Republic (CZ) and Slovakia (SK) offer not only exclusive integrated products but also other insurance products not related to bank products. In Slovakia (SK), all financial products are offered within the brand CSOB, though benefits for clients are not specified on the official website. In the Czech Republic (CZ), integration of a banking and insurance product is not completely clear. Some insurance products are linked to bank products but there is a range of products without apparent benefits.

4 Conclusions

This paper aimed at determining whether similarities in how the financial group KBC Group is organized also mean similarities in how bancassurance in the selected countries functions. Four countries which are located in the Central and Eastern European region were selected: Czech Republic, Slovak Republic, Hungary and Bulgaria.

To be able to do this, a qualitative research was performed and the following research questions were answered: What kind of integration can we find in each examined country? What kind of internal integration have the banking and insurance products achieved in examined countries?

The conducted qualitative research has discovered that all selected countries show similarity. In every country, there is only one cooperating insurance company which is a daughter company of KBCG (KBC Insurance is completely owned by KBCG). The financial group KBCG operates as an integrated bank and insurance company. Integrated bancassurance products are offered in all countries.

What kind of integration can we observe in individual countries? KBCG is an integrated bank and insurance group. KBC Group owns two daughter companies (100% share): KBC Bank and KBC Insurance. Banks in all countries are owned by the company KBC Bank (100% share). Insurance companies in all countries are owned by KBC Insurance (100% share). KBCG is a financial group with the following type of integration: "partial integration with a parent universal bank."

What kind of internal integration have the banking and insurance products achieved in examined countries? Based on the conducted research, we found that in the monitored countries, the bank product is connected with an insurance product. Clients are offered discounts on insurance or interest rates. These products are offered exclusively to banks' clients. The countries Hungary and Bulgaria offer insurance products only with relation to bank products. The Czech Republic and Slovakia offer not only exclusive integrated products but also other insurance products not related to bank products.

In case that the insurance company offers life insurance, various types of investment life insurance products are offered. Variations of travel insurance are also offered. Having compared numbers of products offered, we can state that the highest number of products can be found in the Czech Republic, followed by Hungary, Slovakia and Bulgaria. General contracts are offered in the Slovakia.

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The Specifics of Forced IFRS Adoption by Czech Private Companies: A pilot field study

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Abstract: *The adoption of International Financial Reporting Standards (IFRS) around the globe is one of the most challenging events in accounting area of the last decade. The accounting research focuses mainly on the outcomes of mandatory IFRS adoption by listed companies and partially on the determinants of voluntary IFRS adoption by other firms. However, some countries put restrictions on voluntary adoption by unlisted companies and require them to retain the reporting under local GAAP regime. This restriction challenges especially such subsidiaries, for which their parent company prepares IFRS consolidated financial statements. The subsidiaries shall then assure the preparation of two sets of accounting information – public financial statements in compliance with local GAAP for statutory purposes and internal financial statements in compliance with IFRS for consolidation purposes of the parent company. The relation between cost and benefit of such forced IFRS adoption is unclear, which may endanger the quality of information submitted by subsidiaries to parents. This paper investigates specifics of forced IFRS adoption in transition country, applying a qualitative pilot field study by three Czech companies.*

Keywords: IFRS adoption, forced adopters, private companies, parent-subsidiary links

JEL codes: M41

1 Introduction

The adoption of International Financial Reporting Standards (IFRS) around the globe is one of the most challenging events in accounting area of the last decade. The accounting research focuses mainly on the intended outcomes of mandatory IFRS adoption by listed companies (Brüggemann, Hitz, & Sellhorn, 2013), i.e. on the changes in investors' decision making and capital market characteristics (such as cost of capital, liquidity, analysts' coverage) of listed companies. The IFRS adoption brings about also unintended outcomes, e.g. in the sphere of contracting, companies' regulation or corporate taxation. Voluntary IFRS adoption by unlisted companies can also be conceded as an unintended outcome of accounting harmonization. (Nobes, 2010), (Andre, Walton, & Yang, 2012), (Yang, 2014) indicate that decision of voluntary IFRS adopters to abandon local GAAP is motivated by their reporting incentives to produce financial statements of better quality for their users. There are two main subgroups of voluntary adopters. Either in individual financial statements of subsidiaries under the control of a parent, which reports in compliance of IFRS, or in consolidated statements of unlisted groups with major international operations. However, an important condition shall be met for the voluntary adoption – local accounting law has to contain an option to choose IFRS instead of local GAAP. An attitude of various countries differs, even for countries with similar accounting tradition, e.g. German corporate law permits under certain condition to opt for IFRS regime, but Austria restricts the IFRS usage just to listed companies (Procházka & Pelák, 2015). The legal restrictions put on the voluntary IFRS adoption as a statutory system challenge especially those subsidiaries belonging to the groups, for which the parent company prepares IFRS consolidated financial statements. These subsidiaries shall then assure the preparation of two sets of accounting information – public financial statements in compliance with local GAAP for statutory purposes and internal financial statements in compliance with IFRS for consolidation purposes of the parent company. In this context,

such internal preparation of IFRS statements based on the parent's command can be labelled as a forced IFRS adoption.

This paper is the fraction of a broader project focusing on the evaluation of benefits and costs connected with the IFRS adoption by Czech private (unlisted) companies under foreign control, following the command of the parent to adopt IFRS for the group's purposes. The project progresses in several steps. Firstly, recent literature is reviewed to identify the main benefits and costs of IFRS adoption on the preparers' side. Unfortunately, evidence is available only for the parent listed companies (Jermakowicz & Gornik-Tomaszewski, 2006), (Fox, Hannah, Helliar, & Veneziani, 2013), (Morris, Gray, Pickering, & Aisbitt, 2014). Despite the experience with IFRS implementation differs across stakeholders and countries, the respondents share a widespread agreement that the costs exceed the benefits under IFRS reporting on the company level. However, the methodology applied is not utterly suitable for this project, because the focus of these studies on parent listed companies result in: (a) examination of capital market benefits of IFRS adoption by listed companies, which are, although, not available for unlisted companies; (b) addressing of a motivation behind the decision of parent companies to stay at capital markets even if benefits of switch to IFRS do not compensate the costs – subsidiaries do not have such discretion, as they have to comply with the parent's instructions about the group's reporting regime. Therefore, the second phase of the project employs a pilot field study among three Czech companies – unlisted subsidiaries under foreign control – to detect the specifics of forced IFRS adoption, which are not addressed by recent accounting research. The findings of in-depth interviews with the companies' managers are consequently utilized to refine the research hypotheses about the benefits and costs of IFRS adoption by the entire population of the companies under the project's scope. Furthermore, the outputs of the pilot study serve as the starting point for the construction of semi-structured survey to test the hypotheses empirically on a sample containing more Czech subsidiaries under foreign control adopting IFRS as the groups' main reporting regime alongside their statutory local GAAP system. The main goal of this paper is to present the results of the pilot study.

2 Methodology and Data

A pilot field study was run by three Czech private companies under foreign control. The research interest is put on the main challenges and outcomes surrounding the implementation of IFRS into the accounting system, following the command of parent company to adopt IFRS as the group's primary accounting regime. The data collection rests on the in-depth interviews with the chief financial officers of those subsidiaries. The unstructured discussion of selected issues with respondents enables to express their personal perspective of the particular situation, including changes over the time based on own experience and involvement in the case (Smith, 2015).

The Company A launched the operations in the late 1990s, originally as a private family firm. The main business was a subject to major changes over several years. Finally, the company started to engage in the energy industry as a trader. Following the liberalisation of Czech electricity and gas market in 2006 and onwards, the owners sold the company to a German competitor. Before the sale, the company's turnover reached over CZK 2,000m, total assets were around CZK 300m and had less than 10 employees. The group's securities are listed on the Frankfurt Börse.

The Company B was established in early 1990s within the process of so-called small privatization, as a successor of the former public entity transformed into a company under private ownership. The centrally-planned company was privatized and operated as a family business. The company had been steadily growing and was acquired by a German competitor, partially in 2002 (40%) and fully in 2006. At the time of the ultimate sale, the company's turnover was around CZK 700m, total assets of CZK 500m, and had

200 employees. The parent was and still is one of the world-leading producers in automotive industry, and it is listed on the Frankfurt Börse.

The Company C was established in 2002 with a view to capitalize on the advantages of free movement of services after the planned accession of the Czech Republic to the European Union. The company operates as a software developer; the parent company was listed on the Paris Bourse at the time of subsidiary's incorporation, and it is still listed (nowadays on Euronext). The investment by the parent – expressed as the amount of subscribed capital – was CZK 3m.

Regarding the IFRS adoption as required by the parent for the reporting purposes within and outside the group, the pilot companies experienced a different schedule:

- Company A: the IFRS implementation immediately after the acquisition (i.e. from 2006 onwards),
- Company B: firstly, the requirement of the parent for additional reports based on German GAAP (since 2002); then a switch to IFRS following the parent's listed status (partial IFRS reporting in 2005 and full reporting since 2006),
- Company C: firstly, internal reports based on French GAAP in the period 2002-2004; IFRS adoption from 2005 onwards.

3 Results and Discussion

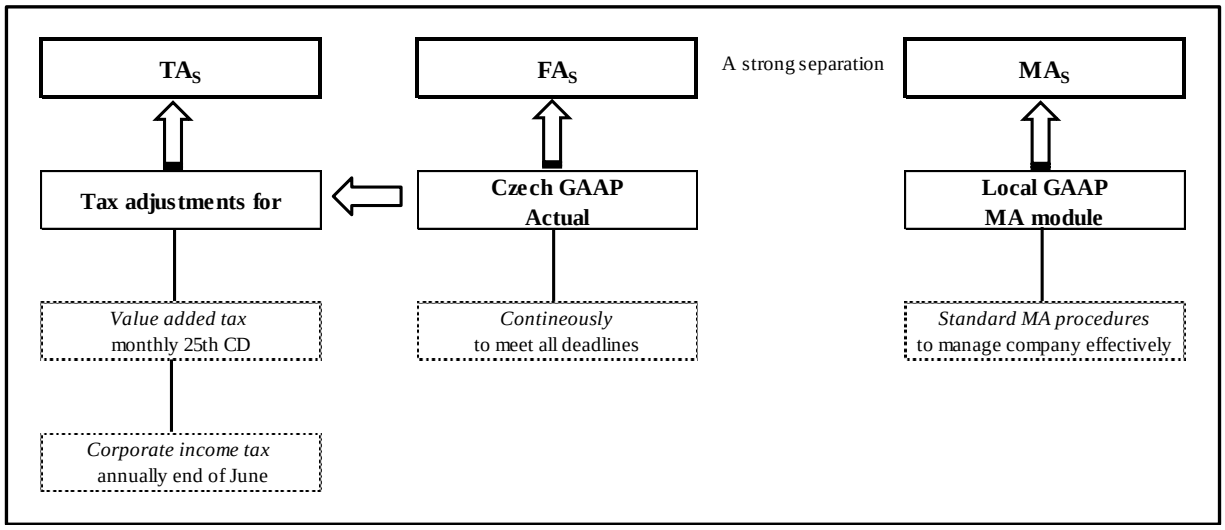
The first part of the interviews concerned on the changes in the architecture of accounting system of the company, once the parent required the subsidiary to adopt IFRS. Figures 1 and 2 sketch a simplified look at the reporting scheme within the Company A before and after the acquisition. The chart depicts not only the specific case of the Company A, but it is a picture of common situation for all Czech private companies. Regarding the external reporting pressures, the companies must prepare individual statutory financial statements once a year, which are made available to the public via an online application of the Business Register. Secondly, entities are obliged to meet their tax duties. On a regular monthly basis, companies are mandated to report their status relating to value added tax. The preparation of VAT tax filling, including supportive control reports is usually the major activity in corporate interim reporting. It shapes the bookkeeping and reporting schedules of private companies decisively, especially if firms engage in complex business transactions (involving international trade, reverse charge transactions, etc.). The next tax duty relates to corporate income tax. The tax filling shall be prepared on an annual basis. The calculation of tax profits is based on the profit determined in compliance with the Czech GAAP, adjusted for non-taxable items. Because of historical and institutional factors, Czech GAAP are tightly aligned with the tax rules. The subordination of financial reporting to fiscal needs is constituted in a considerably significant manner (Mejzlík, Arltová, Procházka, & Vítek, 2015), which impairs the quality of statutory financial statements and their serviceability for making sound economic decisions. This is the main factor, why management accounting for internal purposes of Czech companies is strongly decoupled from financial accounting and why Czech practice strongly supports the tendency to operate financial accounting system (FAS) and management accounting system (MAS) separately in a dual manner. The extent of autonomy of MAS on FAS goes far beyond the practices common in developed countries (Procházka, 2014).

The acquisition by the foreign parent adds new dimensions to the reporting processes – the change is captured at Figure 2. In particular, the Company A has to process data to comply with following informational demands.

- External:
  - separate financial statements for statutory purposes in compliance with Czech GAAP;
  - tax accounting based on adjusted Czech GAAP;
- Internal:

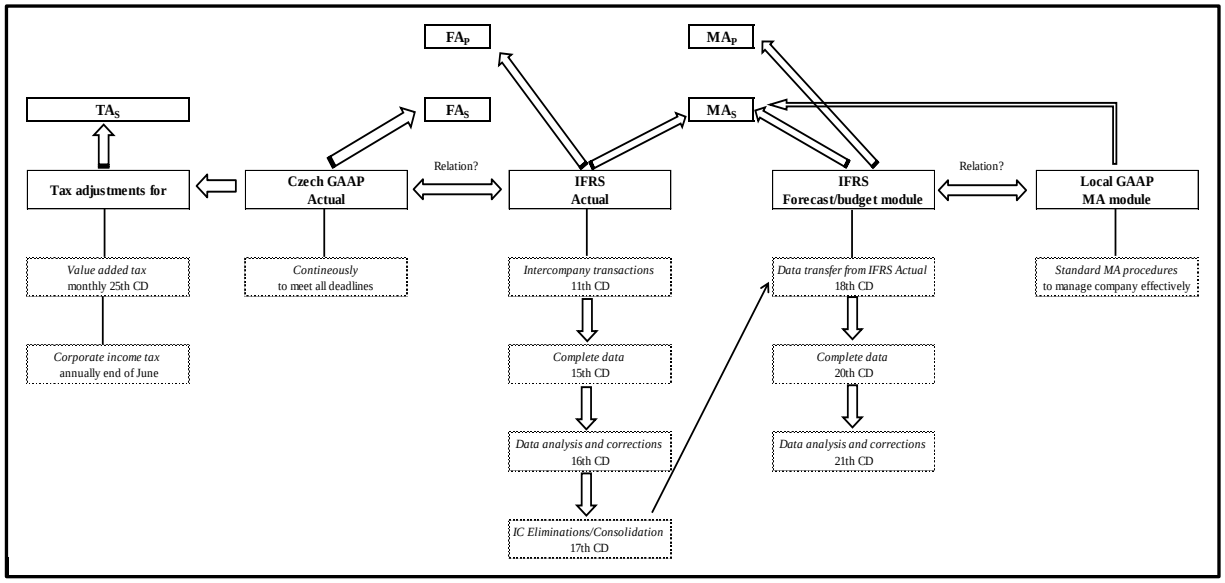
- required by parent company:
  - financial statements for consolidation purposes in compliance with the IFRS;
  - management accounting reports based on IFRS principles;
- own decision tasks (budgeting, cost allocation, price calculations, etc.) based on local practices.

Figure 1 Reporting schedules of a real Czech private company before acquisition



Source: own construction based on the interviews
(TA: tax accounting; FA: financial accounting; MA: management accounting; P: parent, S: subsidiary; CD: calendar day)

Figure 2 Reporting schedules of a real Czech private company after acquisition



Source: own construction based on the interviews

The additional information requirements raised by the parent relate to the supply of accounting information based on IFRS. In addition to three areas previously described, the Company A is commanded to prepare financial statements presenting actual results according to IFRS monthly (by the 15th calendar day at the latest). Furthermore, forecasted figures and other management reports shall be prepared by the 20th day. The parent designs the group's management accounting system as a superstructure over the

group's financial accounting system (both based on IFRS), which confirms the evidence collected by (Angelkort, Sandt, & Weißenberger, 2008) in case of EU listed companies. Although the accounting system is expanded "only" by two processes, additional information requirements of the parent have greatly increased the complexity of the subsidiary's accounting system. The additions do not enlarge the architecture of accounting system linearly, but in a multiplicative way, as it is easily visible in Figure B. The similar experience was expressed by the Company B and C, apart from the alternative set of accounting standards used as the primary information source within the group.

The Figures 1 and 2 indicate that the reporting workload of a subsidiary increases dramatically, after being acquired by an MNE using IFRS as the group's main reporting standard. Secondly, if the parent is located in a country with materially different economic, political, social background, then local institutions clash against global standards. When reconstructing the accounting system to meet requirements and commands of the parent, the subsidiary's management needs to select an appropriate strategic approach to counterbalance all institutional pressures subject to a cost-benefit constraint, the subsidiary is exposed to. Basically, the management can follow several strategies based on the assessment of relevant internal and external factors corresponding to the (Oliver, 1991)'s model:

- To reject the MNE's objectives defined by the Parent and to continue giving priority to their own goals. Consequently, the IFRS are adopted only in a ceremonial way (Kostova & Roth, 2002).
- To incorporate the parent's goals into own strategy by:
    - addressing all internal and external pressures individually and designing separate information modules specifically to each purpose; i.e. operate local FAS and MAS based on Czech GAAP and group's part of the FAS and MAS based on IFRS;
    - aligning own statutory FAS with the internal reporting of the Parent, by the voluntary adoption of IFRS, as evidenced e.g. by (Guerreiro, Rodrigues, & Craig, 2012) in the case of Portugal;
    - aligning own MAS with the internal reporting of the parent, i.e. by incorporating IFRS principles into local management accounting practices (Procházka, 2014).

The second part of the interviews therefore focused on the reaction of companies on the parents' commands to adopt IFRS as well as on the influence of IFRS adoption on internal decision-making processes within the companies. Unlisted companies were neither required nor allowed to select IFRS in their statutory accounts until 2011; therefore Scenario based on the model of (Guerreiro et al., 2012) could not have been opted for by subsidiaries around the group's switch to IFRS. To obey the command by the parents, IFRS had to be implemented alongside with local GAAP. The procedure resulted in a substantial extension of accounting systems, with an impact on the cost of operating such a complex system. Operating two separate and quite different modules of financial accounting increases compliance costs and administrative burden in general; this aspect was stressed by the Company A. The CFO admitted that in the first phase (2006-2007), the management had opted to adopt IFRS only symbolically. They had not complied with reporting deadlines and the overall quality of submitted information had been low. The parent had criticized the subsidiary repeatedly for the non-compliance. The subsidiary management paid a low attention to IFRS reporting and to the critique, because the old bonus scheme designed by the previous owners was still applied for their compensation. The old remuneration system referred to Czech GAAP results; therefore, management did not have sufficient incentives to handle the IFRS reporting in timely and quality manner. Except for the CFO, no member of top management even knew what IFRS are and how much they differ from Czech GAAP. In the post-adoption phase, local

practices survived the parent's effort to import the standards globally applied by the group.

The situation changed rapidly in 2008, when the parent company introduced a new compensation plan based on IFRS results (combining three key performance indicators "revenue, gross profit, and ROCE"). Initially, the management board of Company A pleaded the CFO to present regularly both actual and forecasted IFRS figures, which were sent to the parent. In next step, the management decided that major business decisions would be approved only if backed-up by calculations assessing the impact on IFRS results. The increase in perceived importance of IFRS by management boosted the workload of the financial department. However, the usage of outputs from the local MAS module started to fall steadily. At the end, the traditional management accounting tools (investment planning, budgeting, cost allocation, price calculation, etc.) survived, but the figures based on Czech GAAP were replaced by the procedures referring to IFRS numbers. The previous ignorance of IFRS reporting turned to its perceived usefulness in internal decision-making. However, the company's expression of moderate favor is preconditioned by (a) relatively low number of differences between statutory accounting and IFRS module regarding measurement of financial statements' elements, and (b) discretion in choosing the appropriate conversion method. As far as the first point, the principle variation between both systems relates to the presentation of the items within the income statement (nature vs function classification of expenses, different structure of operating vs finance costs, etc.) and minor differences in the recognition. As far as the latter condition, the company developed an Excel-based semi-automatic solution, which is sufficient for frequent monthly reporting and yet it is relatively cheap.

The adherence of Company B to the IFRS principles applied in the group reporting was also supported by the existence of IFRS-based compensation plan for top managers. However, the initial perception of IFRS usefulness was very low, as the company struggled with a lot of differences between Czech GAAP and IFRS without having a suitable IT solution for the complex conversion. The company was required to implement the group's common accounting and reporting software, which was, although, insufficient to account for all transactions of the subsidiary. The inadequacy was a result of different business model of the subsidiary compared to the rest of the group. The problem was removed after the implementation of new group's accounting software, which took place as a response to Company B's pressure on the parent to help it with optimizing the reporting process. The conversion process speeded up, the quality of prepared data increased and subsidiary started to utilize the new database in internal decision-making more extensively. On the other hand, the costs of implementing new software were so high, that – in the view of the company's management – they outweighed the incremental benefits. To at least balance plusses and cons, the Company B substantially rearranged the structure of management accounting by implementing tools and practices developed by the parent. The balanced relation between benefits and costs of IFRS adoption is therefore a result of (a) relatively high number of differences between statutory accounting and IFRS module regarding measurement and recognition; (b) quick conversion of financial statements using two-book system, which is, although, costly; (c) heavy reliance of the parent on uniformity of management accounting techniques within the group to promote higher cooperation among the group's units.

Company C exhibits a different pattern of IFRS adoption. The information flows within the group had been based on French GAAP and the preference of national standards survived even after the mandatory adoption of IFRS. The statutory consolidated financial statements in compliance with IFRS were perceived only as a necessary condition required by the regulators to remain on capital markets, but without any material benefits for the parent and group. This might correspond to evidence of (Daske, Hail, Leuz, & Verdi, 2013) that some companies adopt the IFRS as a label without any vital reporting incentives to provide high-quality data for the users. The reporting structure within the group was replenished by new package for IFRS consolidation (replacing the

original package based on French GAAP). The change of underlying standards brought more complexity to the conversion of financial statements of Company C, as the number of differences between Czech GAAP and IFRS was substantially higher than the distance between Czech and French GAAP. However, other reporting tools (especially in the group's management accounting) remained to grow up on French GAAP-based figures (including management compensation). The management of Company C considers the IFRS adoption as a "lost game" bringing costs without any measurable benefits.

4 Conclusions

Based on the literature review and the outcomes of the pilot study presented in this paper, the project's goal to assess the specifics of forced IFRS adoption by Czech subsidiaries under foreign control will be concretized into four hypotheses:

- H1: The costs of forced IFRS adoption exceed corresponding the benefits by Czech private companies under foreign control
- H2: The benefits, if any, will be realized within the internal structure of subsidiaries and not in relations with external parties
- H3: The positive attitude of the subsidiaries' management towards the outcomes of IFRS adoption is conditioned by the implementation of executives' bonus plan based on IFRS results
- H4: Different combinations of factors influencing the form, processes, and outputs of IFRS reporting can result in similar outcomes regarding the cost-benefit analysis

As the in-depth interviews are less structured and they incline to be subjective and less comparable across different respondents, the findings from interviews will be complemented with archival data in the next stage of the research project, as recommended by (Smith, 2015). The outcomes of empirical evidence will be confronted against preliminary findings of the pilot study presented by this paper. Missing robust empirical evidence precluding generalization is thus the main limitation of this paper, but the paper still complies with methodological approach applied for the whole project.

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How do remittances react to business cycle in receiving countries? Evidence from transition countries

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Abstract: *There are two main views on remittances. The first one implies that remittances increase dependency of receiving countries and distort economic development, serving as a transfer mechanism for business cycles. The second view claims that remittances serve as an important mechanism for internal development through various channels and that on the contrary remittances reduce volatility of economic growth in receiving countries due to their stability and size. The paper assesses the association of remittances with the aggregate output in receiving countries. The analysis consists of 11 transition countries over the period 1993-2015. The findings reveal that remittances towards transition countries seem to be rather procyclical as in 4 countries there is a downturn in remittances when GDP decreases and vice-versa. Only in one country remittances are found to be countercyclical. For the remaining 6 countries, no pattern of cyclicality is found, the character of remittances being assessed as acyclical. The paper discusses possible explanations for these findings.*

Keywords: Remittances, Economic cycle, Migration, Transition countries

JEL codes: F24, F22, E32, F32, F35

1 Introduction

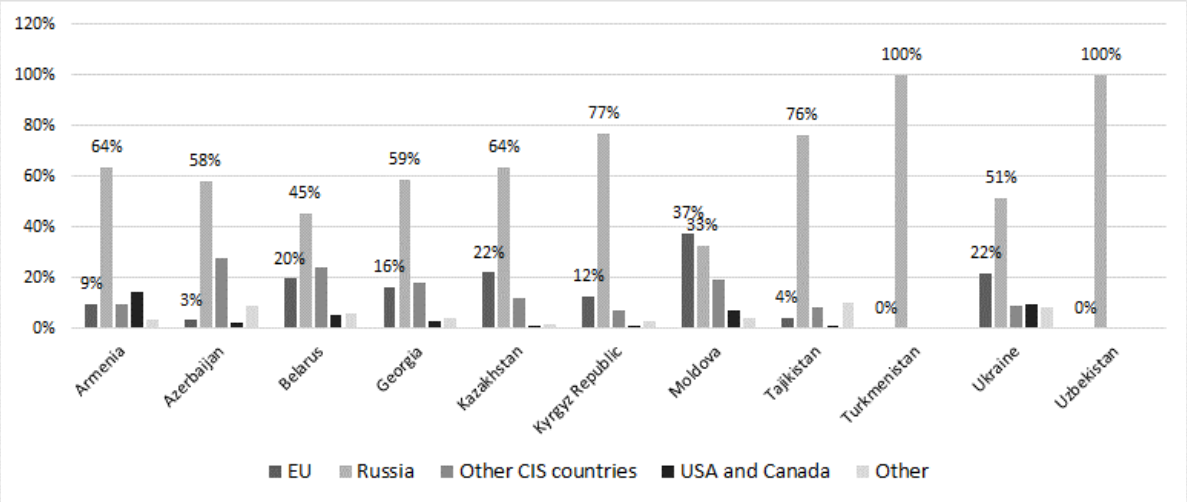
Remittances, private transfers from migrants to family members in the home country, add up to significant amounts annually. The number of international migrants has reached 244 million in 2015, which was the highest absolute number ever recorded (from 232 million in 2013). Migration as a share of the world population has been oscillating around 3 % for the past decades (IOM, 2017). After the fall of the Soviet Union, the successional states have been passing through a period of intense emigration. The yearly net emigration rate for 11 countries (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan) has been 3 % in 1992 and people were still continuing to emigrate from these countries at a rate of 0,2 % in 2012. As a comparison, low-income countries have a net emigration rate oscillating between 0,2 %-0,5% (World bank 2017a, own calculations).

People that emigrate because of work reasons usually remit certain amounts of money to their families in the home country. These financial flows, called remittances, represent a considerable source of national income, in some countries even exceeding not only official development assistance, but also incoming foreign direct investments. Recorded remittance flows towards the 11 transition countries were estimated to be 19,6 billion USD in 2015 (falling from 28,3 billion in 2014), an amount represents over 4,5 % of their GDP in the year 2015, 5,3 % in 2015 (World Bank 2017a, own calculations).

Transition countries form a specific geographical, cultural and economic area. They are also facing numerous problems related to political and economic instability (WEF, 2016). Immigrants coming from this area are relatively high skilled; they have good premises to integrate in the host country both due to their language skills and cultural proximity to

both Asian and European cultures. However transition countries are not a homogenous group. The share of remittances on GDP is not even through the analyzed group of countries. While in some countries remittances represent over 20 % of their GDP (Kyrgyz Republic, Moldova, Tajikistan), in other the share is close to 0 % (Turkmenistan, Kazakhstan) (World Bank 2017a, own calculations). The source of remitted money is similar for all countries in the dataset. As figure 1 shows, in all cases the main source is Russia. The only exception is Moldova with 37 % of all remittances coming from EU and only 33 % from Russia.

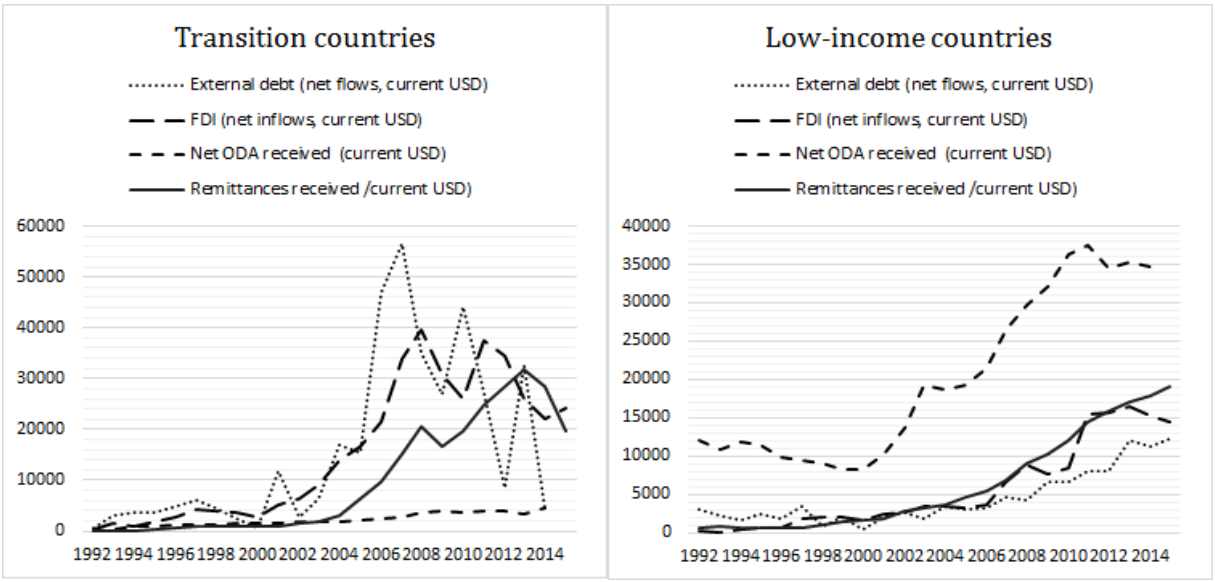
Figure 1 Source of remittance receipts by country in 2015 (as a share of total remittances)



Source: World Bank, 2017a, own calculations

Figure 2 shows how remittances and other capital flows have developed over time in the selected transition countries. As a comparison, the right side of the figure indicates the data for low-income countries. In both cases remittances proved to be resilient over the time. Unlike other capital flows, remittances represent numerous small transfers between private individuals, often family members. This might be one of the factors explaining why they have proven to be relatively less volatile than other financial flows as foreign direct investments, official aid flows, etc.

Figure 2 Remittances receipts by transition countries and low-income countries compared to other external financial flows (billions USD, current prices)



Source: World Bank, 2017a, own calculations

As showed in Figure 2, remittances represent a significant source of external financing for developing countries. It is therefore not surprising that there are various studies on how these financial flows affect the receiving regions. Early studies on remittances were elaborated by Stark and Bloom (1985), Russell (1986). Later, the study of remittances divided into various directions. Most studies are focused on the impact of remittances on development in migrant sending countries (economic growth, poverty, education, entrepreneurship, etc.). There are also studies that deal with the techniques of collecting remittance data (Reinke, 2007, Kapur, 2004). Much work concerning remittances and migration is being done by the World Bank, which has made attempts to examine both official and unofficial remittance flows (Maimbo and Ratha, 2005).

The idea of remittances as a transmitter of business cycle is not new to economic thinking. Recent studies search for the effect of the current economic crisis on remittances (O'Hara et al., 2009, Dietz, 2009, Ratha and Sirkeci, 2010; Barajas et all., 2012). Some studies find evidence of remittances being countercyclical to receiving countries' output, tending to even increase during periods when GDP drops (Spatafora, 2005, Kapur, 2005, Yang, 2007, Bugamelli and Paterno, 2011). This finding seems logical, as the main reason of remitting is to help families at home. On the other hand, some studies find that the relative size of remitted amounts is not as high as one could expect, Leontiyeva and Tollarová (2011) for example estimated that migrants send home about 22-27 % of their income. Hard times in the host country are likely to affect migrants' income. Remittances therefore can also have a procyclical character, responding accordingly to changes in output in the host country.

The goal of this paper is to assess the association of remittances with the aggregate output in receiving countries. The analysis consists of 11 transition countries from former Soviet Union over the period 1993-2015. The paper is organized as follows. Section 1 introduces the topic, including literature review. Section 2 outlines the methodological approach applied, including data sources. Next section presents and discusses the main findings. Section 4 concludes.

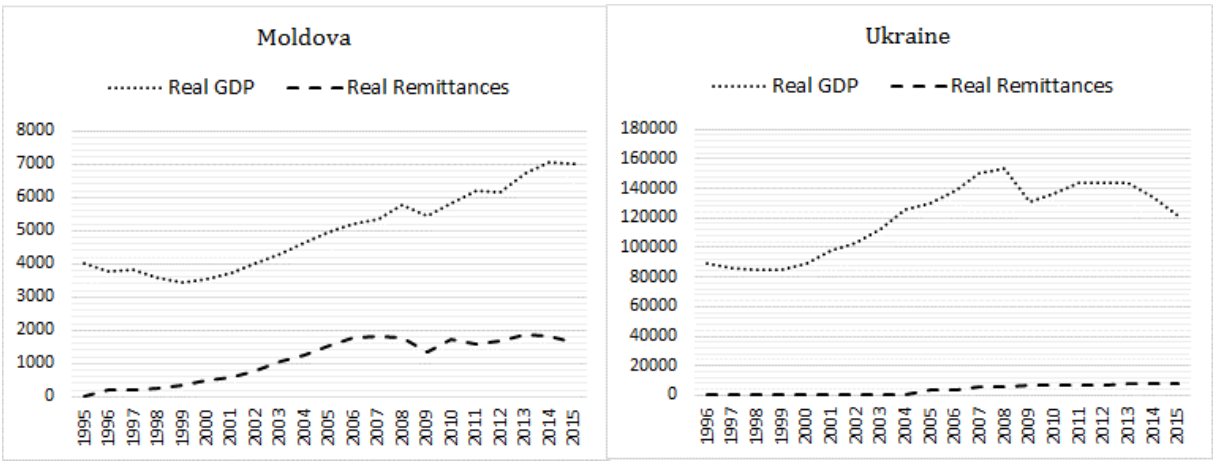
2 Methodology and Data

In this section, the paper analyzes how remittances react to changes in the receiving countries' output for each of the selected countries individually. I chose not to make the calculations for all the countries as a group as I do not consider it relevant. The calculations will be made for 11 countries (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan), using annual data between 1993 and 2015. In fact, only for two countries data covering the whole period was available (Belarus and Kyrgyz Republic), for some countries the data covered a much shorter period (only 10 years for Turkmenistan and Uzbekistan).

The calculations will be made based on real GDP and real remittances. GDP was extracted from World Bank Databank, while real remittances were obtained by multiplying the share of remittances on GDP by the real GDP (for details on the Databank see World Bank, 2017a).

Figure 3 shows how real remittances and real GDP have variated over time. Moldova and Ukraine were chosen as an example. Data from Figure 3 indicate in both cases a growing time trend with observable fluctuations around this (supposed) trend. The first step of the analysis is therefore to detrend the time series. Detrending by eliminating the estimated time trend makes possible to calculate deviations (cyclical components) of real GDP and real remittances from the trend. These cyclical components would be stationary to zero making possible to statistically assess procyclicality (in case remittances will be on the same side of the trend as output) or countercyclicality of remittances (in case remittances will be on the opposite side of the trend than the corresponding output value). The absence of any procyclical or countercyclical character will be interpreted as acyclicality of remittances (see also Kydland and Prescott, 1990; Sayan, 2006 for details on detrending time series).

Figure 3 Evolution of real remittances and real GDP in selected transition countries (current 2010 USD)



Source: World Bank, 2017a, own calculations

Detrending will be done by using a polynomial of degree k for output (see Equation 1) and remittances (see Equation 2):

$$y_t^T = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \alpha_3 t^3 + \ldots + \alpha_k t^k \quad (1)$$

$$r_t^T = \beta_0 + \beta_1 t + \beta_2 t^2 + \beta_3 t^3 + \ldots + \beta_k t^k \quad (2)$$

Tables 1 and 2 present the results for the polynomial trends estimated for each of the time series:

Table 1 Estimated trends for real GDP (y_t^T)

y_t^T	α_0	t	t_2	t_3	t_4		R^2adj	F-statistic	Press-statistic
ARM	27.791*** (0.019)	2.163*** (0.107)	-0.233* (0.112)	-0.326*** (0.106)			0.969	211.588***	0.0879
AZE	22.805*** (0.021)	3.656*** (0.142)	-0.279* (0.155)	-0.394** (0.147)	-0.332** (0.125)	0.372*** (0.098)	0.993	581.757***	0.0855
BLR	30.134*** (0.009)	1.810*** (0.041)	0.046 (0.041)	-0.396*** (0.041)			0.989	677.485***	0.0513
GEO	22.610*** (0.023)	1.210*** (0.165)	0.535*** (0.162)	-0.535*** (0.124)	0.218** (0.076)		0.990	452.125***	0.0396
KAZ	29.575*** (0.007)	1.877*** (0.047)	0.254*** (0.050)	-0.471*** (0.047)	0.211*** (0.041)		0.996	1,232.024***	0.0372
KGZ	23.955*** (0.009)	1.253*** (0.042)	0.131*** (0.042)	-0.137*** (0.042)	0.141*** (0.042)	-0.110** (0.042)	0.977	188.656***	0.0736
MDA	23.838*** (0.014)	0.727*** (0.100)	0.619*** (0.102)	-0.536*** (0.087)	0.260*** (0.064)		0.981	248.830***	0.0508
TDJ	21.301*** (0.094)	4.686*** (0.620)	-1.919*** (0.495)	0.893*** (0.264)	-0.210** (0.082)		0.999	3,824.357***	0.0102
TKM	23.519*** (0.016)	3.205*** (0.070)					0.996	2,075.240***	0.0231
UKR	27.479*** (0.021)	1.225*** (0.121)	-0.515*** (0.120)				0.842	51.777***	0.1005
UZB	27.732*** (0.041)	3.602*** (0.238)	-0.587*** (0.143)	0.134** (0.042)			1.000	38,509.620***	0.0043

Note: Significance levels: *** p-value < 0.01 ; ** p-value < 0.05; * p-value < 0.10
Source: own calculations based on data of World Bank, 2017a

Table 2 Estimated trends for real remittances (r_t^T)

r_t^T	β_0	t	t_2	t_3	t_4	R^2adj	F-statistic	Press-statistic
ARM	25.643*** (0.058)	4.158*** (0.358)	-0.800* (0.382)	-1.119*** (0.361)	0.728** (0.314)	0.951	97.659***	0.2674
AZE	18.208*** (0.086)	9.864*** (0.462)	-4.414*** (0.475)			0.958	229.895***	0.4136
BLR	25.052*** (0.150)	6.266*** (0.721)	-3.499*** (0.721)	3.906*** (0.721)	-3.478*** (0.721)	0.870	37.923***	0.9508
GEO	20.278*** (0.066)	0.971** (0.440)	1.675*** (0.417)	-0.951*** (0.315)		0.891	49.956***	0.2147
KAZ	23.343*** (0.070)	-0.902** (0.377)	0.601 (0.387)			0.178	3.160*	0.3212
KGZ	20.423*** (0.149)	11.534*** (0.713)	-2.131*** (0.713)	-1.704** (0.713)		0.925	91.990***	0.7715
MDA	21.984*** (0.043)	3.939*** (0.296)	-1.193*** (0.304)	-0.749** (0.258)	0.793*** (0.190)	0.984	290.126***	0.1428
TDJ	18.102*** (2.241)	16.375 (14.819)	-6.887 (11.842)	0.370 (6.316)	0.444 (1.968)	0.949	61.163***	0.3292
TKM	-40.915** (11.662)	361.929*** (72.734)	-252.439*** (51.332)	105.880*** (22.236)	-22.422*** (4.862)	0.901	21.564***	0.2124
UKR	22.250*** (0.108)	11.550*** (0.750)	-2.398*** (0.771)	-2.420*** (0.655)	1.659*** (0.481)	0.988	389.340***	0.2718
UZB	-32.765 (18.051)	366.226** (112.585)	-258.357** (79.457)	113.500** (34.419)	-26.412** (7.526)	0.873	16.398***	0.2570

Note: Significance levels: *** p-value < 0.01 ; ** p-value < 0.05; * p-value < 0.10
Source: own calculations based on data of World Bank, 2017a

The best fitting trend was selected for each country based on the p-values, R^2-adjusted and Press-statistic. The Press-statistic summarizes the fit of a particular model in a sample of observations that were not used to estimate the model parameters (Statistica, 2017). For example, the trend for real output in Kazakhstan is best represented by a polynomial of 4th degree, which explains 96,6 % of the real GDP evolution and a Press-

statistic of 0,0372 (the absolute value is not relevant, it is important to compare the Press-statistics for various polynomials for the same country knowing that the lower value the better).

After removing the trend three types of correlations between cyclical components of real output and real remittances were run:

- contemporaneous correlation (between real output for year t and real remittances for year t)
- asynchronious correlations (remittances shifted backward or forward by one year compared to GDP)
- asynchronious correlations (remittances shifted backward or forward by two years compared to GDP)

The scope was to identify possible delays in the way remittances responded to output shifts (in case remittances prove to react to changes in GDP with some delay). In case remittances react to changes in GDP in advance, that could indicate that remittances work as a business cycle transmitter.

3 Results and Discussion

The results of contemporaneous and asynchronous correlations are showed in Table 2 (Pearson correlation was run). The values highlighted in bold represent the values with the lowest p-value.

Table 3 Results of correlation analysis

Pearson correlation coefficients	Remit(t-2)	Remit(t-1)	Remit(t)	Remit(t+1)	Remit(t+2)
ARM	0,404	**0,459****	0,193	-0,004	-0,217
AZE	-0,154	0,212	0,370*	0,247	-0,176
BLR	**0,481****	**0,521****	-0,080	**-0,756*****	**-0,455****
GEO	-0,226	0,186	**0,485****	0,193	-0,198
KAZ	0,134	-0,020	-0,351	-0,350	-0,145
KGZ	0,154	0,144	0,188	0,137	-0,142
MDA	-0,149	0,364	**0,651*****	-0,229	-0,040
TDJ	0,158	**0,554****	0,496*	-0,285	-0,529*
TKM	-0,539	0,539	0,250	-0,508	0,040
UKR	-0,001	0,051	0,027	0,098	-0,181
UZB	-0,045	-0,093	0,558	-0,007	**-0,822**

Note: Significance levels: *** p-value < 0.01 ; ** p-value < 0.05; * p-value < 0.10
Source: own calculations based on World Bank, 2017a

Table 4 summarizes the results. Remittances seem to be countercyclical only in Uzbekistan, while in 4 other countries (Armenia, Georgia, Moldova and Tajikistan) they are procyclical. No specific pattern of cyclicality was detected in the remaining 6 countries (Azerbaijan, Belarus, Kazakhstan, Kyrgyz republic, Turkmenistan and Ukraine).

Table 4 Character of correlation between real HDP and real remittances

	Character of correlation (coefficient)	Share of remittances on GDP (2015)	Main sources of remittances	Length of time series (number of years)
ARM	**procyclical (0,459)**	**14,2%**	Russia (64%)	21
AZE	acyclical	2,4%	Russia (58%)	21
BLR	acyclical	1,4%	Russia (45%)	24
GEO	**procyclical (0,485)**	**10,4%**	Russia (59%)	19
KAZ	acyclical	0,1%	Russia (64%)	21
KGZ	acyclical	**25,7%**	Russia (77%)	24
MDA	**procyclical (0,651)**	**23,4%**	EU (37%), Russia (33%)	20
TDJ	**procyclical (0,554)**	**28,8%**	Russia (76%)	14
TKM	acyclical	0,04%	Russia (100%)	10
UKR	acyclical	3,4%	Russia (51%)	20
UZB	**countercyclical (-0,822)**	8,8%	Russia (100%)	10

Source: own calculations based on data of World Bank, 2017a and 2017b

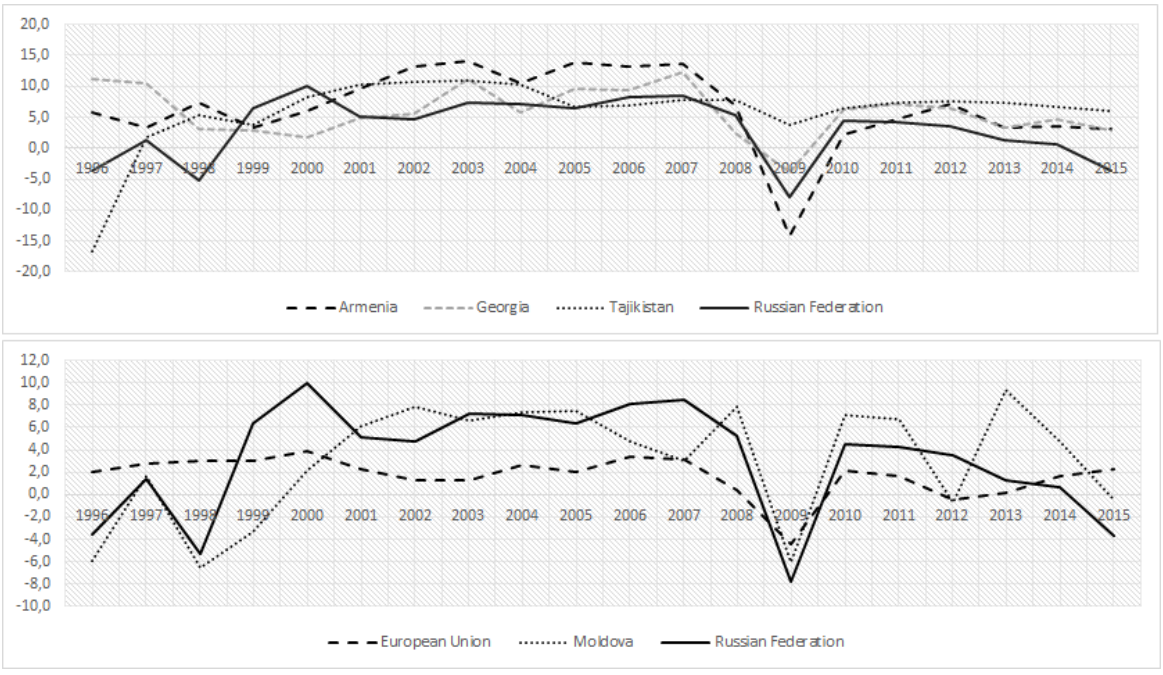
The results for Uzbekistan indicate that Uzbek remitters increase money transfers towards their home country when GDP at home decreases and vice-versa. Furthermore,

remittance react to changes in GDP with an anticipation 2 years. These results might seem surprising, as it seems quite improbable for migrants to anticipate changes in the home country GDP and act accordingly years in advance. In the case of Uzbekistan, it is important to take account of the limited number of observations for this country (only 10 years) and consider the possibility that this limitation could have biased the results.

In the case of Armenia, Georgia, Moldova and Tajikistan, the correlation coefficient is around 50 % and is positive. This reflects a procyclical behavior of remittances respective to output. Remittances are synchronous in Moldova and Georgia (no time shift) and asynchronous in Tajikistan and Armenia (remittances react with a one year delay to changes in output). In different words, remitters from these countries lower their money transfers during economic downturn at home, which could indicate that their main motive to remit is mainly to support investment and at a lesser extent to smooth consumption at home. Remitters could be risk aversive, not trusting the home country in times of economic hardship and preferring to spend (or save) their gains otherwise than sending it home. Another, more plausible reason, could be that that remittances are simply affected by the business cycle in the remittance-sending country. Economic hardship in the countries where migrants are employed implies loss of jobs, reduction of wages, which would cause a drop in the amounts remitted. As Figure 4 suggests, business cycles in Armenia, Georgia Tajikistan and even Moldova have very similar paths as the business cycle in Russia (which is the main source for remittance flows for all countries except Moldova). When there is less (or more) to remit because of economic downturn (or upturn), remittances would in fact act as a transmitter of business cycle.

It is interesting to remark that for the remaining 6 countries (Azerbaijan, Belarus, Kazakhstan, Kyrgyz republic, Turkmenistan and Ukraine) remittances and business cycles at home are uncorrelated. Except Kazakhstan, all these countries have a low share of remittances on GDP, which could explain these results. Studies dealing with various form of transition capitalism indeed classify these countries (except Kyrgyz republic) differently, as "commodity exporters", while countries like Armenia, Georgia, Moldova, Tajikistan and Uzbekistan are viewed as "remittance and foreign aid receivers" (Vlčková, 2017).

Figure 4 Comparison of GDP growth in remittance-receiving and main remittance-sending countries (in %)



Source: World Bank, 2017a

4 Conclusions

The results of the discussion in this paper indicate that remittance receipts in transition countries respond rather procyclically to the economic activity in the home country in some countries, while in some countries no pattern of cyclicality was found. It is not surprising that countries with acyclical character of remittances also have a low share of remittances on GDP.

While countercyclical behavior of remittances would indicate the prevalence of consumption smoothing motive of remitters, procyclical movements of remittances and output point out remitter's risk aversion and predominance of investment reasons over consumption reasons of remitting. Another, more credible reason of procyclicality, is synchronicity of business cycles in remittance sending and receiving countries. This seems to be the case of the transition countries with procyclical character of remittances.

It should be noted that transition countries form a specific group of countries in terms of data availability. The results reported in this paper could be improved by increasing the number of observations. As adding more years is not possible, what come into consideration is to use more detailed data, for example quarterly data instead of annual. The latest is however difficult to achieve due to limitations of data availability. A third possibility is to separate the time series into shorter period of times and observe whether cyclical character of remittances does not change over time. Due to relatively short data series the applicability of this method is limited.

Another final note is on the reliability of remittance data itself. It is well-known that besides official channels, migrants also make use of unofficial money transfer channels, geographical proximity of transition countries and the main remittance source country being a strong reason for that. In time, as technologies and information are increasingly accessible, migrants tend to switch to official channels. The uneven capturing of genuine remittance flows in time can also bias the results.

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Analysis of Prize Money Gap in Wimbledon 2007 - 2016

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Abstract: *Currently, it is rare in professional sports to offer equal prize money to male and female players. Tennis Grand Slam tournaments represent the leading part of those sports that committed to prize money parity. In 2007, Wimbledon, the oldest Grand Slam tournament, became the last Grand Slam to pay the same prize money to male and female players. Although men and women are paid equally they still play a different number of best-of sets: men play best-of-three sets while women play best-of-two sets in Wimbledon. These two competing circumstances have given rise to a financial gap in prize money obtained for a game played by men compared to women on average. The present paper estimates this financial gap by analyzing the unique data set on Wimbledon prize money and game scores in years 2007-2016.*

Keywords: tennis, gender inequality, gender bias, prize money

JEL codes: G02, Z21, Z23

1 Introduction

Wimbledon and all three other Grand Slam tournaments - Australian Open, French Open, and US Open, are the most prestigious individual tennis competitions in the world, which are open to all internationally ranked players. Among all tennis professional championships, Grand Slams constitute the highest media attention, prize money and the highest amount of ranking points entering ranking systems. Moreover, Grand Slams are the only championships which are organized for both, men and women. This fact yields an opportunity to compare how men and women are treated in professional tennis competitions and what is the most important, it allows us to conduct an analysis in which we will compare the actual prize money obtained by male and female athletes.

The goal of this paper is to extent the study conducted by Svoboda and Rakovska (2017) which examined single-player payment structures of four Grand Slam tournaments: US Open, Australian Open, Wimbledon and French Open in year 2016. In the present study, we will use enlarged data set containing data from 2007 to 2016. We decided to study data only for one Grand Slam, concretely for Wimbledon, in order to develop research design which would be beneficial for our further research of prize money gap in tennis tournaments within a wide history of periods. Wimbledon (The Championships)[7] is the oldest Grand Slam tournament, and paradoxically, it was the last tournament which announced prize money parity. It happened in 2007 [8] (US Open was the first Grand Slam and the first sport tournament in sports history, to pay equal prize money to men and women athletes as of 1973). We decided to study Wimbledon because of the fact that we

[7] Wimbledon, as the oldest tennis tournament in the world was first played in 1877 while Ladies' singles were initiated in 1884. Since its establishment it is held in Wimbledon, a south-west suburb of London, between late June and early July. It is the only Grand Slam which has kept playing on the original game's surface - grass (Wimbledon, 2017).

[8] Even though Wimbledon was the last Grand Slam which announced prize-money-parity, it paid approximately 90 % of men's reward to women athletes as early as in 1977 (ITF, 2016).

are able to encompass the whole period of prize-money-parity by taking the shortest range of years - from 2007 to 2016.

The structure of a regular tennis match is designed with an odd number of sets to ensure a winner come up at the end of the match. In Wimbledon, and in all Grand Slams, the amount of best-of sets played by women and men differs. Women are playing the best two of three sets which is typical for tennis matches, and men are playing best three of five sets. In other words, rounds in women's singles may end up with two or three sets (2,5 sets on average), while rounds in men's singles may end up with three, four or five sets (4 sets on average) [9]. Therefore, women athletes play on average only 62,5 % of amount of sets played by men in each round of each Wimbledon tournament. We also assume that the number of games played by both genders is proportional to amount of sets played, which yield the premise that female players perform only 62,5 % of amount of games performed by male athletes in the same round [10].

There are two competing circumstances, on one hand, men and women are rewarded equally in Wimbledon tournaments as of 2007. On the other, women are playing only 62.5 % of amount of games played by men in each round. Let us suppose that an average male player performed 100 games till the 3rd round of 2010 Wimbledon tournament. Then an average female player played only 62.5 games till this round, but both players would obtain the same prize money, let us say x £, if they would have ended in the 3rd round of 2010 Wimbledon. Applying a simple math to compute prize money obtained for a game played by each of the two players (x/100 £ for a man and x/62.5 £ for a woman) would directly imply that women are rewarded by 60 % more prize money for a game played than men. Such trend informs our research question: Women earn on average 60 % more prize money for a game played compared to men in all Wimbledon tournaments since 2007 when Wimbledon announced prize-money-parity. We address this inequality in financial rewards between male and female tennis players as prize money gap.

The paper is organized as follows. Section 2 offers a review of present literature studying the role of gender in sports. Section 3 describes data used in the analysis and proposes a methodology to be employed. The central part of the present study is formed in Section 4 in which we examine the results of our study and offer a general discussion of the analyzed phenomenon of a prize money gap. Finally, Section 5 delivers conclusions of this article.

2 Literature Review

In general, there is a big literature gap when considering gender inequality in sports. We failed to find and we are not aware of existence of a single article from the financial or economic field of study which would discuss this issue. Gender inequality and stereotyping is usually examined in articles from social, psychological, or marketing fields. Concepts such as gender inequality, or gender bias are in this type of literature inevitable, and results discussed in such papers might seem opinionated or subjective. Therefore, we feel that it is important to emphasize that the aim of this paper is to deliver factual numbers without assessing subjective views on gender stereotyping. In this part of the paper we will offer a short review of existing academic literature that might provide at least an insight into studied topic.

Trolan (2013) suggest that the leading problem of gender inequality in sports news lies in the way the media present female athletes, which is - bodies that only exist to be observed. The first studies considering gender stereotyping and inequality in sports examined data mainly from Olympic Games as the most sizable sport event advertised in both paper and electronic news (Eastman and Billings, 1999; Higgs et al., 2003). A pilot

[9] We assume that all possible amounts of sets in men's and women's singles are equally possible.

[10] We follow assumptions raised in (Svoboda and Rakovska, 2017, p.45).

study of gender stereotyping in everyday sports broadcasting was developed by Eastman and Billings (2000). Authors analyzed data extracted from printed and electronic sports broadcastings in order to deliver two types of statistics: time devoted to men and women by news announcers, and positivity/negativity towards women exhibited by sports commentators. Results of the study revealed significant gender bias in sports broadcasting in year 2000 - only 5 % of total period examined was devoted to women athletes, and women athletes were considerably stereotyped by commentators through use of adjectival descriptors [11].

Similar study was conducted by Billings and Young (2015). Authors extracted clock-times - the amount of time devoted to each gender by analyzing 118 hours recorded from sports channels FOX Sports Live, ESPN and SportsCenter. Results presented in this paper are significantly favoring hypothesis about gender stereotyping as women's stories were shown approximately 1 % of the total time studied and when shown, they represented approximately 70 % of the length of men's story.

Eastman and Billings (2001) studied gender and race stereotypes in college Basketball matches broadcasted in a number of US channels by analyzing the proportion of commentary about women and men athletes. Findings suggests that basketball announcers do not favor or underestimate any gender, what contradicted authors' hypothesis about stereotyping. Nevertheless, result of the study showed that only 37 % of broadcasting is devoted to women athletes in college basketball.

Literature presented above suggests considerable inequality between men and women in a question of sports media coverage. Gender inequality might be found in several other aspects of sports, but we will concentrate our discussion on phenomena linked to prize money. Study conducted by BBC in 2014 (BBC, 2014) showed that 35 out of 56 examined sports paid prize money at world level, from which 25 paid equal prize money and 10 did not in 2014. More interestingly, study showed that those 10 sport (30 %) paid more prize money to men than to women. Sports with highest disparity in prize money were identified to be football, golf, cricket or snooker, and the magnitude with which men were rewarded more ranged from two (surfing) to more than 300 times (Football FA Cup).

3 Methodology and Data

To calculate prize money gap we processed two sets of data: scoring tables for Gentlemen's and Ladies's Singles events for each Wimbledon tournament in years 2007-2016 [12] and respective Prize Money tables. Both sets of data were obtained from the official web site for Wimbledon tournament [13]. Resulting data set represents unique collection of observations on performance of each tennis player in studied Wimbledon tournaments and her prize money reward.

Each Wimbledon tournament is played by 128 players and consists of seven rounds. After the first round there are 64 losers resulting from initial 64 matches and in the seventh round, the winner is determined. The total prize money is apportioned based on rounds so as each player defeated in a certain round, let us say *j*th round, obtains the prize money assigned to *j*th round. This holds for all rounds except for the last seventh round in which runner-up and winner athlete obtain different amounts of prize money. Therefore, our aim was to calculate average prize money gap for each level of a payment

[11] Eastman and Billings (2000) states that men athletes are being attributed with personalities hence they obtain nick names, while women athletes do not. Moreover, authors found out that sports announcers often comment on women's age whereas men are described by age only time-to-time.

[12] We decided to examine Singles events because of the study design - to calculate a prize money gap between individual male and female players in Wimbledon tournaments.

[13] http://www.wimbledon.com/index.html

structure and then to construct the total prize money gap for each studied Wimbledon tournament.

Firstly, we calculated the number of games played by each player *i* corresponding to *j*th round (the round in which the player ended up) and denoted it by $games_{i,j}^{year,g}$, where *g* represents gender of a player and *year* ranges from 2007 to 2016. Secondly, we computed prize money obtained for a single game by each individual player *i* by using prize money amounts assigned to *j*th round - $Prize_j^{year}$. For $j = 7$, we determined which player was winner and which was runner-up and based on this specification we assigned respective prize money. As a next step, we took average per rounds to obtain average rewards payed to male and female tennis players for a single game played in Wimbledon as:

$$AVG\,\mathrm{Prize}_j^{year,g} = \frac{\sum_{i=1}^{N_j} \frac{\mathrm{Prize}_j^{year}}{games_{i,j}^{year,g}}}{N_j} \tag{1}$$

where N_j represents the number of players that ended up in the *j*th round, again taking in the account situation for $j = 7$. Finally, we denoted the prize money gap for each round *j* and *year* - how much are women athletes payed more for a single game played compared to men, as follows:

$$gap_j^{year} = \frac{AVG\,\mathrm{Prize}_j^{year,women} - AVG\,\mathrm{Prize}_j^{year,men}}{AVG\,\mathrm{Prize}_j^{year,men}} \tag{2}$$

The analysis in next Section will be conducted using variables defined in equations (1) and (2). In order to examine our research question we will conduct basic statistical analysis and visual representation of the data. Our aim is to express the prize money gap variable for years 2007 - 2016 which does not depend on nominal prize money itself but on actual difference in number of games played by male and female players. Hence, we will not adjust prize money amounts for historical Wimbledon tournaments with respect to yearly inflation levels in the United Kingdom. The nature of formulated research question and chosen variables does not allow for more complex statistical analysis, however the present study might serve as a starting point for our further research in which we will analyze prize money gaps of all Grand Slam tournaments.

4 Results and Discussion

Using equation (1) we calculated average prize money for a game played by men and women who ended up in one out of seven rounds denoted as: first round losers, second round losers, third round losers, fourth round losers, quarter finalists, semi-finalists, and runner-up and winner who represent athletes competing in the 7th round. Results are displayed in Table 1.

Firstly, looking at the numbers for male and female athletes, it is evident that women's rewards are higher than men's rewards in each level of payment structure. We will calculate the prize money gap later on, therefore we will comment on this difference more in next parts of this section. Secondly, the table shows that average financial reward for a game played is the lowest for the second and the third round losers, both men and women. What is more interesting, the first round losers and the fourth round losers obtain on average almost the same prize money for a game played. Further, male and female winners are compensated the most and their earnings represent on average 10 times the earnings of the first round loser. Last but not least, the average prize money for a game played is increasing with time what respects not only inflation but also tendency of a Wimbledon organizers to announce total prize money increase each year. The highest year-to-year rise in prize money per game happened between years 2012

and 2013 and represented almost 60 % on average for both men and women. The underlining increase in total prize money announced by organizers was 50 % - from 5.77 mil £ to 8.588 mil £.

Table 1 Prize money per game

	Level	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Men	Winner	3415	3012	3114	4000	4762	4873	6695	6377	7611	9174
	Runner-up	1362	1589	1284	1923	2282	2138	3390	3745	4178	3571
	Semi-Finalist	787	824	951	1297	1290	1452	1962	2131	2280	2278
	Qrter Finalist	456	467	578	677	762	795	1216	1281	1230	1318
	4th Rnd Losers	353	344	372	394	527	509	811	747	840	969
	3rd Rnd Losers	259	261	256	270	332	350	628	641	691	742
	2nd Rnd Losers	227	239	258	263	299	314	609	570	657	716
	1st Rnd Losers	304	332	328	327	347	454	721	835	850	842
		327	**343**	**351**	**375**	**422**	**483**	**789**	**839**	**894**	**930**
Women	Winner	4861	5396	5822	7752	8088	6805	11765	12847	12789	14599
	Runner-up	2303	2717	3972	3788	4435	3993	5333	6197	5912	6711
	Semi-Finalist	1431	1396	1692	2053	2254	2534	2886	3779	3825	3666
	Qrter Finalist	787	858	990	1265	1181	1274	1738	2101	2229	2369
	4th Rnd Losers	570	575	679	854	795	906	1281	1383	1428	1443
	3rd Rnd Losers	447	435	462	522	527	618	942	1034	1239	1178
	2nd Rnd Losers	427	386	415	455	480	559	998	1020	1080	1221
	1st Rnd Losers	517	492	510	559	586	725	1204	1336	1453	1493
		559	**545**	**593**	**674**	**698**	**800**	**1282**	**1412**	**1516**	**1587**

Source: authors own calculations

As a next step in our analysis we have calculated prize money gap for each level of payment structure in years 2007 - 2016. This part represents the core section in which we will answer our research question. Table 2 summarizes values calculated by employing formula (2).

Table 2 Prize money gap

Level	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	AVG Levels
Winner	42%	79%	87%	94%	70%	40%	76%	101%	68%	59%	71%
Runner-up	69%	71%	209%	97%	94%	87%	57%	65%	42%	88%	78%
Semi-Finalist	82%	69%	78%	58%	75%	75%	47%	77%	68%	61%	67%
Qrter Finalist	72%	84%	71%	87%	55%	60%	43%	64%	81%	80%	69%
4th Rnd Losers	61%	67%	83%	117%	51%	78%	58%	85%	70%	49%	69%
3rd Rnd Losers	73%	67%	80%	94%	58%	76%	50%	61%	79%	59%	67%
2nd Rnd Losers	88%	62%	61%	73%	60%	78%	64%	79%	64%	70%	70%
1st Rnd Losers	70%	48%	56%	71%	69%	60%	67%	60%	71%	77%	66%
AVG Years	**71%**	**59%**	**69%**	**80%**	**66%**	**65%**	**62%**	**68%**	**70%**	**71%**	**68%**

Source: authors own calculations

Looking at the results in the Table 2, we can see that the prize money gap ranges from 40 % to 209 %. This range is quite extensive and represents the variability in number of

games played within Wimbledon tournaments. The highest gap on average is identified in runner-up level of payment structure and suggests 78 %. This percentage is mainly driven by results in 2009 tournament in which runner-up female player, Venus Williams, ended up with 107 games played [14] on the one hand. On the other hand, the male runner-up athlete, Andy Roddick, ended up with the highest number of games played in studied period - 331. Consequently, prize money gap calculated for runner-up level in 2009 was 209 %. The minimum gap, 40 %, was calculated for winner level in 2012 and demonstrate the situation in which male winner, Roger Federer, played 236 games with 242 games as the average for male winners, while the female winner, Serena Williams, played 169 games what represents the overall maximum number of games delivered by female athletes in studied period. In other words, the more games conducted by women in the given round, the lower gap calculated.

Overall, computed average prize money gaps for years and levels validate our initial assumption, that women are rewarded by 60 % more than men for a game played. Moreover, the results showed that the average gap is even higher in all levels of payment structure and in all years except for 2008 in which gap represented 59 %. Given the fact that Wimbledon organizers announce increase in prize money each year and the systematic nature of prize money gap showed in the studied period, we can conclude that the nominal difference in financial rewards per game is increasing with time. The similar conclusion was made in (Svoboda and Rakovska, 2017, p.51). The fact that Wimbledon offer the equal prize money for both genders while women demonstrably play fewer best-of sets might seem unfair and intriguing. The other view, however, is that the International Tennis Federation together with individual Grand Slam national organizations exert effort flatten the present gender inequality in sports and that equal payment structure for male and female tennis players might stand as the pioneering example for future development of women's position in sports. Continuing in this debate is not the aim of our article therefore, we will leave the reader with open assumptions.

5 Conclusions

The present paper examined financial gap in prize money paid to female players compared to male players in Wimbledon tournaments through years 2007 - 2016. It represents an extension of study of Svoboda and Rakovska (2017) in which only one year was explored. We collected data from official site of the Championship and created an unique data set capturing performance of each participating tennis player and her financial reward in studied period. In the core part of our analysis we calculated prize money gap that resulted from two competing circumstances: prize-money-parity in Wimbledon tournaments as of 2007, and gender inequality in number of best-of sets - two best-of sets played by women and three best-of sets played by men.

Firstly, the results validated our assumption that women obtain on average 60 % more prize money than man for a single game played. Moreover, the average gap was showed to be even higher for all the studied years except for 2008 for which we computed 59 % gap and this result holds for all levels of payment structure - from first round losers to winners. Secondly, given the systematic difference in prize money paid for a game to male and female athletes, and the fact that total prize money announced by Wimbledon organizers is rising yearly by more than inflation rates (the highest increase was announced in 2013 - almost 50 %) we can conclude that nominal prize money gap will have increasing tendency in feature periods.

The topic discussing gender inequality in sports is very wide and covers several academic fields. We decided to study financial aspect connected to payment structure of one of the most famous tennis tournaments in the world. The aim of this paper was to access the

[14] The low number of games played resulted mainly from the fact that Venus Williams beat her competitor Agnieszka Radwanska in the quarter-final with score 6-1 6-2 and Dinara Sofina in the semi-final round with result 6-1 6-0 (Wimbledon, 2017).

prize money gap quantitatively and to deliver comprehensive examination of factual data without assessing gender stereotypes or opinionated views. We are aware of several shortcomings of the present study based mainly on the low complexity of used statistical methods. The future research should concentrate on data analysis by use of more advanced statistic or possibly by use of econometric models. Eventually, the analysis might incorporate data from other tennis tournaments organized by the Association of Tennis Professionals (ATP), and the Women's Tennis Association (WTA), or tournaments from other sports disciplines.

Acknowledgments

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Comparison of algorithmic trading using the homogeneous and non-homogeneous Markov chain analysis

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Abstract: *This empirical study deals with stochastic modelling of a short-term share price development. We use Markov chain analysis (MCA) to predict the share price development. When defining a state space we assume that the share price moves in three types of trends: primary, secondary and minor. The subject of our interest is a minor trend, which usually lasts for several days. During this trend the share price accumulates a certain profit or loss in relation to the price at the beginning of the trend. The state space is defined by the amount of the accumulated profit or loss. The aim of this study is to compare two approaches to modelling the state space. In the first approach, we assume homogeneous Markov chains, i.e. approximately the same volatility, and MCA is performed with unvarying state space. In the second approach, we assume non-homogeneous Markov chains, i.e. a changing volatility, and MCA is performed with varying state space. We create trading strategies for automatic generation of buying and selling orders based on these models. Three business systems have been created for each approach. The profitability of each business system is calculated and compared. The study was performed using historical daily prices (opening and closing) of CEZ shares from the beginning of 2006 until the end of 2016. This study has proved that trading models with varying state space, on the average, outperform trading models with unvarying state space.*

Keywords: algorithmic trading, Markov chain analysis, share price prediction

JEL codes: G17, C53

1 Introduction

In our long-term research we deal with models used to predict short-term share prices and their success in algorithmic trading. The results of this research are stated for example in Svoboda and Říhová (2016). We proceed from technical analysis (TA). TA is based on some scientific theories; however, it is, above all, based on a number of empirical findings. Based on these findings, individual methods are created and their number is practically unlimited. Principles and methods of TA are described, for example, by Murphy (1999) or Rejnuš (2011). TA is an extensive set of methods that predict future prices from past prices and trade volumes. The basis of TA can be summarized by the following three theses:

- The share price is determined only by a mutual interaction between supply and demand. Supply and demand are influenced by fundamental and psychological factors.
- Share prices move in trends which are inertial. A trend change is caused by a change of ratio between the selling and buying parties. These trend changes must be identified in time by studying historical prices and trade volumes. Technical analysts distinguish three types of trends. A primary trend which lasts from one

year to several years, a secondary trend which lasts for several months and a minor trend which lasts for several days to weeks.
- Development cycles and formations are repeated. It is caused by the nature of human behaviour that tends to react in a similar way under the same circumstances. This fact allows us to predict the future share price development.

The basic assumption for technical analysts is the second thesis. The trend identification in good time raises hopes for an above-average profit. Nowadays, the main focus of technical analysts is predicting of short-term price movements (the minor trend), where the price level is not important but the estimate of price changes plays an important role. We assume that the probability of this trend change is increasing with a rising accumulated loss or profit. A key question for us is what amount of the accumulated loss or profit is needed to change the trend. Considering the data character (daily opening and closing prices) we use the analysis of Markov chains (MCA) for modeling the probability of trend change.

The MCA is used very little for a stochastic description of the behaviour of stock markets. The infrequent application of MCA is probably also caused by some studies (Zhang and Zhang, 2009), (Doubleday and Esunge, 2011) and (Vasanthi at al., 2011). The common feature of these studies is the fact that they define the state space very simply. The state space is defined on the basis of the intensity of daily changes and it does not allow for suitable applications. Contrary to the above, the study (Svoboda, 2016) defines the state space on the basis of the intensity of daily cumulative changes in share prices. The study shows that in the state space thus defined there are states in which the minor trend changes with a high probability. This study is based on this approach. In the study (Svoboda, 2016), individual states are defined as multiples of the standard deviation of daily price changes and the deviation is calculated for the entire monitored period. We would like to modify this principle in this study and define the varying state space as multiples of the moving standard deviation.

The aim of this study is to compare the profitability of trading strategies to generate trading signals using MCA either with the unvarying state space or with the varying one.

2 Methodology and Data

Markov chain analysis theory is described for example in (Hillier and Lieberman, 1986). MC is a random process with a discrete set of states, discrete time and of that kind that the probability $p_i(n)$, that at the time moment t_n the process will be in state i, is stochastically dependent only on the state at the previous time moment, i.e. on the state at the time t_{n-1}. Particular realizations x_i are elements of a countable set $S = \{s_i\}$, $i = 1, 2, ..., N$ which is called a state space. Behaviour of the described process is determined by:

- Vector of unconditional probabilities $p(n)^T=[p_1(n), p_2(n), ..., p_N(n)]$, where T means transposition and $p_i(n)$ denotes probability that the process is in the moment n in the state i.
- Transition probability matrix **P** whose elements p_{ij} give conditional probability of process transition from the state i to the state j. That could be formally described $p_{ij} = P(X_n = s_j | X_{n-1} = s_i)$, where $i = 1, 2, .. N$ and $j = 1, 2, ... N$ and where p_{ij} can depend on n. In case that p_{ij} does not depend on n at all we speak about homogenous MC, in the opposite case we speak about non-homogenous MC.

For our needs, a suitable model of the state space is the one in which there are states from which the process will move into states with the opposite trend with a sufficiently high probability.

Data

The study was carried out using only the ČEZ shares for the 11-year period from the beginning of 2006 until the end of 2016. The data were provided by Patria Direct. During this period, the company paid out dividends. Paid and reinvested dividends are calculated. If we invested one unit of capital in ČEZ shares at the beginning of 2006 and reinvested the dividends paid, the value of capital would be 0.886 at the end of 2016. This passive strategy is called Buy & Hold (B&H). The yield of this passive strategy is compared with the yield of our trading strategies. A cumulative change of price Y_t is interpreted as short basic indexes of daily closing prices where the basic period is the day of the minor trend change, i.e. the transition from a decrease into a growth or vice versa. The trend duration is determined by the number of consecutive rising or falling closing prices. Y_t can be calculated according to the following relations:

$$Y_t = Y_{t-1}\frac{P_t}{P_{t-1}} \; if \; \left(P_{t-2} \le P_{t-1} \le P_t\right) or \left(P_{t-2} \le P_{t-1} \le P_t\right)$$
$$Y_t = \frac{P_t}{P_{t-1}} \; otherwise \quad , \tag{1}$$

where P_t is the daily closing price in time *t*, P_{t-1} is the daily closing price in time *t-1* and P_{t-2} is the daily closing price in time *t-2*. We define the state space by values y_t which are the percentage expression of Y_t. A set with eight states will be used for data classification. The state when the share price decreases is labelled D_i. State D_1 is the state with the lowest decrease in price, and, on the contrary, state D_4 is the state with the highest decrease in price. G_i is the state when the share price is rising. G_1 is the state with the lowest increase in price, and, on the contrary, G_4 is the state with the highest increase in price. A general model of the state space is defined by the following principle:

D_4: $y_t < -3\Delta_t$	G_1: $0 \le y_t < 1\Delta_t$
D_3: $-3\Delta_t \le y_t < -2\Delta_t$	G_2: $1\Delta_t \le y_t < 2\Delta_t$
D_2: $-2\Delta_t \le y_t < -1\Delta_t$	G_3: $2\Delta_t \le y_t < 3\Delta_t$
D_1: $-1\Delta_t \le y_t < 0$	G_4: $3\Delta_t \le y_t$

where Δ_t is the width of interval, according to which the individual states are assigned y_t values. In the case of unvarying state space, Δ_t is invariant for all *t*, it is equal to the standard deviation and its value is 1.842. In the case of varying state space, we calculate Δ_t as a moving standard deviation of length 20, which is calculated according to the following formula:

$$\Delta_{t,20} = \sqrt{\frac{1}{20}\sum_{i=0}^{19}\left(y_{t-i} - \bar{y}_{t,20}\right)^2} \quad , \tag{2}$$

where y_t is the daily change in the share price on day *t-i* and $\bar{y}_{t,20}$ is the moving average length *n* on day *t*. Length 20 was chosen more or less randomly, it corresponds to a length of one month, in another study we will try also other lengths. The procedure for assigning the states is shown in Table 1.

Table 1 Procedure for assigning the states

Date	P_t	Daily change %	y_t %	Unvarying model		Varying model	
				Δ_t	state	Δ_t	state
...	...	...	...	...	...	...	...
18-03-2009	722.0	1.91	2.56	1.842	G_2	2.527	G_2
17-03-2009	708.5	0.64	0.64	1.842	G_1	2.561	G_1
16-03-2009	704.0	-1.26	-1.26	1.842	D_1	3.102	D_1

13-03-2009	713.0	2.89	2.89	1.842	G_2	3.125	G_1
12-03-2009	693.0	-0.45	-0.45	1.842	D_1	3.066	D_1
11-03-2009	696.1	3.66	8.28	1.842	G_4	3.071	G_3
10-03-2009	671.5	2.52	4.45	1.842	G_3	2.960	G_2
09-03-2009	655.0	0.46	1.88	1.842	G_2	2.932	G_1
06-03-2009	652.0	1.42	1.42	1.842	G_1	3.252	G_1
05-03-2009	642.9	-3.03	-3.03	1.842	D_2	3.236	D_1
...	...	...	...	...	...	...	...

Source: data Patria, own calculation

Trading strategies

Trading strategies are created on the following principles. When a share price reaches a certain fall level, a buying signal is generated. When a share price reaches a certain growth level, a selling signal is generated. Trading strategies are always implemented according to the following rules:

- One trade (transaction) means the buying and subsequent selling of shares.
- If a buying or selling signal is generated on one day, the trade is implemented for the opening price from the following day.
- The whole capital is always invested (it means that it is theoretically possible to buy a part of a share).
- We do not take any transaction fees into consideration.
- We count and reinvest the paid out dividends after tax in case that we obtained the shares on the record day.
- A short selling is not taken into account.
- Two consecutive purchases are not possible.

The invested capital value is calculated according to the following relation:

$$C_n = C_0 \prod_{i=1}^{n} \frac{S_i + D_i}{B_i}, \tag{3}$$

where C_0 = 1.000 is the initial value of the capital, C_n is the value of the capital after the n^{th} transaction, S_i is the selling price in the i^{th} transaction, D_i is dividend after taxation in case that during the i^{th} transaction there was ex dividend day, B_i is the purchasing price in the i^{th} transaction. To compare the success rate of the individual models, we also determine the average yield of $\bar{C}$, which can be ascertained according to the formula mentioned below:

$$\overline{C} = \frac{C_{D_2-G_2} + C_{D_2-G_3} + \ldots + C_{D_4-G_4}}{9}, \tag{4}$$

where $C_{Di\text{-}Gj}$ is the achieved appreciation of the trading strategy in which the buying signal generates state D_i and the selling signal generates state G_j.

Altogether, we calculate three business models. In the first model, certain states generate the buying and selling signals. In the second model, the buying and selling signals are generated when a certain level of growth or decrease has been exceeded. In the third model, the signal is generated only after the end of the growth and decrease, with the minimum required level of growth or decrease being reached.

3 Results and Discussion

For each model we calculated 9 (3x3) trading strategies. The buying signals were gradually generated by states D_2, D_3, D_4 and the selling signals were gradually generated by states G_2, G_3, G_4. States D_1 a G_1 were not used for generating signals, as a certain minimum decrease or growth of the share price was required. Firstly, we examine probabilities of transition between individual states.

Transition probabilities

As well as Svoboda (Svoboda, 2016), we firstly carry out filtration of MC. Filtration is leaving out the consecutive, identical states. By means of filtration we remove the states where the share price stagnates (or, more precisely, it changes only a little within the same trend). These states are not interesting from the trading point of view. To illustrate this, let us give a part of the chain before filtration: … D_4, G_1, G_1, G_1, G_2, D_1, D_1, D_2, G_2, D_2, D_2, … and after the filtration … D_4, G_1, G_2, D_1, D_2, G_2, D_2, ... We then determine a probability matrix of transition **P** for the filtrated MC. The transition probabilities are given in Table 2. The found probabilities are shown only up to two decimal places, and therefore the sum of probabilities may not equal 1 precisely. Direct transitions between some states are impossible and in these impossible transitions there is null without decimals. Columns $\sum D_i$ and $\sum G_i$ state the probability of continuance in a trend or a change in a trend. The number of occurrences of individual states is given in the last column.

Table 2 Transition probabilities

		D_4	D_3	D_2	D_1	G_1	G_2	G_3	G_4	$\sum D_i$	$\sum G_i$	n
D_4	unvarying	0	0	0	0	0.36	0.45	0.13	0.06	**0.00**	**1.00**	64
	varying	0	0	0	0	0.54	0.31	0.14	0.01	**0.00**	**1.00**	106
D_3	unvarying	0.29	0	0	0	0.55	0.13	0.03	0.00	**0.29**	**0.71**	106
	varying	0.43	0	0	0	0.38	0.16	0.03	0.00	**0.43**	**0.57**	158
D_2	unvarying	0.08	0.26	0	0	0.54	0.10	0.01	0.00	**0.35**	**0.65**	284
	varying	0.09	0.30	0	0	0.43	0.16	0.02	0.00	**0.39**	**0.61**	322
D_1	unvarying	0.01	0.03	0.31	0	0.55	0.09	0.01	0.00	**0.35**	**0.65**	537
	varying	0.02	0.06	0.33	0	0.44	0.13	0.01	0.00	**0.41**	**0.59**	471
G_1	unvarying	0.00	0.01	0.09	0.52	0	0.33	0.04	0.01	**0.63**	**0.37**	530
	varying	0.00	0.04	0.13	0.41	0	0.33	0.09	0.00	**0.58**	**0.42**	464
G_2	unvarying	0.00	0.01	0.11	0.55	0	0	0.25	0.08	**0.67**	**0.33**	291
	varying	0.00	0.02	0.13	0.44	0	0	0.30	0.11	**0.58**	**0.42**	325
G_3	unvarying	0.01	0.02	0.10	0.51	0	0	0	0.37	**0.63**	**0.37**	114
	varying	0.00	0.02	0.17	0.46	0	0	0	0.35	**0.65**	**0.35**	175
G_4	unvarying	0.03	0.03	0.36	0.59	0	0	0	0	**1.00**	**0.00**	75
	varying	0.00	0.04	0.37	0.59	0	0	0	0	**1.00**	**0.00**	101

Source: own calculation

The results in Table 2 show that the unvarying model has a higher probability of the trend change, because the trend probability values are around 0.66, while the varying model values are around 0.60. Therefore, the model with unvarying state space should theoretically be more suitable for speculative trading.

Next, we will examine the evaluation of individual models. The total appreciation and the number of realized transactions were calculated for individual trading strategies in each model. Cases where the model with varying state space exceeded the model with unvarying state space are marked in bold type. Also the average yield and its standard deviation are calculated for each model. Its development over time, including its comparison with B&H strategy are graphically represented.

Model 1

In this basic model, the individual buying orders are sequentially generated directly by states D_2, D_3 and D_4, and the selling orders are gradually generated directly by states G_2, G_3, and G_4. The achieved appreciation is presented in Table 3.

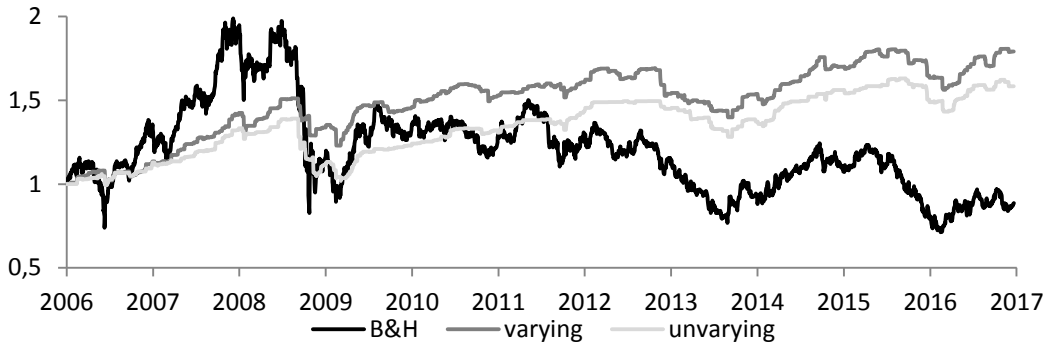
Table 3 Results of Model 1

	sell	G_2		G_3		G_4	
buy		C_n	**n**	C_n	**n**	C_n	**n**
D_2	unvarying	1.764	189	1.546	101	1.321	62
	varying	1.178	218	1.504	143	1.298	87
D_3	unvarying	2.167	88	0.923	61	1.190	46
	varying	2.147	135	**2.055**	101	**1.635**	73
D_4	unvarying	2.115	56	1.586	43	1.643	38
	varying	**2.613**	91	**2.064**	81	1.628	56

Source: authors, own calculation

The results in Table 3 show that all trading strategies with both models have outperformed the B&H strategy. The unvarying state space model had an average value of 1.791 and a standard deviation of 0.434. The unvarying state space model had an average value of 1.584, and a standard deviation of 0.383. The development of the average value of invested capital over time for both models is shown in Figure 1.

Figure 1 Development of capital value in model 1



Source: authors, own calculation

Model 2

A drawback of Model 1 is the fact that a signal does not have to be generated even if there is a marked price change. For example, when generating the selling signal by G_2, the selling signal was not generated in the following sequence of states G_1, G_3, G_4, G_4. This shortcoming is eliminated in model 2, where the B_i state is a minimum decrease to generate the signal and S_i is a minimum growth to generate the signal. That is $S_2 = \{G_2, G_3, G_4\}$; $S_3 = \{G_3, G_4\}$; $S_4 = \{G_4\}$; $B_2 = \{D_2, D_3, D_4\}$, etc. The obtained results are shown in Table 4.

Table 4 Results of Model 2

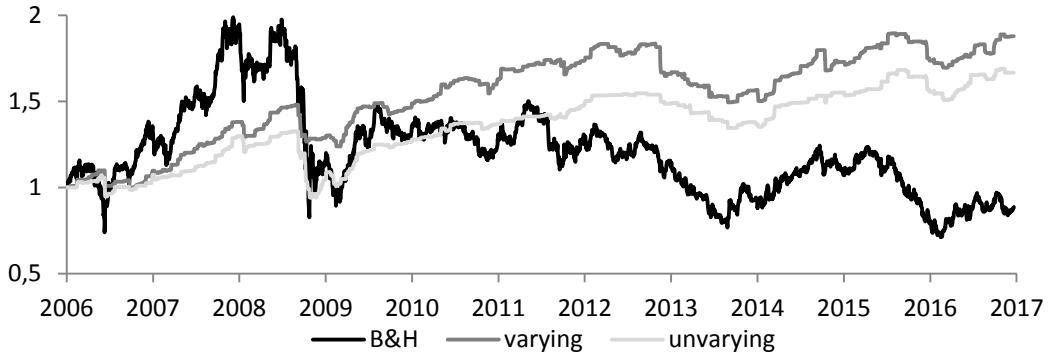
	sell	S_2		S_3		S_4	
buy		C_n	**n**	C_n	**n**	C_n	**n**
B_2	unvarying	1.319	233	1.434	129	1.246	67
	varying	1.140	297	**1.522**	182	**1.525**	93
B_3	unvarying	2.475	124	1.410	88	1.121	54
	varying	2.437	173	**1.965**	130	**1.749**	79
B_4	unvarying	2.133	61	2.217	54	1.643	38
	varying	**2.342**	96	**2.587**	86	1.628	56

Source: authors, own calculation

We can conclude from the results in Table 4 that all the trading strategies with both models have once again outperformed the B&H strategy. The average value of capital in the unvarying state space model was 1.877 and the standard deviation was 0.461. The

average value of capital in the unvarying state space model was 1.667 and the standard deviation was 0.458. The development of the average value of the invested capital over time for both models is shown in Figure 2.

Figure 2 Development of capital value in model 2



Source: authors, own calculation

Model 3

In the last model, we use the full length of the minor trend. The trading signal is generated only after the change in the minor trend. Thus, for example, the S_2 sales signal at time *t* occurs if at *t*-1 the process is in one of states G_2, G_3, and G_4 (the minimum growth at G_2 level) and at time *t* is the process in one of states D_1, D_2, D_3, and D_4 (the declining trend started). Similarly, for example, the buying signal B_3 at time *t* occurs if at time *t*-1 the process is in one of states D_3 or D_4 (the minimum fall to level D_3) and at time *t* the process is in one of states G_1, G_2, G_3, and G_4. The results are shown in Table 5.

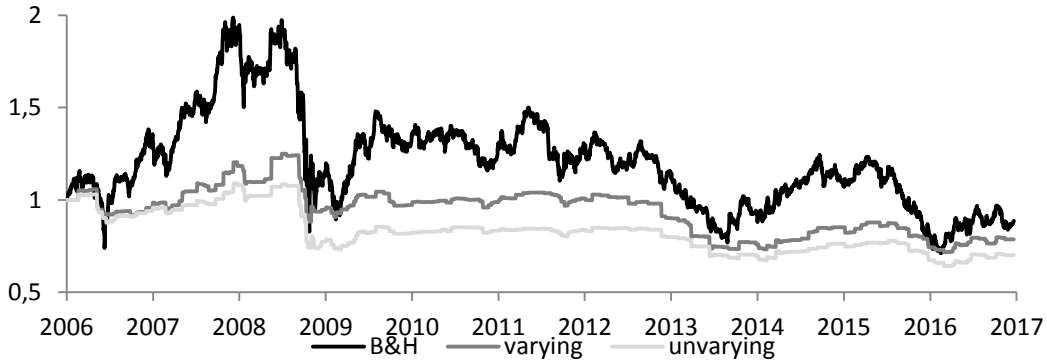
Table 5 Results of Model 3

	sell	**S_2**		**S_3**		**S_4**	
buy		**C_n**	**n**	**C_n**	**n**	**C_n**	**n**
B_2	unvarying	0.878	672	1.077	342	1.075	147
	varying	0.878	672	1.077	342	1.075	147
B_3	unvarying	0.504	325	0.659	233	0.763	129
	varying	0.472	391	0.628	253	0.806	126
B_4	unvarying	0.441	139	0.584	124	0.467	88
	varying	0.744	204	1.098	163	0.810	97

Source: authors, own calculation

In most trading strategies, Model 3 did not outperform the B&H strategy. It turned out that what we got in the remaining duration of the trend was lost at the start of the opposite trend. The average value of capital in the unvarying state space model was 0.787 and the standard deviation was 0.144. The average value of capital in the varying state space model was 0.702 and the standard deviation was 0.157. The development of the average value of invested capital over time for both models is shown in Figure 3.

Figure 3 Development of capital value in model 3



Source: authors, own calculation

4 Conclusions

In this initial study, we compared the profitability of trading strategies using MCA with unvarying state space and varying one to generate trading signals. The study has proved that trading models with varying state space, on the average, outperform trading models with unvarying state space. Our assumption that models with varying state space may be more suitable for modeling the short-term development of share prices than models with unvarying state space has been confirmed. The promising results of this study are the reason why we are going to continue in the research in the future. We intend to concentrate on the following areas:

- to find the best length of the moving standard deviation;
- to confirm the results of this study by applying them to other shares;
- to perform a detailed analysis of the individual trading strategies and to find out the ratio of profitable transactions and the average yield stemming from profitable trading transactions;
- to perform a more detailed analysis of successfulness of trading strategies based on growth, digressive and sideway primary trends.

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Analysis of quality of life in Poland based on selected economic indicators

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Abstract: *The standard of living in Poland is diverse. This level is determined by many factors. The article analyzes the level of life of the population in particular voivodships. Attention was drawn to several indicators that determine the quality of life. The article analyzed, among other things, income and wealth, health status, education in particular voivodships. For the analysis in the paper the statistical data has been used from the Central Statistical Office of Poland (Statistical Yearbook of the Regions – Poland 2016). The object of the analyses were all the Polish voivodships in 2015. Indices were selected so the provinces could be identified with high, medium and low living standard.*

Keywords: quality of life, the health of the region, the level of poverty, education level

JEL codes: I00, I30, I11, I32, I20

1 Introduction

Quality of life is important not only for individuals but also for the society as a whole. At a time when basic vital needs are met, every human being begins to strive for "higher" goals in life, such as happiness, self-fulfilment, independence, the need for knowledge and aesthetics. People who feel that their quality of life is high have a better approach to challenges, life problems, are more productive at work, more often and more actively get involved in social activities. A society gains more benefits from people with a higher quality of life than from those with low one.

Quality of life depends on external and internal factors. External factors are established by the community in which we live, e.g. income, material possessions, social welfare, medical care, sense of security. Internal factors relate to an individual, for example, his or her optimism, adaptation to the environment, a sense of satisfaction with one's achievements, health condition, way of living.

The purpose of the article is an attempt to analyse the quality of life in Poland in particular voivodships. The quality of life was examined in economic terms. Indicators determining the level of poverty, health care and education level were selected for the analysis.
Data from the Central Statistical Office in Poland were used in the passage.
This article is of a review nature.
Many authors are investigating the quality of life.(Glebocka, Gawor, 2008), (Panek, 2016).

2 Material situation of the population in Poland

An important area for determining the economic level of citizens is the level of satisfaction of material needs and the condition of material possessions.

The first measure determining the material level of the population is the average gross wage. (Panek, 2014)

Table 1 shows the average gross remuneration in 2015 in individual voivodships in Poland.

Table 1 Average monthly gross wages and salaries in 2015 in Poland

	voivodship	**PLZL**	**Euro**
1.	**dolnośląskie**	3960,48	942,97
2.	**kujawsko-pomorskie**	3369,85	802,35
3.	**lubelskie**	3497,98	832,85
4.	**lubuskie**	3375,72	803,74
5.	**łódzkie**	3574,72	851,12
6.	**małopolskie**	3667,02	873,1
7.	**mazowieckie**	4801,53	1143,22
8.	**opolskie**	3565,04	848,82
9.	**podkarpackie**	3371,47	802,73
10.	**podlaskie**	3455,57	822,75
11.	**pomorskie**	3851,68	917,07
12.	**śląskie**	3969,67	945,16
13.	**świętokrzyskie**	3374,56	803,47
14.	**warmińsko-mazurskie**	3324,04	791,44
15.	**wielkopolskie**	3543,24	843,63
16.	**zachodniopomorskie**	3526,96	839,75
	Poland	3907,85	930,44

Source: Statistical Yearbook of the Regions – Poland 2016

The average wage in Poland is PLN 3,907.85 (EUR 930). The highest average wage is in the mazowieckie voivodship: PLN 4,801.53 (EUR 1,143.22), then in the śląskie voivodship PLN 3,969.67 (EUR 945.16), with dolnośląskie to follow with the average wage of PLN 3,960.48 (EUR 942.97). The lowest income is earned by the population of warmińsko-mazurskie voivodship, where the average wage is PLN 3,324.04 (EUR 791.44), with slightly more earned by the residents of kujawsko-pomorskie: PLN 3,369.85 (EUR 802.35) and of the podkarpackie voivodship PLN 3,371.47 (EUR 802.73). The above data shows that the level of earnings in individual voivodships in Poland is varied. The difference between the average wages between the highest-earning and the lowest-earning voivodships is PLN 1,477.49 (EUR 351.78). That makes a significant difference.

Another measure that determines the economic level of citizens is the possession of selected material goods, i.e. washing machine, car, computer and usable floor space per person. The table below shows the percentage of persons who own an automatic washing machine, a car, a computer in particular voivodships in Poland. The last column of the table below shows the usable living space in m^2 per person.(Bieńkuńska , 2017)

Table 2 Households equipped with selected durable goods in 2015

voivodship	automatic washing machine	passenger car	personal computer	**useful floor area in m^2 per person**
dolnośląskie	96,9 %	59%	73,8%	28,3
kujawsko-pomorskie	95,3%	56,1%	71,3%	24,5
lubelskie	91,7%	66,4%	70,5%	27,4

lubuskie	96,7%	63,7%	75,3%	26,3
łódzkie	93,7%	65,0%	73,4%	27,6
małopolskie	95,7%	62,2%	76,3%	26,5
mazowieckie	95,7%	64,7%	78,5%	29,5
opolskie	97,6%	64,3%	70,7%	28,4
podkarpackie	92,5%	72,2%	75%	24,7
podlaskie	91,9%	63,4%	67,9%	28,2
pomorskie	95,9%	58,1%	76,2%	26
śląskie	96,8%	62,5%	75,9%	26,8
świętokrzyskie	91,9%	63%	67,9%	25,9
warmińsko-mazurskie	95,5%	55%	68,4%	23,9
wielkopolskie	97,7%	68%	74,4%	27,4
zachodniopomorskie	97,5%	54,9%	72,3%	26,3
Poland	95,5%	62,8%	74,2%	27

Source: Statistical Yearbook of the Regions – Poland 2016

Analysing the above data, it is noticeable seen that the possession of material goods is not always correlated with the level of income in a given voivodship. For example, the highest percentage (72.2%) of persons with cars is in the podkarpackie voivodship, while at the same time it is the voivodship with one of the lowest incomes in Poland. It is also podkarpackie that has a high percentage of people owning a personal computer - 75% of the population. A similar situation is in the lubuskie voivodship, where wages belong to the lowest in Poland, while the possession of selected goods is at quite a good level. E.g. automatic washing machine is owned by 96.7% of the population of this voivodship. Also a high percentage of ca. 75.3% possesses a PC.

Mazowieckie voivodship has the largest in Poland percentage of people with a computer: 78.5% of the population. Also the best housing conditions in Poland are in Mazowieckie voivodship. There is 29.5 m^2 of useful floor area per person.

Another important indicator that determines the economic level of a given society is the poverty rate. It provides information on what percentage of people in a given population is at the risk of poverty. It is expressed in percentages. The average of 14% of population is at the risk of poverty in Poland. In 2015 it was assumed that the poverty threshold for a single-person worker's household was PLN 1,043 (EUR 248.33). A person whose income is below this amount is at risk of poverty.(Dercon, 2005)

The table below shows the percentage of population at risk of poverty by voivodships.

Table 3 Percentage of people at risk of poverty

voivodship	
dolnośląskie	11%
kujawsko-pomorskie	17%
lubelskie	27%
lubuskie	11%
łódzkie	15%
małopolskie	15%
mazowieckie	11%

opolskie	11%
podkarpackie	21%
podlaskie	17%
pomorskie	13%
śląskie	9%
świętokrzyskie	24%
warmińsko-mazurskie	17%
wielkopolskie	13%
zachodniopomorskie	16%
Poland	14%

Source: Statistical Yearbook of the Regions – Poland 2016

Based on the above data it can be stated that the proportion of persons at risk of poverty is very diverse. The worst situation is in lubelskie voivodship, where as much as 27% of the population lives below the poverty threshold. Another voivodeship with a high percentage of people living below the poverty threshold is the świętokrzyskie voivodship, where 24% of the population is at the risk of poverty. A high 21% percentage of poverty is also present in the podkarpackie voivodship. The best situation is in the śląskie voivodship, where the proportion of persons at risk of poverty is 9%. Fair situation is in mazowieckie and opolskie voivodships, where the proportion of persons at risk of poverty is 11%.

3 Level of health care in individual voivodships

Other indicators that show the quality of life in a given country and on the health of a society are the life expectancy of the population and the infant mortality rate per 1,000 live births. [Dolan, Olsen, 2002) The longer the average life expectancy in a given country, the health of the region is higher. On the other hand, a low infant mortality rate per 1,000 live births indicates a better health of the region.

Table 4 The average life expectancy in 2015

voivodship	man	women
dolnośląskie	73,2	81
kujawsko-pomorskie	73,5	81,3
lubelskie	73,3	82,4
lubuskie	72,8	80,9
łódzkie	71,4	80,4
małopolskie	75,1	82,4
mazowieckie	74,0	82
opolskie	73,8	81,4
podkarpackie	74,9	82,5
podlaskie	73,8	82,6
pomorskie	74,2	81,4
śląskie	73	80,3
świętokrzyskie	73	82,2

warmińsko-mazurskie	72,7	81,1
wielkopolskie	73,7	81,2
zachodniopomorskie	73,5	81,1
Poland	73,6	81,6

Source: Statistical Yearbook of the Regions – Poland 2016

The longest life expectancy of men is in małopolskie voivodship and lasts 75.1 years. Then there are the provinces of podkarpackie, with the average life expectancy of men of 74.9, and pomorskie voivodship with the average life expectancy of men of 74.2 years. It is clearly visible that the health level of these regions is better than others. The reason for this situation is that in these voivodships the condition of the natural environment is better than in other regions.

The worst health situation is in the łódzkie voivodship, where the average life expectancy for men is 71.4 years.

Analysing the average life expectancy of women, it can be seen that the highest life expectancy of women is in podlaskie (82.6), podkarpackie (82.5), małopolskie (82.4) and lubelskie (82.4). All those Polish regions are characterized by a better condition of the environment than others. This is especially visible in the average age of women in the śląskie voivodship. At 80.3 years it is the lowest in comparison with other regions of Poland. This region is heavily polluted, hence the health level of this area is one of the worst in Poland.

This situation is particularly evident in the data below, which illustrate the mortality of infants per 1,000 live births. In Silesia this indicator is 4.7 (IMR per 1,000 live births) and is one of the highest in Poland. This is due to the poor condition of the environment. It is also confirmed in this aspect that the worst health situation is in the łódzkie voivodship where the IMR is 4.8 (infant mortality rate per 1,000 live births). The best situation is in the małopolskie voivodship, where the mortality rate of infants is 2.8 (IMR per 1,000 live births).

Table 5 Infant deaths per 1000 live birth

voivodship	
dolnośląskie	3,8
kujawsko-pomorskie	4,1
lubelskie	3,8
lubuskie	4,1
łódzkie	4,8
małopolskie	2,8
mazowieckie	3,8
opolskie	4,1
podkarpackie	4,1
podlaskie	4,5
pomorskie	3,7
śląskie	4,7
świętokrzyskie	3,8
warmińsko-mazurskie	4,0
wielkopolskie	4,5

zachodniopomorskie	3,6
Polska	4,0

Source: Statistical Yearbook of the Regions – Poland 2016

4 The situation of higher education in Poland

The situation of higher education in particular voivodships varies. The table below shows the number of higher schools in particular voivodships, the number of academic teachers and the number of graduates in the academic year 2014/2015.

Table 6 Higher education institutions in 2015/2016 academic year

voivodship	university	academic teachers	graduates*
dolnośląskie	36	8627	34717
kujawsko-pomorskie	18	4181	17590
lubelskie	18	6374	22700
lubuskie	6	1189	4821
łódzkie	26	6226	21905
małopolskie	31	12610	50358
mazowieckie	102	17428	70323
opolskie	6	1528	8424
podkarpackie	14	3028	18970
podlaskie	16	2773	10855
pomorskie	27	5841	24427
śląskie	38	8725	38683
świętokrzyskie	14	1774	9779
warmińsko-mazurskie	7	2443	10214
wielkopolskie	37	9318	38062
zachodniopomorskie	19	3855	13159
Poland	415	95919	394987

Source: Statistical Yearbook of the Regions – Poland 2016 (*graduates in the academic year 2014/2015)

Analyzing the above data it can be concluded that the best situation of higher education in Poland is in the province mazowickie, śląskie, wielkopolskie, dolnośląskie. Most of the higher schools are in the capital of Poland, in Warsaw. There are also the most academic teachers and graduates. Second place in terms of the number of academic teachers and graduates occupy the młopolskie voivodeship. The smallest institutions of higher education, academic teachers and graduates of higher schools are in the province of lubuskie.

5 Conclusions

Based on the analysis of various indicators, it can be stated that the quality of life in individual voivodships in Poland is varied. The voivodships which are on the best material level are mazowieckie, śląskie and dolnośląskie. The worst material situation is in lubelskie, świętokrzyskie and podkarpackie voivodships.

On the other hand, the best health situation of the population is in the małopolskie, podkarpackie and podlaskie voivodships. These voivodships enjoy a better condition of their natural environment. The worst health situation is in the łódzkie and śląskie voivodships. These are the voivodships characterized by high environmental pollution due to the large number of industrial plants.

It is clear that it is impossible to unequivocally determine which voivodship has the highest level of the quality of life. It is not always that the voivodships with a high material status have healthier population, as we see on the example of the śląskie voivodship.

The best level of education is in mazowieckie, małopolskie, dolnośląskie and śląskie voivodships. These are the regions with the highest number of universities. It is clear that wages are also highest in these voivodships. That is caused by the fact that most educated people decide to stay in these academic cities and undertake a well-paid job.

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Effective Risk Culture in Banks: Responsibilities and boundaries of the Risk Management

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Abstract: *The Financial Crisis of 2007-09 showed, that a not appropriate risk culture as well as deficiencies in the risk management played a major role in banking failures. To establish a "good" risk culture has become an object of focus by regulators. They are focusing on the bank's norms, attitudes and behaviors, linked with the risk taking and risk awareness. There is not an ideal, how banks should manage their risk taking, but it becomes clear, that the enterprise-wide risk oversight should be improved, the chief risk officers' role in corporate governance should be strengthened. Effective risk culture contributes to the bank's ability to act with risk changes. Because taking risks is a part of the bank business, there still will be a chance, even if a small one, that some undesirable outcomes will appear. A good risk management contributes to avoid unpredictable and unwanted developments. The appropriate risk management framework must be designed in accordance with the banks optimal risk level and the business strategy. To change a risk culture in a bank is not an easy task, because it requires not only improvements in risk measurement, governance and communication process. Behavioral aspects should also be taken into account. The cycle of an appropriate risk level setting in line with the business strategy, risk taking in line with value-growth opportunities and timely, transparent and honest communication of risks should be reconsidered. The risk management should gain a higher weight in the decision-making process. This paper provides an explanatory framework for the setting the right risk level and discuss the responsibilities and boundaries of risk management in the new light of the current regulatory environment. It shows, that risk management is closely related to governance structure and business model.*

Keywords: risk taking, corporate governance, risk management, Value at Risk, banking regulation

JEL codes: G21, G28, G32, G34, C15

1 Introduction

The discussion about risk culture is not a new theme as it is not a new risk management approach. Despite it, till now, it is still a very relevant issue. There are many international institutions as International Monetary Fund (IMF), The Institute of International Finance (IIF) or Financial Services Authority (FSA) among other researchers and regulatory authorities, who dedicated their work to this subject. Their findings show, that corporate culture plays a substantial role by taking risks as well as it can foster fraudulent employee behavior.

The financial crisis 2007-08 showed shortcomings in identification and assessment of risks as a possible consequence of a week risk control and risk culture. (Power et. al., 2012, FSB, 2014). The aim of the new regulatory requirements, as European market infrastructure regulation (EMIR), Basel III and its implementation into the EU law, Bank Recovery and Resolution Directive (BRRD, 2014/59/EU), is to avoid a similar crisis as well as to restore public trust in the banking system and to enhance financial stability. The banks have to satisfy a range of liquidity and capital ratios to strengthen their capital basis and make themselves more resilient. To establish a strong risk management and an effective and an exactly fitting risk culture is necessary.

Risk culture as a part of the corporate culture

The lived culture of an organization affirms every task that should be done, every decision should be made. It also determines the meaning of risk and how to handle it. (Muchova, Klimikova, 2016, p.3.). There is an overall accepted definition of risk as a deviation of a target value. But speaking about risk, most people think about danger. The positive risk, called chance, seems not to be the point of interest. Which role the risk, in the sense of the definition above, plays in an organization and when it should be taken or mitigated, depends on the personal judgement. The perception of the company leaders affect directly the role of risk and risk management.

Risks are usually interconnected. The change of one risk type causes changes in risk of another type. How to deal with these changes, especially how are they communicated across bank and which are incentives for risk-taking is a part of risk culture. There is not a general definition of a risk culture yet and there probably is not a universal risk culture that fits all institutions, because it depends on external and internal factors. (For definitions of organizational culture, see f. e. Power et. al., 2012, p. 16.):

The Basel Committee on Banking Supervision (BCBS) who plays a major role in improvement the quality of banking supervision worldwide, deals with the question of the risk culture in bank institutions. In the GL 328 (2015, p. 2) the term risk culture is defined as: "A bank's norms, attitudes and behaviors related to risk awareness, risk-taking and risk management, and controls that shape decisions on risks. Risk culture influences the decisions of management and employees during the day-to-day activities and has an impact on the risks they assume."

The Financial Stability Board (FSB, 2014, p. 1) highlights the connection between the risk culture and an effective risk management: "A sound risk culture consistently supports appropriate risk awareness, behaviors and judgements about risk-taking within a strong risk governance framework. A sound risk culture bolsters effective risk management, promotes sound risk-taking, and ensures that emerging risks or risk-taking activities beyond the institution's risk appetite are recognized, assessed, escalated and addressed in a timely manner."

Consequently, risk culture supplements the quantitative risk management framework with behavior-related components.

Two important inquests relating to an effective risk culture

The first step to reach an effective risk culture is to define what the notion "risk culture" exactly means and what characteristics does it include. There is a question, if a uniform definition fits for all banks equally. Since some recent studies show the heterogeneity in the risk culture among the financial institutions (Sheedy and Griffin, 05/2016), the answer seems to be "no". Sound risk culture and a proper risk-taking behavior are supported by an effective risk control function, a framework for an appropriate risk appetite and remuneration practices (FSB, 04/2014). There are also various factors which influence the lived risk culture, as:

- Societal influences: Country, technology, economic/market environment,
- Industry influences: Regulatory requirements, competition, clients,
- The enterprise patterns itself: Ownership structure, corporate strategy and politics, corporate structure, internal communication, lived ethics, risks and transparency about taken risks or handling risks, risk bearing capacity, management,
- Individuals: Social background, qualification, age, nationality, family, position in the company, individual merits.

Alongside this multidimensionality, there are two different views on a risk culture, which affects its implementation: the regulatory view and the bank view. For the regulatory purpose, it has to be measurable. It should be audited and examined. The regulatory

authority should be able to set up suitable improvement suggestions. A financial institution puts prevention of risks and controlling of existing risks in the foreground. The balance between risk taking, which is necessary for the further stage, competitiveness as well as for performance improvement and an appropriate risk limitation should be found. Hence, which is an "appropriate" level of risk depends on the business model and strategy of the respective financial institution. Whereas, the role of a risk management should be intensified. As an integral part of the bank, it has to reach more weight in the decision-making process and be fully in line with the risk culture.

The second step is to answer the question, how to establish or redefine risk culture in the financial institution and how to deepen the acceptance of the risk management role. There are different approaches as adopting and holding on measures, for example ratios, or installation of rules for a requested behavior, defining of incentive structures and an appropriate remuneration. Focusing this theme, it is necessary to look more on the motivation for a behavior which supports a risk-aware working atmosphere.

The answers in the literature

In the literature both inquests were examined. Until now, no distinct answer could be showed. In 2013 the Financial Stability Board (FSB) presented four important indicators for appraisal a good risk culture: (i) the ton from the top, (ii) accountability, (iii) effective communication and challenge, (iv) incentives. The guidance shows standards which helps regulatory authorities to achieve a picture about the lived risk culture in the investigated financial institution.

In 2014 Ernest Young (EY) interviewed 52 banks around the world to investigate key attributes of a sound risk culture and the relevance of an open communication, which should be reinforced by the management acting. The authors find, that the risk appetite, positioned in all business activities consistently, is an important indicator of a good risk culture.

The Group of Thirty (G30, 2015) interviewed about 80 employees in central banks, regulatory bodies and governance figures in 17 countries. On this base, the study includes specific recommendations for the board members and regulatory authorities. The authors state four driver of a good risk culture: (i) „Governance and accountability", (ii) „Performance Management and Incentives", (iii) „Staff development" and (iv) „Three lines of defence".

The aim of the Basel Committee on Banking Supervision Guidelines, GL 328 (BCBS, 2015), is to underline some important components of risk governance, as risk appetite, but also to reinforce risk governance responsibilities of the board, its specific role, board risk committees, senior management and the control functions. GL 328 describes 13 principles, where the increased focus on responsibilities of different parts of bank for addressing and managing risk and the compliance function are highlighted.

Sheedy and Griffin (2014) measure the risk culture, based on interviews, by using the "risk culture score". Their results show marked differences in the risk culture among the banks, but the relevant factors are not available from publicly accessible sources.

Fritz-Morgenthal, Hellmuth and Packham (2016) closed this gap and defined risk culture indicators, which can be derived from banks' public information. They examine 81 banks, which were directly supervised by the European Central Bank (ECB). For every bank, they determine its special risk culture score and validate it against outcomes of the Comprehensive Assessment and ECB-Stress-test. Their results show a week, but visible correlation between the risk culture indicator and the stress-test indicator. A significant contribution to explain the stress-test results presents the risk indicator governance (which comprise for example a qualification and an appropriate size of board and supervisory council) and the effect of regulatory adjustments. Among the ratios, the leverage ratio is the one with the strongest impact on the risk culture score. It is interesting, that in this study, the risk culture indicators of a stable bank structure are

connected to the successful ECB-stress-test. Even if these outcomes not necessarily display a causal relation, they give useful clues for the measuring of financial institutions' risk culture.

Power, Ashby and Palermo (2012) in an interim research study, which base on talks to different organizations as banks, insurers and their advisors as well as readings of academic studies, observed how the risk culture manifests within an entity and show it as the outcome of a series of trade-offs across a number of dimensions. They also identify pivotal subjects that may impede the development of a good risk culture.

Landier, Sraer, Thesmar (2009) focus on organization design and show a model which helps to explain risk management failures. They found, that increase in the risk of assets traded reduces the impact of risk management independence and that risk-budgets contingent on information help to implement the efficient asset choice, when the information is not noisy. They also show, that an increase in side payments (as career opportunities) make risk management ineffective.

Stulz (2016) provides the framework for a better understanding of the risk management limitation from the perspective of increasing the bank's shareholder value. He shows, that risk management can destroy value, if (i) it fails to ensure that the bank has the right amount of risk and (ii) it prevents risks which would be valuable. Risk measurement tools play an important role for incentives and for the culture. Risk-taking decisions must be assessed in line with the overall bank risk: If a good risk management is in place, there is no reason for a bank to have low risk.

This paper is organized as follows: The first section introduces risk culture as a part of an organization culture and effective risk culture as a building block for strong risk management, the second section describes methodology, the third section depicts the framework for a risk culture focusing the role and responsibilities of risk management, the final section concludes and outlines further research areas.

2 Methodology and Data

This paper provides an explanatory framework for a link between an effective risk culture and a comprehensive risk management in the new light of the current regulatory environment. The aim of this paper is to offer a better understanding of the underlying aspects of risk management responsibilities and boundaries in respect to a risk culture. It highlights the relevance of the understanding of risk taking. The following approach also shows connection of rules and quantitative methods in the risk management. For this reason, the explanatory manner is more suitable than a normative. The methods of description, analysis, synthesis and deduction are used.

3 Results and Discussion

This section outlines an approach for a risk management as an integral part of a business strategy, its responsibilities and boundaries and the influence of a risk culture.

The base of a comprehensive risk management is an effective risk culture

Risk culture is a multidimensional concept. It includes risk and culture which are complex scopes. To manage risk culture would imply, that it can be reduced to some observable properties which can be audited. Additional to quantitative assessment of a risk culture as the calculation of ratios, the qualitative appraisal is necessary: the identification of risk culture indicators, which base on binding behavior rules, ethics and the risk culture in the risk management. Regarding ECB Supervisory Review and Evaluation Process (SREP) requirements, regulators have to intensify focus on this subject. "Financial and non-financial incentives play in misconduct a crucial role" said Danièle Nouy, the head of ECB-Banking supervision. (EZB, 21.06.2016) Referring to Bundesanstalt für Finanzdienstleistung (BaFin) Conference in May 2016, the assessment of internal

governance adequacy and of internal control system should focus following scopes, relating to risk: (https://www.bafin.de/SharedDocs/Downloads/DE/Rede_Vortrag/dl_160504_Neues_SREP_Konzept_vortrag_1.pdf?__blob=publicationFile&v=, p. 12.)

- Corporate- and risk culture,
- Structure and execution of tasks of the corporate management (executive board, supervising body),
- Risk management: Risk appetite, risk strategy, ICCAP and ILAAP, Stress-test,
- Internal control system: Risk governance and controlling processes.

The European directive Capital Requirements Directive IV (CRD IV), recital 54, claims the introduction of standards for an effective risk control through the executives. These principles, as a part of risk management, should promote a sound risk culture. The role of risk management is also one of the objectives of BCBS GL 328.

If an organization wants improve its risk management, it has to redesign its risk culture as well and vice versa. An effective risk culture means the ability to take valuable risks, which the financial institution is able to manage in the way to enable an achievement of a sustainable business strategy. (Fritz-Morgenthal et. Al., 2016, p. 72.) For this purpose, two initial questions have to be answered:

1. The already lived risk culture and the role risk management plays in the financial institute have to be understood,
2. The vision of the target risk culture: The aim, how the institute wants to handle it's risks in the future should be set. Especially: Is the understanding of risk still the same? How should be the risk taking/risk reduction interpreted through the organization in the future?

The way, how a financial institution fulfills the regulatory requirements facing risk culture is up to it. (Muchova, Klimikova, 2016, p. 6.) The following steps outline an approach for a realignment of the risk culture:

Step 1: Define the risk.

Step 2: Define what kind of a risk culture will suit for the individual business strategy.

Step 3: Identify paths for the implementation of the risk culture and the communication.

Step 4: Deploy arrangements for encouragement of requested behavior.

Step 5: Specify control mechanisms and documentation.

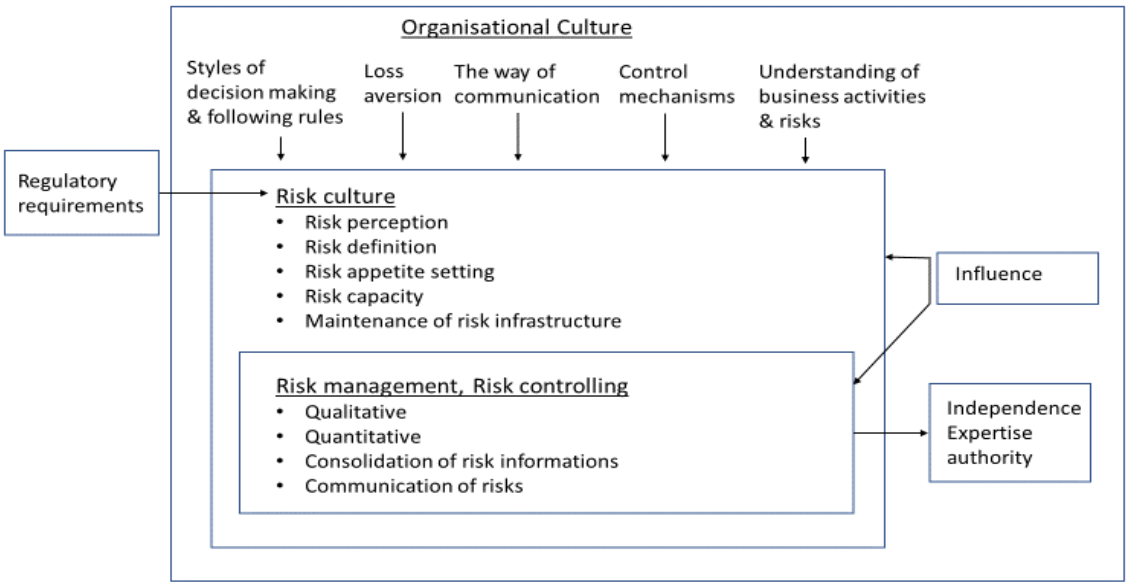
Step 6: Ensure a backflow of the risk culture into the decision-making process.

Hence, there are formal and informal processes to be set. An important point about the fulfilling the regulatory requirements is to be aware how the institution behave to rules, because rules influence behavior. But the behavior is influenced by culture background, relationships, kind of decision making too. The risk culture, as the steps above may suggest, cannot be rearranged only by following an ordinance. The behavior – how the management and the employees are used to apply rules should be investigated as well, when the risk culture program is operationalized. The compliance focused acting is not enough anymore. Values and key risk driving events gain importance and should be flexible applied within the guidelines. The balance of using rules and good judgement should be found, factors that create risk, especially a behavioral one, have to be identified.

Regulators enforced, among others, rules for sanctioning excessive risk-taking behavior, as cutting bonus payments (a part of CRD IV) and the reversal of proof for senior management, who have to prove they have done everything to ensure a rule-consistent behavior of their staff. The assumption for these rules to work is, that sanctioning of misbehavior leads to improvement of risk culture. (Fritz-Morgenthal et. Al., 2016, p. 73)

The following figure shows the descriptive model of risk management in a risk culture framework.

Figure 1 Explanatory Model of Risk Management in Risk Culture Framework



Source: Own processing.

The approach: Risk Management as an integral part of a financial institution

Since taking risks is the core of the bank business, the first step to imbed the risk management into a risk culture is to define risk on the organizational level. As a part of the business strategy should be designated, which risks the company intends to take and which are not wanted. (Stulz, 2016, p. 43.) The requested risks accompany all activities, which can be profitable on a special probability level. For this purpose, questions about how to invest should be asked: how much exposure is reasonable to carry in respect of the unanticipated changes and how can loss, due to extreme risk events, be minimized. The risk appetite, the optimal risk-return profile and the proper optimal risk level should be set by the executives. Instead of risk mitigation, the risk optimization should be targeted. If and how these themes will be translated into the business life, determinates the risk culture and the appropriate ethical values. (Sants, 2010.)

Hence, risk management must be visible within the institute: It should be understood as an issue of every employee. Risk managers shouldn't be seen as devil's advocates. The decisions about risk-taking are made daily across the bank divisions, so everyone has to be aware of them. Every decision implies a probability, even if a small one, of financial distress, so every single risk must be taken in accordance with the overall bank's risk. Consequently, embedding the risk manager function into business units leads to greater awareness of risk. But: the independence cannot be achieved any more. To ensure the objectivity as well as the relevance to the decision have been made, a strong and an independent central risk management, which is not driven by the markets, is necessary. It also monitors the risk of business units. (Stulz, 2008, 2014, Landier et. Al., 2009, Ellul, 2015.). If an effective communication between units is in working order, greater understanding of risk across the bank can be achieved.

Setting optimal risk level: An executive function

The optimal risk level has to be defined by executives, the measurement and monitoring of risks is the purpose of risk management. (BIS, 2010: BCBS 176, p. 18, Stulz, 2008, p. 45.) Hence, the task of a risk management is not to mitigate risks in general. It has to measure risk and compare it to the optimal risk level. It has not to detain the authorities from the risk-taking, whilst the risks contribute to create value. (Ellul, 2015, p. 8.) Consequently, risk management can reduce costs, which would be too high or existence-

threatening in case of a distress. Its aim is to mitigate the tail risk which could be destroying and to communicate it to the management and board. Such risks have an impact to the business strategy (Stulz, 2008, Ellul, 2015).

Failures in communication of risk is a failure of risk management. But the one, who decides about the risk-taking after being prompt and understandable informed, is the top management. "A company's risk managers must keep track of and manage the firm's risks to ensure they remain within the established guidelines, a task that could involve hedging risks and rejecting proposed trades or projects." (Stulz, 2008, p. 41.)

Risk quantification and styles of decision making

The responsibility of the risk management is to make sure, that the bank takes risks which it intends to take. For this purpose, the risks have to be appropriately measured and continuously monitored. To meet the objective of the top management, the risks also have to be hedged. But, some risks can change rapidly, even if the bank doesn't make any changes in its position, for example in the portfolios of complex derivatives. Some risks also may be hidden for some time period. Then, the risk monitoring is shedding more light to the risk situation, but it can turn to be costly quite fast. Incentives of employees aligned to risk taking makes the detection of risks more effective. (Stulz, 2008, p. 47.)

Five risk categories a financial institution is facing can be distinguished: financial, operational, strategic, compliance and other risks. All of them are important, but not all of them can be measured by standard statistical tools. The key of the quantitative risk management is to choose an appropriate risk metrics which suits the risk strategy. Usually the Value at Risk (VaR) approach is adopted, because the aggregation of various types of risk is possible. VaR measure is easy to understand: It is the maximum potential loss of a portfolio of financial instruments with a given probability p over a certain time horizon. (Schmitt, 2016, p. 693, 694.) There are two main problem areas by measuring risks: (i) risks are not measured adequately, (ii) risks are ignored because they couldn't be identified or they are wrongly viewed. (Stulz, 2008, p. 41.) Further, the modern risk models are not designed for measuring risks of crisis. Using historical data are lacking in predictability of future events. (Schmitt, 2016, p. 697.) During a distress, the daily measured VaR will be exceeded. Hence longer-term measures and scenario analyses should complement the VaR. Even the Extreme Value Theory (EVT) which base on statistical models too, cannot exactly capture such complex events. Limitations in models cannot be seen as a failure of risk management.

4 Conclusions

In the past decades supervisors and banks increased their focus on strengthening the risk culture. (FSB, 2014). A lot of statistical approaches for measuring risks precisely were developed. Despite that, even high sophisticated tools like EVT cannot prevent financial institutions from suffering large losses, which may occur as a consequence of a not appropriate employee behavior. Hence, it is necessary to focus more on incentives for excessive risk taking or taking risks with no appropriate risk management in place.

To establish an efficient risk culture deals with feelings and values. It rests on conditions evolved historically, bases on interpersonal relationships. It is a process which cannot be implemented in a short time, but it is worth the effort: reputation and employee satisfaction rise, decision-making process improves, financing costs and earning-loss volatility decrease. Focusing on the risk identification and mitigation before it materializes is the target key of an anticipatory risk management. An effective risk culture must be formed according to the individual characteristics of each organization. There is need for more research into factors that boost or impede the realization an effective risk culture in financial organizations and incentives for monitoring of risk taking.

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Testing the Semi-strong Form of Efficiency in Czech Stock Market

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Abstract: *The efficient market hypothesis represents possible analytical approach when analyzing behaviour of financial markets. The aim of this paper is to test the efficient market hypothesis in its semi-strong form using data from Czech stock market. Information efficiency of the Czech stock market is assessed in relation to seven announcement of Moody´s rating agency regarding changes of credit rating of Greek government bonds in the period of 2009-2012 years. For the purpose of this paper, the event study method is applied. The basic idea of this statistical method is to determine values of abnormal returns, which can be defined as a difference between actual and equilibrium returns. In order to calculate equilibrium returns the Capital Asset Pricing Model is used. Observed differences between actual and equilibrium returns were verified with a help of selected nonparametric statistical tests. Namely, the exact sign test and the Wilcoxon sign-ranked test were utilized. Based on results of statistical tests, the null hypothesis of efficiency was rejected.*

Keywords: CAPM, Czech stock market, event study, semi-strong form of efficiency, statistical tests

JEL codes: C12, G14, G18

1 Introduction

Public announcements of important macroeconomic data about inflation, production, profit and other economic issues cause considerable attention in both financial literature and practically oriented analyses. Practitioners and academicians are interested in knowledge which macroeconomic information are reflected in prices of financial instruments and how. Impact of macroeconomic information on equity prices for assessment of stock market efficiency and possible forecasting of stock market reactions (Gurgul and Wójtowicz, 2015). Most theories claim that prices on stock markets are efficient and therefore cannot be forecasted. However, practitioners have never believed in it, and logically tried to maximize profit using sophisticated forecasting methods. Information efficiency therefore depends on fact how market prices reflect all relevant information (Fama, 1970). In other words, the market efficiency means that prices of financial instruments fully reflect all available information (Seďa and Jimber del Río, 2016).

Market efficiency is defined within a hierarchy of three nested information sets. According to Fama (1970), there exist the weak, semi-strong and strong forms of efficiency. Semi-

strong form of efficiency means that equity prices contain not only historical data but also publicly available information. Testing the semi-strong form of efficiency is usually focused on a measurement of a speed with which new information is absorbed in stock prices. The event study method is a suitable tool for testing the information efficiency in its semi-strong form (MacKinley, 1997).

The global financial crisis significantly hit stock markets worldwide. Czech Republic, as an export-oriented economy with substantial reliance on foreign capital, was not an exception. The fund withdrawal led by foreign investors in the Czech stock market exacerbated volatility in stock market and decline of the whole market by more than 60% (Seďa, 2012). Greece is one of the countries that were affected by the global financial crisis and subsequent debt crisis fatally. This fact led to a repeated credit rating downgrade. Since mutual relations among stock markets were growing during the global financial crisis (Seďa and Jimber del Río, 2014), crucial events in Greek stock markets could led to significant reaction also in Czech stock market.

Central European stock markets with respect to the semi-strong form of efficiency have been investigated very rarely (Gurgul and Wójtowicz, 2014). Investigators usually assessed just the weak form of efficiency of those markets. In addition, research studies are not up-to-date (e.g. Tran, 2007). However, Hanousek et al. (2009) investigated the reaction of Central European stock markets to announcement of news from USA and eurozone. More precisely, they examined how stock prices in the Czech Republic, Hungary and Poland responded to macroeconomic news coming from USA and eurozone. They found that the strongest reaction to data announcements from USA was observed in the Czech stock market. Hence, this paper contributes to discussion on the efficiency of newly emerged stock markets in transition economies.

The main aim of this paper is empirical testing the semi-strong form of efficiency of Czech stock market. There will be measured a response of Czech stock market to changes of credit rating of Greek government bonds as published by Moody´s agency in the period of 2009-2012 years. For the purpose of this paper, the event study method will be utilized.

Our paper is organized as follows. In chapter 2, there will be discussed the theoretical basis of the event study method. Moreover, the development of Greek government bonds rating will be described. In addition, the methods of calculation the actual, equilibrium and abnormal returns will be defined. Finally, selected non-parametric tests, which are usually used for statistical evaluation of abnormal returns, will be described. Application part of this paper contains mainly empirical testing the semi-strong form of efficiency of Czech stock market and statistical evaluation. In particular, there will be investigated response of Czech stock market on seven changes of credit rating of Greek government bonds. Conclusion summarizes this paper and opens possible extensions of investigated topic.

2 Methodology and Data

In this section, a brief description of the experimental material and methods used in this paper will be given. The semi-strong form of efficiency will be investigated using data from Czech stock market in the period of 2009-2012 years. We will use log-returns of just 12 shares, which were included in the PX index base during complete testing period.

Greek Crisis

Changes of credit rating of Greek government bonds as published by international rating company Moody´s in the period of 2009-2012 years have become a key motivation for this paper. Poor state of Greek public finances was a major reason for credit rating downgrade from grade A1 to A2 on December 22, 2009. Rating downgrade resulted in a fall of prices of Greek securities and decline of euro currency. The reason for credit rating downgrade from A3 to Ba1 was especially a high rate of economic risks associated with

the implementation of the rescue program. A further decline in credit rating happened on June 14, 2010 when Moody's downgraded Greek credit ratings to a speculative level. Next, Greek credit rating was downgraded by Moody's on March 7, 2011 by three steps deeper from Ba1 to B1 level. In that case, the reason of credit-rating downgrade was a lack of confidence in reforms that should help to correct deficit financing and lack of government revenue. Moody´s downgraded the credit rating of Greek commitments to Caa1 level on June 1, 2011 because of increasing risk of government's inability to stabilize their debt. Greek rating downgraded again as the result of extraordinary summit of euro members on July 27, 2011. Credit rating was reduced at lowest possible grade C on February 3, 2012. The development of credit rating of Greek government bonds is shown in Table 1.

Table 1 Changes in credit rating of Greek government bonds

Date	Rating
22. 12. 2009	A2
27. 4. 2010	A3
14. 6. 2010	Ba1
7. 3. 2011	B1
1. 6. 2011	Caa11
25. 7. 2011	Ca
3. 2. 2012	C

Source: www.moodys.com

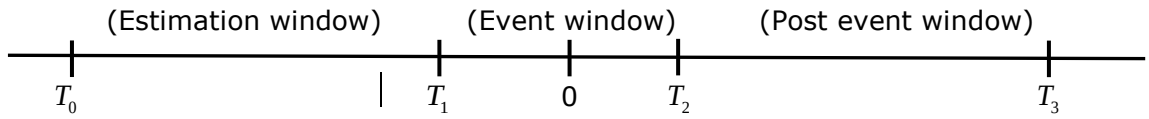
Event Study Method

The most commonly used approach to assess potential impact of macroeconomic news announcements on stock prices is based on regression with dummy variables (Harju and Hussain, 2011). However, this method has some serious imperfections because of intraday volatility patterns and overnight returns. In order to avoid these imperfections, we utilized the event study method. This method has been applied when investigating an impact of news announcements on daily data (Corrado and Troug, 2008). An event study is a statistical method to assess an impact of economic event on the value of financial assets. The event study approach can be also used to elicit potential effects of practically any type of economic event on direction and magnitude of stock price changes. This approach is thus commonly used in various research areas, such as accounting, finance and so on (Jelínková, 2013). History of the event study is relatively long. Fama (1969) utilized this approach in finance for the first time. In later years, there were defined a lot of modifications that should eliminate complications resulting from violations of statistical assumptions (MacKinley, 1997). When applying the event study approach on testing the semi-strong form of efficiency, it is possible to describe it in the following five steps:

- definition of an event and timeline,
- calculation of actual returns,
- determination of equilibrium returns,
- calculation of abnormal returns,
- verification of statistical significance and economic interpretation of results.

The structure of an event should be defined prior to testing a response of market to announcement of new information. It consists of three basic windows or periods that do not overlap. These periods are: the estimation window, event window and post event window. The timing sequence is illustrated in Figure 1.

Figure 1 The general time line for an event study



Source: MacKinley (1997)

The estimation window is a period preceding the event window. The estimation window represents an interval with length of $L_1 = T_1 - T_0$. The estimation window is a period that is used for calculation the actual returns and coefficients of financial models. It is usually 100-250 days long when using daily data. The event window represents a period when new information has been published. Even if the event is represented by an announcement on a given date, it is recommended to set the event window length to be larger than one day (MacKinley, 1997). This facilitates the use of abnormal returns around the event day in the analysis. The event window is defined as an interval with the length of $L_2 = T_2 - T_1$. Finally, the post event window is defined as an interval with the length of $L_3 = T_3 - T_2$. After identification of an event and definition of term structure, it is necessary to establish criteria for selection of companies used for the purpose of the event study.

Equilibrium Returns

The principle of the event study method is to compare actual returns with their equilibrium returns during the event window period. Equilibrium returns can be defined as returns that would be achieved by trading agents if new information had not been published at all. The differences between actual and equilibrium returns represent abnormal returns. Equilibrium returns are based on values of coefficients of financial models used for the purpose of the event study. Equilibrium or expected returns represent a benchmark which actual returns are compared with. The Capital Asset Pricing Model (CAPM) is the most common economic model that may be used to determine equilibrium returns in financial modeling. The CAPM model was built on diversification and modern portfolio theory (Sharpe, 1964). Expected return can be according to CAPM model calculated as follows:

$$E(R_{i\tau}) = r_f + \hat{\beta}_i \left(E(R_{M\tau}) - r_f \right), \tag{1}$$

where $E(R_{i\tau})$ is expected return, r_f is risk-free rate, $\hat{\beta}_i$ represents parameter of share sensitivity and $E(R_{M\tau})$ is expected return of market portfolio. When testing the semi-strong form efficiency, a necessary condition is to measure values of abnormal returns. Let $AR_{i\tau}$ be a sample of L_2 abnormal returns for *i*-th share in the event window. The sample abnormal return is given by:

$$AR_{i\tau} = R_{i\tau} - E(R_{i\tau}), \tag{2}$$

where $R_{i\tau}$ is normal return. In order to evaluate the semi-strong form of efficiency and assess the absorption rate of newly published information, it is necessary to sum calculated values of abnormal returns of the event window period. The abnormal return observations must be aggregated in order to draw overall inferences for the event of interest. The aggregation should have two dimensions - through time and securities. Let´s define $CAR_i(\tau_1, \tau_2)$ as the sample cumulative abnormal return (*CAR*) from τ_1 to τ_2 where $T_1 < \tau_1 \leq \tau_2 \leq T_2$. The *CAR* from τ_1 to τ_2 is the sum of abnormal returns:

$$CAR_i(\tau_1,\tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i\tau}. \tag{3}$$

The abnormal returns must be aggregated for the event window. The absence of any overlap and distributional assumptions imply that the abnormal returns and the cumulative abnormal returns will be independent across securities. The abnormal returns of individual shares can be aggregated using $AR_{i\tau}$ from (2) for each event period $\tau = T_1 + 1,...,T_2$. Given *N* events, the sample average aggregated abnormal returns for period τ is given by:

$$\overline{AR_\tau} = \frac{1}{N}\sum_{i=1}^{N} AR_{i\tau}, \tag{4}$$

where N is a number of events included. The average cumulative abnormal returns can then be aggregated over the event window using the same approach that was used to calculate the cumulative abnormal return for *i*-th security. For any interval in the event window, it can be calculated as follows:

$$\overline{CAR}(\tau_1,\tau_2) = \sum_{\tau=\tau_1}^{\tau_2} \overline{AR}_\tau. \tag{5}$$

Testing the semi-weak form of efficiency will be carried out just on the basis of f $\overline{AR_\tau}$ and $\overline{CAR}(\tau_1,\tau_2)$.

Nonparametric Statistical Tests

The basic idea of semi-strong form of efficiency can be expressed as follows: if stock market is efficient, there should not be a statistically significant difference between actual and equilibrium returns. When the assumption of normality of abnormal returns is violated, some nonparametric tests should be used. The most commonly used nonparametric tests are the sign test and the Wilcoxon signed-rank test (Hendl, 2009). The null and alternative hypothesis can be therefore defined as follows:

$$H_0 : \overline{AR}_{i\tau} = 0,$$
$$H_1 : \overline{AR}_{i\tau} \neq 0.$$

If stock market is efficient, an announcement of new information should be reflected in stock prices immediately. It is apparent that in the case of efficient market, there should not be observed any statistically significant differences between actual and equilibrium returns. In other words, abnormal returns should not be significantly different from zero.

3 Empirical Results and Discussion

In the application part of this paper, we will focus on empirical testing the semi-strong form of efficiency of the Czech equity market using the event study method. All calculations and estimations will be carried out with a help of MS Excel and SPSS.

Calculation of Abnormal Returns

When testing the semi-strong form of efficiency using the event study method, the most important and significant periods are the estimation window and event window. In this paper, the length of the estimation window is one year. The event window is a period within which the speed of absorption of new information is tested. For the purpose of this paper, the event window consists of 15 trading days before publication of new information and 15 trading days after publication of new information. "Zero day" is set on the date of announcement of new information. The event window consists of 31 trading days. Response of the Czech stock market on announcements of changes of Greek credit

rating will be tested with a help of values of abnormal and cumulative abnormal returns, which will be calculated according to equations (2) and (3). In order to estimate equilibrium returns according to CAPM model it is necessary to set risk-free rates r_f. The values of r_f will be calculated as average gross yields of Czech government bonds (Březinová, 2013). In this paper, the risk-free rate for the period of 2009 – 2012 years was determined by gross monthly returns of 3-year government bonds as shown in Table 2.

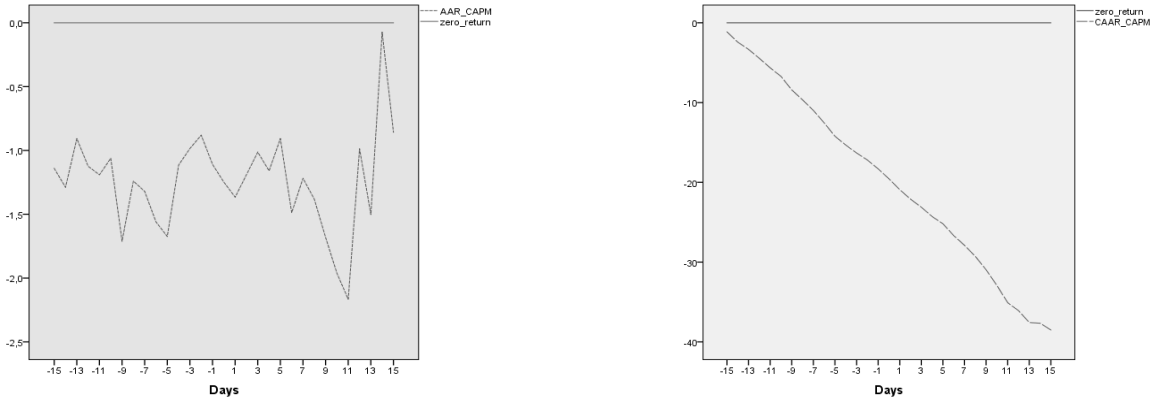
Table 2 Value of risk-free rate (in %)

	2009	**2010**	**2011**	**2012**
Yields of Czech government bonds	2.945	1.762	1.926	0.926

Source: Březinová (2013)

In order to assess response of Czech equity market on new information, it was necessary to determine average aggregate abnormal returns and cumulative average abnormal returns for the event window. Equilibrium returns have been calculated using the CAPM model. The difference between these two values represents abnormal returns. By averaging of abnormal returns for each day of the event window, we obtained aggregated abnormal returns. Next, we calculated cumulative abnormal returns. Since credit rating of Greek government bonds has changed seven times in the period of 2009-2012 years, it was necessary to calculate average values of aggregated returns. The aggregated abnormal returns achieved negative values only. It means that actual returns reached lower values than returns estimated according to CAPM model on average. Regarding publication of information on "zero day", it can be concluded that there have not been observed any significant deviations from reference values. Thus, it is clear that publication of new information did not result in jump drop. Values of average aggregated abnormal and cumulative abnormal returns of the Czech stock market for a period of fifteen days before and after announcement of seven credit rating changes are shown in Figure 2.

Figure 2 Average abnormal and cumulative average abnormal returns



Source: own calculations

Figure 2 also shows values of cumulative average abnormal returns based on equation (5). Market response to announcement of new information is evident. The cumulative abnormal losses on the day of announcement achieved the value of 19.56%. Moreover, the cumulative abnormal loss reached the value of 38.51% on the 15th day following the publication of new information. The abnormal returns calculated according to CAPM model started to decrease already fifteen days before announcement of new information.

When testing the efficiency of stock markets, the values of abnormal stock returns of all companies included in PX index in the event window are compared with zero abnormal returns that are considered as a hallmark of efficient market. In order to accept the null

hypothesis, it is necessary that values of abnormal return for the event window on both sides of median should be approximately equal. Table 3 shows the values of average abnormal returns of all shares included in PX index in %.

Table 3 Average abnormal returns of shares traded on PSE in %

AAA	**-1.323**	**ORCO**	**-1.889**
CETV	-1.648	**Pegas Nonvowens**	-1.268
ČEZ	-0.664	**Philip Morris**	-1.247
Erste group	-1.151	**Telefonica**	-0.958
Komerční banka	-1.167	**Unipetrol**	-0.979
NWR	-1.354	**VIG**	-1.256

Source: Březinová (2013)

Results of Nonparametric Statistical Tests

When calculating the values of abnormal returns based on the CAPM model, none of returns reached positive values $(Z_+ = 0, Z_- = 12)$. First, testing the semi-strong form of efficiency or evaluation of abnormal returns was carried out using the sign exact test since the scale of our sample is less than 25. Under the null hypothesis, positive and negative values of abnormal returns have binomial distribution B(0.5, 12). Table 4 shows cumulative probabilities for binomial distribution B(0.5, 12).

Table 4 Cumulative probabilities of binomial distribution B(0.5, 12)

Value of *x*	**0**	**1**	**3**	**4**	**5**
Probability *P*(*X*≤*x*)	0.00024	0.00317	0.01929	0.07300	0.19385

Source: Hendl (2009)

If the efficiency of Czech stock market is tested using the CAPM model, **the null hypothesis of efficiency can be rejected** and the stock market can be considered inefficient at 5% significance level (*p*-value = 0.00024 < 0.05). Second, the Wilcoxon sign-ranked test was applied. This test is more powerful and is based on absolute values of differences between actual returns and expected values of median. These differences are sorted by their size. The null hypothesis is not rejected if the sum of sequences of positive abnormal returns T_+ and the sum of sequences of negative abnormal returns T_- are approximately equal. Since abnormal returns achieved negative values only, the value of T_+ is equal to zero while the sum of sequences with negative values T_- reached the value of 78. Testing the null hypothesis is performed by comparison of smaller value of T_+ and T_- with precise critical values $w_{12} = 13$ (at 5% significance level). The value of $T_+ = 0$ lies within interval of critical values of $W = \langle 0,13 \rangle$. Thus, **the null hypothesis of efficiency can be rejected** again. Results of both nonparametric tests are summarized in Table 5.

Table 5 Comparison of results of the sing test and Wilcoxon sign-ranked test

	Sign test		**Wilcoxon sign-ranked test**	
	H_0	H_1	H_0	H_1
CAPM	Rejected	Not rejected	Rejected	Not rejected

Source: own calculations

Based on statistical tests provided, it can be concluded that results does not depend on type of statistical nonparametric test that was applied. If we use for determination of equilibrium yields the CAPM model, Czech stock market cannot be considered efficient.

Discussion

Empirical results we achieved indicated that Czech stock market is inefficient in terms of semi-strong form efficiency. Our results have shown that, as it would be expected in a rational marketplace, prices do not respond to new information immediately. Our results are in harmony with findings of empirical studies being performed before. Tran (2007) rejected the weak form of efficiency in Czech market. Hanousek et al. (2009) found that news originating in the EU affected the returns in Czech, Hungarian and Polish markets. Contrary to that, U.S. announcements have an impact on the Czech and Hungarian markets only. The results delivered for the Czech market do reflect the fact the significant part of traded volume in Czech market is caused by foreign investors that put more weight on foreign announcements. Gurgul and Wójtowicz (2014) examined the reaction of the Polish stock market to U.S. announcements based on intraday data. They found that Polish market reacted to unexpected news from the USA just one minute after a news release.

Our findings could have some important implications for regulators and investors. For regulators, our research provides empirical assessment of the current state of information efficiency and detects areas for potential improvements. For investors, fundamental analysis can bring above average returns since share prices do not reflect their inner value. Moreover, our results may also have important implications for diversification and risk management strategies since Czech Republic prepare to enter the eurozone. We can expect that Czech market will be more sensitive to macroeconomic shocks, especially those coming from the eurozone. Investors should apprise this expected higher volatility when investing in Czech market. This paper examined the speed of information dissemination, so that investors may anticipate the effect of news announcement on their portfolios.

4 Conclusions

Rational investors seek for mispriced stocks to make a profit on purchase or sale. However, activities of investors on efficient market lead to the fact that no market participant is able to overcome respective market and achieve above-average returns. In this paper, we examined the semi-strong form of efficiency of Czech stock market in the period of 2009-2012 years. Efficiency of Czech stock market was assessed in relation to publication of credit rating change of Greek government bonds as published by Moody's rating agency. For the purpose of this paper, the event study method was applied. All computations were based on daily log-returns of the share included in PX index. Based on results of the sign test and the Wilcoxon sign-ranked test, we found that results of our analysis does not depend on a type of selected statistical nonparametric test that was applied. If the semi-strong form of efficiency is based on the CAPM model, it is possible to classify Czech stock market as inefficient. This fact may led to implications for investors and regulators.

Our findings may lead to possible extensions of investigated topic. The semi-strong form of market efficiency can be further examined by separating positive and negative news announcements. In addition, the effects of news announcements could be investigated on different types of companies (according to size, value or growth). Finally, the reaction of stock market could be theoretically related to behavioral aspects of market participants.

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Tax burden and interest burden on business in the agriculture, fishing and forestry sector

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Abstract: *Financial burden on enterprises is determined by negative cash flows, which brings down the value their assets and owner's equity. The aim of this paper is to analyze the financial burden on Czech business in the agriculture, forestry and fisheries in the past six years and point out the factors that influenced their capital structure and performance. According to Du Pont equations the financial burden is given as reduction of interest and taxes from earnings before interests and taxes. The value of financial burden of enterprises is dependent on macroeconomic environment, in which the enterprises exist. It was detected asynchronously dependence between real payments and changes of rates of interests and tax rates in the analysis. Reducing both rates had a positive effect on the performance of Czech enterprises, their capital base has increased, it has become more attractive to foreign investors and improved return on invested capital. In following up the results of analysis is performed an estimate of the development of financial results of companies in 2016 - 2018.*

Keywords: financial burden of business, tax burden, interest burden, accounting statements, financial analysis, performance and efficiency

JEL codes: M21, M41, G32

1 Introduction

The financial burden on a business[15] is closely associated with the financial flows of a business with the purpose of performing all of its activities. Financial flow takes an opposite direction to the flow of assets. Purchase and production are associated with expenditures while sales are associated with revenues. Other financial flows are related to the profit distribution, investments, financial instruments, research and development, etc. Financial flows do not include cash flows only, but also the flows of financial resources (capital) of the business. Based on accounting rules, money and its equivalents have a form of assets of a company while the capital represents the source of the company financing (as a liability or debt).[16] This financial resource is necessary not only to purchase the assets, but also to bridge the time lag between the expenditures spent on the production of the final product (purchasing services, payments for the energy, wages and other operational or financial expenses), and the reception of the money for its sale. Positive financial flows (inflows) should prevail over the negative ones (outflows).

Based on the place where the financial flows arise, they are divided into the internal and the external ones (Wagenhofer, 2003). The first source of finance is the internal flow resulting from the sales of products, services, or goods. Additional capital flows in a business created by its own activity to be re-used.[17] The second source is external financial flows, which are both investors' deposits arising from the purchase of shares (equity), and the means obtained in the forms of credits and loans or issued debt

[15] The word business includes all the legal forms of entrepreneurial entities that operate in the monitored sector of the Czech economy.

[16] The Czech accounting legislation does not differentiate between liabilities and capital, while the financial books of companies use the word capital meaning long-term capital which is used to finance company's fixed assets and the permanent part of circulating assets.

[3]This is 'self-financing' done from sales, withheld payments and the profit.

securities (liabilities). The price at which the company gets the capital represents a financial burden (including levies imposed by the state), which is measured by the cost of capital. The company looks for such a relationship between the amount of equity and liabilities (capital structure) at which it achieves the lowest cost of capital (Ohlson, 1980). Bokpin (2009) or Nurmet (2011) pointed out that when optimizing the capital structure, not only the cost of capital and the tax shield but also the company's financial distress cost should be taken into account. Financial flows flowing towards the bearers of liabilities and equity take out a part of the generated equity (profit) from the company and thereby reduce the economic efficiency of their activities as well as value (Brealey et al., 2006).

2 Methodology and Data

The aim of this paper is to analyze the financial burden on businesses in the Czech agriculture, fishing industry and forestry over the past six years and point out the factors that have affected their capital structure and performance.

The basic criterion for measuring the production power of a business is the Earnings Before Interest and Taxes ratio indicator (EBIT) calculated from the profit and loss account as a surplus of sold performance over the performance consumption after deducing the work consumed, depreciation and other operating costs and the financial profit or loss (Damodaran, 2000). After withdrawing the contribution for the creditors (capital costs), the Earnings Before Taxes (EBT) remain to the company. According to Rajan and Zingales (1998), the last contribution is the income tax on legal persons, designated for the state; after this is paid, the owners are left with the Earnings After Taxes (EAT).

The EAT achieved by the company for a marketing year is placed within the equity in the balance and it increases the accounting value and often also the market value of the company (Kislingerová et al., 2010). It is intended for allocation after approval by the general meeting. To measure the impact of the financial burden on the profitability of the company, it is possible to use the decomposition of the second Du Pont equation (Sedláček, 2007) as follows:

$$\mathrm{ROE} = \frac{\mathrm{EAT}}{\mathrm{E}} = \frac{\mathrm{EBIT}}{\mathrm{S}} * \frac{\mathrm{EBT}}{\mathrm{EBIT}} * \frac{\mathrm{EAT}}{\mathrm{EBT}} * \frac{\mathrm{S}}{\mathrm{A}} * \frac{\mathrm{A}}{\mathrm{E}} \qquad (1)$$

Where:

ROE	- Return on Equity is a measure of the rate of return to stockholders.
EBIT	- Earnings Before Interest and Taxes is determined as the sum of the operating and the financial profit or loss.
EBT	- Earnings Before Taxes represent EBIT reduced by the cost interests reported by the company
EAT	- Earnings After Taxes represent a net (disposable) income of a company
S	- Net Sales from the sale of products, goods and services
A	- Total Assets
E	- Total Equity
EBIT/S	- Return on Sales (ROS)
EBT/EBIT	- is known as the company's interest burden (IB). It expresses the impact of the price of liabilities on the profitability of the business. The price of liabilities is determined by the macro-environment and indirectly characterizes the conditions under which the company gets outside funds. If a company uses liabilities, then inequality EBT/EBIT< 1 is applicable
EAT/EBT	- expresses the company's tax burden (TB), i.e. the effect of the state's tax policy on the profitability of the business. It is a factor that is objectively given by the environment where the business is located. If the business achieves a positive profit or loss account, then inequality EAT/EBT< 1 is applicable

S/A - Asset Turnover, characterizes the degree to which the company uses the assets.

A/E - Equity multiplier expresses the level of company indebtedness and is also known as financial leverage (FL).

To analyze the financial burden on businesses, or their financial stability, the data that are published at the Ministry of Industry and Trade (MIT) of the Czech Republic website (MIT, 2016) will be applied. They represent the aggregate values from the statements of businesses from the fields of agriculture, forestry and fishing (AFF), whose data are summarized in Table 1. The state quantities are calculated as means of the values reported by the companies at the beginning and the end of each year. Tax rates of legal person's income and the interest rates on loans to non-financial companies presented on the last two table lines were taken from the Czech National Bank (CNB, 2016)) website. In addition, the income tax rates from years 2008 (21%) and 2009 (20%) and the interest rate of the year 2008 (4.80%) and 2009 (3.72%) were used in the calculations.

Table 1 Input data for the analysis of the financial burden on business in the AFF sector

Item (in bill. CZK)	2008	2009	2010	2011	2012	2013	2014	2015
Assets			98.2	105.0	112.4	113.7	108.0	108.0
Equity			86.7	93.3	98.3	95.9	92.6	94.0
Sales			25.1	30.6	29.1	27.5	28.1	32.5
EAT			3.2	5.3	5.1	5.2	6.5	6.3
EBT			4.0	6.6	6.4	6.4	7.8	7.6
EBIT			4.088	6.670	6.485	6.482	7.862	7.659
Interest paid (I)			0.088	0.070	0.085	0.082	0.062	0.059
Income tax (T)			0.8	1.3	1.3	1.2	1.3	1.4
Interest rate (I%)	4.80	3.72	3.47	2.86	2.61	2.26	2.22	1.74
Tax rate (T%)	21	20	19	19	19	19	19	19

Source: own calculation based on the data of the MIT CR and CNB

Tax burden

Tax is defined as an obligatory, regular, non-refundable and non-specific payment determined by the act allotted to the public budget. By that, a part of income is withdrawn from predefined entities on an irreversible principle[18] (without a right to consideration from the public sector corresponding to the amount of tax paid). According to the OECD classification, also duties, health and social insurance premiums as well as local fees are considered taxes. A company is burdened with all of these taxes, provided that the circumstances that require payment have arisen.

Indirect taxes (value added tax and excise tax) treat a business that is a registered payer neutrally. In this case, the business is only a 'collector' of the tax and the real taxpayer is the end consumer who purchases the product or the service. Tax non-payers have the tax included in the price of purchased inputs (materials, energy, machinery, etc.), but they do not add tax to their outputs and are not entitled to a tax deduction. The tax becomes part of the assets measurement.

Direct taxes are paid by the business (as a taxpayer) from its assets (they withdraw a part of its revenues). These include property taxes (real estate tax, property transfer tax and road tax) as well as income tax of legal persons. Property taxes are an expense which is at the same time considered a tax expense (expenditure) in compliance with the income tax act[19]. The subject of income tax is the accounting profit (loss), determined

[18] This differentiates it from the charges that are included in the revenue side of the public budget but take the form of payments for the public sector services.

[19] Tax expenses are also the contributions paid by a business per an employee to statutory health insurance and social security.

from the difference between revenues and expenses before taxation, which is subsequently adjusted for:

- the sums which cannot be included in expenses in compliance with Income Tax Act (e.g., shortages exceeding their compensations, the costs of company promotion, the differences between the tax and accounting depreciations);
- the sums that are included in the costs in the wrong amount;
- any sums unduly reducing the income;
- tax exempt incomes (e.g. incomes from the operation of small power plants);
- incomes not included in the tax base (e.g. incomes taxed as earned at the source).

These adjustments turn the accounting profit into the tax base, which is then used to calculate the tax by the corresponding rate. Income tax is an accounting and not a taxation expense, i.e. it does not enter the company's profit and loss account before taxation or the income tax base. On the contrary, tax payment means a reduction of the company's assets (money) and a withdrawal of produced profit or loss for the current period (EBT). The amount of money flowing towards the state is expressed by the tax reduction of the profit - tax burden (TB), which is determined by the following equation:

$$TB=EAT/EBT \qquad (2)$$

Table 2 shows that the value of the tax burden (TB) does not have a clear trend, which corresponds to the TB effect on the development of shareholders' equity profitability in the second Du Pont equation (DeAngelo and Masulis 1980). The indicator shows a positive influence of macro-economic policy of the state in the form of income tax rate reductions. The correlation of temporal series can be used to measure the impact of tax rates on the amount of taxes paid. Table 2 presents the income tax rates as values of the independent variable x_i and the values of percentage of the paid income tax in the profit before tax (T/EBT) as the dependent variable y_i. The tightness of the two temporal series is expressed by the correlation coefficient calculated from the following formula:

$$r_{xy} = \frac{\overline{xy}}{\sqrt{\left(\overline{x^2} - \overline{x}^2\right)\left(\overline{y^2} - \overline{y}^2\right)}} \qquad (3)$$

The ratio of T/EBT also expresses how the company shared its profit with the state. Although the income tax on AFF businesses increased in absolute values from 0.8 billion CZK in 2010 to 1.4 billion CZK in 2015, the relative tax burden decreased by 1.58 percentage points. In 2015, an average business in this sector paid 18.42% of its operating profit reduced by interests while the applicable tax rate was 19%. The calculations confirmed that the fair value of the paid taxes is delayed behind the tax rate by two years, when the coefficient of asynchronous correlation of temporal series amounted to 0.89516.

Table 2 Development of tax reduction and state share in profit of an average company in the AFF sector

Year	EAT	EBT	TB	T%	T	T/EBT	E	E/A	ROE %
2008	x	x	x	21	x	x	x	x	x
2009	x	x	x	20	x	x	x	x	x
2010	3.2	4.0	0.80000	19	0.8	0.20000	86.7	0.8829	3.691
2011	5.3	6.6	0.83030	19	1.3	0.19696	93.3	0.8886	5.681
2012	5.1	6.4	0.79687	19	1.3	0.20312	98.3	0.8745	5.188
2013	5.2	6.4	0.81250	19	1.2	0.18750	95.9	0.8434	5.422
2014	6.5	7.8	0.83333	19	1.3	0.16666	92.6	0.8575	7.019
2015	6.3	7.6	0.82894	19	1.4	0.18421	94.0	0.8704	6.702

Source: own calculation based on the data of the MIT CR and CNB

The reduction in the tax burden is positively reflected in the growth of companies' equity as a source of self-financing. The positive trend stopped in 2013, in response to the reduction in the value of equity ratio (E/A) in the preceding year. During the reference period, a constant tax rate allowed businesses to do their operations with net operating surplus, which increased the owners' equity and allowed investments in the expansion of the production, thereby strengthening the company's position and independence.

Interest burden

The lack of equity in the form of retained profits and depreciations forces companies to get finances in the form of liabilities (L). They can be short-term debts (short-term bank and trade credits, debts to employees, issued debt securities, loans, etc.) or long-term liabilities to creditors who have lent their money to the company for more than one year or have invested in long-term bonds issued by the company (Sedláček, 2016). The relationship between the equity and liabilities depends on the nature of the business, the macro-economic environment in which the entity is situated, and the risk associated with obtaining resources. Generally, the price of equity paid in the form of dividends or profit share is higher than the price of liabilities in the form of paid interests (Higgins, 1995; Hýblová et al., 2013). This is due to the fact that the investors are the main carriers of the risk associated with poor management or even the company decline, and they can lose their capital.

The optimum capital structure of a company is formed with minimum cost of capital (C), which is calculated as the sum of the weighted costs of liabilities (n_L) and equity (n_E) based on equation:

$n_C = n_L + n_E = (1 - T\%)\ L/C + (\text{dividend yield} + \text{dividend growth rate})\ E/C \rightarrow \text{minimum}$

A company should only use liabilities for financing in the event of a positive effect of financial leverage. The leverage rises (strengthens), like in physics, the profit capacity of the equity by means of liabilities (Otavová, 2017). Therefore, the owners look for greater leverage to multiply their earnings (issue of new shares would mean a reduction in ownership and voting rights of the existing shareholders). However, the positive effect of the debt ratio on the profitability of equity occurs only when the Return on Assets (ROA) is greater than the interest rate (I%). Otherwise, the leverage has a negative effect. In contrast, creditors prefer the lowest possible debt ratio (L/A), as a larger share of equity means greater safety cushion against their losses in the case of business liquidation (Bauer, 2004; Levy and Sarnat, 1999).

The conditions under which the business obtains liabilities are expressed in the price of the liabilities that the business pays for the provision of capital to the creditors, i.e. the interest burden (IB):

$$IB = EBT/EBIT \qquad (4)$$

The growing trend of the IB indicator reinforces the profitability of the capital invested by owners, like the tax reduction, corresponding to the second Du Pont decomposition. The release of the state monetary policy in the form of reducing interest rates of loans to non-financial companies and better availability of credits have meant a gradual reduction of the financial burden of businesses. The interest burden as measured by the share of interests paid in the profit before tax and interests (I/EBIT) decreased during the years observed from 2.15% to 0.77%. To explore the dependence of this share in the interest rate on loans (see Table 3) we again use the formula to calculate the correlation coefficient r_{xy}.

Table 3 Development of interest reduction and creditors' share in profit of an average company in the AFF sector

Year	EBT	EBIT	IB	I%	I	I/EBIT	L	L/A	ROA %
2008	x	x	x	4.80	x	x	x	x	x
2009	x	x	x	3.72	x	x	x	x	x
2010	4.0	4.088	0.98747	3.47	0.088	0.02152	11.5	0.1171	4.16
2011	6.6	6.670	0.98950	2.86	0.070	0.01049	11.7	0.1114	6.35
2012	6.4	6.485	0.98689	2.61	0.085	0.01307	14.1	0.1255	5.77
2013	6.4	6.482	0.98735	2.26	0.082	0.01265	17.8	0.1566	5.70
2014	7.8	7.862	0.99211	2.22	0.062	0.00788	15.4	0.1425	7.28
2015	7.6	7.659	0.99229	1.74	0.059	0.00770	14.0	0.1296	7.09

Source: own calculation based on the data of the MIT CR and CNB

Table 3 shows that the interest burden on businesses, both in absolute and relative values decreased significantly during six past years. In absolute values, the share of operating profit[20] attributable to the creditors and produced by the analysed companies decreased from 88 million CZK to 59 million CZK between 2010 and 2015. Thus companies in the AFF sector produced resources for a possible enhancement of capital availability in the amount of 6.3 billion CZK in 2015, compared with 3.2 billion CZK reported in 2010. The tightest dependence between the interest rate and paid interests (I/EBIT) occurred, with a delay of one year, when the delayed correlation coefficient reached a value of 0.98723. Liabilities (L) in absolute values increased compared to the initial year and the total indebtedness (L/A) developed as supplementary to the opposite value of financial leverage.

3 Results and Discussion

A company starts to generate the Economic Value Added (EVA) for the owners (Kislingerová and Neumaierová, 2000) only at the moment when the return on capital invested exceeds the alternative cost (rate of return).[21] In the second Du Pont equation, the main factor affecting the return on equity is the profitability of sales (EBIT/S), which should be positive, while EBIT should grow faster than sales ($I_{EBIT} > I_S$). In the sample examined, this requirement was met with the exception of the year 2015, as shown in Table 4. The positive effect of interest reduction caused a mean annual growth of the EBT indicator by 16.26%; together with the effect of tax reduction they caused the growth of net profit by 17.14% annually on average. The index of the mean growth in the company's disposable income caused by the reduction in the financial burden (after elimination of the EBIT change impact) was 1.36%. Also the profit growth indexes listed in Table 4 should be in compliance with the inequality:

$$I_{EAT} > I_{EBT} > I_{EBIT} \quad (5)$$

Similar behaviour is observed in the turnover of assets, which supports the ROA indicator, if it grows and the growth index should meet the condition $I_S > I_A$. The last factor is the financial leverage, which reflects the impact of the involvement of liabilities in the company financing and has a variable character.

Table 4 The indexes of the growth rates of basic indicators within the AFF sector

Index	2011	2012	2013	2014	2015	Average
$\mathbf{I_A}$	1.071	1.070	1.011	0.949	1.000	2.02 %
$\mathbf{I_E}$	1.076	1.053	0.975	0.965	1.015	1.68 %
$\mathbf{I_S}$	1.219	0.951	0.945	1.022	1.156	5.86 %

[20] These are absolute values of the produced profit after deduction of total losses reported by the companies in the years observed.

[21] The Economic Value Added is determined by relation $EVA = (ROE - r_e) * E$ or $EVA = EAT - E * r_e$.

I_{EBIT}	1.631	0.972	0.999	1.213	0.974	15.78 %
I_{EBT}	1.650	0.970	1.000	1.219	0.974	16.26 %
I_{EAT}	1.656	0.962	1.020	1.250	0.969	17.14 %

Source: own calculation based on the data of the MIT CR and CNB

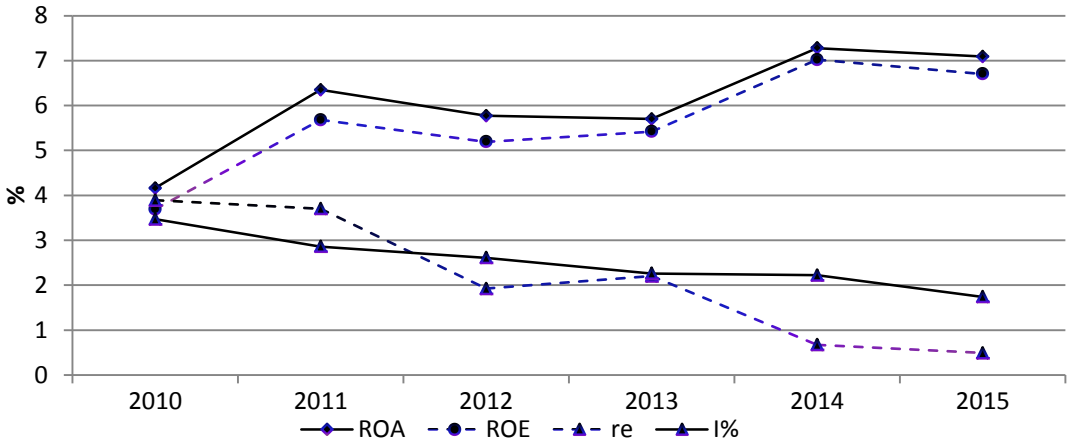
The moment at which an average company in the AFF sector starts to create value for its owners is indicated in Figure 1, comparing the ROE indicator with alternative return on equity (r_e)[22]. The economic value added started to be generated in 2011 (see Table 5), when the return on equity exceeded the return on the capital invested expected by investors, and it is located in the area where inequality (ROE - r_e) > 0 is valid. Additionally, the return on total assets behaves positively, as it is located over the price of liabilities for the entire observed period (see Table 3). Therefore, it pays to involve further capital in the company financing, as increasing the debt ratio already helps to improve the rate of return for the owners. The differences between the values of the indicator of return on total capital of an average company and the prices of liabilities (called spread) are again shown in Figure 1, showing the two series moving apart and thus the increase in positive spread ROA – I% > 0.

Table 5 The development of the spread of an average Czech company in the AFF sector

Indicator	2010	2011	2012	2013	2014	2015
ROE	3.69	5.68	5.19	5.42	7.02	6.70
r_e	3.89	3.70	1.92	2.20	0.67	0.49
ROE - r_e	-0.20	1.98	3.27	3.22	6.35	6.21
ROA	4.16	6.35	5.77	5.70	7.28	7.09
I%	3.47	2.86	2.61	2.26	2.22	1.74
ROA - I%	0.69	3.49	3.16	3.44	5.06	5.35

Source: own calculation based on the data of the MIT CR and CNB

Figure 1 The development of the spread of an average company in the AFF sector



Source: own calculation based on the data of the MIT CR and CNB

Prediction of the development of the financial burden on companies in the AFF sector

The growth trend of performance series of companies in the sector, which was manifested in the period observed, is determined by positive macroeconomic effects, including the tax and interest burden reductions (Oxelheim, 2003; Svoboda and Bohušová, 2017; Hýblová, 2011). The pro-growth environment of the Czech economy, favourable for the companies' balance, is likely to remain in the coming years. The

[22] Alternative return (cost of equity) is considered in its simplest form in the graph for illustrative purposes, i.e. at the level of state bond revenues for convergence purposes 10R based on CNB – interest rates.

businesses have their own resources for further development, and there is no obstacle to access loan issues. The total indebtedness of companies (L/A) decreased as well as the indebtedness to the banking sector. The decline was a consequence of lower interest rates on loans, and at the same time it was associated with the increase in assets and equity of companies that create value for owners and potential investors. The decline in interest rates also led to reduced costs of debt services.

To calculate the expected loan burden in the future period it is necessary to establish the values of the input data for the years 2010 to 2015. The future values of EBIT are determined by the extrapolation of the temporal series presented in Table 3 using linear function (Hindls et al., 1997) and the expected interest rates on loans to non-financial companies from the macroeconomic prognosis of the Ministry of Finance of the Czech Republic are used – see Table 6. Taking into account the observed asynchronous correlation of temporal series, we can estimate the values of actually paid interests on loans, or the values of the interest burden, and finally we can calculate the EBT values of an average company.

$$EBIT_t = a_0 + a_1 t \tag{6}$$

where the constants are calculated by the following equations:

$$a_0 = \frac{1}{n}\left(\sum y_t - a_1 \sum t \right) \tag{7}$$

$$a_1 = \frac{n \cdot \sum t \cdot y_t - \sum t \sum y_t}{n \cdot \sum t^2 - (\sum t)^2} \tag{8}$$

After fitting the calculated constants in equation (6) we obtain the equation to calculate the expected values of EBIT:

$$EBIT_t = 4{,}3067 + 0{,}6171t \tag{9}$$

Table 6 Prediction of the financial burden on companies in the AFF sector

Item (in bill. CZK)	2015	2016	2017	2018
EBIT	7.659	8.63	9.24	9.86
Interest paid (I)	0.059	0.03	0.04	0.06
IB	0.923	0.9965	0.9957	0.9939
EBT	7.6	8.6	9.2	9.8
Income tax (T)	1.4	1.5	1.5	1.5
TB	0.8289	0.8255	0.8953	0.8469
EAT	6.3	7.1	7.7	8.3

Source: own calculation based on the data of the MIT CR and CNB

A similar procedure is taken to determine the actually paid income tax, or the value of tax burden, from the estimated tax rate, and this is then used to calculate the value of the mean EBT. The positive trend of the tax and interest burdens of businesses will not be manifested as intensely in the future, for the macroeconomic forecasts assume a shift away from interest rate reductions and taxation issues are currently being intensively discussed. However, changes in the interest burden on businesses can be expected to take effect in 2017 at earliest and a year later in the taxation area.

4 Conclusions

After the financial and economic crisis that hit the global economy in 2009, the performance of the Czech economy has been on gradual increase. The growth trend of ROA and ROE series in the AFF sector is attributed to the effects of the external environment in particular, which include reduced tax and interest burden. The turning

point for the Czech businesses was the year 2011, when their performance as measured by ROA and ROE indicators improved substantially. This turnover in the development of companies was helped by the release of the macroeconomic policy (reduction of interest rates on loans and a low rate of income tax of legal entities), the stage of economic growth, and the strengthening of the offer side of the economy. Businesses were able to create a new financial structure in accordance with the capital structure, so that after the deduction of some profit for the creditors and the state, still a value remained for their own development.

The analysis has proved one- to two-year delay in the effects of changes in income tax rates and paid interests. The value for owners also increased due to the reduction of interest burden for companies, which originally took 2.15% from their gross profit and then decreased to the current 0.77%. This trend is not going to be as intense in the future for the macroeconomic forecasts assume a gradual rise in interest rates. The reduction of the tax burden was slightly slower - the contribution for the state from EBIT decreased from the original 19.57% to 18.27%, due to the constant income tax rates and the time delay behind the change. In the future, the reduction of the tax burden is going to stop due to the discussed progressive taxation of entrepreneurial entities.

The positive development of the Czech companies' performance in the AFF sector in subsequent years will probably not be supported by external factors, but by the involvement of internal factors, such as innovation in production and technology, leading to reduced share of the costs in revenues, increase in the production power of companies (EBIT), and creation of value added for owners.

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The analysis of Slovak Republic's competitiveness

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Abstract: *The aim of the article is to analyse the competitiveness of Slovak republic. There are many organisations, that evaluate the competitiveness of the countries. We choose the Global Competitiveness Index published by World Economic Forum as the key competitiveness index. We analyse the position of selected countries including the Slovak Republic in this yearly published ranking for the 5 years. We try to answer, in which pillar has our country competitiveness advantage, in which not. It is important to learn the model of successful countries to make our country more competitive. According to this, we choose countries from European Union, which take the top position in the Global Competitiveness Index and the countries with similar position in this index that have Slovak Republic. Besides this index, we analyse other factors, which may affect competitiveness advantage in the future. We analyse the dependence between selected indicators. This dependence will be verified using statistical tests. We will use data from Statistical Office, Eurostat, World Economic Forum and other institutions.*

Keywords: Global Competitiveness Index, Slovak Republic, Ranking, World Economic Forum

JEL codes: O11

1 Introduction

Competitiveness is, in many ways, an important indicator for the countries. In a market economy, this concept affects all activities that are associated with man and society. (Jenčová et al., 2015) Among the first authors to express the competitiveness of the nation are Freeman, Lundvall and Porter, who have defined national competitiveness as the output of national ability to innovate and gain a competitive advantage (Cooke, 2002). The developed region is an accelerator for the growth of the country's economy, thus affecting its competitive position. (Štefko et al., 2010) Countries can create competitive advantages by improving their position through innovative and inventive potential. These are dynamic competitive advantages based on human capital, an educated workforce and a high level of active scientific research potential (Kollar, 2013).

Competitiveness is the ability of the economy to create goods and services to ensure external economic equilibrium, while ensuring the growth of per capita income, a sufficient level of utilization of national factors and the attainment of social and environmental goals (Hečková and Chapčáková, 2012). Competitiveness reflects the extent to which the country can operate on the international market while preserving or expanding the real income of citizens under the conditions of a free market. (Waheeduzzaman and Ryans, 1996). The basic prerequisite for the growing living standard of the country's population is long-term sustainable competitiveness of the domestic economy, which is conditioned by the competitiveness of its businesses. (Hečková and Chapčáková, 2011)

Although there is no precise and unambiguous definition of national competitiveness in the literature, many international organizations devote much attention to this area. Of

particular importance is the ability to compare country data, create order and evaluate information. (Gordiakova, 2011)

Competitiveness can be measured from a number of perspectives. Institutions aimed at assessing the competitiveness of countries can be divided into:

1. assessing international and global competitiveness,
2. testing independent credit rating agencies,
3. Impact on their economic outcomes (Burda, 2014).

International competitiveness is assessed by the Swiss Institute of IMD and global competitiveness is assessed by the World Economic Forum WEF. Both compare national economies and their living standards and national profile. They are the most famous world institutions dealing with the competitiveness of the national economy. (Gavurova et al., 2016)

The Global Competitiveness Index (GCI), published by the World Economic Forum, is also used to assess the competitiveness of the country. The World Economic Forum is an international organization for co-operation between the private and the public sector, dealing with political, commercial and other facts that shape global, regional and industrial programmes. Since 1979, this institution has published the Global Competitiveness Report on selected countries of the world since 1979. In 1979 Klaus Schwab was the creator of this idea. Since 2005, this initial index has been completed and redesigned by Xavier Sala and Martin in collaboration with the World Economic Forum. (Schwab et al., 2016) The Global Competitiveness Report is devoted to 114 indicators, which are grouped into 12 pillars.

2 Methodology and data

The aim of the article is to analyse the competitiveness of the Slovak Republic. After the analysing of the Slovak Republic's performance according to Global competitiveness index (GCI) in the period of 5 years, we identify the pillars, in which Slovakia has had the worst results. In the next step, we have compared Slovak's results with the results of other selected countries, and then we have identified, which were the key areas that made the other countries successful.

For comparison, we have chosen these 5 countries: Switzerland, Netherlands, Germany, Romania and Macedonia. The selection of these countries was not random, because we have chosen only countries geographically belonging to Europe. Firstly, we pick out 3 most competitive countries according to results of Global competitiveness index 2016/2017 from the Europe. 2 countries were from the European Union and one is a separate state, Switzerland. Secondly, we have selected states on better and/or worst position than Slovakia in GCI 2016/2017 from Europe. Also, one state is the EU member and one is not. The results from GCI 2016/2017 are in the table 1.

Table 1 The position of selected countries in GCI 2016/2017

Rank 2016/2017	Country	Rank 2015/2016
1.	**Switzerland**	**1.**
2.	Singapore	2.
3.	United States	3.
4.	**Netherlands**	**5.**
5.	**Germany**	**4.**
	.....	
62.	**Romania**	**53.**
63.	Jordan	64.
64.	Botswana	71.
65.	**Slovakia**	**67.**
66.	Oman	62.
67.	Peru	69.
68.	**Macedonia**	**60.**

Source: own processing according to Global competitiveness report

We have examined if there is the dependence between the 5th pillar of higher education and the 12th pillar of innovation. In particular, among the indicators of tertiary education enrolment rate and quality of scientific research institutions. We have verified this dependency on a sample of 6 selected countries.

We have used data from Statistical Office, Eurostat, World Economic Forum and other institutions.

3 Results and Discussion

When analyzing the development of the country's ranking or the score itself, it is clear that the development of the countries is not unambiguous. Only Switzerland has still been ranked the 1st in this ranking. Slovakia has a tendency to improve its position when it got 65 points from GCI 2013/2014. Other countries surveyed have not shown a clear trend. Their ranking is unstable.

Table 2 Ranking of selected countries in the 5 year period

Rank	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Switzerland	1	1	1	1	1
Netherlands	5	8	8	5	4
Germany	6	4	5	4	5
Romania	78	76	59	53	62
Slovakia	71	78	75	67	65
Macedonia	80	73	63	60	68

Source: own processing according to Global competitiveness reports

Score development has been increasing since the GCI 2013/2014 in both the Netherlands and Germany. Their overall score has grown every year. Romania recorded a slight decline in GCI 2016/2017 as well as Macedonia. By then their development was growing. Slovakia also has had a growing trend since 2013/2014. However, the values achieved

by Slovakia are significantly lower than these of Switzerland, Netherlands and Germany, which is also expressed by the location in the second half of the evaluated countries.

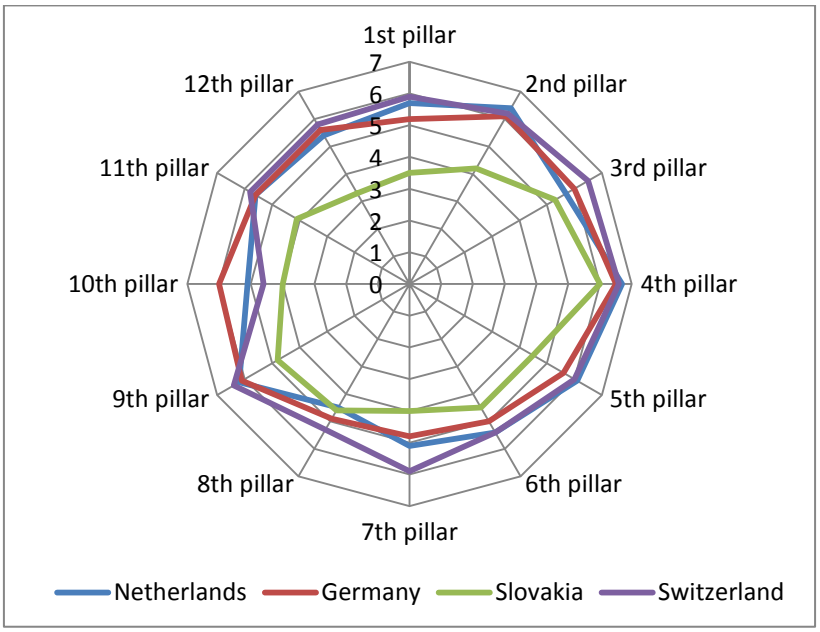
Table 3 Score of selected countries in the 5 year period

Score	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Switzerland	5,722	5,666	5,704	5,759	5,800
Netherlands	5,502	5,425	5,454	5,505	5,600
Germany	5,477	5,510	5,488	5,529	5,600
Romania	4,069	4,125	4,302	4,324	4,300
Slovakia	4,144	4,103	4,148	4,220	4,300
Macedonia	4,045	4,136	4,256	4,281	4,200

Source: own processing according to Global competitiveness reports

However, this was an overall assessment of the competitiveness of the countries. As we have already mentioned, this assessment is made up of 12-pillar sub-ratings. A closer analysis of these pillars over the period 2016/2017, can help better understanding of the strengths and weaknesses of the analyzed countries. First we have compared the results of Slovakia for individual pillars with the best rated countries.

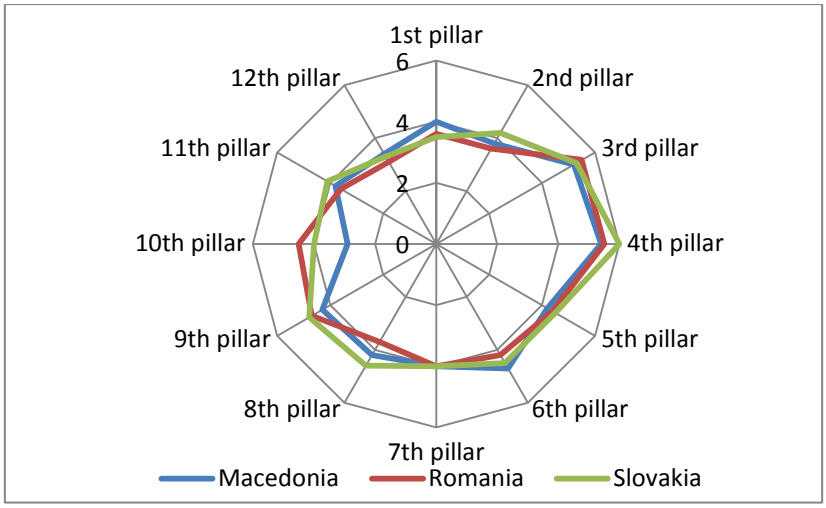
Figure 1 Pillar analysis of Slovakia and leading countries



Source: own processing according to data from WE Forum

Slovakia, compared with the leading countries in the ranking, has comparable values in these pillars: 8th - financial market development, 4th - health and primary education and the third pillar - macroeconomic environment. On the contrary, Slovakia has a significantly different value for the 12th pillar - innovation, 1st pillar - institution and 2nd pillar - infrastructure.

Figure 2 Pillar analysis of Slovakia and similar competitive countries



Source: own processing according to data from WE Forum

When we compare performance of Slovakia with European countries placed on similar positions, we can see, that Slovakia is better in the 2nd pillar - infrastructure, 4 th pillar health and primary education, 8th pillar - financial market development and 11 th pillar - business sophistication.

When we want to be more competitive, we must find out, what our weaknesses and strengths are. According to complete competitiveness evaluation made by World economic forum in Word competitiveness yearbook, we can see, that Slovakia has the biggest problems in the 1st pillar - Institution, especially in "Efficiency of legal framework in settling disputes" and others. Slovakia has had long-term problems in the area of institutions. (Xhala and Nemec, 2016). Another problematic pillar is 12th pillar - Innovation. So, the most problematic factors for country's competitiveness and for performing business are corruption, tax rates and inefficient government bureaucracy.

We supposed, that to be more competitive in Slovakia, we must improve our pillars institution, innovation and education. In pillar institution, there are big problems with corruption. One notion, how to improve mentioned area Institution, especially corruption is mentioned by Grega and Nemec (2015). They found out, that for Slovakia fully competitive procurement is, if there are 5 or more competitors. So, when we prepare competitive procurement, this could be the first step to remove corruption in the Slovakia.

To make improvements in the pillars Innovation and Education, we have examined if there is the dependence between the 5th pillar of higher education and the 12th pillar of innovation. In particular, among the indicators of tertiary education enrolment rate and quality of scientific research institutions. Based on the results of statistical testing among analysed countries, there are big direct linear dependence between analysed variables. Correlation coefficient R is 0,667542, at the level of significance of alfa 5 %. The adjusted R-Squared value was only 0,445612, which seems to be too low to make predictions or draw conclusions.

4 Conclusions

The development of Slovak competitiveness has a desirable, improving tendency. The position in the Competitiveness Ranking is steadily improving. Still, the country faces considerable problems. Until we change access to the problematic areas of Innovation and Institutions, our competitiveness will not be able to progress. One notion, how to improve mentioned area Institution, especially corruption is, if there are 5 or more competitors in fully competitive procurement.

Stabile leading countries are stabile, innovation leaders, have almost zero corruption and one of the few problems are lack of capacity for research and innovation, because there are many research centres and innovation enterprises.

Following these Leader countries in their competitive advantages should be a priority of Slovakia. By learning from the very best, we can move our country forward.

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Legal Background for an Expert Witness to a Corporate Name Valuation

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Abstract: *According to American Marketing Association, brand is a name, term, design, symbol, or any other feature that identifies one seller's good or service as distinct from those of other sellers. A corporate name is one of the possible forms of the brand. In the sense of the Czech Civil Code, a corporate name is a name under which the entrepreneur is registered in the commercial register. An entrepreneur may not have several corporate names. The role of an expert witness is to provide the court with an independent and neutral assessment (e. g. valuation) based on his expertise. The aim of this paper is within the legal system of the Czech Republic to define legal background of the institute of a corporate name so that it can subsequently result in a reliable valuation by an expert witness. For this purpose, the paper examines the legal nature of a corporate name and its possible dispositions that might require an expert valuation.*

Keywords: expert witness valuation, corporate name, brand

JEL codes: M21,K22

1 Introduction

The issue of the brand (and eventually its valuation) deals with several economic disciplines such as marketing, strategic management, corporate finance. The brand also has its accounting connotations as well as microeconomic understanding. The views occupied by these disciplines often highlight different aspects of the brand, often overlapping and expressing the same message in different languages.

The most widely cited and widely respected definition of the term "brand" is the definition of the American Marketing Association: *"a name, term, design, symbol, or any other feature that identifies one seller´s good or service as distinct from those of other sellers*"(American Marketing Association, 2017). A corporate name meets this definition as well.

What is a legal definition of a corporate name? According to the Civil Code, a corporate name is a name under which the entrepreneur is registered in the commercial register.

Issues with the valuation of things - measuring the value of things among themselves - are among the important and perhaps fundamental questions of economics. Answers to these questions find practical application in the context of everyday life when deciding economic subjects about their further action. These questions can be considered in relation to individual things, but also to sets of them. The answer can be usually found through market prices as an objectified, indivisible independent measure.

However, market prices are not available for all individual things or sets of them. Over time, a whole range of methods have been derived that attempt to derive at least estimates of these prices in various ways.

"The value of a thing, if it can be expressed in pecuniary terms, is its price. The price of a thing is determined as a usual price, unless otherwise agreed or provided by a statute." (Civil Code, 2012)

The role of an expert is to provide the court with an independent and neutral assessment based on his expertise. (Bělohlávek, 2011)

In his practice, the expert witness can be confronted with the need for a corporate name valuation, especially in connection with a business enterprise. A corporate name can be one of the determining factors of the cost of a business enterprise, as the client valuating things identifies the entrepreneur or his business enterprise just by the corporate name (Večerková, 2014).

In the Czech Republic, the issue of a business enterprise and a corporate name is regulated by the Civil Code. For an expert witness, the legal background of a corporate name valuation is important, perceived in the concrete context of his individual case and in the context of the economic framework. The relatively recent recodification of private law, which took effect in the Czech Republic since 2014, has brought new possibilities for dispositions with a corporate name in this field. The aim of this paper is within the legal system of the Czech Republic to define legal background of the institute of a corporate name so that it can subsequently result in a reliable valuation by an expert witness.

2 Methodology and Data

The paper deals exclusively with a corporate name as one of the possible brand forms. It focuses only on cases of dispositions with a corporate name; it does not deal with, for example, compensation for damage.

To achieve the aim of this paper, the legal nature of a corporate name and its inclusion in the systematics of the Civil Code were detected. In addition, it was necessary to define within the Civil Code the dispositions to which it could actually be present with the corporate name.

This research assesses the legal nature of a corporate name and its possible dispositions as a legal background for a reliable valuation provided by an expert witness. The analysis is founded on the assumption that the role of an expert witness is to provide the court with an independent and neutral assessment. (Bělohlávek, 2011)

The research approach was developed after an extensive review of academic literature and research on branch and valuation (Aaker, 1996; Bharadwaj et al., 2011; Coopland, 2005; Damodaran, 2008; Dommer at al., 2013; Feldwick, 1996; Himme, Fischer, 2014; Chen, Zhang, 2013; Keller, 2003; Larkin, 2013; Liberman, Herbden, 2012; Kotler, Armstrong, 2015; Raggio, Leone, 2009; Rego et al., 2011; Salinas, Amber, 2009; Shrinivasan, Hanssens, 2009; Simon, Sullivan, 1993; Smith, Richey, 2013; Taylor, 2007).

As the phenomenon under study is complex and explanatory in nature, qualitative data with content analysis proved to be the best way to assess a legal background for a reliable expert valuation. As essential source of secondary data represents Acts of Collection of Laws of the Czech Republic and their Explanatory Memoranda and commentaries on law. Experts witnesses were interviewed to gain primary data.

To achieve the aim of this paper, material regulation of a corporate name in the Czech Republic current legal system was examined. Relevant laws were examined, especially the Civil Code (2012), explanatory memoranda, comments on laws (secondary data). Considering the fact that the subject is an intersection of the law and the area of economics, the methods used for the study were mainly content analysis, deduction, induction, compilation and comparison. The description and method of analogy were used for more advanced considerations.

3 Results and Discussion

The Legal Nature of a Corporate Name

According to the present Civil Code a corporate name is a name under which the entrepreneur is registered in the commercial register. In the case of a legal person it is the name indicated in the forming juridical act. An individual shall register in the

commercial register under the corporate name generally consisting of his name. If his name changes, his former name may continue to be used in the corporate name; however, he shall publish such a change of name. (Civil Code, 2012)

A corporate name must be distinguished from a so-called special designation, typical for restaurants, for example, which is another type of brand, unless it is identical with the corporate name.

Examining the legal nature of a corporate name, we will come to a conclusion, that a corporate name is, within the framework of the Civil Code, a thing in a legal sense (legal abbreviation and hereinafter a "thing"), meeting its definition "everything that is different from a person and serves the needs of people". According to the explanatory memorandum, a corporate name is explicitly included among incorporeal things *("rights whose nature allows it, and other things without corporeal substance"*). A corporate name is a movable thing (all other things except defined immovable things, whether of a corporeal or incorporeal nature, are movable). A corporate name is a non-fungible thing (cannot be substituted with another thing of the same kind) and, finally, non-consumable thing (common use does not consists in its consumption, processing or alienation). The summary of the analysis is shown in Table 1.

Table 1 The legal nature of a corporate name as a thing in a legal sense in the systematics of the Civil Code

	description
Incorporeal thing	rights whose nature allows it, and other things without corporeal substance
Movable thing	is not immovable thing
Non-fungible thing	cannot be substituted with another thing of the same kind
Non-consumable thing	common use does not consist in its consumption, processing or alienation

Source: own elaboration on the basis of the literature research (The Civil Code (2012)).

A corporate name is within the Civil Code a part of a business enterprise (an organized set of assets and liabilities created by an entrepreneur which, based on his will, are used to pursue his activities). A business enterprise is presumed to comprise everything that is typically used for its operation.

By definition, a person who owns a corporate name can only be an entrepreneur, both a legal person and a natural person. Therefore a corporate name is a part of entrepreneur property, belonging to this person as so as *"The totality of what belongs to a person constitutes his property."* (Civil Code, 2012)

A corporate name is rather a property right than a personal right. (Explanatory Memorandum, 2012) The Civil Code differentiates the approach to absolute and relative property rights. Absolute and relative property rights that can be in the systematics of the Civil Code theoretically considered in connection with a corporate name were analyzed, whereas the summary of the analysis is shown in Table 2.

Table 2 Absolute and relative property rights, which can be in the systematics of the Civil Code theoretically considered in connection to a corporate name

Absolute property rights	**Rights in rem**	**Possession**	
		Ownership	
		Co-ownership	
		Rights in rem in things of others	Pledge
		Administration of property of others	
	Law of succession		
Relative property rights	Obligations arising from juridical acts	Transfer of a thing into the ownership of another	Donation
			Purchase
			Exchange
		Relinquishing a thing to be used by another	Precarious loan
			Loan for use
			Lease
			Usufructuary lease
			License
			Loan for consumption
	Obligations arising from torts	Compensation for pecuniary and non-pecuniary harm	
		Abuse and restriction of competition	
	Obligations arising from other legal causes	Unjust enrichment	
		Agency without mandate and the use of a thing of another for the benefit of another person	

Source: own elaboration on the basis of the literature research (Explanatory memorandum of Act No. 89/2012 Coll, The Civil Code. (2012)).

As can be seen from the table, the spectrum of situations where a need for an expert witness valuation may arise is very broad. After this precise definition, this paper will focus only on the basic corporate name dispositions.

Dispositions with a Corporate Name

The elementary option of a corporate name disposition is the acquisition of the right of ownership. The elementary option of the acquisition of the right of ownership in the case of a corporate name is shown in Table 3.

Table 3 Elementary options of the acquisition of the right of a company name ownership

Originary		**Establishment**
Derivative	Transfer	Donation
		Purchase
	Passage	As a result of the death of a physical person
		As a result of the dissolution of a legal person

Source: own elaboration on the basis of the literature research (The Civil Code. (2012)).

To focus on these elementary acquisition options, a need for an expert witness corporate name valuation may arise mainly in the case of a derivative acquisition, although a need of valuation in the case of originary acquisition is also possible, especially in the situation, when name, which shall become a corporate name, does exist before a registration in the commercial register for quite long time and is therefore another form of valuable brand. In any matter, the Civil Code requires a corporate name to be unmistakable, such as there is a prohibition on misleading. Other requirements for a corporate name are set by other laws, such as the Business Corporations Act or the Banking Act.

The transfer of a corporate name will take place either alone or together with the transfer of a business enterprise. In the case of transition, it is probably possible to consider the transfer of a corporate name together with the business enterprise, but the separate transfer of a corporate name cannot be excluded a priori.

It should be borne in mind that the registration in the commercial register is constitutive. Before the registration, there is no corporate name, but it is a different designation, which is not the subject of this paper. Thus, titulus of the transfer is the contract, the decision about the application for entry in the commercial register and its implementation is a modus.

It is also essential for this issue that a corporate name uses legal protection (beyond which it may still be protected by, for example, a trademark), with the help of means of protection against unfair competition. Special rules apply in this case for so-called business groups.

A person who acquires a corporate name has the right to use it subject to the consent of his predecessor or the legal successor thereof; however, he is required to attach to the corporate name information indicating legal succession.

In addition to situations of corporate name acquisition, it is also possible to consider cases of transfer of usable rights to a corporate name belonging to another, e.g. in the case of franchise (Skalický, 2015). As the most appropriate, licensing for the corporate name appears to be the case here. According to Večerková (2014), a procedure analogous to that of the grant of a trademark license should be applied in such a case. This will be particularly practical if the entrepreneur's corporate name is identical to its trademark and both intend to provide it to another entrepreneur. Some authors, however, believe that the provision of a corporate name is in use for example by a license agreement and is not possible because the deletion of a corporate name from the commercial register will terminate it and consequently all the rights of the entrepreneur to a corporate name (srov. Knoblochová, V., Lavrushin, K, 2016).

Therefore, an entrepreneur has only one corporate name within the framework of the Civil Code (even though he may have more business enterprises). Thus, if an entrepreneur transfers a corporate name to another, he can no longer use it on his own, and vice versa, if an entrepreneur acquires a new corporate name, he cannot retain his original one.

For an expert witness, this issue is important because his valuation can be significantly determined whether, for example, in the case of a sale of a corporate name, the buyer can provide the corporate name with another or not. The author of this paper believes that theoretically it is necessary to admit this possibility, but the practical implementation prevents the way of entry in the commercial register. If it would be possible to synchronize the registration and deletion of a corporate name to the same moment with two entrepreneurs at the same time, licensing a corporate name would not hinder anything. However, in view of the current practice of the registry courts, this is practically excluded for the time being.

4 Conclusions

A corporate name is one of the forms of the brand. After the recodification of Czech private law, the possibility of dispositions with a corporate name expanded (the transfer of a corporate name was not possible under previous legal regulation), thus creating a requirement for an expert witness to be able to find the reliable corporate name value. For this purpose, the expert witness needs to know the legal nature of a corporate name, to include a corporate name in the system of the Civil Code and to have an idea of the situations with which the corporate name can take place and of their possible limitations or confusion in their interpretation.

In the context of a corporate name and the requirement of its valuation, an expert witness can be confronted with a variety of situations. This paper only dealt with dispositions with a corporate name.

Firstly, the legal nature of a corporate name as a thing in a legal sense has been determined with its inclusion in the system of the Civil Code. The result was summarized in Table 1. Furthermore, absolute and relative property rights within the framework of the Civil Code were defined, which can be considered in real terms in relation to a corporate name. The results are summarized in Table 2. The following options have been selected and Table 3 summarizes the basic options that can be found under the Civil Code and corporate name be acquired.

The paper also deals with the possibility of transferring a corporate name to another, for example, under a license agreement where the professional public does not entirely agree on whether such a situation can be realized with a corporate name.

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The Development of the Excise Gap on Mineral Oils: Recent Evidence from Slovakia

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Abstract: *Tax evasion and avoidance are both phenomena that are probably as old as taxation itself. Wherever and whenever authorities decide to levy taxes, individuals and firms try to avoid paying them. Though this problem has always been present, it becomes more pressing in the course of globalization as this process extends the range of opportunities to circumvent taxation while simultaneously reducing the risk of being detected. In recent years, an increasing numbers of tax authorities have attempted to estimate the amount of tax that is legally owing to their government but not collected. This amount is commonly referred to as "tax gap" which is the difference between the theoretical tax liability due in accordance with the tax legislation and the actual revenue collected. The aim of this paper is to analyse the collection efficiency of the excise duty on mineral oils in Slovakia.*

Keywords: Indirect taxes, Excise duty collection, Excise gap on mineral oils

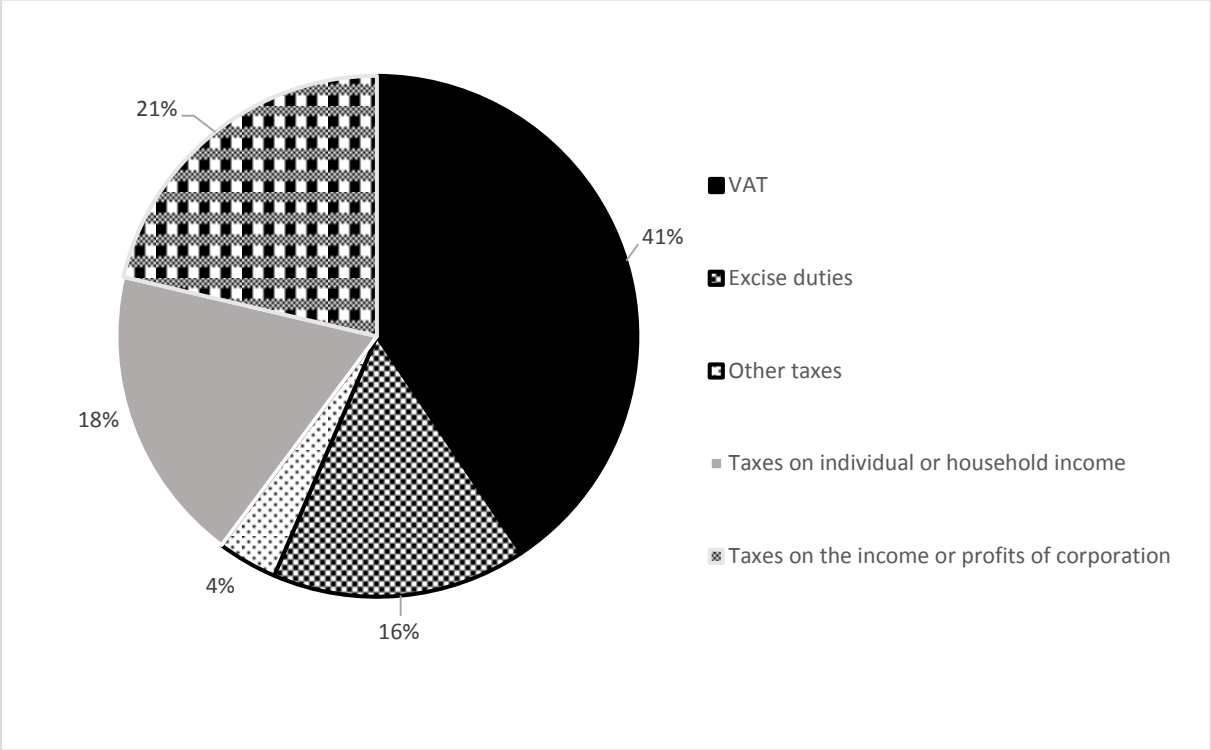
JEL codes: H26, H29, H39

1 Introduction

Excise duties are indirect taxes on the consumption or sales of specific products. Excise duties are collected for fiscal reasons but they are also intended to promote social and health policy objectives as well as environmental and energy policy goals. In contrast to the Value Added Tax (VAT), excise duties are mainly specific taxes, i.e. expressed as a monetary amount per quantity of the product. Typical examples of these "excise" goods and services include alcohol, tobacco, fuel and gambling, where the perceived negative externalities of their consumption are given as justification for the payment of a special tax.

While the most common explanation for these excise duties is that they compensate the social costs of the consumption of these harmful commodities, they also provide an important and sizeable source of revenue for national budgets (Roštárová, Janać, 2014). These two reasons both contribute to the general consensus among national states and international organizations that excise duties should remain in place and the imposed rates could potentially be increased (Semerad, David, 2015).

Figure 1 Tax structure in Slovakia (2015)



Source: Financial Administration of the Slovak Republic

The excise gap, as defined in our paper, is the difference between potential revenue and actual revenue for a given excise. Under this broad definition, the excise gap can be separated into two main components: the impact of non-compliance (the compliance gap) and the impact of policy measures (the policy gap). We have identified the tax gap using top-down approach, as the difference between total (potential) petrol and diesel consumption and the actual tax revenue collected by the Financial Administration of the Slovak Republic.

The rest of the paper is structured as follows. Section two provides a brief review of the market environment, section three presents the methodology used and results, while the last section concludes the paper.

2 Market environment

Excise duties are product-specific, which means that the amount of duties paid is based on the number of products consumed in taxable use or products supplied for taxable use. EU legislation on excise duties was largely prompted by the launch of the Single Market in 1993. As tax controls at the borders between Member States were abolished, common rules were needed to facilitate cross-border trade in certain products and to prevent competitive distortions (Rentková, Panevski, 2017). There are two types of excise duty in the European Union: excise duties that have been harmonised by directives and excised duties that are set by individual Member States. Harmonisation means that the products are subject to excise duty in all EU Member States and that minimum tax rates have been set for these products.

The harmonised excise duties are as follows:

- Excise duty on tobacco products
- Excise duty on alcohol
- Excise duty on liquid fuels

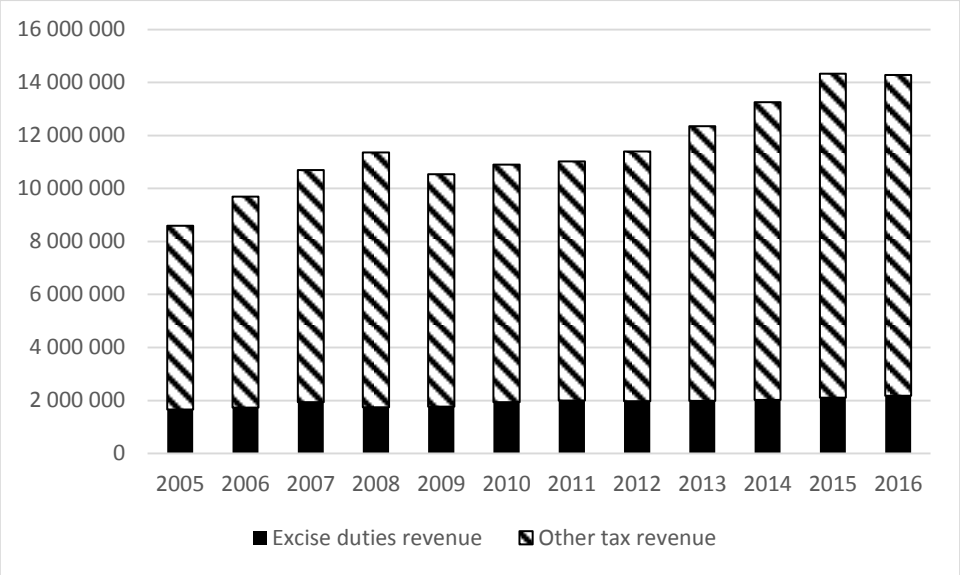
- Excise duty on electricity and certain fuels.

National excise duties and tax-like charges:

- ✓ Excise duty on soft drinks
- ✓ Excise duty on beverage containers
- ✓ Waste tax
- ✓ Oil waste duty
- ✓ Oil damage duty
- ✓ Strategic stockpile fee.

In 2016, a total of EUR 2,174 billion in excise duties were collected in Slovakia. The largest excise tax bracket includes energy taxes, with a total tax revenue of EUR 1,194 billion in 2016. Economically significant tax brackets also include the excise duty on tobacco products and the excise duty on alcohol and alcoholic beverages (Eurostat, 2017).

Figure 2 Tax revenue and excise duties revenue (thousand of EUR)

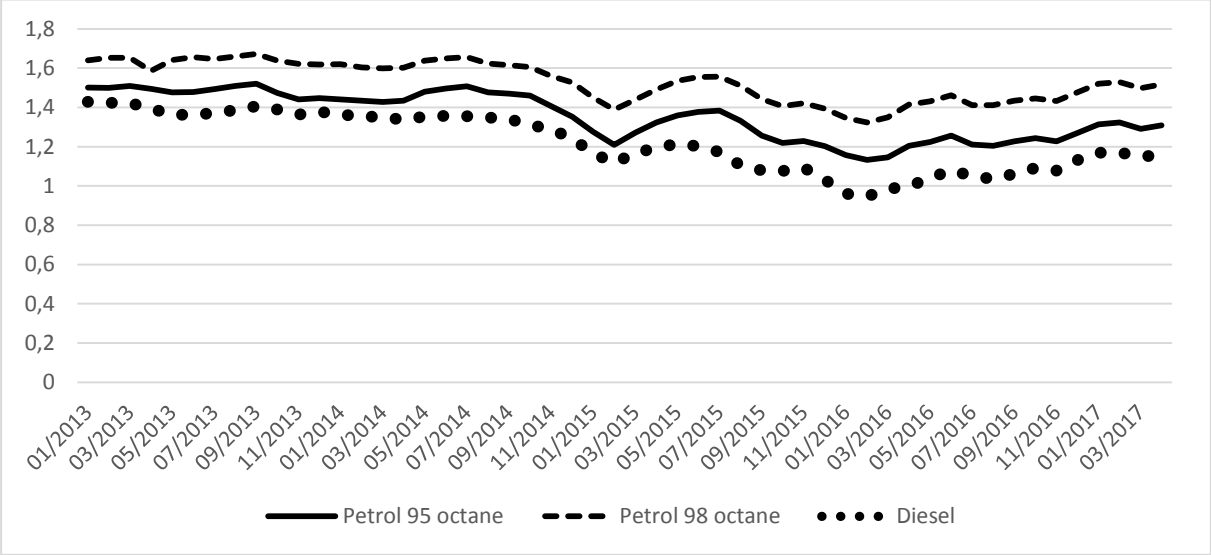


Source: Eurostat

The excise duty on liquid fuels is levied on motor and heating fuels, such as petrol, diesel oil, light and heavy fuel oil, biofuels, liquefied petroleum gas and jet fuel. Oil waste duty is levied on lubricating oils and preparations to cover the expenses arising from the treatment of oil waste. Motor and heating fuels are exempt from the oil waste duty as they do not generate oil waste. The oil damage duty is levied on oil which is imported into or transported through Slovakia and which is subject to oil damage duty.

The fuel industry in Slovakia is highly regulated and generally compliant with its obligations. A small number of clients dominate the fuel industry. They account for the majority of excise and duty collections. Monitoring strategies identify large-scale non-compliance, helping to keep the gap smaller. Figure 3 represents average fuel prices in Slovakia from 2013 to 2017 in EUR per litre. It shows that the average prices slowly decreased over this period (Statistical Office of the Slovak Republic, 2017).

Figure 3 Average fuel prices in Slovakia



Source: Statistical Office of the Slovak Republic

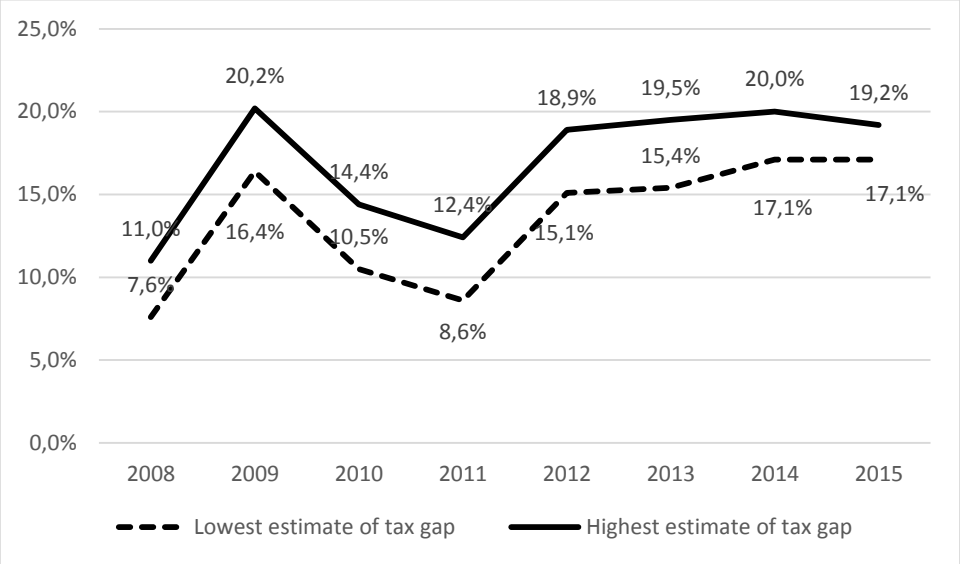
3 Methodology and Results

All tax systems will have a tax gap. It is inevitable that there will be some differences between the planned tax take and what actually comes in. There are many opinions, across the world, on the best way in which to provide robust estimates on the scale of the tax gap (IMF, 2017). Apart from numbers produced by individual countries, some of these come from academic studies by economists and statisticians, some from campaigning groups, and some from official bodies such as the Financial Administration of the Slovak Republic.

One way of describing the tax gap is to call it the difference between actual and anticipated tax revenues. Put like this it seems simple but, in fact, it is full of pitfalls and dispute over what certain terms mean, consequently it is hard to get universal acceptance of any number. It is worth stressing that calculating the tax gap is more of an art than a science. It requires the use of judgements, estimates and assumptions. So it is seems unlikely that there will be a consensus on the final figures.

We have identified the tax gap using top-down approach, as the difference between total (potential) petrol and diesel consumption and the actual tax revenue collected by the Financial Administration of the Slovak Republic. The Figure 4 below shows the trend in duty gap over the period 2008-2015.

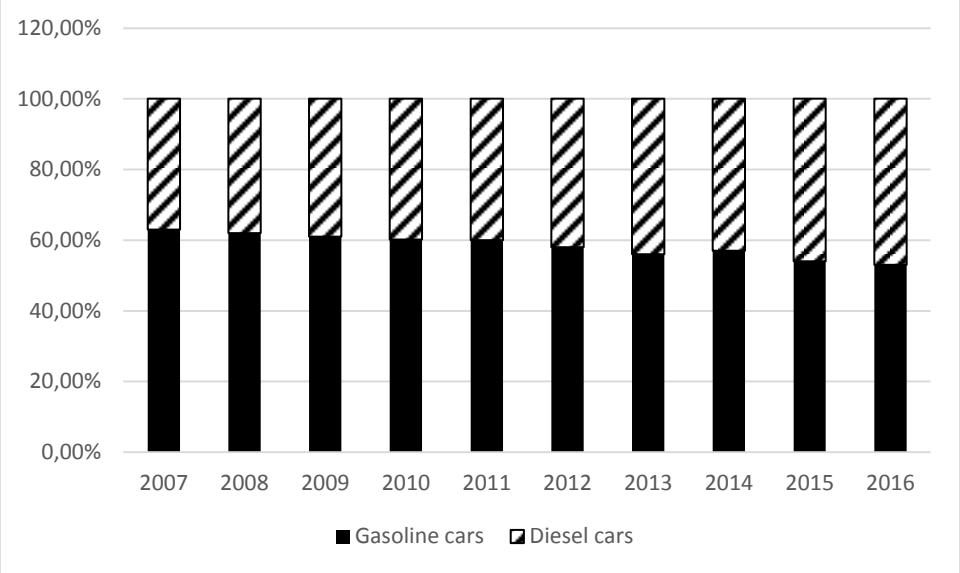
Figure 4 Lowest and highest tax gap estimation



Source: Author's calculations

The upper and lower estimates corresponding to confidence intervals indicate the range where the true value of the illicit market may lie and arises because of random sampling error and the uncertainties associated with model input data. For example, to estimate total fuel consumption we use estimates of how many kilometres are driven in total by different types of vehicle on different types of road and estimates of fuel efficiency corresponding to those journeys, as we cannot directly observe how much fuel is used in a year (Ministry of Transport and Construction of the Slovak Republic, 2017, Ministry of Interior of the Slovak Republic, 2017).

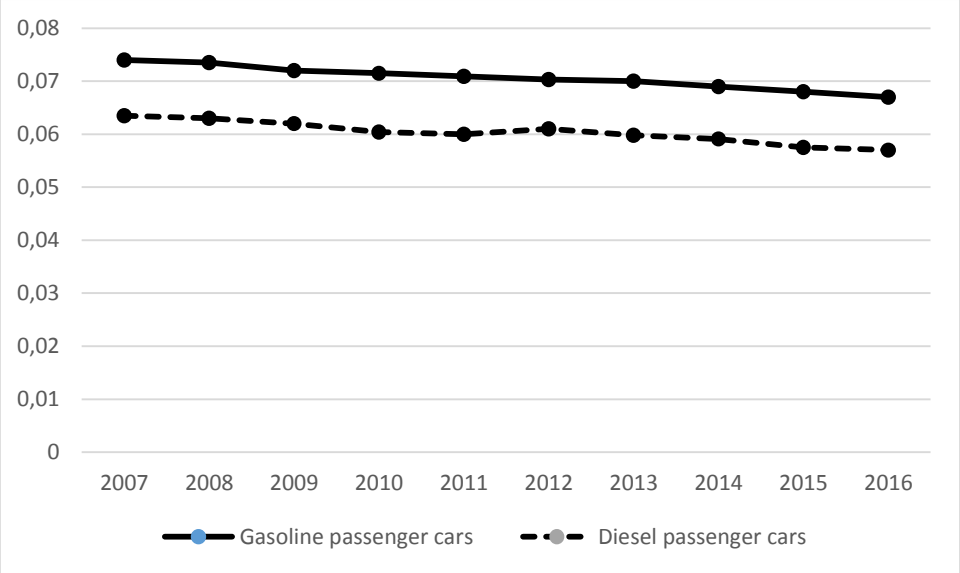
Figure 5 Gasoline cars and diesel cars in Slovakia



Source: Ministry of Transport and Construction of the Slovak Republic

If our estimate of distance travelled is too high or too low, or our estimates of fuel efficiency are too generous or too conservative, this will have an impact on the tax gap. The confidence intervals reflect the uncertainty in model inputs such as these.

Figure 6 Fuel consumption



Source: Ministry of Interior of the Slovak Republic, author's calculations

Due to the methodologies used, all tax gap estimates are subject to error, are uncertain and can change from year to year due to improvements in method and data updates (Vossler, McKee, 2017). The main sources of error are systematic errors in the assumptions used to calculate the estimates and sampling errors in the data used. The methodologies used to calculate tax gaps are subject to regular review which could result in revisions to any of the published estimates (Kuchumova, 2017).

4 Conclusions

The tax gap covers a range of behaviours which include: the tax that is lost through non-payment, use of avoidance schemes, the interpretation of the tax effects of complex transactions, error, failure to take reasonable care, evasion, the hidden economy and criminal attack on the tax system (Šlahor, 2015).

Excise tax gap is estimated using a top-down approach by comparing consumption expenditure data with tax receipts. At first, independent, external data on consumption is used to estimate tax base. Next, this tax base is used to calculate a theoretical value of tax that should be collected. As the last step, the actual amount of tax collected is subtracted from this theoretical value to estimate the tax gap.

Excise duties make a significant contribution to Slovakia government revenues. In 2014-2016, the duties levied on fuel, tobacco and alcohol raised EUR 170 million, comprising approximately 15 % of total receipts (MF SR, 2016). However, the future of these taxes is uncertain. Revenues from existing duties are set to decline in coming years, and new planned and proposed regulations, such as plain packaging for cigarettes and minimum pricing for alcohol, would likely to act to accelerate this process if enacted.

Based on the data presented in this paper, we can draw the following two fundamental conclusions:

- Our results suggest that the tax gap has increased between 2011 and 2015.
- The more information one has on the taxation basis from sources other than the taxpayers themselves, the smaller the scope for errors.

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Analytical view on performance evaluation of service enterprises

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Abstract: *Recently, there have been several changes in performance measurement approaches as well as in the application of performance evaluation methods and tools. In the past, business performance was evaluated using a profit margin, later evaluated by profit maximization and various profitability indicators. Currently, the main indicator of performance and competitiveness measurement is the Economic Value Added indicator, which is an important benchmark for determining value added for owners. The aim of our paper is to find out and identify key performance indicators of service enterprises and their mutual influences by applying selected mathematical and statistical methods. To evaluate performance, 55 financial indicators have been selected, divided into 7 groups. Key performance indicators have been identified by selected mathematical and statistical tools to uncover the interrelationships and links between selected financial indicators and the Economic Value Added indicator, which is a modern tool for evaluating the performance and competitiveness of enterprises. The contribution of the paper is to identify the key determinants of the performance and competitiveness of service enterprises and to identify strengths and weaknesses in the area of financial performance assessment and competitiveness for the service sector.*

Keywords: Financial indicator, Economic Value Added, performance

JEL codes: M210, G300

1 Introduction

Performance as an economic category is a complex issue with a differentiated approach to its measurement and evaluation. Measuring the performance of an enterprise is nowadays a very topical issue. In its historical development it has passed from the normal reporting of profit margins through profit maximization, various types of profitability indicators and up to the criteria for achieving value for owners. The traditional way of tracking the performance of enterprises based on assessment of their ability to achieve desired financial indicators - profits, turnover or market share. The enterprise is ranked as powerful when it reaches the planned financial results.

By Kislingerová et al. (2011), the performance evaluation is traditionally carried out in three ways: evaluation by a set of indicators usually of five evaluation areas, namely liquidity, activity, capital structure, profitability and market value; evaluation by a set of indicators that are arranged in a pyramidal breakdown products; evaluation using a single aggregate indicator that is the synthesis of partial indicators and other statistical data into one unit, which is one of prediction models.

The latest approaches to performance are aimed at assessing the level of the production system functioning, where it is necessary to measure the effectiveness of the

transformation process and to implement for the measure except for financial indicators also the indicators of effectiveness and severity (Hyránek et al., 2014). Key tool in increasing the overall economic performance of the enterprise in the selected Slovak industries seems to be employing a system of strategic performance management of the firm, supported by a knowledge-based Business Intelligence Information System (Rajnoha et al.,2016).

Stewart (1991) defines the economic value added (EVA) by a simple wording "EVA is a residual income that remains after, when the operating profit covers the full cost of capital."

Economic value added, unlike accounting profit, also reflects the levels of taken risk, which is also influenced by the solvency and credibility of the enterprise. By calculating the economic value added the enterprise owner's alternative cost of equity become relevant for evaluating the business activity. This cost expresses the value of equity represented by the amount that could have been earned from an investment alternative involving the same risk and that has been forgone as a result of the existing business activity. (Neumaierová and Neumaier, 2016, s. 503)

Several authors such as Neumaierová and Neumaier (2002), Marinič (2008), Mařík and Maříková (2005), Petřík 2009, Kiseľáková et al., (2016), Wagner (2009), describe methods for the calculation of EVA indicator have a few modifications:

- the *method of entity* (ie. the gross method, the method of Capital Charge),
- *the equity method* (ie. the net method, the Value Spread),
- *the method APV - the present value* (*Adjusted Present Value Approach).*

Although the method of Capital Charge is considered the most accurate method of calculating the economic value added in the Slovak legislation more appropriate seems to be Value Spread method. The essence of this method is to compare the Return of Equity (ROE) with the Cost of Equity (re). The difference between these two values is called value spread (Value Spread). By Mařík and Maříková (2005, p. 365), in spite of the declared, generally most used method is entity method.

Recently, when evaluating enterprise performance relative indicators EVA are coming to the fore that are gaining higher information value compared to the absolute indicator.

Equity method

The calculation of the EVA equity indicator represents the return on equity, which is reduced by equity and equity costs. The basic relationship for the EVA equity estimate states (Damodaran 2010) as follows:

$$\text{EVA equity} = (\text{ROE} - \text{r}_\text{e}).\text{E} \quad (1)$$

ROE – Return of Equity, r_e – alternative costs of Equity, E - Equity

Entity method

The calculation of economic value added according to the EVA method represents the difference between the achieved NOPAT (Net Operating Profit After Taxes) and the average cost of capital, multiplied by the total invested capital. Below we describe the EVA calculation formula by Mařík and Maříková (2005):

$$\text{EVA entity} = \text{NOPAT} - \text{WACC} \times \text{C} \quad (2)$$

NOPAT – Net Operating Profit, WACC – alternative costs of Equity, C – Capital (Equity + Debt)

Capital represents the value of all the financial resources invested by the investors. The calculation of the volume of invested capital can take place in two ways, either from the operational point of view through the assets (assets) or financially through the liabilities. The conversion of the amount of capital invested through assets is the sum of fixed assets (long-term operating assets at residual prices) and working capital. The

calculation of invested capital through liabilities is equal to the amount of the carrying amount of equity and interest bearing liabilities. The calculation in both ways is the same because the balance principle applies (Kislingerová et al., 2011).

APV method

In the adjusted current value (APV) approach, we start with the value of the company without debt. If we add company debt, we think about the overall impact on value by considering the benefits and costs of loans. The value of a company that finances its operations through borrowing can then be estimated at different levels of debt, and the level of debt that maximizes the firm's value is the optimal credit risk. The credit value of an enterprise is not a function of the expected leverage and can be estimated as described in the previous section by discounting the enterprise's free cash flows to capital costs. In fact, if the company does not want to estimate this value and is willing to assume that the current market value of the firm is right, it could leverage the value of the firm with a long deduction from the tax benefit and adding the expected bankruptcy costs from the existing debt (Damodoran 2012). Following is the concept of calculation in the adjusted enterprise current value approach:

$$\mathrm{EVA\,APV} = \mathrm{NOPAT} - \mathrm{r_e} \times \mathrm{NOA} \tag{3}$$

NOPAT – Net Operating Profit, r_e – alternative costs of Equity, NOA – Net Operating Assets

For an enterprise, it is required to have the positive value of EVA indicator and the positive "spread" that means the difference ROE and re. Positive value is the fact that an enterprise generates economic gain and produces value for owners. Otherwise, i.e. if the negative value of the indicator is reached, that means the cost of capital is higher than the return, the enterprise does not create a value for shareholders.

2 Methodology and Data

The paper working-out was based on secondary data from the financial statements of the selected service enterprises that we obtained from publicly available data from the financial statements register. The selection file consisted of 80 Slovak service enterprises and their structure was the following 44 hotel companies and 36 travel operators and agencies for period 2013 - 2015. We removed the enterprises from the sample, which had a negative net profit.

The performance of analyzed service enterprises was evaluated by EVA indicator, which has several modifications and for our realized analysis we chose the indicator EVA - equity and applied the following relationship (1). We have chosen top indicator EVA as the synthetic indicator, in the design of the ratio indicator EVA_{ROS}. This choice can be justified by the fact that all the indicators entering correlation analysis are proportional, so the top synthetic indicator is ratio indicator. There are several models to determine the equity costs as CAPM (Damodaran 2010), a complex modular model (Neumaierová and Neumaier 2002).We applied the same method as Neumaierová and Neumaier (2016) namely the INFA methods, which is also used by the Ministry of Industry and Trade of the Czech Republic.

As other analyzed parameters there were selected financial indicators (55), which were divided into 7 groups:

- the group of liquidity ratios (**Liquidity & Cash Flow**)
  Quick Ratio (L1) Current Ratio (L2), Total Ratio (L3) Security Indicator (L4), solvency (F1), financial return on assets (F2), financial profitability of equity (F3), degree of de-commitment (F4), loan repayment rate (F5), financial interest coverage (F6),
- the group of activity and stability indicators (**Activities & Stability**)

Turnover of Receivables (A1), the Turnover of Short-term Liabilities (A2), Stock Turnover (A3), Cash to cash (A4), Debt Ratios (A5), the Stability of the company (S1),

- the group of profitability indicators (**Profitability**)
  Return on Assets ROA (P1), Return on Equity ROE (P2), Return on Revenues ROR (P3), Return on Sales ROS (P4), Return on Costs (P5), Return on Investment (P6), Return on Long-term Assets (P7) Return on Value Added (P8), Return on Personnel Costs (P9), Share of Total Revenue to Total Capital P(10),
- the group of cost indicators (**Intensity**)
  Total Cost Ratio (I1), Manufacturing - consumer Cost Ratio (I2), Personnel Cost Ratio (I3), Depreciation Cost Ratio (I4), Financial Cost Ratio (I5), Material Cost Ratio (I6), the Economic Cost Ratio (I7),
- the group of efficiency indicators (**Effectiveness**)
  Cost Effectiveness (E1), the Effectiveness of Operating Expenses (E2), the Efficiency of Assets (E3), the Effectiveness of Long-term Assets (E4), the Efficiency of Inventory (E5), the Effectiveness of Debt Capital (E6), the Effectiveness of Equity (E7), Material Efficiency (E8),
- the group of commitment indicators (**Commitment**)
  Committed Assets (C1), Committed Long-term Assets (C2), Commitment of Stocks (C3), Committed the Debt Capital (C4), Committed Equity (C5),
- the group of value added tax indicators (**Value Added**)
  the Share of Value Added in Sales (VA1), the Share of Value Added in Total Revenues (VA2), Financial Productivity through Added Value (VA3).

Correlation analysis was the tool to reveal the interrelations between indicators for assessing the performance of the Slovak services enterprises EVA_{ROS} and the selected financial indicators and from the statistical tools there was Kendall tau's test (τ) used. MS Excel 2007 and program STATISTICA was used for processing the interrelations.

3 Results and Discussion

To meet the objective, which was to identify the key performance indicators, it was necessary to construct a correlation matrix. Performance in this matrix was quantified by ratios EVA_{ROS}, which is more meaningful than absolute EVA indicator. This indicator provides the new perspective to measure enterprise performance, while identifying key indicators that determine the creation of added value for shareholders. In the next part of the paper we deliver the results of correlation analysis, into which 55 selected financial ratios were included to confirm statistically significant dependencies on the indicator EVA_{ROS}. Of the 55 indicators analyzed, statistically significant dependence on the EVA_{ROS} indicator was confirmed for 32 indicators.

The Liquidity & Cash Flow indicator group was first analyzed. The mutual statistically significant dependence was confirmed among the 4 selected indicators from the Cash Flow group and the EVA_{ROS} indicator, and only for solvency (F1) and the Degree of de - commitment (F4) indicator the statistically significant dependence was not confirmed. In the Liquidity indicator group, statistically significant dependence between any liquidity indicators and the EVA_{ROS} indicator was not confirmed.

Table 1 Correlation among EVA_{ROS} and indicators of Cash Flow

	Correlation EVA_{ROS} a indicators of CASH FLOW $p < 0.05$ N=158			
VARIABLE	**F2**	**F3**	**F5**	**F6**
EVA(ROS)	0.2205	0.1599	-0.1422	-0.1131
	p=0.00	p=0.003	p=0.008	p=0.036

Source: own processing in software STATISTICA

Indicator Financial Return on Assets (F2), reached the highest positive dependence (0.2205) within this group and F4 - Loan repayment rate on the other hand, the highest negative dependency (τ = - 0.1422).

The second set of indicators were the indicators of Activities and Stability. For this group of indicators we can state that there is not one statistically significant dependence on the EVA_{ROS} indicator. These results show that, within the second set of indicators analyzed, it was not possible to identify a key performance indicator.

The third set of indicators analyzed were Profitability indicators, with a statistically significant positive dependence on the EVA_{ROS} for all indicators from the group of 10 indicators. The highest positive impact on the EVA_{ROS} indicator has P1 - ROA and P6 - ROI (τ = 0.3711) and the lowest P10 - Share of Total Revenue to Total Capital Ratio. None of the analyzed indicators from the Profitability group showed a negative relationship with the EVA_{ROS} indicator.

Table 2 Correlation among EVA_{ROS} and indicators of Profitability

	Correlation EVA_{ROS} and indicators of PROFITABILITY p < 0.05 N=158									
Variable	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**
EVA_{ROS}	0.3711	0.2154	0.2726	0.2724	0.2728	0.3711	0.2314	0.3418	0.3508	0.1423
	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.008

Source: own processing in software STATISTICA

For cost indicators, a statistically significant dependence, but indirectly proportional to the EVA_{ROS}, was confirmed for all indicators except for I5 - Financial Costs Ratio (t = 0.1604), where the positive dependence was shown and the I2 - Manufactoring - consumer cost Ratio as the only one of this group of indicators did not reach statistically significant dependence (p = 0.1443). Cost is one of the two important factors that determine the performance of an enterprise, so this dependence is significant. The strongest dependency was confirmed in the Total Cost Ratio (I1), but also in the Depreciation Cost Ratio (I4) and Material Cost Ratio (I6).

Table 3 Correlation among EVA_{ROS} and indicators of Intensity

	Correlation EVA_{ROS} and indicators of INTENSITY p < 0.05 N=219					
Variable	**I1**	**I3**	**I4**	**I5**	**I6**	**I7**
EVA_{ROS}	-0.2576	-0.1744	-0.2425	0.1604	-0.1952	-0.1165
	p=0.00	p=0.001	p=0.00	p=0.003	p=0.00	p=0.03

Source: own processing in software STATISTICA

In analyzing and identifying key performance indicators, it was necessary to focus on the choice of indicators determining the performance of an enterprise, both on input and on output. We also applied Effectiveness in our analysis. In this group of indicators 8 were included, only 5 of which had a statistically significant positive dependence and E5 - Efficiency of Inventory (p = 0.1446), E6 - the Effectiveness of Debt Capital (p = 0.1043) and E7 - The Effectiveness of Equity (p = 0.3939), the dependence on the EVAROS indicator was not confirmed. Statistically significant dependencies were achieved in the case of both Efficiency (E1) and Material Efficiency (E8).

Table 4 Correlation among EVA_{ROS} and indicators of Effectiveness

	Correlation EVA_{ROS} and indicators of Effectiveness p < 0.05 N=158				
Variable	**E1**	**E2**	**E3**	**E4**	**E8**
EVA_{ROS}	0.2576	0.1165	0.1423	0.1310	0.1952
	p=0.00	p=0.00	p=0.008	p=0.015	p=0.030

Source: own processing in software STATISTICA

An important branch that determines the performance of an enterprise is the chain of ownership of assets and resources. In this group of 5 indicators, a statistically significant negative relationship between the 4 of the group and EVA (ROS) indicators was confirmed. Only the C4 - Committed the Debt Assets indicator was not confirmed a statistically significant dependence, because in this case it reached p = 0.2239, which was more than the level of significance α = 0.05. The most severe negative dependence on the EVA indicator (ROS) was confirmed by the C5 - Committed Equity Ratio.

Table 5 Correlation among EVA_{ROS} and indicators of Commitment

	Correlation EVA_{ROS} and indicators of Commitment p < 0.05 N=158			
Variable	**C1**	**C2**	**C3**	**C5**
EVA_{ROS}	-0.1217	-0.2202	-0.1606	-0.2998
	p=0.00	p=0.00	p=0.003	p=0.023

Source: own processing in software STATISTICA

Finally, we analyzed indicators based on added value, as the added value is the bearer of the company's personnel performance. We can confirm the statistically significant dependence between these indicators and the EVA_{ROS} indicator. The strongest negative dependency was identified for the value-added indicator of the Share of Value Added Value in Total Revenues (VA2) and the statistically positive dependence on the EVA_{ROS} indicator for the Productivity Value through Value Added (VA3) indicator.

Table 6 Correlation among EVA_{ROS} and indicators of Added Value

	Correlation EVA (ROS) and indicators of Added Value p <0.05 N=158		
Variable	**VA1**	**VA2**	**VA3**
EVA_{ROS}	-0.1128	-0.1300	0.1305
	p=0.035	p=0.015	p=0.015

Source: own processing in software STATISTICA

The following table summarizes the indicators that have the confirmed statistically significant dependence with the EVA_{ROS} indicator.

Table 7 List of indicators correlating with EVA_{ROS}

Group of indicators	**Name of indicators**									
LIQUIDITY & CASH FLOW	**F2**	**F3**	**F4**	**F5**						
Kendall tau (τ)	0.2205	0.1599	-0.1422	-0.1131						
ACTIVITY & STABILITY										
PROFITABILITY	**P1**	**P6**	**P9**	**P8**	**P5**	**P3**	**P4**	**P7**	**P2**	**P10**
Kendall tau (τ)	0.3711	0.3711	0.3508	0.3418	0.2728	0.2726	0.2724	0.2314	0.2154	0.1423
INTENZITY	**I5**	**I7**	**I3**	**I6**	**I4**	**I1**				
Kendall tau (τ)	0.1604	-0.1165	-0.1744	-0.1952	-0.2425	-0.2576				
EFFECTIVENESS	**E1**	**E8**	**E3**	**E4**	**E2**					
Kendall tau (τ)	0.2576	0.1952	0.1423	0.1310	0.1165					
COMMITMENT	**C5**	**C2**	**C3**	**C1**						
Kendall tau (τ)	-0.2998	-0.2202	-0.1606	-0.1217						
ADDED VALUE	**VA3**	**VA2**	**VA1**							
Kendall tau (τ)	0.1305	-0.1300	-0.1128							

Source: own processing

Based on the Table 7 above, we chose from each group one key indicator that had the highest positive or negative dependence on the analyzed EVA_{ROS} indicator. No indicator

was selected from the Activity & Stability group because our analysis did not confirm statistical significance in either case.

Key business performance indicators of service enterprises of our choice include:

- **F2 - Financial Return on Assets** as a representative of the profitability indicator with the cash flow application,
- **P1 - Return on Assets (ROA)** as a representative of the company's production power,
- **I1 -Total Cost Ratio** as one of the inputs to the enterprise, which also ensures the determination of performance by financial costs,
- **E1 - Cost Effectiveness** as output Indicator from Enterprise,
- **C5 - Committed Equity** as counterpart to equity and input indicator,
- **VA2 - the Share of Value Added in Total Revenues** as a profit potential indicator.

The above-mentioned key performance indicators could be appropriate input indicators for creating an Enterprise Performance Model that would assess the performance of Slovak service enterprises.

4 Conclusions

In this paper we addressed the analysis and identification of key performance indicators of the selected Slovak services enterprises through selected statistical methods - correlation analysis.

For the analysis, 55 ratios were selected, divided into 7 groups, each group containing a different number of indicators. The Liquidity & Cash Flow Group consisted of 4 liquidity indicators and 6 indicators in which the cash flow indicator was applied. The Activity & Stability Group included 5 activity indicators and 1 Stability indicator. The most numerous group was the Profitability indicator group, where up to 10 different profitability indicators were selected. The Intensity Indicators Group was composed of 7 indicators, a set of indicators of Effectiveness of 8 indicators, and 3 indicators were selected in the last Value Added Group.

The total number of indicators for which statistically significant dependence was confirmed with the EVA_{ROS} indicator there were 32. Of these indicators the direct proportional dependence was confirmed for the 19 indicators and for the 13 indicators the indirect dependence with EVA_{ROS} was confirmed.

Finally, correlation analysis of all analyzed enterprises was elaborated, namely those with positive but also the negative value of the indicator EVA_{ROS}. The total number of the indicators for which statistically significant dependence with the indicator EVA_{ROS} was confirmed is 32. Of these indicators are the directly proportional dependence was confirmed in the case of 19 indicators and at 13 there was confirmed inversely proportional dependence with EVA_{ROS}.

From the 55 selected financial indicators applying correlation analysis we have identified the following 5 key financial performance indicators of the service enterprises: Return on Assets (P1), Cost Effectiveness (E1), Financial Return on Assets (F2), Committed Equity (C5), Total Cost Ratio (I1) and the Share of Value Added in Total Revenues (VA2), that positively or negatively affect the indicator EVA_{ROS} belonging to modern tools for assessing enterprises performance.

The above-mentioned key performance indicators could be appropriate input indicators for creating an Enterprise Performance Model that would assess the performance of Slovak service enterprises.

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Determination of Revenue Potential of Financial Transaction Tax and its consideration as own resource of the EU budget

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Abstract: *Although the responsibility for realizing the Europe 2020 strategy is shared between the EU and its 28 member states, the main criticism of the current EU budget relates to the lack of a link between the budget and Europe 2020 strategy. Therefore a new budget design as well as alternative revenue sources is currently explored within a mid-term review. One of the possible candidates is a Financial Transaction Tax (FTT). To research FTT revenue potential, a model based on a remittance system was designed. We analyze full or partial replacement of VAT- and GNI-based own resources by the transfer of the tax revenues from a FTT raised on a national level to the EU budget. Our research revealed that the introduction of a FTT would be able to fully replace VAT-based own resources (except of variant B and E). In the case of GNI-based own resources, the full replacement of GNI-based own resources in the amount of USD 89,255 mil would only be reached by variant D. In the remainder of the cases, partial replacement would be achieved.*

Keywords: Sustainability, funding, FTT, European Union, budget

JEL codes: H25, H61

1 Introduction

The idea about taxation of financial market usually came after economic crisis. The last one came after the economic and financial crisis in 2008. The European Commission (2011a-e) assumes that taxes could enhance the efficiency and stability of financial markets and reduce their volatility and the harmful effects of excessive risk-taking which can create negative externalities for the rest of the economy. Therefore, the European Commission published a draft of a directive introducing a common FTT system in September 2011. However, the proposal was rejected, and eleven EU member states started to negotiate its introduction through enhanced cooperation based on the Article 20 of the Treaty on the EU and Articles 326 and 334 of the Treaty on the Functioning of the EU.

After the introduction of a FTT proposal, the potential FTT tax revenues have been often discussed in the literature. Schulmeister and Sokoll (2013) predicted revenue of EUR 56 bn. employing the relocation effect (i.e., introducing the factor of reaction of the market participants on the introduction of the tax) and considering implementation through enhanced cooperation. European Commission (2013a,b) estimated that the introduction of FTT through enhanced cooperation could raise the revenue in the range of EUR 30-35 bn. Nerudova and Dvorakova (2014) estimated the revenue in the range of EUR 24.9 – 28.3 bn. in case of introduction of FTT through enhanced cooperation. The only two studies employing the introduced issuance principle are by Naess-Schmidt, Hansen and Ringsted (2014) and Schäfer (2015). The former estimates the FTT revenues only for Germany on EUR 57.3-87.5 bn. in the case of a static model and EUR 17.6-33.4 bn. in the case of a dynamic model.

Although initially the effort to impose a FTT was to ensure a fair contribution of the financial sector for repaying the public funds invested into the sector during the crisis, it was also considered as a potential candidate for a new own resource to finance the EU

budget. Based on the estimations of the European Commission (2012) it is expected an almost 50% reduction of GNI contributions of all member states in case of the mandatory implementation of FTT within EU-27. Similarly as a FTT, the common consolidated corporate tax base system (CCCTB) was also considered with the result of full replacement of VAT-based own resource by CCCTB-based own resource with the only exemption, which is Cyprus (Nerudová et.al, 2017).

When considering FTT as an own resource of the EU budget, one must consider the design of the tax-based system of own resources (Heinemann, Mohl and Osterloh 2008). The possible design of an EU-tax based system of own resources was studied by Raddatz and Schick (2003). The authors discussed three possible designs, namely linked system, surcharge system and separation system. In this paper we further develop the methodology of the authors by adding another design option: a remittance system. This design of a FTT-based own resource foresees replacing VAT- and GNI-based own resources by the remittance of tax revenues from a FTT collected on the national level to the EU budget.

The aim of this paper is to determine the revenue potential of FTT in the EU28 and consider the possible replacement of a VAT- and GNI-based own resources by FTT-based own resources through a remittance system as one element of sustainability-oriented future EU funding.

2 Methodology and Data

This section is dedicated to the presentation of the methodology used in this paper for the estimation of the potential revenues from a FTT in the EU and the possible replacement of the VAT-and GNI-based own resource by a FTT-based own resource.

In our study, we considered the following formula to determine the potential revenue from a FTT in the EU:

$$R = 2 * \tau * V * (1 - E) * \left(1 + \frac{2 * \tau}{c}\right)^{\varepsilon} \quad (1)$$

Where

R – represents the annual revenue,

τ – represents the tax rate, which is doubled as both side of transactions are taxed,

V – represents the annual transaction volume,

E – represents fiscal evasion and relocation,

c – represents transaction costs in per cent of the transaction volume and

ε – represents elasticity, which describes the effect of a tax increase on the transaction volume, i.e., the tax base.

As a dataset was applied the World Federation Exchange (WFE), which includes annual transaction values of trades performed around the world. However, only the transactions performed through EU financial markets in 2015 were considered for the purpose of our research, namely the value of share trading, value of bond trading, ETFs and investment funds in the case of equity transactions and currency options and futures, and commodities options and futures in the case of derivative transactions. Based on it, the tax base covers securities and exchange derivatives trades performed in the EU financial markets. Further, tax base was identified using a source principle. Under the source principle, the EU would have the right to tax all the financial transactions that are deemed to have occurred in the EU, regardless of the tax residence of the parties involved in the transactions – i.e., only the transactions taking place on EU territory

would be taxable events. Furthermore, we assumed that the transaction should be taxed on both legs in the trade (i.e. the buyer and the seller).

Further, table 1 below presents the variables that were taken into account for the prediction of FTT revenues. The first - *the tax rate* - was applied both in accordance with the proposal of FTT directive and various tax rates were considered. The second – *relocation and evasion rates* – FTT revenues are estimated with relocation and tax evasion effects in the range of 60 – 95% in case of derivatives and in the range of 5-25% in case of securities. The assumptions in the paper are based on the impact assessment of the European Commission (2010, 2011e, 2013a,b) and on the research of Coelho (2014), which assumed large avoidance responses of the market participants after the introduction of FTT. Moreover, we also utilize zero fiscal evasion. The third – *transaction costs* – we applied the transaction costs in accordance with the last surveys performed by Burman et al. (2016), Collins (2016), Pollin, Heintz and Herndon (2016), Schäfer (2015), Naess-Schmidt, Hansen and Ringsted (2014), the European Commission (2011e, 2013a,b), Nerudová and Dvořáková (2014), Schulmeister, Schratzenstaller and Picek (2008) and Bivens and Blair (2016). The last one – *elasticity* – which is defined as the relative change in the transaction volume to a relative change in the tax rate was applied according to the European Commission (2011e).

Table 1 Variables and their values used for the determination of a FTT estimates

Financial instruments / **Variant**	**Tax rates**				
	A*	**B**	**C**	**D**	**E**
Securities**	0.1 %	0.01 %	0.05 %	0.1 %	0.01 %
Derivatives	0.01 %	0.0025 %	0.005 %		
	Relocation and evasion rates				
Securities	0 %, 5 %, 10 %, 15 %, 20 %, 25 %				
Derivatives	95 %, 90 %, 85 %, 80 %, 75 %, 70 %, 65 %, 60 %, 0 %				
	Transaction costs				
Securities	0.6, 0.12, 0.1, 0.2, 0.98, 0.032, 0.32, 0.2, 0.3, 0.14, 0.08				
Derivatives	0.3, 0.024, 0.7, 0.005, 0.003, 0.01, 0.013, 0.042, 0.56, 0.002				
	Elasticity				
Securities and Derivatives	-2, -1.5, -1, -0.5, 0, 0.5, 1, 1.5, 2				

* Based on the proposal of FTT directive. ** bonds and stocks

Source: own compilation

All of the aforementioned variables and their values were separately used in the various combinations for the estimations of FTT revenues. The results are presented as a range between first and third quartiles, i.e., 25p and 75p, when the extreme estimations were omitted. Moreover, our study considered three different scenarios. The first scenario, the "static scenario", neglects all potential market reactions initiated by implementing FTT, in that elasticity, evasion and relocation effects are not considered. The second, the "maximum evasion scenario", assumes a 60-95% range of evasion for derivatives and 5-25% for securities and considers other variables explained above. The third scenario, the "no-evasion scenario", assumes no evasion in the markets at all (i.e., evasion is expected to be 0%) and assumed only transaction costs and elasticities.

3 Results and Discussion

Revenues potential of a FTT

Based on the methodology mentioned above, the estimates of FTT revenues were performed for five variants depending on different tax rates (variants A-E) and three

different scenarios, such as the static scenario, maximum evasion scenario and no-evasion scenario.

In the static scenario which neglects all potential market reactions initiated by introducing FTT, the highest FTT revenues could accrue to the EU from variant D, which includes the highest assumed tax rate for derivatives and securities in the amount of 0.1%. The estimated range of the volume for the entire EU is USD 433 bn.-5,884 bn. The lowest FTT revenues could accrue in variant B (i.e., 0.01% tax rate for securities and 0.0025% tax rate for derivatives) with the estimation in the amount of USD 7-11 bn.

Under other scenarios (i.e. max evasion or no evasion), estimates of FTT revenues are in the range of USD 2-251 bn. (max evasion scenario) and USD 5-1,058 bn. (no evasion scenario), for more details, see table 2.

Table 2 Summary of the estimates of the FTT revenue for EU

Financial instruments	**Static scenario (without E and ε)**		**Max evasion scenario**		**No evasion scenario**	
Percentiles	**25p**	**75p**	**25p**	**75p**	**25p**	**75p**
Variants in mil USD	**Variant A (0.1 % and 0.01 %)**					
Derivatives	32 370.22	96 296.41	1 444.388	6 864.745	10 043.21	29 331.52
Equity	22 563.38	43 146.71	15 647.96	33 774.69	15 806.17	35 552.00
Total	54 933.6	139 443.1	17 092.35	40 639.43	25 849.38	64 883.53
	Variant B (0.01 % and 0.0025 %)					
Derivatives	5 510.627	9 066.407	446.7758	1 492.534	3 648.166	5 046.787
Equity	2 423.232	2 651.237	2 203.68	2 425.594	2 257.627	2 488.934
Total	7 933.859	11 717.64	2 650.455	3 918.128	5 905.793	7 535.721
	Variant C (0.05 % and 0.005 %)					
Derivatives	15 140.87	31 197.23	851.519	3 050.998	6 328.831	11 639.46
Equity	11 589.08	16 952.7	9 340.492	14 297.19	9 482.793	14 814.15
Total	26 729.95	48 149.93	10 192.01	17 348.18	15 811.62	26 453.61
	Variant D (0.1 %)					
Derivatives	410 707.78	5 841 691	13 025.61	218 116.3	36 842.92	1 022 589
Equity	22 563.38	43 146.71	15 647.96	33 774.69	15 806.17	35 552
Total	433 271.16	5 884 838	28 673.58	251 890.9	52 649.09	1 058 141
	Variant E (0.01 %)					
Derivatives	20 303.04	74 881.39	1 444.388	6 864.745	10 043.21	29 331.52
Equity	2 423.232	2 651.237	2 203.68	2 425.594	2 257.627	2 488.934
Total	22 726.27	77 532.63	3 648.068	9 290.339	12 300.84	31 820.46

Source: WFE, author´s calculation.

Replacement of VAT and GNI own resources

This paper considers the design of FTT-based own resources, which is based on a remittance system (the system expects the replacement of VAT- and GNI-based own resource by the transfer of tax revenues from FTT raised on national level to the EU budget). In the case of EU28, the VAT-based own resource generates EUR 17.6 bn. (USD 15.91 bn.) and GNI-based own resources generates EUR 99.07 bn. (USD 89.25 bn.). A FTT is able to generate substantial tax revenues for EU28 depending on the set tax rates and the reaction of the financial markets (i.e., the elasticity, transaction costs or the relocation effects). Globally, based on our estimates, a FTT could generate tax revenues between USD 2.65 bn. – 5 884.8 bn. Therefore, the replacement of VAT- or GNI-based

national contributions to the EU budget by new FTT-based own resource can be considered.

The replacement of VAT- and GNI-based own resources with FTT is presented in tables below. As is obvious, in the case of VAT-based own resources (shown in table 3 below), a FTT would not be able to fully replace the overall contribution of the EU member states to the EU budget in the amount of USD 15,916 mil if the variant B or variant E max evasion scenario is considered. It would be achieved only partial replacement, which varies from 2.81% to 73.62%, depending on the selected scenario. In the respect of other variants and scenarios the full replacement is possible, specifically in all scenarios in variants A and D.

Table 3 FTT revenue potential in the case of VAT-based own resource replacement

VAT replacement in % Total VAT for EU28 - USD 15 916.56 mil						
Financial instruments	**Static scenario (without E and ε)**		**Max evasion scenario**		**No evasion scenario**	
Percentiles	**25p**	**75p**	**25p**	**75p**	**25p**	**75p**
Variants			**Variant A**			
Derivatives	**100.00**	**100.00**	9.07	43.13	63.10	**100.00**
Equity	**100.00**	**100.00**	98.31	**100.00**	99.31	**100.00**
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
			Variant B			
Derivatives	34.62	56.96	2.81	9.38	22.92	31.71
Equity	15.22	16.66	13.85	15.24	14.18	15.64
Total	49.85	73.62	16.65	24.62	37.10	47.35
			Variant C			
Derivatives	95.13	**100.00**	5.35	19.17	39.76	73.13
Equity	72.81	**100.00**	58.68	89.83	59.58	93.07
Total	**100.00**	**100.00**	64.03	**100.00**	99.34	**100.00**
			Variant D			
Derivatives	**100.00**	**100.00**	81.84	**100.00**	**100.00**	**100.00**
Equity	**100.00**	**100.00**	98.31	**100.00**	99.31	**100.00**
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
			Variant E			
Derivatives	**100.00**	**100.00**	9.07	43.13	63.10	**100.00**
Equity	15.22	16.66	13.85	15.24	14.18	15.64
Total	**100.00**	**100.00**	22.92	58.37	77.28	**100.00**

Source: WFE and own calculations.

With regard to the replacement of GNI-based own resources with FTT revenues, the full replacement would not be reached in the majority of variants, namely by variant A (except the static scenario – 75p), B, C and E. The full replacement of GNI-based own resources in the amount of USD 89,255 mil would only be reached by variant D. In the remainder of the cases, partial replacement would be achieved between 0.50% and 86.87% (for more details, see table 4 below).

Table 4 FTT revenue potential in the case of GNI-based own resource replacement

GNI replacement in % Total GNI for EU28 - USD 89 244.32 mil						
Financial instruments	**Static scenario (without E and ε)**		**Max evasion scenario**		**No evasion scenario**	
Percentiles	**25p**	**75p**	**25p**	**75p**	**25p**	**75p**
Variants			**Variant A**			
Derivatives	36.27	**100.00**	1.62	7.69	11.25	32.86
Equity	25.28	48.34	17.53	37.84	17.71	39.83
Total	61.55	**100.00**	19.15	45.53	28.96	72.69
			Variant B			
Derivatives	6.17	10.16	0.50	1.67	4.09	5.65
Equity	2.71	2.97	2.47	2.72	2.53	2.79
Total	8.89	13.13	2.97	4.39	6.62	8.44
			Variant C			
Derivatives	16.96	34.95	0.95	3.42	7.09	13.04
Equity	12.98	18.99	10.46	16.02	10.62	16.60
Total	29.95	53.95	11.42	19.44	17.72	29.64
			Variant D			
Derivatives	**100.00**	**100.00**	14.59	**100.00**	41.28	**100.00**
Equity	25.28	48.34	17.53	37.84	17.71	39.83
Total	**100.00**	**100.00**	32.13	**100.00**	58.99	**100.00**
			Variant E			
Derivatives	22.75	83.90	1.62	7.69	11.25	32.86
Equity	2.71	2.97	2.47	2.72	2.53	2.79
Total	25.46	86.87	4.09	10.41	13.78	35.65

Source: WFE and own calculations.

4 Conclusions

To determine the revenue potential of the FTT, we identified and analyze dataset from WFE database through three different scenarios (the estimates of the FTT in the case of static, max evasion and no-evasion scenarios) and variants depending on the tax rates. Furthermore, we considered the source principle for the determination of FTT revenues. Our model of FTT estimates revealed that a FTT is able to generate substantial tax revenues depending on the level of tax rates and the reaction of financial markets. Globally, based on our estimates, a FTT could generate tax revenues between USD 2.65 bn. – 5 884.8 bn., depending on the simulated variant.

Further, for the purpose of replacement of VAT- and GNI-based own resources, this paper considered the design of FTT-based own resources, which is based on a remittance system. Accordingly, we suggest the replacement of VAT- and GNI-based own resources by the transfer of tax revenues from a FTT raised on a national level to the EU budget. Our research revealed that the introduction of a FTT would not be able to fully replace VAT-based own resources if variant B or variant E (max evasion scenario) is considered. In the case of GNI-based own resources the full replacement of GNI-based own resources in the amount of USD 89,255 mil would only be reached by variant D. In the remainder of the cases, partial replacement would be achieved.

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The Government Expenditure Efficiency in OECD Countries with DEA Approach

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Abstract: *Data Envelopment Analysis (DEA) is one of the methods to measure efficiency in the service sector. DEA searches individual scales for each production unit. In the presence of different input and output factors, efficiency is perceived as the ratio of the weighted sum of outputs to the weighted sum of inputs. The aim of our paper is to analyze efficiency in the health care sector using DEA models. In several OECD countries, it is possible to point to the ineffectiveness of public spending on health care. We use the basic health characteristics of the population as well as the basic macro indicators from the point of view of health financing in OECD countries. The paper shows on the impact of individual indicators on the level of efficiency in the health sector.*

Keywords: health expenditure, life expectancy, infant survival rate, physicians´ density, impatient bed density, Data Envelopment Analysis

JEL codes: I15, H51, C61

1 Introduction

In recent years, we follow the growing trend of investment and innovation in the service sector (Obradović et al. 2016). An essential part of this trend should also be an analysis of the effectiveness of the invested funds (Djogo and Stanisic, 2016; Khalid et al. 2016). The health sector today can be seen as leading in terms of investment (Bartak et al. 2016). In recent years, we often encounter many analyzes by authors who point to the shortcomings and difficulties of this sector (Soltes and Gavurova, 2015). In many cases, the non-parametric method – Data Envelopment Analysis (DEA) is also used to analyze efficiency of the used resources in the production of outputs. Health sector is mostly financed by government expenditures. Governments of OECD countries are under high pressure to improve public sector performance and at the same time to reduce the government expenditure (Popesko et al. 2015a; Rogalewicz et al. 2016). Therefore, in the process of improvement public sector performance, it is necessary to ensure the efficiency in the provision of health care services, at the same time, the countries are required to provide their health care services by minimizing the value of public expenditures directed to them (Popesko et al. 2015b). This prompted us to implement the comparative study to evaluate the efficiency of health expenditure in selected European countries, which are member of OECD, during the years 2005-2014. In first step we try to analyze the development of all variables used in DEA, as average in all analyzed countries. Then we try to analyze the relation between health expenditure and life expectancy and infant survival rate using scarlet plots. We assume, that countries with the high level of expenditures should have higher level of life expectancy and infant survival rate. In the next part of our paper we try to analyze, if countries used health

expenditures in maximal possible way, considering other characteristics which influence the individual's health indicators. According to the aim, the paper is organized as follow. In the section 2 a review of relevant literature is provided. In the section 3, applied methodology and data are described. The section 4 presents the results and key findings. The paper concludes main findings and suggestions for future research.

2 Literature preview

DEA is considered as a suitable methodology for evaluation of efficiency in the service sector. It is often used to study the efficiency of health care system from different point of view. In some papers we can see an application of this method to evaluate the efficiency of hospitals in one country, or it can be also used for international comparison of health care systems within the group of selected countries. Grosskopf et al. (2006) analyzed the efficiency of spending on health care in 143 countries. They used the DEA method and the Malmquist productivity index to estimate technical efficiency. Inputs included private and public health expenditures as percentage of per capita GDP, gross capital formation per capita, per capita labor force and enrollment rate in primary education. In model the life expectancy, infant survival rate and per capita GDP were considered as outputs. They used two multilateral health sector quantity indexes and the improvement index. They divided countries to three groups: developed, less developed and middle-incomes countries based on cumulative health index. The analysis showed that the public sector has a greater importance in health care financing in developed and middle income countries than in less developed countries. While the developed countries show signs of having better health, as measured, it does not necessarily imply that this is a result of reliance on a larger share of publicly funded healthcare. Better signs of health indicators in the context of developed countries may not be the result of higher spending on health care in countries.

The efficiency within the OECD countries were analyzed in study of Hadad et al. (2013). They used two models: one incorporating mostly inputs that were considered to be within the discretionary control of the health care system (i.e. physician's density, inpatient bed density, health expenditure), and another, including mostly inputs beyond health care system control (i.e. GDP, fruit and vegetable consumption, health expenditure). In both models the life expectancy and infant survival rate were considered as outputs. They found that nine countries (Australia, Canada, Israel, Italy, Luxembourg, Spain, Sweden, Switzerland, and the United Kingdom) with large and stable economies were defined as efficient in model 1, but were found to be inefficient in model 2.

In our conditions, the DEA was applied in the paper presented by Grausová et al. (2014). In their study they evaluated efficiency in four countries of the Visegrád group during the period 2004-2010. They applied the Data Envelopment Analysis, namely Super SBM model. The number of physicians per 100 000 inhabitants, the number of hospital beds per 100 000 inhabitants and the share of health expenditures to GDP were considered as inputs, and infant mortality and life expectancy at birth were considered as outputs. They concluded that the best ranked was the health system of Poland, and Hungary together with the Slovakia ranked at the lowest positions. They also suggested measures that could improve the efficiency. Czech Republic, according to the results should reduce the number of doctors and the number of beds and slightly reduce the share of health expenditure to GDP. Hungary together with Slovakia may also reduce the number of doctors and beds. However, the problem in these countries were performance indicators, child mortality and life expectancy, which did not correspond to the level of health care system inputs.

Medeiros and Schwierz (2015) estimated the relative efficiency of health care systems across all European Union countries using three models with different combinations of inputs and outputs. Outputs were commonly reported health outcome indicators (i.e. life expectancy, healthy life expectancy, amenable mortality rate). Inputs included

expenditure on health care, physical inputs and environmental variables. They found, that on average in the EU, life expectancy could be increased by 2.3%, by moving from current positions to the efficiency frontier. Specifically, Czech Republic, Lithuania and Slovakia had the lowest efficiencies in most of the models that were used. Hungary, Latvia, Poland and Estonia, although were scoring marginally better than the previous group, but were also underperformers. Belgium, Cyprus, Spain, France, Italy, Sweden and the Netherlands consistently score among the top seven performers in most of the models.

Comparison in the area of health is offered by Van den Heuvel and Olariou (2016). They compared data for 31 countries in Europe. They used life expectancy at birth as the output and health care expenditures, expenditures on social production and education. They showed, that countries with more curative beds, fewer nurses and caring personnel has lower score of life expectancy. It has already been confirmed in the above-mentioned papers, it is important that health and investment policies have a direct focus on social protection, the quality of care provision and the healthy lifestyle.

3 Methodology and Data

In the literature, several authors emphasize the need to measure efficiency in economics. Koopmans (1951) defines technical efficiency as an input/output vector. Debreau (1951) and Farell (1957) derived input-oriented indices. These authors gave the basis for the development of Data Envelopment Analysis. DEA was later developed in papers by Charnes et al. (1978), Banker et al. (1984)). The purpose of DEA is to compare organizational unit productivity (DMU). DEA compares individual organizational units with respect to the entire set of units. DEA and Free Disposal Hull (FDH) are the nonparametric methods. The main output is technical efficiency. Parametric methods include Distribution Free Approach (DFA), Thick Frontier Approach (TFA) and Stochastic Frontier Approach (SFA). The main output is economic efficiency. DEA through the optimization process calculates the weight of inputs and outputs. We can divide the results into efficient and inefficient units. In inefficient units, DEA analyzes the size of inputs and outputs that would lead to efficiency. Charnes et al. (1978) developed a model called the CCR model. The CCR model is the output-oriented model that uses constant returns on a scale. Variable returns on scale (VRS) uses the BCC model developed by Banker et al. (1984).

In our paper will be used input oriented super SBM model under the condition of variable return to scale. The SBM models (Slack Based Measures) are non-radial models. SBM models are invariant to the units and alternative to the additive models. According to Cooper et al. (2007) the properties of SBM models are: invariant to the units (SBM is invariant to each input and output item) and monotone (SBM is monotone decreasing in each input and output slack). Cooper et al. (2007) defined the input oriented super-efficiency under the condition of VRS as the optimal function value δ^* from:

$$\text{Super SBM} \qquad \delta^* = \min_{\bar{x},\bar{y},\lambda} \frac{\frac{1}{m}\sum_{i=1}^{m} \bar{x}_i / x_{io}}{\frac{1}{s}\sum_{r=1}^{s} \bar{y}_r / y_{ro}} \tag{1}$$

$$\text{Subject to} \qquad \bar{x} \geq \sum_{j=1,\neq 0}^{n} \lambda_j x_j \tag{2}$$

$$\bar{y} \leq \sum_{j=1,\neq 0}^{n} \lambda_j y_j \tag{3}$$

$$\bar{x} \geq x_0 \ and \ \bar{y} \leq y_0 \tag{4}$$

$$\bar{y} \geq 0, \quad \lambda \geq 0 \tag{5}$$

$$\sum_{j=1}^{n} \lambda_j = 1, \lambda_j \geq 0, \forall j. \quad (6)$$

Models of super-efficiency can be used to find efficient units. In the models of super - efficiency it is possible to evaluate the effectiveness of already effective units. The super SBM model is derived from the SBM model (in detail defined e.g. in Cooper et al. 2007). The resulting super SBM purpose function is greater or equal to one. The resulting value is more effective as the function value is higher.

Based on the previous studies, there was set up that we use in our paper and set the following input and output variables, which have impact on the efficiency of each health care system. In our analysis were used three inputs and two outputs. All variables, their definitions and data sources are presented in Table 1.

Table 2 Definition and source of variables included in the DEA model

Variable	*Role*	*Definition*	*Data source*
Life expectancy at a birth	*Output*	*The average number of years that a person could expect to live if he or she experienced the age-specific mortality rates relevant in a given country in a particular year.*	*OECD*
Infant survival rate	*Output*	*Infant survival rate is calculated as difference between 1000 and infant mortality rate. Infant mortality rate is the number of deaths of children under one year of age expressed per 1000 live births.*	*OECD*
Physicians´ density	*Input*	*The number of physicians, general practitioners and specialists, actively practicing medicine in a region during the year, in both public and private institutions.*	*OECD*
Inpatient bed density	*Input*	*Number of hospital beds (occupied or unoccupied) immediately available for use by patients admitted to all types of hospitals (general hospitals, mental health hospitals and other specialist hospitals) in all sectors (public and private).*	*OECD*
Health expenditure as a percentage of GDP	*Input*	*Total expenditure on health include the final consumption of health goods and services plus capital investment in health care infrastructure. It includes both public and private spending on personal health care services.*	*OECD*

Source: prepared by authors

As the output variables were chosen life expectancy (LE) at birth and infant survival rate (ISR). Life expectancy is a robust measure widely used in studies of health production efficiency (e.g. Grosskopf et al. 2006; Hadad et al. 2013) and is the most general and best known measure of the health status of the population (OECD, 2012). The second input, the infant survival rate is just mathematical transformation of the infant mortality rate (IMR). The reason why we did not use the infant mortality rate is, that according to DEA the outputs should be considered in such a way that "more is better". The infant survival rate was calculated as ISR = 1000 – IMR. The inputs included in our analysis were as follow: physicians' density, inpatient bed density and health expenditure as a percentage of GDP. All these variables were chosen according to the accepted conceptual model that recognizes that the following determinants have significant impact on individuals´ health: available medical care services and environment. Density of physicians is frequently used as an indicator of health-care provision. An adequate number of qualified practicing physicians, located according to need, helps to ensure the delivery of safe, high-quality medical services (OECD, 2012). The number of hospital beds usually provides a measure of the resources available for delivering health services in hospitals.

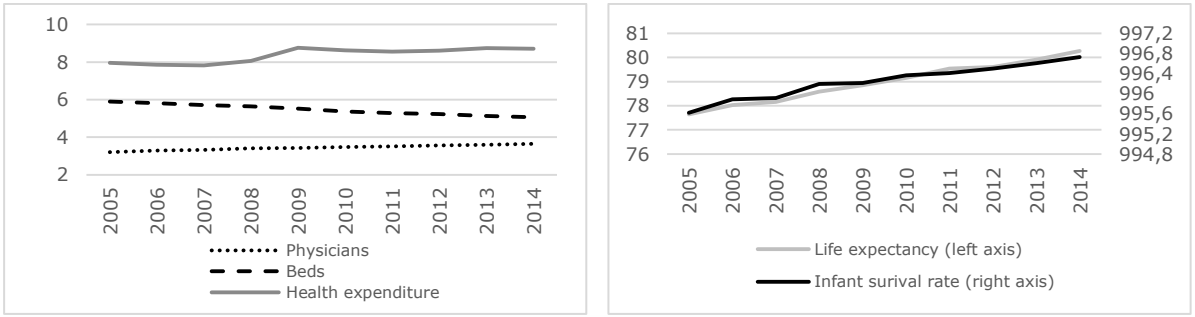
4 Results and Discussion

We try to analyze the relative efficiency of 20 European countries, which are members of OECD. The analysis is done during the period from 2005 to 2014. The year 2015 was not involved, as all data were not available. In order to eliminate the impact of the size of

individual countries, all variables were adjusted and calculated per 1000 inhabitants, per 1000 of live births, or in a case of health expenditure as a percentage of gross domestic product (GDP). In this study, an input oriented model is used with consideration that life expectancy and infant survival rate for a single country are basically given, and the objective of the health care system is to minimize the level of inputs (physicians, beds and expenditure on health). If the country is able to use minimal level of inputs to produce given level of outputs, it could be considered as efficient. This analysis provides inefficient countries with useful information regarding the ability to improve their efficiency by utilizing inputs in a more efficient manner.

The aim of the paper is to analyses and compare the relative efficiency of the countries´ health care systems. In first step we try to analyze the development of all variables used in DEA, as average in all analyzed countries. Then we try to analyze the relation between health expenditure and life expectancy and infant survival rate using scarlet plots. We assume, that countries with the high level of expenditures should have higher level of LE and ISR. In the next part of our paper we try to analyze, whether countries used these expenditures in maximal possible way, taking into consideration other characteristics which influence the individuals´ health indicators. In this part of our analysis the data were analyzed using DEA Solver software.

Figure 1 The development of average values of inputs (a) and outputs (b)

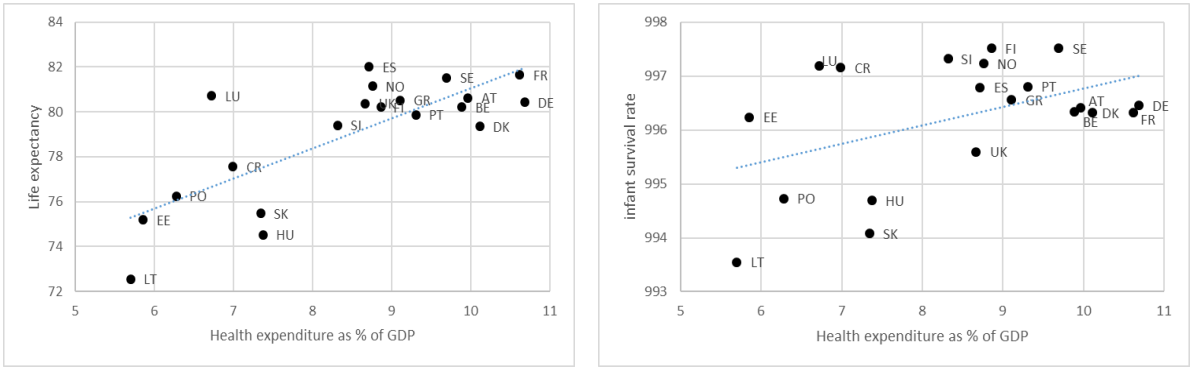


a) Average values of input variables b) Average values of output variables

Source: Prepared by authors

The tendency of development of all variables used in the analysis is presented in Figure 1. There can be seen a trend to reduce the number of hospital beds density. This fact is often a factor in transfer of hospital care to ambulatory care. There can be seen decrease by 14.2% between 2005 and 2014 in average. There is also a very slow rise in share of resources that is being devoted to health. Between 2005 and 2014, average analyzed countries health expenditure as percentage of GDP has grown by around 9.5%. Life expectancy during the analyzed period increased. It could be affected by several factors: e.g. rising living standards, better nutrition, less smoking and drinking, better education, greater access to quality health services, reduction in cross-country differences, longer live of old people thanks to improve access to health services and medical progress, especially in the treatment of cardiovascular diseases. Also the infant survival rate has the increasing tendency. It could be positively affected with new medical technology and improved prenatal care which increase survival of smaller infants.

Figure 2 The health expenditure versus life expectancy and infant survival rate



Source: Prepared by authors

In the next part of our paper we try to analyze the relation between health expenditure and life expectancy and infant survival rate. For this analysis was used the average values of indicators for each country. The scarlet plots are presented in next figure (Figure 2). The results of the analysis pointed to the fact, that the countries should be divided into three main groups:

- Countries with good results of individuals´ health indicators and higher health expenditures (e.g. Germany, France, Denmark, Austria, Belgium, Portugal, Sweden, Greece, Finland, Spain, Norway, United Kingdom, and Slovenia).
- Countries with good results of individuals´ health indicators and lower health expenditures (e.g. Luxembourg, Estonia and Czech Republic).
- Countries with lower results of individuals´ health indicators and lower health expenditures (e.g. Latvia, Poland, Slovakia, and Hungary).

In the last part of our paper we used DEA model to evaluate relative efficiency of healthcare in each country. Assuming that life expectancy and infant survival rate for a single country are basically given, then the objective of the healthcare system is to minimize the level of inputs (physicians, beds and expenditure on health). Table 2 compares the results of Super SBM input oriented model under the assumption of variable return to scale.

Table 3 Results of Super SBM input-oriented model

	2005	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2005-2014***	***Average Rank***
Austria	*0.6313*	*0.6359*	*0.6347*	*0.6394*	*0.6511*	*0.6425*	*0.6474*	*0.6469*	*0.6605*	*0.6531*	*0.6443*	*20*
Belgium	*0.7775*	*0.7727*	*0.7628*	*0.7625*	*0.7710*	*0.7663*	*0.7449*	*0.7506*	*0.7619*	*0.7575*	*0.7628*	*16*
Czech Republic	*0.8413*	*0.8390*	*0.8329*	*0.8370*	*0.8255*	*0.8331*	*0.7899*	*0.8018*	*0.7703*	*0.7688*	*0.8140*	*14*
Denmark	*0.8540*	*0.8540*	*0.8507*	*0.8528*	*0.8453*	*0.8440*	*0.8676*	*0.8700*	*0.9046*	*0.8962*	*0.8639*	*10*
Estonia	*1.1234*	*1.1265*	*1.1154*	*1.0739*	*1.0517*	*1.0517*	*1.0765*	*1.0879*	*1.0654*	*1.0449*	*1.0817*	*5*
Finland	*0.8807*	*0.8651*	*0.8550*	*0.8587*	*0.8658*	*0.8542*	*0.8236*	*0.8272*	*0.8223*	*0.8173*	*0.8470*	*12*
France	*0.7298*	*0.7314*	*0.7319*	*0.7365*	*0.7397*	*0.7299*	*0.7800*	*0.7835*	*0.7872*	*0.7834*	*0.7533*	*17*
Germany	*0.6666*	*0.6656*	*0.6634*	*0.6676*	*0.6709*	*0.6656*	*0.6628*	*0.6683*	*0.6748*	*0.6686*	*0.6674*	*19*
Greece	*0.7164*	*0.7178*	*0.7148*	*0.7022*	*0.7268*	*0.7129*	*0.7586*	*0.7833*	*0.8076*	*0.8249*	*0.7465*	*18*
Hungary	*0.7512*	*0.7641*	*0.7953*	*0.8205*	*0.8354*	*0.8144*	*0.8062*	*0.8088*	*0.8268*	*0.8311*	*0.8054*	*15*
Latvia	*0.8479*	*0.8551*	*0.8570*	*1.0965*	*1.0787*	*1.0863*	*1.1288*	*1.1387*	*1.1401*	*1.1254*	*1.0354*	*6*
Luxembourg	*1.0847*	*1.1087*	*1.1312*	*1.1238*	*1.1094*	*1.1213*	*1.2187*	*1.2036*	*1.2274*	*1.2412*	*1.1570*	*2*
Norway	*0.8219*	*0.8454*	*0.8292*	*0.8561*	*0.8257*	*0.8169*	*0.8849*	*0.8845*	*0.8775*	*0.8770*	*0.8519*	*11*
Poland	*1.1329*	*1.1184*	*1.0999*	*1.0834*	*1.1055*	*1.1059*	*1.0829*	*1.0876*	*1.0807*	*1.0793*	*1.0976*	*4*
Portugal	*0.8881*	*0.8967*	*0.8983*	*0.8978*	*0.9060*	*0.8958*	*0.9510*	*0.9737*	*1.0004*	*1.0064*	*0.9314*	*9*
Slovak Republic	*0.8315*	*0.8198*	*0.8046*	*0.8450*	*0.8150*	*0.8125*	*0.8280*	*0.8180*	*0.8391*	*0.8629*	*0.8276*	*13*
Slovenia	*1.0409*	*1.0332*	*1.0233*	*1.0273*	*1.0240*	*1.0309*	*1.0275*	*1.0277*	*1.0162*	*1.0155*	*1.0267*	*7*
Spain	*1.0199*	*1.0111*	*0.9672*	*0.9452*	*0.9450*	*0.9293*	*1.0375*	*1.0418*	*1.0520*	*1.0484*	*0.9997*	*8*

Sweden	*1.2654*	*1.2870*	*1.2655*	*1.2969*	*1.2679*	*1.2798*	*1.4590*	*1.4979*	*1.4979*	*1.4979*	*1.3615*	*1*
United Kingdom	*1.1223*	*1.1099*	*1.0978*	*1.1001*	*1.0941*	*1.0920*	*1.1296*	*1.1324*	*1.0925*	*1.0925*	*1.1063*	*3*
Minimum	*0.6313*	*0.6359*	*0.6347*	*0.6394*	*0.6511*	*0.6425*	*0.6474*	*0.6469*	*0.6605*	*0.6531*	*0.6443*	
Maximum	*1.2654*	*1.2870*	*1.2655*	*1.2969*	*1.2679*	*1.2798*	*1.4590*	*1.4979*	*1.4979*	*1.4979*	*1.3615*	
Average	*0.9014*	*0.9029*	*0.8965*	*0.9112*	*0.9077*	*0.9043*	*0.9353*	*0.9417*	*0.9453*	*0.9446*	*0.9191*	

Source: prepared by authors

As can be seen the average efficiency during the analyzed period was relatively stable. Also the position of the most and less efficient countries was relatively stable. The outcomes from the analysis point to the following findings:

- The less efficient country was during the whole analyzed period Austria. Therefore, we can say that the health care system can be considered as the most inefficient in evaluated group of countries under the used criteria. On the other hand, as the most efficient was marked health care system in Sweden. This country can be considered as efficient in term of the effective usage of health expenditure, physicians and beds to reach the best results of individuals´ health indicators (life expectancy, and infant survival rate). At the given level of individuals´ health indicators the Sweden was able to use the minimal level of inputs, compared to other countries within the sample.
- In average, nine countries have efficiency score higher than the average value (0.9191). Seven of them could be considered as efficient, where the score is higher than 1 (e.g. Estonia, Latvia, Luxembourg, Poland, Slovenia, United Kingdom and Sweden). The others (Spain and Portugal) could not be marked as efficient, as the score is above the 1. In average, eleven countries have efficiency score under the total average: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Norway and Slovak Republic).

When we look at the data in 2014, it is possible to observe that nine countries were labelled as efficient (Estonia, Latvia, Luxembourg, Poland, Portugal, Slovenia, Spain, Sweden and United Kingdom). These countries created benchmark for inefficient ones. We could see that Luxembourg, Sweden, Slovenia and Spain were located in the efficient frontier because it performed well in individuals´ health indicators (life expectancy, and infant survival rate), getting the first four position in the case of both indicators. At the same time, they were able to have the first four position in one of the input variable. Estonia and Latvia could be located in the efficient frontier because they had the lowest levels of expenditures which were able to use in maximal possible way in form of good results in health indicators compared to other countries. For example, Latvia reached the similar level of infant survival rate as Greece using health expenditures lower by 34%, and the similar level of life expectancy like Hungary using expenditures lower by 23%. The same tendency could be also seen in a case of Estonia. Poland could be considered as efficient because it had the lowest level of physicians' density and was able to use this variable to reach outputs comparable with Czech Republic (physicians´ density higher by 60%) or Hungary (physicians´ density higher by 44%). Also the United Kingdom had the lowest levels of physicians´ density and beds´ density which was able to use to reach outputs comparable with Greece. We can see that Greece must use inputs higher by 127% respectively by 55% to get the similar level of outputs, therefore it was not able to get mark as efficient. Portugal was able to reach the outputs similar to Germany using beds´ density lower by 60% and health expenditures lower by 19%.

However, it is hard to estimate the minimum number of physicians required to guarantee adequate provision. Also the adequate bed density depends on many factors. In fact, a country may have an optimal number of beds but accessibility may be low if the hospital is located far from the population. That's why we can talk only about the relative efficiency, within the selected group of countries and under the used criteria. When we take into consideration different criteria or wider set of countries, the results should be

different. It is also necessary to search external factors (e.g. macroeconomic environment and social status of population) which have significant impact on the health care efficiency in individual countries.

5 Conclusions

The countries are required to provide their health care services by minimizing the value of public expenditures directed to them. This prompted us to implement the comparative study to evaluate the efficiency of health spending in selected 20 European countries, which are members of OECD, during the years 2005-2014. The aim of this paper was to compare the development of all variables used in our analyses and compared the results of Super SBM input oriented model under assumption of variable return on scale. In first step of our analyses we can see decrease of number of hospital beds density by 14,2% between 2005 and 2014 in average. Health spending as percentage of GDP has grown on average by around 9,5%. Life expectancy and infant survival rate has the increasing tendency during the analyzed period. We think, it could be positively affected with new medical technology and improved prenatal care which increase survival of smaller infants. In the next part of our paper we tried to analyze the relation between health expenditures and life expectancy and infant survival rate. We divided the countries into three groups, with good results of health indicators and higher health expenditures, with good results of health indicators and lower health expenditures and lower results of health indicators and lower health expenditures. The outcomes from the Super SBM analysis pointed to the findings that, Austria was the less efficient country during the whole period. The most efficient was marked health system in Sweden. The average value was 0.9191 and nine countries have efficiency score higher than the average and eleven countries have efficiency score under the average. We can talk only about the relative efficiency and an open question remains when we take into consideration different criteria or the wider set of countries, the results should be different.

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Efficiency of humanitarian nonprofit organizations – a case of the Red Cross in the Europe and Central Asia

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Abstract: *The efficiency of nonprofit organizations has been a key issue since the donors are interested in efficient and effective utilization of donations. The aim of the article is to compare the efficiency of the Red Cross and Red Crescent national societies (RCNSs) as the world's largest nonprofit humanitarian network. Moreover, the relationship between financial efficiency and super-efficiency score based was investigated. Super-efficiency score is defined as the number of clients to the number of paid staff and volunteers. The Data Envelopment Analysis (DEA) in its super-efficiency modification was used as an indicator of efficiency of the RCNSs from 49 European and Central Asian countries in the average of 2013 - 2015. Nonparametric DEA method has been more frequently used than parametric methods in the nonprofit sector so far. Super-efficiency modification emerged as a good method for efficiency evaluation of humanitarian nonprofit organizations. The results show significant variance in the efficiency scores between countries. Our findings suggest distinct clusters of Red Cross national societies as they were identified by combination of financial efficiency and super-efficiency scores. Authors revealed negative relationship between financial efficiency and technical super-efficiency in all clusters.*

Keywords: humanitarian network, super-efficiency score, Europe, Central Asia, expenditures

JEL codes: L30, G30

1 Introduction

The nonprofit organizations are an essential part of most economies. John Hopkins' Institute defined five key characteristics which nonprofit organizations must share (Salamon and Anheier, 1997). Nonprofit organizations must be organized, institutionally separate from government, nonprofit-distributing, self-governing and voluntary. The mission accomplishment of the nonprofit organization is fundamental for efficiency evaluation of nonprofit organizations because the nonprofit organizations do not have financial indicators as a key indicator of success. The mission accomplishment like any other soft determinants is hard to measure.

There are many types of nonprofit organizations, ranging from small clubs to big societies. Their focus is also diverse. It is not possible to evaluate efficiency of nonprofit organizations through one universal method. So, we focus on the humanitarian organizations which are an important part of the nonprofit sector. They are human-centered organizations providing humanitarian assistance. Their mission intends to save lives, alleviate suffering and maintain human dignity during and after man-made crises and disasters caused by natural hazards, as well as to prevent and strengthen preparedness for when such situations occur. The article evaluates the efficiency of the world's largest nonprofit humanitarian network – The International Federation of Red Cross and Red Crescent Societies (IFRC). It reaches 150 million people in 190 National Societies through the work of over 17 million volunteers. The aim of the article is to

compare the efficiency of the Red Cross and Red Crescent national societies (RCNSs) as the world's largest nonprofit humanitarian network across the countries in Europe and Central Asia. The two regions are considered as one region in the statistics of the IFRC.

The literature agrees that it is not possible to fully apply the methods of evaluating the performance of profit-oriented sector to the nonprofit sector (Cheverton, 2007; Speckbacher, 2003). Methods of evaluating the performance of the for-profit sector are based on certain assumptions that would have to be fulfilled in the nonprofit sector, if they were used. To evaluate the success of an organization, it is necessary to define the success of the organization and to define success criteria and stakeholders towards which success is evaluated.

The comprehensive literature review identified financial performance indicators as dominant success indicators whereas studies using proxies for mission accomplishment were relatively rare (Helmig, Ingerfurth and Pinz, 2014). However, efficiency is more general term than financial performance. Generally, efficiency states the right use of resources to accomplish tasks. Efficiency can be measured as technical or allocative (Coelli et al., 2005). Let's consider that production frontier represents the maximum output attainable from each input level. Hence it reflects the current state of technology in the industry. Organizations operate either on that frontier, if they are technically efficient, or beneath the frontier if they are not technically efficient.

Helmig et al. (2014) presents systems approach to organizational success. In this view, the accomplishment of organizational objectives is only a partial measure of organizational success. Goals are important, but organizations should also be judged on their ability to acquire inputs, conduct efficient transformation processes to produce valuable outputs, and maintain stable relationships with their environment.

In the humanitarian nonprofit organization, the labour productivity is important indicator of success because people (staff and volunteers) provide benefits to people in need. In order to minimize the cumulative unmet demand and maximize volunteers' preference, the allocation of volunteers need to be optimized. It is important to emphasize that the maximization of the number volunteers as a workforce that can immediately serve a community's needs is not appropriate solution. Using robust optimization approach, authors showed that the volunteer managers should consider matching volunteers to their task assignment preferences up to a critical percentage, above which needs fulfilment decrease quickly due to overly strict adherence to volunteer task assignment preferences (Lassiter, Khademi and Taaffe, 2015).

From the methodical point of view, efficiency can be measured through parametric or nonparametric methods. The nonparametric frontier approach, based on envelopment techniques like the Data Envelopment Analysis (DEA) or the Free Disposal Hull (FDH), has been extensively used for estimating efficiency of firms as it relays only on very few assumptions for the set of decision-making units (DMUs). On the contrary, the stochastic frontier approach (SFA) allows the presence of noise but it demands parametric restrictions on the shape of the frontier and on the Data Generating Process (DGP) in order to permit the identification of noise from inefficiency and the estimation of the frontier. In the nonprofit sector, nonparametric methods of efficiency evaluation are more widespread (Lee, Yang and Choi, 2009; Medina-Borja and Triantis, 2014; Motwani et al., 2006; Roh, Moon and Jung, 2013) than parametric methods (Kuo and Ho, 2008). The DEA does not assume any type of the production function and distribution of variables. It is an advantage in nonprofit sector where some axioms of neoclassical production function are not a prerequisite, such as profit maximization. Moreover, the DEA creates frontier curve that serves as benchmark for measuring DMUs comparative efficiency.

2 Methodology and Data

In the paper, the efficiency of the national Red Cross national societies (RCNSs) was examined through nonparametric input-output analysis as it was justified earlier. For our purposes, the problem of the DEA is the limitation of the fully efficient units by 100 percent, so it is not possible to rank efficient units and abide by the conditions of subsequent parametric statistical tests. Andersen and Petersen (1993) allowed the efficient units to receive an efficiency score greater than 100 percent by dropping the constraint that bounds the score of the evaluated unit. Such feature enables better perform the regression analysis or statistical comparison of efficiency between regions because it ranks the efficient units. Alternatively, there are some troubles with the super-efficiency approach. They can range from a lack of units invariance for these measures and extend to non-solution possibilities when convexity constraints are to be dealt with – as in the BCC (Banker, Charnes and Cooper) model (Cooper, Seiford and Tone, 2006). So, authors used CCR model (Charnes, Cooper and Rhodes) to evaluate the efficiency of the RCNSs. The output-oriented modification was selected because the nonprofit sector has usually been resource-oriented and the nonprofit organizations try to maximize output with given amount of finance and labour-input.

Let's assume *n* units (RCNSs). Each $RCNS_j$ (j = 1, 2,…,n) consumes a vector of inputs, x_j, to produce a vector of outputs, y_j. Then, the super-efficiency output-oriented DEA model can be expressed as

$$\max \varphi$$

$$s.t. \sum_{\substack{j=1 \\ j\neq 0}}^{n} \lambda_j x_j \leq x_0; \tag{1}$$

$$\sum_{\substack{j=1 \\ j\neq 0}}^{n} \lambda_j y_j \geq \varphi y_0; \tag{2}$$

$$\varphi, \lambda_j \geq 0, j \neq 0 \tag{3}$$

where x_0 and y_0 represents RCNS. The CCR model assumes constant returns to scale.

Critics of the super-efficiency models (Seiford and Zhu, 2016) concluded that the ranking of the total set of efficient units is impossible because of the infeasibility of super-efficiency DEA models. Nevertheless, the use of the super-efficiency DEA models in the sensitivity analysis of efficiency classifications can be generalized from the CCR model to the situation of non-constant returns to scale.

The dataset on the RCNSs were gained from The International Federation of Red Cross and Red Crescent Societies (IFRC). The dataset contains countries in Europe and Central Asia region. Original dataset of 53 countries was reduced to 49 countries due to the unavailable or extreme data in some countries. The three-year average (2013 – 2015) was calculated to avoid exceptional year. Based on the previous research (Špička and Boukal, 2017), authors suggest possible set of inputs and outputs which should be used in the DEA model for efficiency evaluation. There is no multicollinearity in the set of variables.

- Input I_1 – Number of people volunteering. People that have volunteered at least four hours during the annual reporting period.
- Input I_2 – Number of paid staff. People who work with a National Society or the Secretariat for a minimum of three months and are remunerated.
- Output Y – Number of people reached by disaster response and early recovery, number of people reached by long-term services and development programmes, number of people covered by disaster preparedness.

So, the *super-efficiency score* ("Score") measures a relationship between output Y and the two inputs I_1, I_2.

The average expenditures in CHF per one labor unit (volunteers and staff) is a proxy for the *financial efficiency* ("Fin"). Authors verify the hypothesis that there is a significant positive relationship between financial efficiency ("Fin") and super-efficiency score ("Score") between countries in the European and Central Asian Region.

National societies are clustered according the two variables "Fin" and "Score". The medoid partitioning algorithms used here attempt to accomplish this by finding a set of representative objects called medoids. The medoid of a cluster is defined as that object for which the average dissimilarity to all other objects in the cluster is minimal. The medoid algorithm by Kaufman and Rousseeuw (1990) is applied. Two of the most difficult tasks in cluster analysis are deciding on the appropriate number of clusters and deciding how to tell a bad cluster from a good one. Kaufman and Rousseeuw define a set of values called silhouettes (*s*) that provide key information about both tasks. The silhouette measures how well an object has been classified by comparing its dissimilarity within its cluster to its dissimilarity with its nearest neighbor. When *s* is close to 1, the object is well classified. When *s* is near 0, the object was just between clusters A and B. When *s* is close to negative one, the object is poorly classified. Kaufman and Rousseeuw interpret the average silhouette SC. When SC exceeds 0.5, a reasonable structure has been found. Otherwise the structure is weak and could be artificial. The Manhattan distance method for place similar objects in one cluster is applied (Ciaschini, Pretaroli and Socci, 2011).

3 Results

Table 1 provides descriptive statistics of financial efficiency and super-efficiency scores. It shows high diversity in financial productivity and super-efficiency score between national societies. Countries with the highest expenditures per one labor unit include French Red Cross, Turkish Red Crescent Society and German Red Cross. Alternatively, there is the lowest financial efficiency in the Red Cross of Serbia, Cyprus Red Cross Society and in the Red Cross Society of Bosnia and Herzegovina. The Czech Republic ranked 15th place.

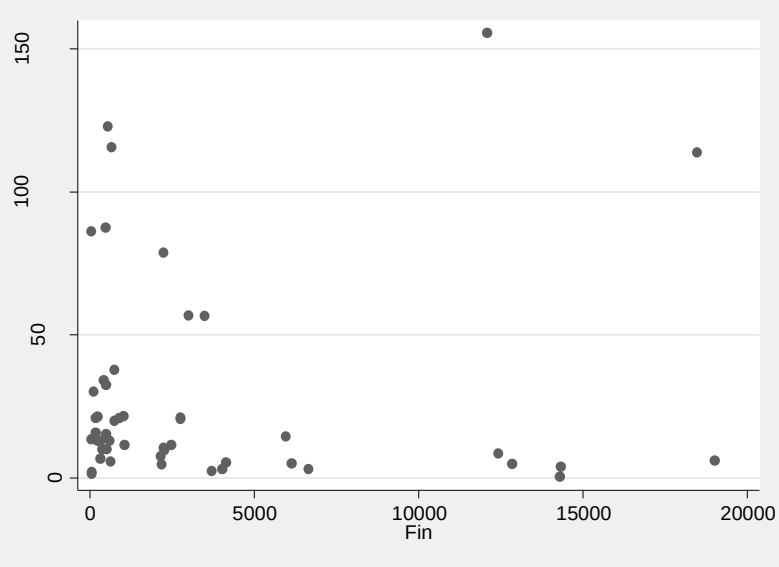
Table 1 Descriptive statistics of variables

Variable	Obs	Mean	St.Dev.	Min	Max
Fin (CHF/unit)	49	3491.14	5042.92	46.31	19019.1
Score	49	28.365	36.549	0.5	155.6

Source: author

Concerning the super-efficiency score, the highest values were reached in the Belgian Red Cross, Slovenian Red Cross and Turkish Red Cross Society. On the contrary, the lowest efficiency recorded the Red Crescent Society of Uzbekistan, the Red Cross of Serbia and the Luxembourg Red Cross. The Czech Republic ranked 8th place. The scatterplot in the figure 1 shows values for the two variables. It enables to see the groups of countries with similar values of variables.

Figure 1 Scatterplot of financial efficiency and super-efficiency score



Source: author

In the top right corner, there are two countries with high financial efficiency and high super-efficiency score – Belgium (SC = 0.3960) and Turkey (SC = 0.3647). These countries can be considered as most effective from the nonfinancial and financial point of view. However, the cluster 1 has no reasonable structure (SC = 0.3803).

There are the most values in the left bottom corner of the scatterplot. There are 35 countries[23] which together create cluster 2 with reasonable structure (SC = 0.6730). This is the biggest cluster with no extremes in the score and financial efficiency.

In the right bottom part of the figure, there are five countries with high financial efficiency and relatively low super-efficiency score – the Red Cross of Monaco, British Red Cross, German Red Cross, Luxembourg Red Cross and French Red Cross. The cluster 3 has reasonable structure because of high SC value (table 2).

Table 2 Statistics of cluster 3

RCNS	Average Distance Within	Average Distance Neighbor	SC
Germany	6.99	40.93	0.8293
Luxembourg	7.97	42.01	0.8102
Great Britain	7.89	36.33	0.7828
Monaco	9.63	34.47	0.7206
France	17.14	53.91	0.6821
Cluster average	9.92	41.53	0.7650

Source: author

The left upper part of the figure shows the group of societies with low financial efficiency and relatively high super-efficiency score - Slovenian Red Cross, Armenian Red Cross Society, Albanian Red Cross, Cyprus Red Cross Society, Estonia Red Cross. Table 3 shows that the five countries have SC value higher than 0.5. The algorithm added other two

[23] Andorra, Austria, Belarus, Bulgaria, Croatia, Denmark, Finland, Hungary, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Malta, Norway, Poland, Portugal, Azerbaijan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Montenegro, Georgia, Moldova, Romania, Slovakia, Spain, Sweden, Switzerland, Serbia, Former Yugoslav Republic, Bosnia and Herzegovina, Russia, Ukraine.

countries in this cluster – Czech Republic and Iceland. But their SC values are much lower.

Table 3 Statistics of cluster 4

RCNS	Average Distance Within	Average Distance Neighbor	SC
Albania	12.81	33.21	0.6143
Armenia	18.25	44.30	0.5881
Cyprus	13.76	33.40	0.5880
Slovenia	20.73	47.25	0.5613
Estonia	13.83	30.67	0.5491
Czech Republic	19.34	23.08	0.1623
Iceland	20.54	23.97	0.1429
Cluster average	17.04	33.70	0.4580

Source: author

The figure 1 shows negative and nonlinear relationship between financial efficiency and super-efficiency score. However, it is valuable to make partial correlation analysis within each cluster. It makes no sense to analyze cluster 1 because there are just 2 Red Cross societies. There are Pearson correlation coefficients in the table 4.

Table 4 Correlation between Score and Fin

Cluster	Pearson correlation	p-value
Cluster 2 (n = 35)	-0.371345	0.028068
Cluster 3 (n = 5)	-0.035062	0.955367
Cluster 4 (n = 7)	-0.790090	0.034504

Source: author

The correlation is significant only in the clusters 2 and 4. All correlations are negative. It means the higher financial efficiency is associated with lower super-efficiency score.

The results can be interpreted in terms of volunteers' engagement and aid standards. The cluster analysis revealed two extreme clusters – No. 3 and No. 4. Volunteers' engagement and aid standard seem to be determinants of financial efficiency and super-efficiency score. In the cluster 3, there are five highly developed countries which provide higher aid standard for clients than less developed countries in the cluster 4. Red Cross ambulance or more individual long-term care for the elderly are examples of higher standard of services. Red Cross societies in the cluster 3 engage significantly less volunteers than societies in the cluster 4 as it was measured by the share of volunteers per one paid staff (table 5). Lower standard of services and high engagement of volunteers are good reasons for low financial efficiency and relatively high super-efficiency score in the cluster 4.

Table 5 Descriptive statistics of volunteers' engagement

Variable	Obs	Mean	St.Dev.	Min	Max
Cluster 2	35	36.18	26.94	1.20	97.93
Cluster 3	5	5.19	3.32	2.64	10.43
Cluster 4	7	83.20	86.50	5.79	207.15

Source: author

4 Discussion

The results could have some limitations from the methodical point of view. Authors chose DEA method as potentially suitable for assessing non-profit organizations. DEA has its limitations and cannot pretend to be a universal and fully objective method. The

possibility to measure and compare values expressed in different units is an important advantage of the DEA method. Selection of variables is the primary and often the most difficult aspect of DEA application in the comparative analysis of DMUs (Nazarko and Šaparauskas, 2014). Kuo and Lin (2011) emphasized two limitations of DEA method: (i) results are based on data integrity and (ii) the number of DMUs must be larger than the sum of the number of inputs and outputs. They pointed out that if the number of inputs and outputs is much larger than the number of DMUs, the discriminating power of DEA is affected. As the number of inputs and outputs increase, there are DMUs that get an efficiency rating of 1, as they become too specialised to be evaluated with respect to other units. They recommend that the number of DMUs is expected to be at least two or three times larger than the sum of the number of inputs and outputs. In this paper, there are two inputs, one output and 49 observations. So, the paper meets the requirement.

5 Conclusions

The aim of the article was to compare the efficiency of the Red Cross and Red Crescent national societies (RCNSs) as the world's largest nonprofit humanitarian network. Moreover, the relationship between financial efficiency and super-efficiency score was investigated. Based on the calculation of efficiency through nonparametric DEA method and cluster analysis, authors revealed distinct clusters with reasonable structure in the group of 49 RCNSs in Europe and Central Asia. The variability of super-efficiency score is high across national societies.

The hypothesis about positive relationship between technical super-efficiency score and financial efficiency was rejected. There is negative relationship between super-efficiency score and financial efficiency. So, the higher financial expenditures per one labor unit (staff and volunteers) the lower number of peoples reached by RCNSs' services per one labor unit. The negative relationship can be explained by volunteers' engagement and aid standards. In the developed countries, there are higher standards of services and lower engagement of volunteers than in less developed countries. It explains relatively high financial efficiency in the developed countries (Germany, Luxembourg, Great Britain, Monaco, France). More individual services caused relatively low super-efficiency scores in these countries. Relatively high super-efficiency score in the cluster of Albania, Armenia, Cyprus, Slovenia, Estonia, Czech Republic and Iceland could be associated with higher volunteers' engagement.

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The analysis of the efficiency of on-line auctions in Poland based on data coming from service Allegro.pl

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Abstract: *Nowadays online auctions become more and more popular. There are many participants, who buy different kinds of products every day. They have information of products and historical prices thanks to new technology and wide access to Internet. The main aim of this work is to check if on-line auction markets are still inefficient (like traditional auctions characterized by geographical fragmentation and limited access to information) and it is possible to gain abnormal profit. Data used in the researches come from one of the Polish biggest and oldest online auction market – Allegro.pl. The category Mobile Phones in Electronics was chosen for the researches. The on-line auction market efficiency was checked by two tests: a unit roots test and variance ratio test. Both tests showed that auctions during the examined period were inefficient. It could mean that it is possible to gain abnormal return with on–line auctions in Poland. Of course, individually participants of on–line auctions usually do not possess a significant amount of money but commonly pose very important market, that's why it seems to be the important problem.*

Keywords: online auctions, efficiency, collectible market, Allegro.pl, stationary process

JEL codes: G14, G19, C19

1 Introduction

The traditional auctions used to be characterized by the inefficiency. The main problems were the following: geographical fragmentation of market and poor information. There was sometimes no possibility to come to the auction or even to know about it. What is also important – people used to pay more money for some goods without the knowledge about the same products in other parts of the country. The development of new technologies in 20th century made it possible to disseminate information all over the world and even to conduct auctions all over the world. There is no problem to buy any products hundred kilometers away without expensive travel costs thanks to IT technologies. One can also observe a great information flow. It is estimated that more than 3,4mld people use Internet (data from researches conducted by agency "We are Social" in 2016). It is 332mln people users more than one year earlier and when one compares it with only 394mln users in 2000, the incredible increase will be visible. Of course, the development of mobile technologies in the last few years make it faster. To understand how important is e–market with on–line auctions helps the statistics that for example Brazilian and Filipino spend 5,2 hours per day on Internet (access through laptop or desktop) and Thaiman 3,9 hours (access through mobile device). These nationalities are the top ones but the rest of the world is not far away. In Poland, people spend usually 4,4 hours on Internet with the use of computer and 1,3 hours with the use of mobile phones. In this way, on-line auctions become bigger and more important market from one year to another.

Nowadays, the problem of the inefficiency is coming back. The problem of poor access to information and geographical distance connected with traditional auctions seems to disappear. So the question is if the on–line auctions are still inefficient? They are conducted under different conditions in comparison to traditional ones. During the traditional auctions, there was always possibility that uninformed bidder would pay too much (Thaler, 1992). The problem of the efficiency of on-line auctions was examined by Song (2007), Vragov (2005) and Kuśmierczyk in Poland (2011) but in operational meaning. The inefficiency

interpreted as the possibility to obtain abnormal returns from on-line auctions was examined by Kauffman on on–line auctions of old stamps and coins (2009). He conducted his research with the use of data coming out from the biggest on-line auctions service in the world – Ebay.com. The problem is worth to be examined always on much smaller and national markets generally without international reach. In Poland, service Allegro.pl is one of the most popular ones. In previous works preliminary researches were conducted on on-line auctions of children clothes (Sroczynska-Baron, 2015) and old coins (Sroczynska-Baron, 2015, 2016). The examination shows that the inefficiency may still exist. However, these products are specific. Both categories are emotional. Mothers are often ready to pay irrational money for particular clothes from one collection, which they want for children. The subjects are relatively cheap so it is easier to bid and raise the price because something took fancy. Nobody is afraid of a potential fraud. Mothers of young children have often similar plans for a day so maybe that's why some calendar effects were observed. Second category - old coins is also specific. Sometimes the collector is ready to pay much more for the item if it is only one he misses to end the whole collection. Of course sometimes bidders could be uninformed properly, for example have small knowledge about the collectible in the world or are the beginning collectors. Both examined earlier categories are also characterized by great liquidity, many auctions are finished with the sale, there are nearly 5 bids per one auction of an old coin. The third feature common for both categories is no established limit of the price, only common sense of bidders. In this work the examination of totally different category will be conducted.

The main aim of this work is to examine the efficiency of on-line auction market with the example of chosen category of mobile phones in Poland. It will be done similarly to verification of hypothesis of the efficiency of stock exchange market. The examined problem is whether prices of on–line auctions are based on all available information. So, in other words, the aim of the work is the attempt to answer the question: is it possible to obtain abnormal returns from on–line auction market. It will be examined with the use of similar tools practised during stock market prices analysis (Wood, 2008, Ashenfelter, 2003). The hypothesis of random walk will be verified. Data coming from the biggest Polish on-line auction service – Allegro.pl are used during the examination.

2 Methodology and Data

The efficiency of on–line auction market

The efficiency of market means that the market price is based on all information available in the market. There are three levels of the efficiency at the stock exchange (Haugen, 1996):

- The week–form efficiency – share prices should contain all information representing by historical prices
- The semi strong-form efficiency - share prices should contain all public information (not only historical prices but for example financial reports of companies)
- The strong-form efficiency - share prices should contain all public and secret information

There are a lot of science works verifying hypothesis of the efficiency of stock exchange, for example works of Fama (1970) and many other. In this work the hypothesis about on–line auction market will be discussed in Poland. The problem is whether the price during on–line auction represents all historical information and is it possible to estimate future price based on historical information? So, in other words, is it possible to gain abnormal return with on–line auctions in Poland? In this way, the week–form efficiency will be examined. If the market is efficient there is no chance for a single participant to gain abnormal profits.

Methodology

The on-line auction market will be checked by two tests. First one is a unit roots test with the use of methodology shown by Kauffman (Kauffman, 2009). Let $P_{i,t}$ be the indexed price for the item *i* at the moment *t.* Then it will be calculated with the following formula

$$P_{i,t} = \frac{price_{i,t}}{price_{i,1}} \tag{1}$$

where

$price_{i,t}$ – the final selling price for the item *i* at the moment *t*

$price_{i,1}$ – the average price for the item *i* at the first moment

Next, let $R_{i,t}$ be the percentage return on item *i* at the moment *t*. Then it will be calculated with the following formula

$$R_{i,t} = \frac{P_{i,t}}{P_{i,t-1}} - 1 \tag{2}$$

Prices in efficient market should follow a random walk (Malkiel, 2003) so next step is to consider the following autoregression function

$$R_{i,t} = \alpha_i + \beta_i R_{i,t-1} + \varepsilon_{i,t}\,. \tag{3}$$

where β_i can be calculated as

$$\beta_i = \frac{\operatorname{cov}\left(R_{i,t}, R_{i,t-1}\right)}{\sigma^2\left(R_{i,t-1}\right)}. \tag{4}$$

The parameter β_i gives the information whether the returns of the item *i* are predictable with the use of previous returns. Random walk occurs when β_i equals 1. In this situation, the estimate of $R_{i,t}$ is drift parameter and the return in the previous period. There is no chance to say if the return of this period will outperform or underperform the expectation. The statistics of Dickey – Fuller test (Dickey, Fuller, 1979)

$$d_i = \frac{\delta_i}{S\left(\delta_i\right)} \tag{5}$$

where $\delta_i = \beta_i - 1$, will be used to verify hypothesis.

Second test used during the researches is variance ratio test. Let $r_{i,t}$ be the logarithmic return calculated with the following formula

$$r_{i,t} = \ln \frac{price_{i,t}}{price_{i,t-1}} \tag{6}$$

Next, Lo and MacKinlay (1988) suggest to calculate the mean and variance of logarithmic prices as

$$\mu = \frac{1}{n}\sum_{t=2}^{n} r_{i,t} \tag{7}$$

$$\sigma^2 = \frac{1}{n-1}\sum_{t=2}^{n}\left(r_{i,t} - \mu\right)^2 \tag{8}$$

The set of data can be segmented based on returns across different period of time. Let $r_{i,t,q}$ be the logarithmic return calculated with the following formula

$$r_{i,t,q} = \ln \frac{price_{i,t}}{price_{i,t-q}} \tag{9}$$

If there is a random walk, the variances should not be changed regardless to the construction of segmentation (it means to *q*). The subsample variance could be calculated with the following formula

$$\sigma_q^2 = \frac{1}{m}\sum_{t=q}^{n}\left(r_{i,t,q} - q\mu\right)^2 \tag{10}$$

where

$$m = q(n-q+1)\left(1-\frac{q}{n}\right) \tag{11}$$

The statistics of variance ratio test

$$v(q) = \frac{\sigma_q^2}{\sigma^2} \tag{12}$$

will be used to verify hypothesis.
In this work the test for random walk will be used to test the efficiency of on–line auction market and both unit root test and variance ratio test will be implemented.

Service Allegro.pl

In Poland more and more people use Internet to buy different products. It is estimated that 20% of people regularly do it. 78% young people (to 34 years old) buy at least one subject per quarter by Internet and 64% older people do it. They do not spend much money – it is no more than 250zł for nearly 79% buyers, but what is significant – only 7% people in Poland never use this form for shopping (SW Research for Nesweek 2015). The most recognizable shopping service is on-line auction service Allegro.pl (report „E-commerce in Poland 2016. Gemius for e-Commerce Polska"). It was established in 1999 by Arjan Bakker and Tomasz Dudziak (Ocetkiewicz, 2012) and one year later became the biggest on-line auction service in Poland. There was first million of users in 2003. Nowadays, more than 50% of internet users visit the service at least once a month and 40 millions of subjects are sold per year. This is peremptory leader among auction services in Poland. The second one – actually service Lekki koszyk has got 3 939 502 auctions (29.05.2017), Allegro.pl has got 55 765 401 auctions at the same time, what is 86% of market. The first subject sold by Allegro.pl was an Internet camera for 320zł, one of very expensive subjects was the car - Porsche 918 Spyder Carbon for 4 500 000 zł. Sometimes You can buy very strange subjects or funny – there was even observed auction of the bottle with water signed as "melted snowman". Generally, it is possible to buy nearly everything. Products are divided into nine main categories, among others there are: Child and Collections and Art examined earlier and Electronics, which is the subject of actual researches.

Data

Data coming from service Allegro.pl was examined in the research. The category Mobile Phones in Electronics was chosen. New product of Apple was observed – Iphone 7 32GB. It is a new product (less than one year old) – its sale started on 23th September 2016 in Poland, 5 days earlier in USA. The official price in September was 3349zl. Of course, the price was quickly falling down. Nowadays one can buy new phone at the price of 2300zł on service Allegro.pl or 2799zł in a shop (ranking ceneo.pl). There are 5 colours of this phone but there is no difference in a price. There were collected data of used phones from 03.2017 till 05.2017. It was 480 observations of used phones. The time of observations seems to be good – there is still a lot of auctions (the number is gradually falling down) of used phones but most of them are in similar condition. They are like new one without any traces of using or with very little traces. They have the guarantee and were used generally no more than three months. All damaged or blocked items were rejected. It allowed to gain uniformity necessary for examinations. The category seems to be interesting because the value of the items is commonly known and they are not unique. There is no problem to buy this phone at once everywhere in Poland and the

range of prices is well known. So it is opposite situation to collectible market or even the market of clothes for children examined before.

3 Results and Discussion

The new kind of Iphone – 7 32GB was the object of the researches. It was rather popular phone and there were a lot of auctions of this item during the observed period. Chosen time of observation guaranteed that items were similar. They were generally like new. The auctions were characterized by low realization. Only 18% of auctions were ended with sale. It is very low result if one compares it with 70% for old coins (Sroczynska-Baron, 2016). There is 3,16 bids per auction. In the middle of the observed period there is a change in behavior of bidders. Lower number of auction is noticed, much more auctions are ended with sale, smaller number of bids is visible, the average price is similar (table 1)

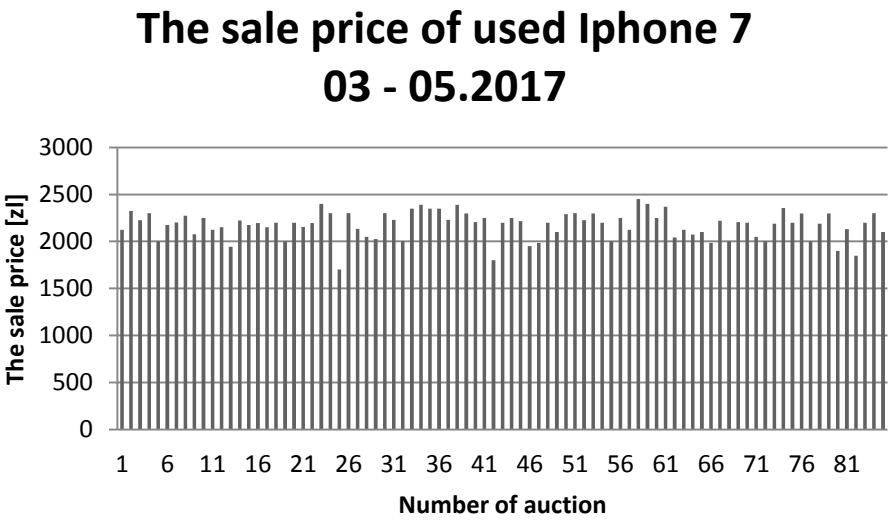
Table 1 Prices of used Iphone 7 32GB on service Allegro.pl 03 – 05.2017 divided into two parts

	I half of period	**II half of period**
Number of auctions	249	231
Percentage of auctions ended with sale	0,068	0,294
Average number of bids	7,82	2,01
Average price of the item	2172	2174

Source: own computation

The data coming from the auctions in period 03 – 05. 2017 are presented on figure 1.

Figure 1 Prices of used Iphone 7 32GB on service Allegro.pl 03 – 05.2017



Source: please own computation

Let us check if auctions in examined period are efficient. First the unit roots test will be used. The parameter β of autoregression function equals -0,51. The statistical analysis is conducted with the use of Dickey-Fuller test. The following hypothesis were verified connected with the equation:

$$R_{i,t} = \beta_i R_{i,t-1} + \varepsilon_t \quad (13)$$

H_0: $\beta_i = 1$ (variable is not stationary)
H_1: $\beta_i < 1$(variable is stationary)

It is equivalent with the process of analyzing the following hypothesis connected with the equation:

$$\Delta R_{i,t} = \delta_i R_{i,t} + \varepsilon_t \quad (14)$$

H_0: $\delta_i = 0$ (variable is not stationary)
H_1: $\delta_i < 0$ (variable is stationary)
The statistics is calculated as δ/S_δ and equals -15,47. It has got asymmetric distribution with an expected value below zero. Critical value (reading from the Dickey-Fuller tables) equals -2,57 (at the level of significance 0,01). The statistics is less than critical value so hypothesis H_0 should be rejected. It means that auctions during the period 03-05. 2017 were inefficient according to unit roots test.
Second, the variance ratios test will be used with the following segmentation: q = 2, 3, 4. The mean and variance of logarithmic prices are $\mu = -0{,}00014$, $\sigma^2 = 0{,}0094$. The estimated subsample variances are the following $\sigma_2^2 = 0{,}0046$, $\sigma_3^2 = 0{,}0032$, $\sigma_4^2 = 0{,}0024$. The expressions $v(2) = 0{,}49$, $v(3) = 0{,}34$ and $v(4) = 0{,}25$ were analyzed. The following hypothesis were verified:
H_0: $v(q) = 1$ (there is random walk)
H_1: $v(q) \neq 1$ (there is not a random walk)
Statistics $\tilde{v}(q)$ calculated, as

$$\tilde{v}(q) = \frac{v(q) - 1}{\sqrt{\frac{2(2q-1)(q-1)}{3qn}}} \quad (15)$$

has got normal distribution $N(0,1)$. If $|\tilde{v}(q)| > z_\alpha$ hypothesis H_0 should be rejected for given significance level α. Critical value for $\alpha = 0{,}01$ equals 2,58. The values of statistics are the following $\tilde{v}(2) = -4{,}75$, $\tilde{v}(3) = -4{,}09$ and $\tilde{v}(4) = -3{,}20$. It means that hypothesis H_0 should be rejected for all three values of parameter q. It means that the various ratios test also showed that auctions during the examined period were inefficient.

It is said that liquidity has got opposite effect to the efficiency on auctions in comparison to the stock exchange (Kauffman, 2009). If there is high liquidity, there could be the inefficiency because there is bigger probability that two bidders will raise the price. During second half of observed time the ratio bids to number of auctions is much smaller so the efficiency will be checked separately for this period.

First the unit root test will be implemented. The parameter β of autoregression function equals -0,49. The following hypothesis were verified connected with the equation (13):
H_0: $\beta_i = 1$ (variable is not stationary)
H_1: $\beta_i < 1$(variable is stationary)
It is equivalent with the process of analyzing the following hypothesis connected with the equation (14):
H_0: $\delta_i = 0$ (variable is not stationary)
H_1: $\delta_i < 0$ (variable is stationary)
The statistics is calculated as δ/S_δ and equals -13,88. It has got asymmetric distribution with expected value below zero. Critical value (reading from the Dickey-Fuller tables) equals -2,59 (at the level of significance 0,01). The statistics is less than critical value so hypothesis H_0 should be rejected. It means that auctions during the second half of the period 03-05. 2017 were inefficient according to unit roots test.
Second, the variance ratios test will be used with the following segmentation: q = 2, 3, 4. The mean and variance of logarithmic prices are $\mu = -0{,}00069$, $\sigma^2 = 0{,}0104$. The

estimated subsample variances are the following $\sigma_2^2 = 0{,}0053$, $\sigma_3^2 = 0{,}0035$, $\sigma_4^2 = 0{,}0029$. The expressions $v(2) = 0{,}51$, $v(3) = 0{,}34$ and $v(4) = 0{,}25$ were analyzed. The following hypothesis were verified:

H_0: $v(q) = 1$ (there is random walk)

H_1: $v(q) \neq 1$ (there is not a random walk)

The values of statistics $\tilde{v}(q)$ (15) are the following: $\tilde{v}(2) = -4{,}04$, $\tilde{v}(3) = -3{,}67$ and $\tilde{v}(4) = -3{,}19$. It means that hypothesis H_0 should be rejected for all three values of parameter q. It means that the various ratios test also showed that auctions during the second part of examined period were inefficient.

4 Conclusions

In this work the auctions of chosen model of mobile phone were analyzed. There were 480 observations which were used for researches. It was a new model so there was no problem to gather the items in similar condition (all of them were in perfect condition as used only 2 or 3 months). The problem was if the on–line auctions were still inefficient? Traditional auctions were considered as inefficient because of most of all the problem of lack of information and geographical limit. When on–line auctions are analyzed these problems disappear. However, the researches show that on-line auctions seems to be still inefficient. Both unit roots test and variance ratios test pointed the inefficiency. Next the analysing period of time was divided because in second half the number of bidders were evidently smaller. It is said that the ratio: number of auctions to number of bidders influences the level of the efficiency. Its influence is opposite to stock exchange where higher liquidity could allow to gain the efficiency. When on-line auctions are considered the higher value of this ratio the higher probability of the inefficiency. There is bigger probability that one bidder will for example raise the price too much (maybe because of sentimental reasons – he had something like this when he was a child or it is the last item for his collection). The second part of analyzed period showed decrease in number of bidders so it could stand for the efficiency for these observations. However, the research showed also the inefficiency. Maybe the ratio was smaller but not small enough. Of course, it is preliminary examination but seems to start an interesting problem.

The similar researches were conducted for different categories. When objects with unfixed price like collectible market is analyzed it seems more obvious to observe the inefficiency. But when the new kind of phone is examined its value is commonly known and it seems to be harder to obtain abnormal returns. That is why this category was examined. However, the researches confirmed the inefficiency like previous examinations for different items.

The researches were conducted on the biggest Polish on-line auction service Allegro.pl. There is no doubt that it is a powerful market but one must say that a little bit different to Ebay.com where big researches were conducted earlier. It is generally local service (only for Poland with some small exceptions), a little bit younger and guided in different economic conditions of potential customers and poorer access to Internet by potential customers for most years of existing from the beginning in comparison to Ebay.com. That is why it seems to be important to analyse it separately.

The on–line auction market is more and more popular in Poland. The institute Homo Homini says that every third user of Internet would sell his objects by on–line auction. What is more people have got unnecessary things worth about 3000zl. Of course, small users of Internet do not possess individually big amount of money but together form very important market. In that way, it seems to be important to learn mechanisms which create on–line auction market and all kinds of anomalies one can meet. Furthermore, even banks introduce auctions to their offers. In Poland for example bank Millennium uses it to create

the term deposit. Public Procurement Authority (in Poland UZP) also carries out on-line auctions in some cases. Of course, the mechanism is different from auctions on service Allegro.pl but it shows how popular become this form of auctions nowadays so it is important to examine it thoroughly and discover all mechanism.

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Development of Patent Activity in Czech Republic

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***Abstract**: Intangible assets play an important role in business activities and represent a significant source of competitive advantage. Firms usually tend to protect their assets regardless of whether they are tangible or intangible. This study focuses on patents and patent activity in the Czech Republic. The aim of our research is to discuss factors affecting the value of a patent and factors affecting its vulnerability. Research in this field also revealed why firms tend to patent their technology. In this paper we analyse the historical development of patent activity, focusing on the engineering sector (classes F16-F17 according to the International Patent Classification), and factors influencing the development. Data were obtained from the annual reports of the Industrial Property Office and the Czech Statistical Office. The analysis showed that the number of national patent applications has been rapidly decreasing since 2002, when the Industrial Property Office became a recipient of European patent applications. Nevertheless, the number of nationally granted patents and European patents validated in the Czech Republic has a rising tendency, suggesting that the Czech market is competitive and worth securing protection of new technology.*

Key words: intangible assets, patent, patent activity, engineering sector

JEL codes: O34

1 Introduction

Intangible assets play an important role in business activities and represent a significant source of competitive advantage. Firms usually tend to protect their assets regardless of whether they are tangible or intangible. This paper focuses on the legal protection of inventions – patents.

Patent represents a legally protected exclusive right to a new invention for a given period of time. Patents, by definition, are granted for inventions which result from inventive actions and also meet several other criteria, especially novelty and industrial applicability. Patents can be granted to an individual, a firm, or a public body. Patents are territorial in nature. Some authors describe patents as a monopoly right (Hall and MacGarvie, 2010; Pérez-Cano and Villén-Altamirano, 2013). Wanetick (2010) objects that a patent certainly is not a right to a monopoly. He argues that competitors are free to design around a patent by producing another technology which yields the same effects. He defines patent as a license to exclude anyone else from reproducing the same effect by applying a specified process during the time in which the patent remains in force, and to grant its holders the right to sue alleged infringers. A patent enables the holder to prevent competitors from using their innovation even if the competitors' products are developed independently (Stahl and Fisher, 2010). Another specific feature of a patent is that it doesn't need to cover the entire product, it can cover only smaller technical advances found in the new product. According to Stahl and Fisher (2010) it is common for companies to develop and produce a single product covered by a number of patents. The holder of a patent is not obliged to use their patented inventions, yet it is generally permissible for the holder to bring infringement lawsuits against competitors who use them.

Andries and Faems (2013) state that firms launching a new product or a new method of production are likely to gain competitive advantage and to realize higher margins in that particular market. Their conclusions correspond with that of Ernst (2001), who suggested

that patents have a positive impact on the firm's sales, and of Helmers and Rogers (2011), who examined high-tech start-ups and concluded that firms which patented their inventions are less likely to fail and achieve higher asset growth within the their first five years of existence compared to similar firms which did not patent. Maresch et al. (2015) also examined the impact of patenting on the firm's performance in relation to the economic value of the patent. They consider patenting an attractive way to turn inventions into economic success, and confirm a positive impact of patenting on the firm's performance and, consequently, on the value of the patent. They emphasize that patents lose their value over time, and they limit the time span of the competitive advantage gained by legal protection of the invention by the time it takes the competitors to enter the market with imitations that circumvent the patent rather than by the patent's expiry date. Hall et al. (2005) label intangible assets as a knowledge stock and believe that these assets positively contribute to the firm's future cash flows, and therefore should be reflected in the firm's market value. Their results showed that the firm's value determinant is given not only by patent counts, but also by patent citations. Nevertheless, they emphasize that citation-based analysis is limited by the fact that, considering forward citation, it is not usable for evaluating current or very recent innovations.

Patent Value Determinants and Patent Vulnerability

Wanetick (2010) emphasizes that a person who attempts to commercialize their patent does not receive the value that the technology deserves, but the value that they negotiate. Nevertheless, he determines several patent value factors. First are the remaining years of the term of the patent. From a potential buyer's point of view it is better to acquire a patent after it has been proven valid during litigation or at least has passed the period when its validity is likely to be challenged. He calculates this period according to the average duration of patents when they are litigated; he estimates it to be three years. The second factor he defines is the number of inventors listed on the patent. Patent quality is supposed to increase proportionally to the number of listed inventors because it means that more engineers or scientists believed in the technology behind the patent as well as in its patentability.

Grönqvist (2009) studied how patent characteristics influence its value. Her results showed that patents held by firms are approximately 1.5 times more valuable than patents held by private persons. She also states that renewing a patent for one more year signals its value is 1.5 times higher compared to if it was not renewed.

Hu et al. (2008) consider oppositions against patents, the number of claims, and the number of backward citations as value determinants. After the date of grant, there is a nine month legal period within which anybody can oppose patents. It is considered to be an important mechanism by which the validity of the patent is challenged. The idea beyond opposition as a value determinant is that no one would oppose a patent which has a value lower that opposition costs. Their results correspond with those of Harhoff and Reitzig (2004), who showed that valuable patents are more likely to be opposed against and that opposition is more frequent in areas with strong patenting activity. Sterlacchini (2016) came to the conclusion that leading European companies intensified their patenting activities as well as the usage of oppositions against the patents of competitors. However, he says the probability of an opposition attack from direct competitors does not depend on the patent value but can be associated with idiosyncratic corporate strategies.

Harhoff and Wagner (2009) note that a patenting firm may benefit from delaying the grant of a patent. During patent examination the applicant is not obliged to pay renewal fees or other associated costs; this positively impacts future cash flows. Moreover, pending applications create uncertainty for competitors, and thus may strengthen the competitive position of the applicant.

On the other side of patent value stands its vulnerability. According to Wanetick (2010) the granting of a patent does not ensure it will be ruled valid in litigation, and he estimates the probability of it being ruled invalid to be roughly 50% (in the United States). Moreover, due to high litigation costs, patentees can rarely afford to assert their rights.

According to Basberg (1987) there are, in general, three reasons not to patent an invention. The first reason is that the invention is not suitable for a patent (there might be a different form of legal protection). The second reason is that the inventor themselves does not believe that their invention can be patented, even if it satisfies all the necessary criteria. The last one, and the most interesting one from the economic point of view, is that the inventor decides to protect their invention by secrecy instead.

Suchý (2015) studied patent propensity of Czech firms, and his results showed several significant motivating factors, especially profit from the direct use of the patent or from licensing, protection against imitation and blocking of competitors, prevention of future litigation, improvement of reputation, or establishing new relationships with other entities. His research also revealed factors discouraging firms from patenting. The most common ones are costs associated with the registration of a patent and its maintenance or a fast innovation cycle not consistent with the duration of patent application examination. Holgersson (2013) along with Stahl and Fisher (2010) state that patents send a positive signal to potential investors, who might consider such investments to be less risky compared to investments in intangibles which lack formal protection.

2 Methodology and Data

In this paper we analyse the historical development of patent activity, focusing on the engineering sector (classes F16-F17 according to the International Patent Classification), and the factors influencing the development. The data were obtained from annual reports of the Industrial Property Office and the Czech Statistical Office. The development of patent activity was analysed for the period from 1998 to 2016. Patent activity was studied by the number of applications filed, by the number of patents granted, and marginally by the number of patents valid in the Czech Republic as of December 31, 2016.

Patent applications were examined by the sector to which their applicants belong. The Czech Statistical Office's classification was used to categorize the sectors; it was then simplified into four sectors:

- firms,
- universities,
- individuals, including enterprising and non-enterprising ones,
- and others, including public research institutions and other government and public organizations, hospitals, unions and non-profit organizations.

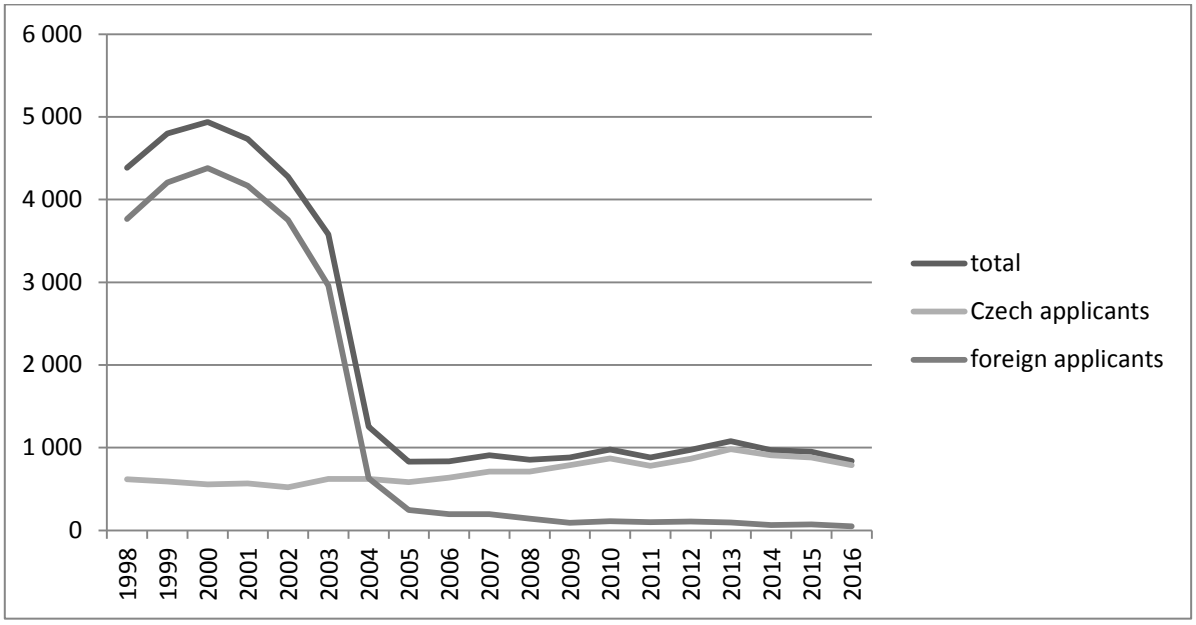
The data were analyzed via descriptive statistics. The studied time period was divided into two sections, from 1998 to 2004 and from 2005 to 2016, because of the fact that the Czech Republic became a member of the European Patent Organization, which affected the development of national patent application filing dramatically. The Czech Statistical Office does not provide detailed information and data related to European patent applications.

3 Results and Discussion

In 2002 the Czech Republic became a member of the European Patent Organization, which is an intergovernmental organization set up on the basis of the European Patent Convention. The Industrial Property Office became a recipient of European patent applications, which resulted in a significant decrease of national patent applications. The

development of the national patent application filing in the Czech Republic has been relatively stable since 2005, as is shown in Figure 1.

Figure 3 Number of patent applications filed in the Czech Republic



Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

Since 2005, the average number of national applications filed in the Czech Republic has been approximately 915 per year, and nearly 87% are accounted for by domestic applicants. Between the years 1998 and 2004 the situation was opposite; only 15% of applications were filed by Czech applicants and the average number of applications filed was 3995 per year. The percentages of national applications filed by foreign applicants since 2005 are as follows: 28.5% from the USA, 18.1% from Germany, 9.2% from Japan, 7.5% from Slovakia, and 5.6% from Switzerland. These results confirm those of Kučera and Vondrák (2016), who characterise the Czech Republic as a country with a low level of patent activity.

Further analysis focused on patent applications filed by Czech applicants. This analysis showed that approximately 41.7% of the defined subset of applications were filed by firms and 36.1 % by individuals in the years 1998 to 2016. Detailed results are shown in Table 1.

Table 4 Patent applications filed by applicants from the Czech Republic according to the type of applicant and year of filing – expressed relatively

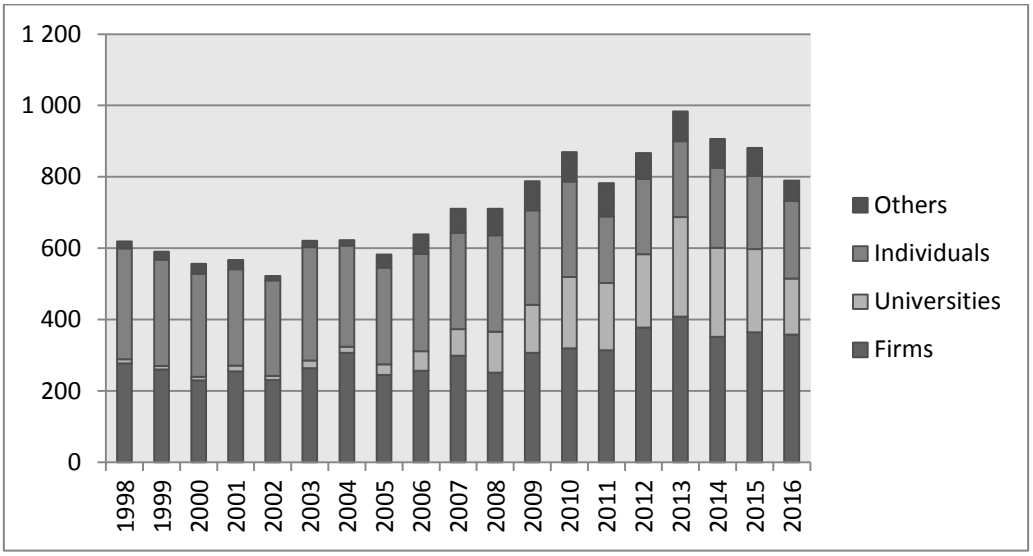
	1998 - 2004	**2005 - 2016**	**1998 - 2016**
Firms	44.50%	40.51%	41.71%
Universities	2.39%	20.21%	14.84%
Individuals	49.67%	30.22%	36.08%
Others	3.43%	9.07%	7.37%

Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

Figure 2 shows the patent activity of Czech applicants broken down by type of entity. Their patent activity had a rising tendency until 2013. The patent activity of universities during the years 1998 to 2004 was almost negligible. However, since 2005, there has been a noticeable increase in their patent activity. Kučera and Vondrák (2016) attribute

this increase to the implementation of new methodology for evaluation of R & D organizations.

Figure 4 Development of patent application filing by Czech applicants

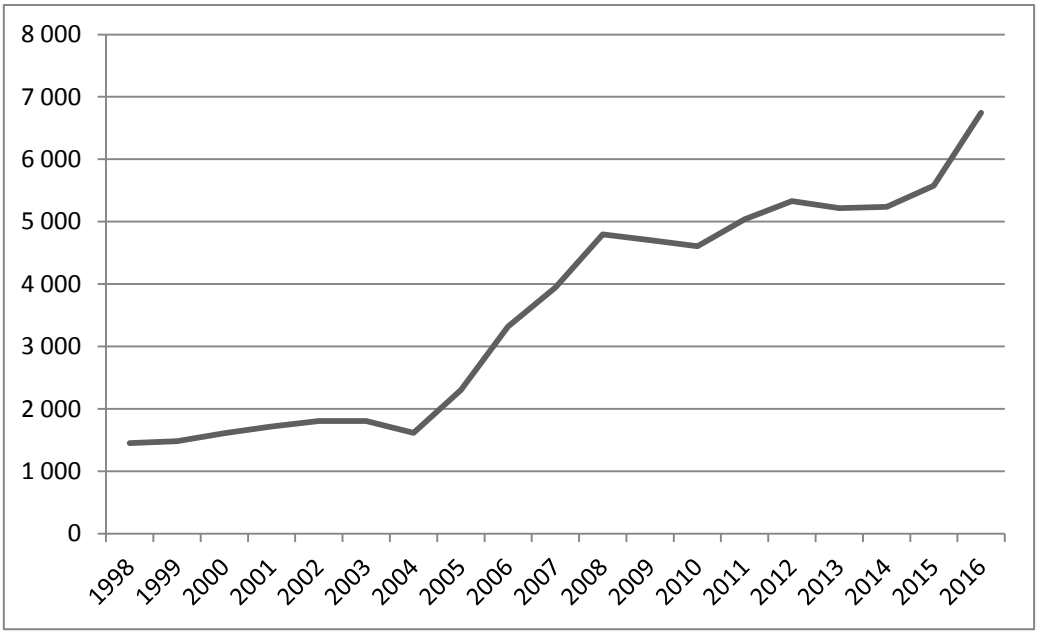


Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

The number of granted national patents and European patents validated in the Czech Republic has a rising tendency, suggesting that the Czech market is competitive and worth securing protection of new technology, as shown in Figure 3.

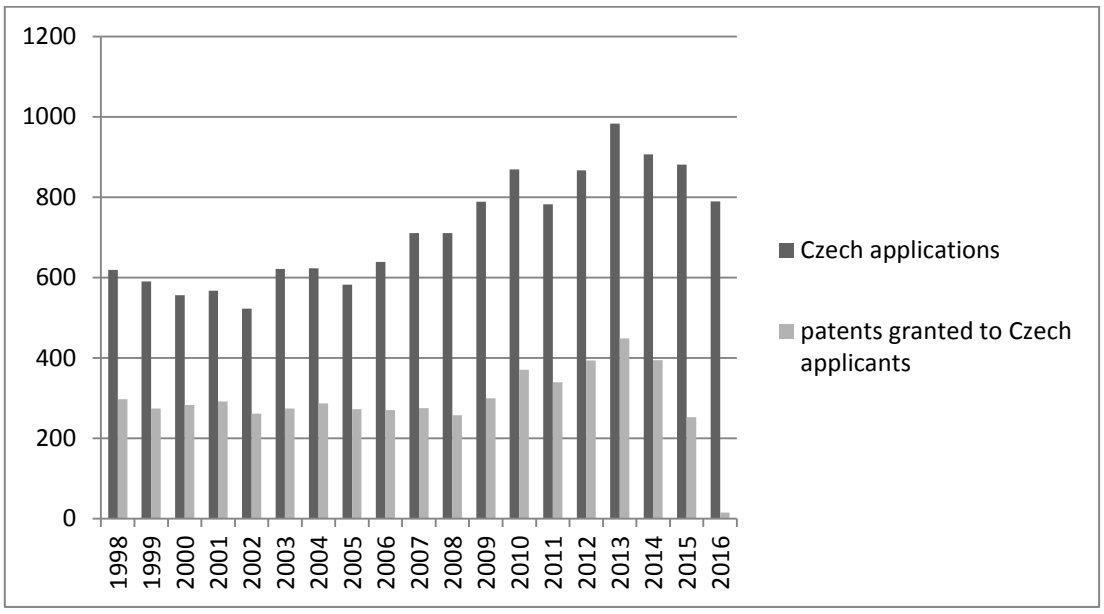
Figure 4 shows the number of patents granted to Czech applicants compared to the number of Czech applications in the given year. Between 1998 and 2013 the Industrial Property Office granted the patent in 44.7% of cases on average. The collected data did not contain detailed information about the number of rejected or pending applications. The duration of application examination is approximately 2.9 years, therefore the analysed time period was intentionally shortened.

Figure 5 Granted national patents and European patents validated in the Czech Republic according to the year of grant / validation



Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

Figure 6 Patents granted to Czech applicants

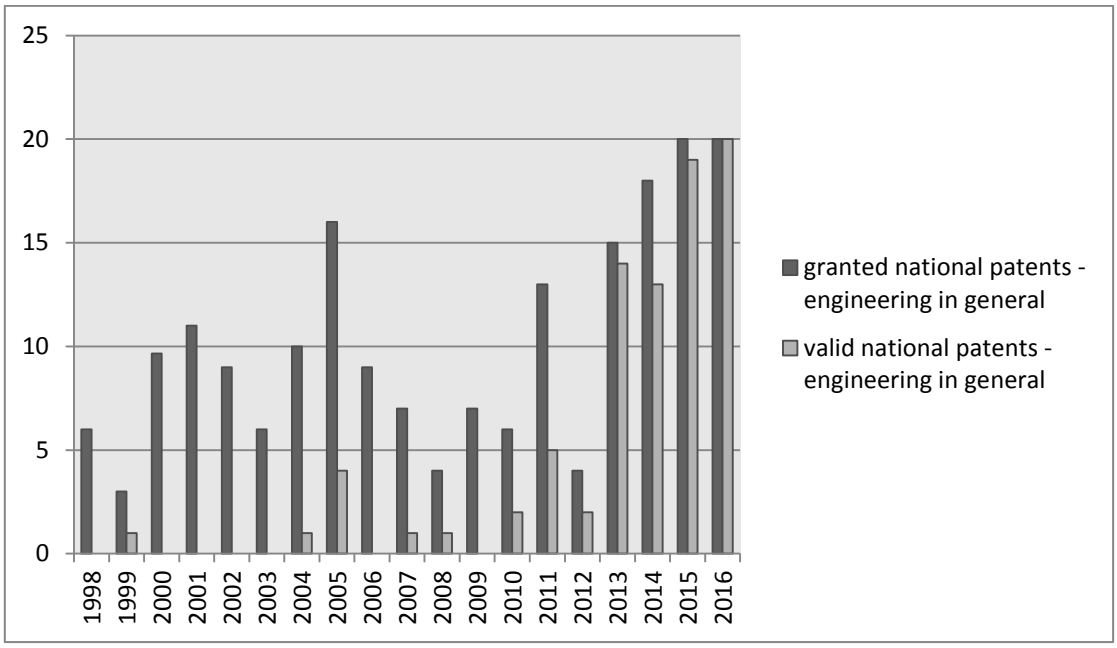


Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

Figure 5 shows the number of granted national patents in the engineering sector compared to the number of valid patents as of December 31, 2016. There are only six valid patents in this sector older than ten years out of a total of 83 valid patents; 63.8% of them are held by firms. The average age of national patents in the engineering sector is a little less than 3 years. Considering only patents held by firms, the average patent

age is approximately 3.3 years, pointing to a fast innovation cycle in the engineering sector.

Figure 7 Granted and valid patents in the engineering sector as of December 31, 2016 according to the year of grant



Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

According to Suchý (2015) firms in the engineering sector prefer patenting over secrecy. He also found out that larger firms are more active in patenting than small ones. This claim can by confirmed by the results of our research. The analysis showed that 1/3 of all patent applications filed by Czech firms in 2016 were filed by 10 Czech firms. In addition, 15% of all patents granted to Czech residents belong to 20 firms.

4 Conclusions

The aim of this paper was to discuss factors affecting the value of a patent and factors which affect its vulnerability. The literature review showed that patenting is a common way of gaining competitive advantage, that it positively affects the firm's performance, and consequently affects the value of the firm holding the patent. Some previous research (Grönqvist, 2009) showed that patents held by firms are more valuable than those held by private persons. The reason may be that firms usually have larger resources (in case of potential litigation) and a better negotiating position. Also because firms have more means to innovate and use the patents. The patent value can by affected by the number of inventors listed on a patent: the higher the number, the more experts believed in its quality. The crucial factor is the remaining life of the patent, because patents which are too young are under the risk of potential infringement litigation. On the other hand, the older the patent is, the shorter the remaining time of legal protection, causing higher uncertainty about future cash flows. Patent oppositions also indicate patent value; nevertheless, Sterlacchini (2016) objects that direct competitors can attack patents in line with their corporate strategy, regardless of the patent value.

Research in this field also revealed why firms tend to patent their technology. Suchý (2015) in his survey identified motivating factors, corresponding with other authors (Wanetick, 2010; Hall and MacGarvie, 2010; Basberg, 1987), for instance profit from the

direct use of the patent or from licensing, protection against imitation and blocking of competitors, prevention of future litigation or improvement of reputation. However, firms might be discouraged by the registration and maintenance costs or the fast innovation cycle not consistent with the duration of patent application examination.

The number of national patent applications filed in the Czech Republic since 2005 is on average 915 per year. The most active in patenting are Czech firms or individuals. Approximately 45% of applications are considered to be justified, and the Industrial Patent Office grants the patent to its applicants. The average duration of application examination is almost three years. Focusing on the engineering sector, the average age of a national patent granted to Czech applicants is approximately three years, in contrast with the average age of all valid patents granted to Czech applicants, which is 3.7 years.

The analysis confirmed the assumption of a current fast innovation cycle in the Czech Republic. On the other hand, it suggests a lower value of Czech patents, because valid patents are too young, and not renewing them means that even their holders do not consider their patents to be worth the renewal fees. Nevertheless, the number of national granted patents and European patents validated in the Czech Republic has a rising tendency, implying that the Czech market is competitive and worth securing protection of new technology, even if for a much shorter period of time than the theoretical 20 years.

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Difficulties in Terminology of Private Equity

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Abstract: *This article is focused on the theoretical definition of private equity capital, which, despite a relatively long history, is not precisely defined. Different entities often use different definitions in this area, which ultimately increases the disharmony of private equity, makes entry of new investors more difficult, and limits the demand for this asset. Even within the European Union, there is an inconsistent definition of private equity capital. We can see differences when comparing the institutional view of the European Union and some companies providing private equity capital. Therefore, we have focused on comparing several views of private equity to create clear definition of this category. Our new view on definition of private equity should adequately reflect the needs of our rapidly changing world and clearly distinguish private equity strategies. The effort to unify terminology is accompanied by highlighting the differences between types of private equity capital.*

Keywords: private equity, venture capital, growth capital, definition

JEL codes: G24, G23

1 Introduction

Private equity transactions represent form of financing business activity. They belong to the group of alternative sources characterized as a distinctive type of asset developed outside of traditional financial system formed by banks and stock markets. Its goal is not only to support financial operations in a company, but also to provide know-how and investors experiences. Companies often do not have detailed information how private equity works. The Slovak Republic is a good example of the lack of information about alternative sources. Nevertheless, this form also exists in Slovakia. According to Mura & Buleca (2012), Czech republic has more developed market of alternative sources, where we can include leasing, factoring, forfeiting, crowdfunding and project financing. (Bánciová & Raisová, 2012; Maresova, 2010)

As part of the private equity investment, we must also mention the second perspective on these assets, namely the investor's point of view. Private equity investments are a part of a broad pool of assets called private capital, defined as private with character of equity and debt in different assets, formed by:

- Private Equity,
- Private Debt,
- Real Estate Financing,
- Infrastructure Financing,
- Funding of Natural Resources. (O'Hare, 2015)

We focus on core private capital transactions marked as private equity. Due to the inconsistency in terminology in this area, we have used several definitions and insights into private equity investments. The result should be the comparison of different definitions according to different perspectives, as well as the consolidation of one conceptual framework for defining private equity.

Definition of private equity investment

The term private equity suggests that it is an investment in the company's equity. This private capital is directed to non-listed companies on the market. The simplest definition speaks about "any investment in a non-listed company on a fixed-term equity market". Because of the simplicity, it does not explain the nature of private equity investments. (Šoltés, Šoltés, Gazda, & Sípko, 2013)

Invest Europe, association representing Europe's private equity, defines private equity as the capital provided to non-listed companies in investment phases: venture capital, growth capital, debt refinancing capital, rescue capital and buyouts. These investments are closed with a fixed life cycle, i.e. exit from investment from company is precisely planned. (Invest Europe, 2016) Slovak Venture Capital & Private Equity Association, member of Invest Europe, define private equity as capital provided to non-listed companies for creating new products and technology, expanding working capital, financing acquisitions or improving the capital structure of an enterprise. (SLOVCA, 2016)

Fenn et al. (1995) use a definition of financial sponsorship activities, where the acquisition of a large equity stake takes the investor into a position with active involvement in the strategic affairs of the company. Using this definition, he includes business angels, providing angel capital to start new companies.

Private equity investments are therefore a temporary investment of private capital into a non-publicly-traded company, with an active involvement of the investor to optimize its growth. This type of investment is typically characterized by a higher risk balanced by higher returns. Such an investment represents a relatively illiquid form of capital by which the investor participates in the company's own capital. End of the investment, also known as exit route, is done by selling investors stake in a company. In summary, Private equity investments have the following characteristics:

- medium to long-term fixed investment life cycle provided as capital injection,
- a contractual relationship between the provider and the recipient of the capital,
- active participation of the investor,
- making profits at the end of the investment,
- it's an illiquid and risky asset,
- investing in a non-publicly traded company.

The last characteristic is criticized by Gilligan & Wright (2010), who say that this condition can be broken. As an example, we can mention private equity investments in publicly traded companies known as PIPE, but because of tradability of stocks during investment we do not include this investments to private equity.

These investments help to support business and innovation on the regional level. As an example, we can mention resources of European Investment Fund flowing into private equity industry. Companies look for resources for innovation, rapid growth and acquisitions. Using private equity this can be achieved in situations, when other forms of capital are not available due to higher risk. On the other side, investors are motivated by higher profits, innovation efforts and ability to provide their know-how to younger generations. Private equity investments are used in all industries, but one private equity company specialize mostly in one industry. (Sipikal, Pisar, & Uramova, 2010)

With these investments risk comes in many forms. Standard risk management tools are not sufficient for investors to handle specific risk of private equity, namely, market risk, liquidity risk, funding risk and capital risk. On the other side, original owners run the risk of losing leading position or even their company because of low business performance.

Private equity industry

Within the private equity market, we recognize several investment strategies. They have developed relatively independently, and over time they have gained unique

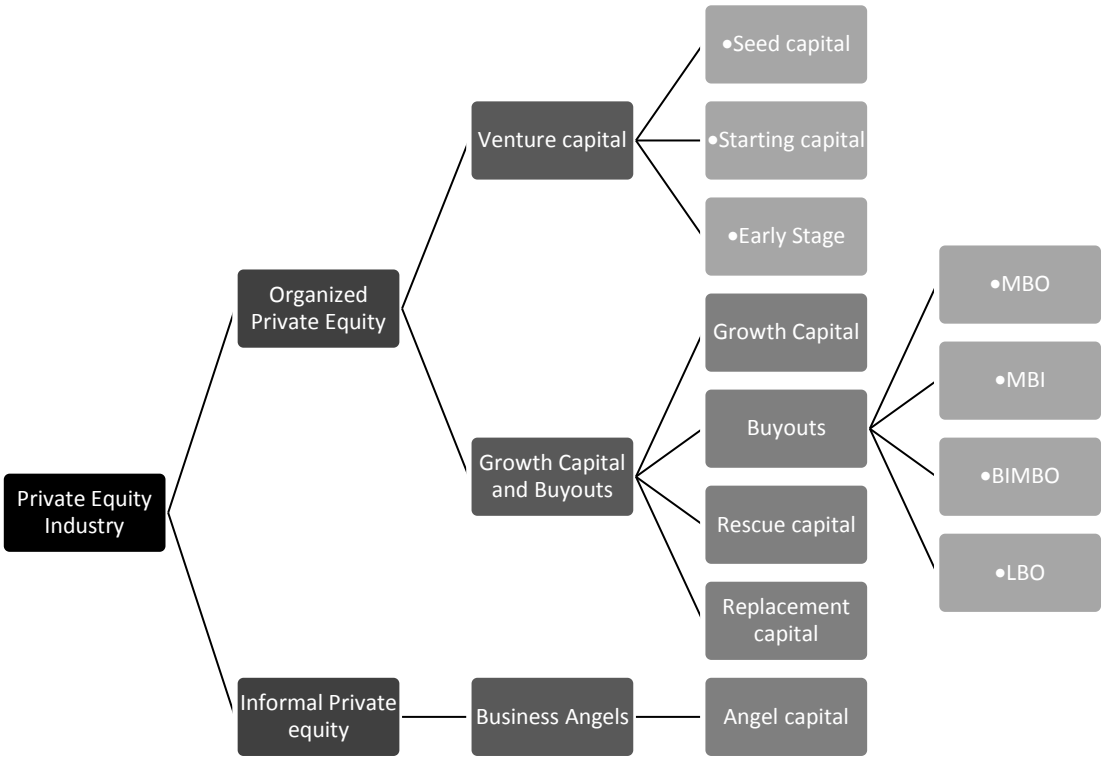
characteristics representing the most important differences of strategies. These differences are very important investors because investors can adjust their portfolio to achieve the optimal investment triangle. To precisely define private equity, we must point to all existing strategies and show their uniqueness. But first we should present organized and informal market. The organized market is professionally managed by intermediaries, who mainly work with sources in the form of funds in cooperation with national and international entities. This category is understood as the main research topic of private equity capital. (Kumpf, 2013) Informal market is formed by business angels. These investors provide funding and know-how with active ownership. According to estimates, the informal is several times larger than the organized market, but it lacks the institutional structure and hence performance data, which prevents to effectively invest on this market. (Fenn et al., 1995)

Private equity companies often do not respect their specific focus and therefore the risk profile of the investment may increase. For example, some buyout funds provide resources meeting the conditions of growth capital, which is linked with higher risk. The main differences between strategies are represented by:

- the stage of business life cycle,
- the size of the investment,
- acquired part of the company,
- structure of resources provided,
- the sector of the funded company,
- the underlying risk and the associated required rate of return,
- exit route of investor from company. (Freňáková, 2011)

Considering all the differences, simple division is not suitable for current market statistics. Private equity industry has grown and diversity of strategies require a more detailed division. Therefore, reporting services as Invest Europe is based on the division of the organized market into five categories, including venture capital, growth capital, buyouts, replacement and rescue capital. Such allocation is also used by the European Union's organizations, namely the Statistical Office and the European Investment Fund. In the Fig. 1 we have created multi-stage division with respect to all mentioned facts.

Figure 1 Private equity industry division



Source: Own elaboration

In one enterprise, multiple private equity strategies may occur. Any new use of private equity may be the exit point of previous investment, and so private equity can stay in a company for a long time. (Robinson & Sensoy, 2016)

Venture capital

In our perception, venture capital is a form of private equity investment focused on new and potentially fast growing companies, mostly in the high-growth sectors. The size of this investment is usually less than the industry average and is provided within several stages of the company's development. This amount is used for product development and market mapping. The investor usually acquires the minority share of the company to motivate the original owners, but every capital injection reduces their share. Nevertheless, venture capital providers maintain a certain level of control over the entity throughout the investment period. Due to the risk profile of investments and relatively low investment size, investors rely on their own capital.

The main goal of these companies is to increase their revenues, market share and brand awareness. These intangible assets are very important for increasing the value of the company. (Drabiková, 2016) Making profits is almost not possible when achieving high growth rate, because of high costs. Dvořák & Procházka (1998) state that venture capital has three stages seed capital, start capital and early stage capital, that differs by the amount of the investment, duration, risk and profitability.

Growth Capital

In this work, we define growth capital as resources provided for established companies to support their growth. They have characteristics of venture capital and buyouts, therefore their unequivocal inclusion into one of these categories is not possible. Their objective is similar to buyouts and so we prefer inclusion to this category.

Like venture capital, they usually earn a minority stake in the company. A minority share is associated with certain rights, pre-determined in a contract. Investors use almost exclusively their own capital. Growth capital, due to the existence of company's assets, brings less risk compared to venture capital. Parallel with buyouts can be seen in the support of mature companies, offering own products with potential to expand domestic and foreign markets. Several forms of investment can be used, but private equity, while accepting higher risk, makes faster growth of the company possible. Growth capital, unlike venture capital, has a form of one financial injection. (European Commision, 2006)

Buyouts

Buyouts are the part of the private equity investment used to buy a mature company to expand its portfolio and market. Due to the presence of tangible and intangible assets, the level of risk is relative small, because failures would be at least partially covered by these assets. Unlike venture capital, buyout are not associated with technological risk, because of existing product portfolio. (Kaplan & Strömberg, 2009)

The goal of the buyout is to maximize the value of the company, which is usually associated with the change of existing management. Through optimization, the company tries to increase its value. There is a negotiation between the current owners of the company and the investor. Given that this sale may become violent takeover, typical for 1980s. Nowadays, investors offer better conditions and proposals, and therefore takeovers are not so widespread. Buyouts often help current or external management to buy a company from owners. In this case we speak about Management Buyouts, respectively about Management Buy-in or Buy-In Management Buyout. (BVCA, 2010; Freňáková, 2011; Jurkasova, Cehlar, & Khouri, 2016)

Such a transaction requires a large amount of funds, the portion of which is borrowed. In this case, we are talking about leveraged buyouts. According to Metrick & Yasuda (2010) these transactions allow to make higher profits, but also to invest in larger companies. Because the average annual return is higher than the cost of borrowed capital, the profitability of the investment increases. Engel, Braun, & Achleitner (2012) talk about the positive effects of the debt on return on investment only to a certain debt level. With a debt ratio over 90% to total capital, the debt becomes too high, which outweighs the positive effects of the leverage. Higher risk is reflected in higher interest, causing reduced profits or raising losses.

Rescue capital

Invest Europe defines rescue capital as a source for mature companies with business difficulties. Investor can provide required capital and experiences to overcome the company crisis. Rescue capital is therefore special use of private equity capital with higher risk profile. (Invest Europe, 2016)

The aim of this capital is to avert the bankruptcy, to direct the company the right way and to restore profits. As part of the restructuring plan, the development program plays an important role. It can involve radical steps such a sale of some divisions or layoffs. Given the nature of supported businesses, rescue capital is associated with a higher risk than the average private equity industry.

Replacement capital

According to Invest Europe, replacement capital is defined as the acquisition of a minority stake from another private equity firm or other shareholder. This capital may also include elements of rescue capital, because, in the case of refinancing debt, the aim is to avert the negative effects caused by high debt. Debt affects the company adversely by credit payments that could lead to a cash-flow collapse. Decreasing debt/equity ratio can improve business predictions, therefore private equity capital can be very helpful. Such form of investment is associated with a higher risk, as an investor enters a business that is in danger of producing a loss. In addition to this use, replacement capital is

invested to compensate new capital requirements, e.g. replacement of another private equity investor. (Invest Europe, 2016)

Angel capital

Angel capital is provided by investors known as business angels. As mentioned previously, they create informal private equity market, widespread in the USA. Business angels are wealthy people investing alone or as a group with several objectives. Profit is one of them, but they are primarily driven by desire to mentor future generations and to transfer their knowhow. Angel capital is mainly flowing into new companies. As part of their activities, they seek to provide insights and gained experience, while the start of the business is the task of the owner.

Other views on private equity

In this section, we tried to analyse other views on private equity capital, including American and European understanding with emphasis on Slovak private equity market. These views should point to inconsistency of terminology. Metrick & Yasuda (2010) highlight the differences between the strategies of private equity, because investors make different decisions in company management. Companies often distinguish only venture capital and buyouts and that cannot provide all necessary information for individual investors. Fraser-Sampson (2011) expects that if there are more investors in the market, the differences between the different categories would be more visible, which would result in changes of present nomenclature.

Given that terminology is not firmly integrated, there is a different understanding of this capital in Europe and the US as well as between individual private equity organizations. Some inconsistencies in terminology are also found in the European market, as we can see in the former name of the Invest Europe association, which was called the European Venture Capital Association. Later, its name was adjusted to European Private Equity & Venture Capital Association to suit the fit focus on the private equity industry.

In Tab. 1 we show the relationship between the US and European definition of private equity. This comparison considers the basic division of the private equity industry shown in the Fig. 1, where replacement and rescue capital is perceived as a form of buyouts.

Table 1 Comparing the understanding of the term private equity in Europe and the US

	Informal market	Organized market		
Europe	Angel capital	Venture capital	Growth capital and buyouts	
			Growth capital	Buyouts
USA	Angel capital	Venture capital		Private equity

Source: own elaboration based on European Comission (European Commision, 2006)

The biggest difference between these definitions is the fact that in American definition venture capital and private equity represent different forms of investment. The term private equity is in the US used to identify transactions that are a part of the growth and buyout category in Europe. Growth capital is a category standing on the dividing line of venture capital and buyouts. In the US, it is understood as part of a venture capital, but in Europe it is considered as a part of wider category of growth capital and buyouts. Growth capital is often represented as expansion capital. We consider expansion capital as part of early stage capital, to support growth of new companies and growth capital as independent category providing support for mature companies American authors like Bance (2004) and Gompers & Lerner (2001) use division of this investment into categories venture capital and private equity. On the other side, Fraser-Sampson (2011) states that the term venture capital can even mark the entire US private equity market. Slovak authors Hečková & Hrabovská (2016) refer to this industry like venture capital,

too, which does not correspondent with Invest Europe, where venture capital is a part of private equity.

In Slovakia and Czech Republic terms private equity and venture capital are often replaced by terms risk and development capital. Freňáková (2011) understands risk capital as the part of private equity that deals with investing in new companies, in our understanding as a synonym for venture capital. The private equity industry may be labelled as "risk and development capital". Even according to the document of Ministry of Economy of the Slovak Republic venture capital can be sufficiently replaced by the synonym risk capital. (MH SR, 2005) On the other hand, Dvořák & Procházka (1998) refer only to venture capital as to risk and development capital. Venture capital is relative broad category including seed, start, early stage, rescue, debt replacement and acquisition capital. Private equity is understood as a wider concept including venture capital investments, as well as buyouts, mezzanine financing and other strategies. We can find this view in some companies too, e.g. Arca Capital.

We have analysed 15 companies providing private equity investments in Slovakia using data obtained from official freely available websites and prospects of this companies. By understanding their active and finished projects, we have created analysis of their products according to statistics of Dvořák & Procházka (1998). Most of these companies are relatively small and therefore, some companies have experiences with only a few investments. They rarely focus on one type of private equity, they even try to provide other forms of investments as real estate or mezzanine finance. We can observe support from the state and the European Union, where Neulogy Ventures and Limerock Fund Managers provide capital support from private sources and European Investment Fund.

Table 2 List of private equity firms in Slovakia

	Venture Capital	Growth Capital	Buyouts	Other financing form	Public portfolio details	Invest Region
Across Private Investments	x	x	x	x		SK
Arca Capital	x	x	x	x	x	CZ&SK
BENSON OAK		x	x		x	CZ&SK
Enterprise Investors		x	x	x	x	EU
Equity Solutions	x	x		x		CEE
Genesis Capital	x	x	x		x	CZ&SK
InfraPartners Management		x	x			World
J&T Private Equity Group		x	x			World
Limerock Fund Manager		x				SK
Neulogy Ventures	x				x	SK
Pro Partners Holding	x	x	x	x	x	CEE
SANDBERG CAPITAL	x	x				CZ&SK
Slavia Capital	x	x	x		x	World
VenCorp group	x			x		SK
WOOD & Company			x	x		EU

Source: own elaboration

Only seven companies precisely define their investment focus, which companies can seek investments. Eight companies do not offer public data about their company and portfolio. Five of them refer to their activities as only private equity investments, which indicate American meaning of private equity investments. The most popular investment strategy is providing growth capital. Although there are companies providing this capital, demand

is not high. Nine companies register together 177 active and finished investments during their existence in our region.

2 Conclusions

In the world, different definitions are used to define private equity, which, despite many similarities, often refer to broader or narrower groups of investments. This situation is observable not only at the level of continents but even countries or individual organizations dealing with this financial asset have chaotic labelling. The aim of this article was to describe and unify the terminology used in this area, along with a basic explanation of each type of capital.

Private equity companies have relatively short history in CEE, but the main problem is information support for enterprises looking for capital. Only few companies described what type of capital they provide. On the other side venture capital becomes relatively well-known through start-up centres and conferences.

Due to the inconsistency of nomenclature, we assume there is a lower demand and supply of this capital. Private equity itself involves a significant part of the risk, therefore any other risk factor discourages new and small investors.

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Disparities in capital markets of the EU and the US

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Abstract: *The aim of the paper is to give strong preview of the EU and US position in global trade by comparing capital/stock markets in the EU and US. For this purpose we used trading volumes on several instruments. After presenting dependence between trading volumes and market capitalization for both sides of pacific, we gradually show major differences in overall trades/volumes and specific areas such as interest rates trading, ETFs, stock options, investment funds etc., using data collected from 70 biggest exchanges, covering more than 90% of total stock market capitalization, In line with expectations, our findings prove that US market is definitely significantly bigger and more dynamic than EU market with almost doubled market capitalization and more than tripled number of trades. Findings in this paper show that Capital Markets Union concept brought by the European Commission could lead to increase in those numbers subsequently make EU market more flexible and dynamic. Improving redistribution and transmission of assets and capital in the EU market supported by CMU could lead to better economic growth and better overall performance.*

Keywords: Capital Market Union, stock markets, capital market, stock exchange

JEL codes: F21, G15, O16

1 Introduction

Stock market is undoubtedly an integral part of the European and American economy. Activity on stock markets could be simple and good indicator about state of economy, if we take into consideration, that investors and traders are rational and are aware of all information. In this paper we focused on concept of Capital Market Union presented by the European Commission in 2015 (see EC–European Commission, 2015). This document presents vision of better trading and investment environment in the EU, better economic performance and also easier access to capital market for businesses, with easier way for investors and mainly improvement of stock markets performance in the EU with aim of stronger economic growth. We decided to compare the EU data from stock markets with the United States in order to achieve clear view how important CMU concept is.

Considering uni-directional linkage from stocks performance to economic growth, positively related results could be found in many papers with variety of approaches, data sets and empirical methodologies (Tsouma, 2009). In terms of the US, studies suggest that stocks return (stock market performance) granger causes economic activity or can be used as a leading indicator of economic activity (Bosworth, 1975; Balvers, Cosimano, and McDonald, 1990; Schwert, 1990; Fama 1990). Asprem (1989) reached similar conclusions for 10 European countries and for G-7 countries Choi, Hauser, and Kopecky (1999). However, across the literature we can find also results with negligible impact of stock market performance on real economic growth and activity (Canova and De Nicolo, 2000).

The majority of empirical results among several studies investigating bi-directional interdependencies show us also positive linkage from stock returns to economic activity.

Stock market performance seems to explain a significant variability in economic activity in the US according to Lee (1992), G-7 countries (Hassapis and Kalyvitis, 2002) or in Canada (Hassapis, 2002). Caporale et al. (2004) comes with more complex conclusions. Besides suggestions, that especially in the long run, economic growth could be fostered by developed stock market, his work also supports theories according to which economic growth bolsters faster capital accumulation and allocation throughout well-functioning stock markets. We assume that CMU has similar complex goals – to encourage activity on stock markets throughout simplifying access to stock and capital markets and achieve faster and more effective capital allocation. There are legislation differences between US and EU undoubtedly too.

Considering a fact, that stock market development implies economic growth, we decided to focus on and compare activity on stock markets in the EU and the US. We use trading volumes as an indicator of activity and accessibility to stock markets. For instance, Gervais, Kaniel and Mingelgrin (2001), Zhou (2010) or Kurniasari (2008) uses trading volumes as an instrument to predict stocks returns, resulting causality where higher returns are caused by higher volumes on particular asset. Kaniel, Ozoguz and Starks (2012) states that higher trade volume on particular stock bring some visibility to it, and increases its interestingness and vice versa. Some literature strands refute this interconnection (f.i. see Huang, Heian and Zhang, 2011). Nevertheless, we put traded volumes not only of particular asset, but whole basket of instruments in context with market capitalization that will represent returns of all stocks. After defining what will imply market capitalization mostly, we analyse these volumes.

Paper is structured as follows; we show panel regression model for US and EU using volumes of trades in order to discover their effects on market capitalization, in line with positive relationship between stock returns and market capitalization, consequently we present results of our model. After that we compare EU and US market in the field of volumes traded on various instruments. Then we conclude our findings.

2 Methodology and Data

To prove some significant disparities between the EU and the US, in this paper we use mainly volumes traded on both futures and options on commodities, currencies, indices, single stocks, long and short term interest rates. For other derivatives there is volume as sum, and for ETF´s we state only options. Data were gathered from world federation of exchanges. Next we adjusted data with respect to our needs, in other words, we gathered volumes of trades only from major US and EU stock exchanges, covering together more than 90% of market capitalization both in the US and the EU. Subsequently, we used panel regression model to estimate influence of volumes traded on particular instruments on market capitalization. Reason for searching this dependence is, that with increasing market capitalization companies are facing capital inflows, and consequently reinvests, while volumes traded present activity of market participants. We used first differences of annual data from 2009 to 2016. It is undoubtedly short time period, nevertheless, we consider our data solid because of large amount of major stock exchanges included. The general linear relationship is defined as follows:

$$MC_{it} = \alpha_i + X_{it}\beta + u_{it} \tag{1}$$

For t = 1,…,T and i = 1,…,N, where MC_{it} is the dependent variable used as proxy variable for market capitalization, observed for US or EU at time t. X_{it} is the time variant matrix of explanatory variables – volumes of trades in our case, αI is the unobserved time-invariant individual effect and u_{it} is the error term, Bai (2009).

We excluded other derivatives and single stock futures from our model, because of missing data, subsequently we were removing variables that were insignificant for our model with respect to their p-value. Main objective here was to determine statistically significant effect of volumes of trades on market capitalization in the EU and the US.

In Table 1 and Table 2 we present trading volumes of tracked instruments in millions of trades and total market capitalization in millions of dollars.

Table 5 US Financial Market Indicators

Year	2009	2010	2011	2012	2013	2014	2015	2016
MC	15 077 285.74	17 283 451.68	15 640 707.04	18 668 333.21	24 034 853.52	26 330 589.19	25 067 539.60	27 352 200.72
SSO	1 392.41	1 110.85	2 370.70	2 284.74	1 689.37	2 342.93	2 179.59	1 975.56
SSF	2.62	4.76	3.60	5.15	6.74	6.16	-	-
SIO	242.34	265.84	300.47	270.49	334.03	390.96	408.10	597.00
SIF	749.58	742.49	800.99	623.16	603.73	608.77	612.92	668.30
ETFO	1 063.48	1 237.33	1 705.56	1 374.56	1 452.09	1 502.14	1 399.47	1 650.90
STIRO	161.03	183.58	196.62	140.54	150.04	216.66	243.99	308.88
STIRF	438.10	511.37	588.35	441.18	524.76	672.35	607.23	688.27
LTIRO	62.90	85.15	77.39	87.30	135.88	148.28	144.16	145.44
LTIRF	411.53	598.49	672.47	565.87	680.55	727.35	703.12	751.61
CURO	6.15	11.89	10.51	10.74	15.39	17.33	21.06	18.16
CURF	156.31	229.09	231.57	210.70	216.95	193.11	212.01	205.41
COMO	113.40	182.90	154.55	166.22	194.35	184.17	200.32	208.52
COMF	555.32	719.93	721.69	806.98	975.71	901.35	1 010.35	1 157.08
OD	33.63	62.77	-	-	40.19	50.62	196.14	208.43

Note: MC: market capitalization (in millions $); SSO: single stock options; SSF: single stock futures; SIO: stock index options; SIF: stock index futures; ETFO: exchange-traded fund options; STIRO: short term interest rate trading options; STIRF: short term interest rate futures; LTIRO: long term interest rate options; LTIRF: long term interest rate futures; CURO: currency options; CURF: currency futures; COMO: commodity options; COMF: commodity futures; OD: other derivatives.

Source: own elaboration according to WFE and World Bank data

From Table 1 we would like to point out very strong increasing trend in market capitalization in the US, which indicates strong money inflows. On the other hand, as it could be seen in Table 2 below, market capitalization in the EU does not indicate any trend, or it is stagnating, while in 2009, market capitalization in the US was more than twice as high as in the EU, in 2016, the US market capitalization was even four times higher than in the EU. We show more comprehensive analysis in Section 3.

Table 6 EU Financial Market Indicators

Year	2009	2010	2011	2012	2013	2014	2015	2016
MC	6 900 113.24	6 705 066.62	5 601 539.01	6 332 388.72	7 932 211.38	7 184 713.37	6 276 080.00	6 379 057.69
SSO	563.28	578.61	549.22	443.82	394.50	361.94	326.48	318.89
SSF	385.96	534.04	479.36	487.73	331.47	256.03	215.86	175.88
SIO	488.37	448.34	540.20	440.03	377.48	397.98	437.88	428.54
SIF	563.96	611.55	665.28	533.34	473.82	516.85	570.57	646.88
ETFO	0.01	0.14	0.06	0.07	0.00	0.01	0.04	0.30
STIRO	191.31	191.02	178.18	112.43	143.03	85.40	58.27	63.64
STIRF	316.31	386.96	391.13	326.39	410.73	307.07	290.02	302.76
LTIRO	51.95	65.00	80.89	71.91	66.42	51.01	79.35	59.28
LTIRF	444.28	546.59	591.40	443.60	492.50	450.88	467.39	524.59
CURO	0.66	0.33	0.22	0.24	0.22	0.16	0.15	0.06
CURF	7.69	7.25	6.06	5.37	9.34	8.77	10.23	3.53
COMO	7.38	3.23	14.88	21.62	28.65	37.11	34.36	37.88
COMF	277.30	328.97	417.86	441.92	484.25	492.48	541.85	587.86

OD	-	-	14.37	18.55	3.64	5.36	28.64	32.36

Note: MC: market capitalization; SSO: single stock options; SSF: single stock futures; SIO: stock index options; SIF: stock index futures; ETFO: exchange-traded fund options; STIRO: short term interest rate trading options; STIRF: short term interest rate futures; LTIRO: long term interest rate options; LTIRF: long term interest rate futures; CURO: currency options; CURF: currency futures; COMO: commodity options; COMF: commodity futures; OD: other derivatives.

Source: own elaboration according to WFE and World Bank data

In second part we present graphs with comparison of development of these traded volumes with theoretical context.

3 Results and Discussion

After removing stock index futures (SSF) and other derivatives (OD) because of missing data for those instruments, we gradually removed single stock futures (SSF), exchange traded funds options (ETFO), short term interest rate options (STIRO), short term interest rate futures (STIRF), long term interest rate options (LTIRO), currency futures (CURF) and commodity options (COMO), because of their p-value signalling insignificance, in order to achieve model where only statistically significant variables will remain. In Table 3 we present only statistically significant variables that remained in our model.

Table 7 Estimated coefficients from panel data

Coefficients	Estimate
COMF	0,077841 (**)
CURO	-0,892964 (*)
LTIRF	-0,862663 (***)
SIF	-1,818970 (***)
SIO	0,422963 (**)
SSO	-0,212954 (***)

Note: ***, **, * denote significance levels on 1, 5 and 10 per cent respectively. R-Squared is 0.92. According to White´s test, there is not heteroscedasticity presented in the model, LM statistic=9,85. Residuals are normally distributed, Chi-square = 0.428. There is no autocorrelation according to Durbin-Watson test.

So the final model is:

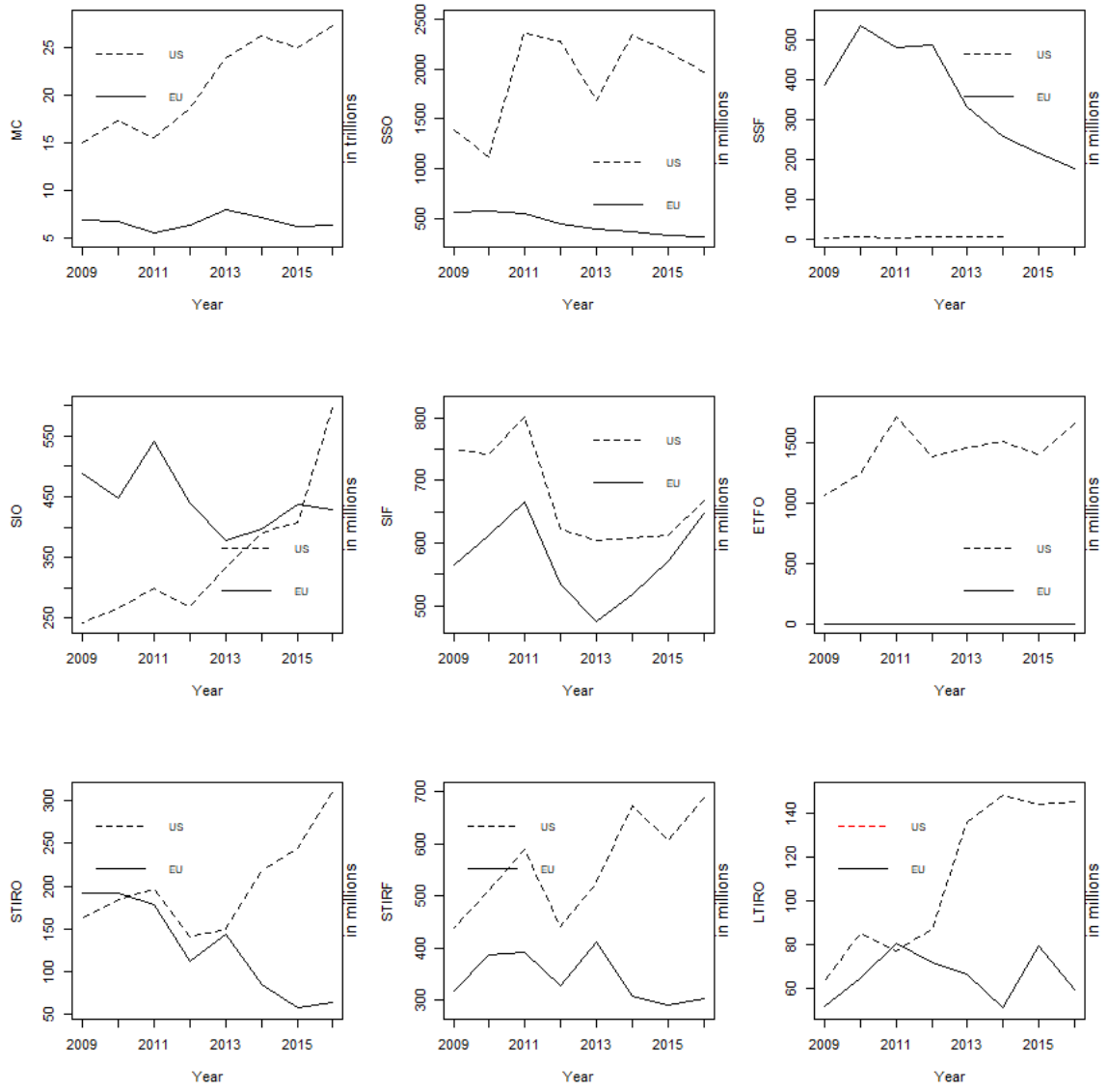
$$\begin{aligned} MC &= 0{,}077841 - 0{,}892964 * COMF - 0{,}149472 * CURO \\ &+ 0{,}862663 * LTIRF - 1{,}818970 * SIF + 0{,}422963 * SIO \\ &- 0{,}212954 * SSO + u_t \end{aligned} \tag{2}$$

These results suggest which trading volumes mostly are significant for market capitalization on both sides of pacific. From our model we can see, that market capitalization is positively implied by changes in traded volumes on commodity futures and stock index options, while changes in volumes traded on currency options, long term interest rates futures, stock index futures and single stock options have negative estimated coefficients.

We consider these results very interesting, because of negative coefficients estimated, and we suggests this interpretation: if we consider options and futures mainly as instruments intended to hedge against future turmoil (especially for currencies, commodities and interest rates), than decrease of those trades could indicate calm and steady environment, so investment flows could be directed to stocks directly and consequently increase market capitalization, while increase could indicate some concerns about future economic development. Nevertheless, market capitalization is significantly implied by volumes of trades of instruments stated above in the US and also in the EU according to our findings.

In next part we focused on volumes traded in nominal values, but separately for the US and the EU. In Figures 1 and 2 we show several graphs of volumes traded on major stock exchanges in the EU and the US. With data processing, we strongly believe that results give us simple but solid preview of where trading activity is in the US and the EU.

Figure 1 Traded volumes comparison 1



Note: MC: market capitalization; SSO: single stock options; SSF: single stock futures; SIO: stock index options; SIF: stock index futures; ETFO: exchange-traded fund options; STIRO: short term interest rate trading options; STIRF: short term interest rate futures; LTIRO: long term interest rate options

Source: own elaboration according to WFE data

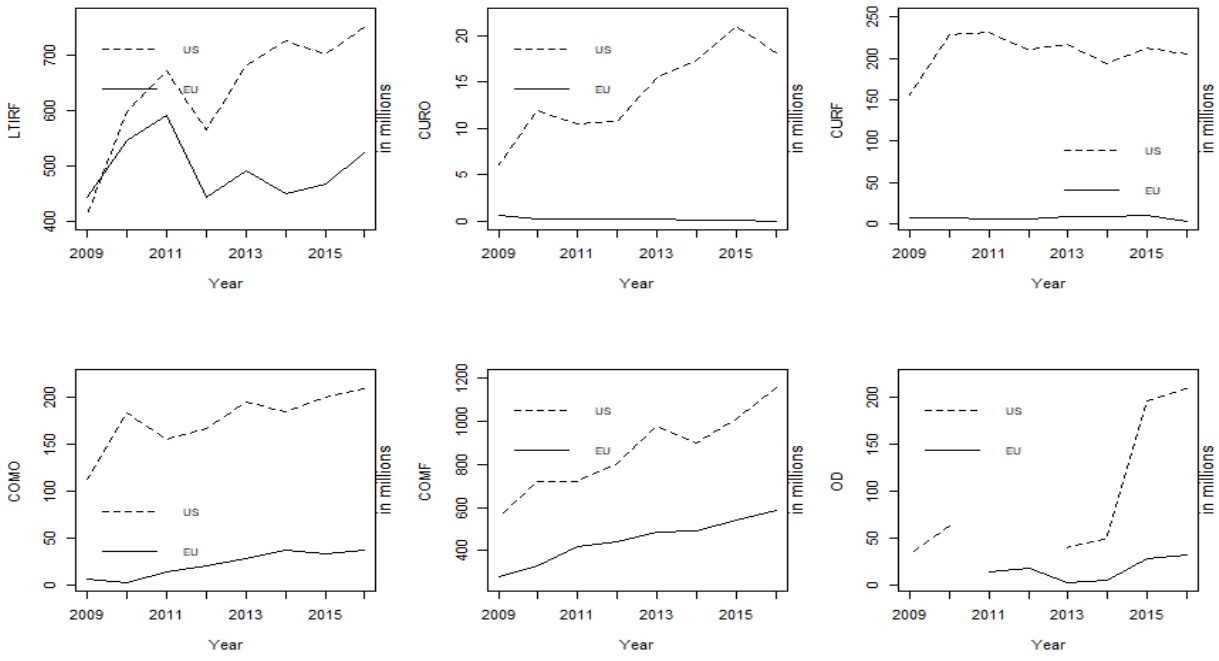
As stated before, in first graph we can see strong increasing trend in market capitalization in the US and also divergence with the EU market capitalization. Next we see that Single Stock Options (SSO) and Single Stock Futures (SSF) have different "popularity" in these regions. Although, SSO, which represents and alternative way how to increase capital, have almost tripled trading volumes in the US than in the EU, even if SSO and SSF in the EU were put together, it would be only somewhere near 50% of volumes traded on SSO in the US. Indexed trading volumes, tracked by Stock Index Options (SIO) and Stock Index Futures (SIF) suggests that volumes on trading index futures are converging in the EU and US, also that SIO have strong uptrend in the US,

and already overcame number of trades in the EU in 2015. That could sign some more investor´s activity, even in less risky investing. Another sign of different activity on markets could be volumes traded on ETF´s (ETF Options-ETFO, Figure 2). ETF´s are very popular and are still getting more attention. In our graph we see volumes on ETF options in the EU are at zero level, while in the US it reaches levels of volumes traded in SSO, SSF, SIO and SIF in the EU together.

Also last graph in Figure 2 – Other Derivatives (OD) shows some different attitude of investors, again in favour for US. This category includes commodity index derivatives, intellectual property futures, single stock dividend futures, equity index dividend futures and dividend options and shows stagnating trend of volumes traded in the EU, while volumes traded in the US have –in line with other showed instruments – strong uptrend.

Following graphs are showing volumes traded on short and long term interest rates futures and options (STIRO, STIRF, LTIRO – Figure 1, LTIRF – Figure 2). In general, every interest rates trading volumes are significantly higher in the US than in the EU for at least few years, but we assume, that this trading activity is caused by FED and ECB policies, that are diverging especially last year, in other words, FED is ready to tighten its monetary policy, which means rate hikes (already hiked three times since 2006, firstly in December of 2015), while even these days' rhetoric of ECB is not changing about interest rates. No matter that fact, in LTIRO we can see some correlation of volumes traded in the EU and US, also from 2009 till 2013 in STIRF, but since 2012 there is again strong uptrend in volumes traded in the US in every stated instrument, while EU volumes are stagnating or decreasing, with increasing volumes only in LTIRF. In line with different monetary policies on both sides of Atlantic, we consider interest rates trading as a part of a hedging for companies. With hedged interest rates that are connected to debt management and risk we assume that company could perform more stable.

Figure 2 Traded volumes comparison 2



NOTE: LTIRF: long term interest rate futures; CURO: currency options; CURF: currency futures; COMO: commodity options; COMF: commodity futures; OD: other derivatives.

Source: own elaboration according to WFE data

Another great disparity could be seen in volumes of traded Currency Options (CURO) and Currency Futures (CURF) shown in Figure 2. It is hard to say what type of contract whether option or future contract is more speculative, but both the EU and the US companies have their business counterparts in countries with different currencies. We assume that especially currency futures could help companies to hedge against negative foreign exchange scenarios in their view. But while in the US we see over 200 million trades almost every year since 2010, volumes traded on currency futures in the EU are fluctuating around 8 million, while in 2016 we faced on 3.53 million of trades.

Figure 3 also shows volumes traded on Commodity Futures (COMF) and Commodity Options (COMO). In general, for manufacturing companies (car industry, steel industry etc. in both the US and the EU) commodities presents necessary inputs, therefore hedging against price instability on commodity markets will logically lead to more stable and sustainable performance of these companies. In both COMF and COMO we can see uptrend in trading volumes in last 6 years in both the EU and the US. Despite stated facts, volumes traded on Commodity futures are double sized in the US than in the EU, while Commodity options volumes are almost 5 times higher than in the EU.

We would also like to put in contrast GDP and population of the US and the EU with those findings. Population (as for 2016) in the EU was 510 mil and in the US 325 mil, while overall GDP (as for 2016) in the US was 18 trillion USD and in the EU 16 trillion USD. Those numbers indicate that economies in the US and the EU are more likely similar than significantly different. This brings us to question why stock markets in the US are much more active than in the EU. One of explanation could be heterogeneity in the EU that causes disinclination of investors in one country to move their capital to other also European country. Another part of explanation could be better unified environment for investors in the US that is missing in the EU.

4 Conclusions

In this study, we mainly focused on disparities between the EU and the US considering trading volumes. Firstly, our panel regression showed that statistically significant dependence between changes of volumes traded and market capitalization exists on both sides of pacific, while we believe that market capitalization could be positive indicator for future economic development. After proving this assumption, we compared trading activity (using trading volumes) in the EU and US in order to achieve solid preview which "region" is more dynamic. According to our findings, US market has significantly bigger volumes of trades on almost every investigated instrument than the EU, in some occasions (single stock options) total number of trades are almost five times higher in the US than in the EU. Especially strong uptrend in market capitalization in the US points to significant amount of money inflows to companies via markets, while trend in the EU suggests stagnation, while we assume that higher trading volumes indicate more participants in the market and could lead to better shock absorptions, also to faster equilibrium pricing and especially more money inflows where needed, with lower effective spreads for investors/traders. In line with Green Book presented by European Commission, we agree upon that EU stock markets need a better and unified environment, that could help to relocate capital more effectively, also could lead to better shock absorptions on markets and gain easier access on markets both for investors and companies. We assume that concept of Capital Market Union could increase number of participants, even volumes of trades and value of those trades in the EU and consequently lead to better economic activity and growth. Therefore, we think individual parts of CMU, and also ability of trading volumes to predict economic and stock market development deserve further research in order to set most effective approach during introducing them.

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IFRS valuation models vs. business entities' practice – a case of Polish publicly traded enterprises

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Abstract: *Disclosure of information about the economic situation including description of assets, liabilities, and equity structure, as well as results of financial performance compose an inherent part of the obligations imposed on contemporary enterprises, especially those whose shares are publicly traded. In order to fulfill the duties, entities must organize bookkeeping procedures; inter alia make decisions regarding valuation models and techniques. From the point of view of stakeholders (investors among them), the above is of crucial importance as faithfulness and relevance of financial reporting depend on the proper decisions in the field of valuation techniques reflecting the results of economic phenomena that it purports to represent. The main aim of the paper is to compare valuation models and techniques encompassed into International Financial Reporting Standards with Polish local accounting norms in the scope of measurement regulations. The meta-analysis of previous studies was conducted in order to present differences between valuation models as well as problems already stated by researchers. Furthermore, the objective of the study conducted is to analyze Polish enterprises' preferences in the domain of assets and liabilities valuation models. The material for the study comprises of financial reports of the biggest Polish publicly traded companies that are incorporated into WIG 30 index. The authors compare International Financial Reporting Standards regulations with Polish norms and find discrepancies, although in Poland the convergence process was finished more than ten years ago. The study conducted among Polish entities shows that the historical cost model prevails among the biggest Polish entities while measurement based on fair value is mainly used for financial assets valuations. The authors conclude that although Polish entities prepare their financial reports in accordance with the International Financial Reporting Standards, the disclosures they make are still under a strong influence of historical implications derived from previous system of accountancy in Poland.*

Keywords: financial reports' valuation, accounting models for measurement, earnings management, Polish accounting practice

JEL codes: M41

1 Introduction

Valuation is one of the most important issues of contemporary accounting. For years, the solutions adopted in IAS/IFRS relating to the preparation of financial reports have focused on assigning properly value to assets, capital and components of total income of an enterprise as well as capital group. By contrast, the form adopted for financial reports is much less important. Amendments to IAS/IFRS generally relate to mandatory or

optional valuation principles and methods. Introduced changes are often accompanied by discussion of theorists and accountants about the effects of their use (e.g. Ijiri, 1967; Hendriksen, Van Breda, 2002; Sapra, 2008; Hellman, 2008). It is important to highlight the controversy surrounding the fair value parameter used on an ever-increasing scale. At the EAA congress, 23-26% of the research presentations were devoted to valuation issues in financial reporting for 2010-2012 (EAA, Program and Collected Abstracts 2010-2012, Cite by Dobroszek, Michalak, 2013).

The solutions adopted in the Polish law governing the accounting process include the process of its harmonization and, in part, also the standardization. However, there are some areas in which the Polish authorities have quite consistently maintained a different, separate approach. This area is primarily the valuation as well as scope and structure of financial reports. In Poland, the dominant approach in the balance sheet valuation is the historical cost model.

The authors of the paper posed a question whether it is possible to indicate the correctness between the scale and form of conducting economic activity of Polish enterprises and preferred models and methods of balance sheet valuation.

Two objectives of the study were formulated:

- comparison of solutions adopted in Polish and international accounting standards,
- examination of preferences for valuation methods in entities using IAS/IFRS on the example of enterprises listed on the Warsaw Stock Exchange, compiled in the WIG 30 index.

The paper analyzes the literature on valuation issues in accounting. A comparative analysis of the IAS/IFRS and Polish standards for valuation of reporting items has also been performed. The qualitative analysis of financial reports was used in the research section of Polish enterprises.

2 Models and concepts of valuation in accounting theory

Valuation is a complex process that assigns value to a particular object. Karmańska (2007) points out that simultaneous attributes of a value are 'present' and 'future'. The change of the 'present' determines future actions and states. From the point of view of processes occurring in economic entities it is particularly important to determine the economic value of the resource. The economic value of a resource, as long as it performs assigned functions, is always an estimate, both mentally and in monetary measurement (Karmańska, 2007; Sawicki, 2009). Generally, in the accounting system it is related to the measurement of a phenomenon or event. The Conceptual Framework for Financial Reporting refers to the valuation process from the point of view of financial reporting. Measurement involves assigning monetary amounts at which the elements of the financial reports are to be recognized and reported (F4.54).

The valuation process involves appropriately selected elements such as:

- correctly identified valuation object,
- adopted valuation concept,
- method used and the associated valuation parameter,
- valuation moment,
- size of the entity (e.g. valuation in micro entities is based on historical cost).

In accounting, the valuation includes all possible assets disclosed and not disclosed in the financial reports, components of equity and liabilities, revenues, expenses and other comprehensive income. The specificity of a particular asset often affects valuation solutions. Examples may be intangible assets, which by their nature are much more difficult to value, with particular emphasis on goodwill.

From the point of view of the moment of carrying out the valuation in accounting, the most important is the current valuation related to the introduction of the asset or capital

component into the accounting ledgers and the balance sheet valuation. The balance sheet valuation consists in determining the value at the so-called balance sheet moment, i.e. the value determined for presentation in the financial reports. It is also possible to indicate the moment of liquidation of an entity and the resulting liquidation value.

Also entity's size is important for valuation. Various types of simplifications in valuation are permitted or even imposed in small and micro entities (Directive, 2013).

The prudence principle in preparing financial reports for this type of entities is a priority.

The choice of the valuation method can be influenced by factors such as the insolvency, liquidation, takeover.

In general, two main valuation models can be identified: historical cost model and fair value model. There are also mixed models in legal solutions. Each of the indicated models has its advantages and disadvantages. The historical cost model is a traditional, conservative approach, based primarily on the prudence principle (N. Hellman, 2008, p. 72). The fair value model is the result of exposing the needs of capital providers, especially investors. The principles for fair value measurement are included in SFAS 157 'Fair Value Measurement' (US GAAP) and IFRS 13 'Fair Value Measurement'.

Some authors in the publications express doubts as to whether one group of users of the financial reports is rightly privileged (eg. Suryaningrum, Anwar, 2012; Whittington, 2008). The problem with determining fair value in the absence of an active market was raised (e.g. Gullette, 2009; Mazur, 2011). It is worth pointing out that fair value is a hypothetical value because the real transaction did not occur at the moment of valuation. Also, the market value is not unequivocal as a valuation parameter, even in the case of an active market for a valuated asset. For the market value from the buyer's point of view is different (according to IFRS 13 the so-called entry price) and so from the seller's point of view (in accordance with IFRS 13 the so-called exit price) (Strojek-Filus, Kumor, 2015). The advantages and disadvantages of these models are summarized in Table 1.

Table 1 Advantages and disadvantages of historical cost model and fair value model in valuation

Valuation model	Advantages	Disadvantages
Historical cost model	• predictability of results • ease of verification of the valuation result, • ease of measurement, • low cost of obtaining information for valuation, • convergence with tax regulations.	• loss of information on current market value, • threat of large discrepancies between book value and fair value under inflation conditions, • creation of unrealized capital gains, • lack of information abort real operating costs.
Fair value model	• reflecting the current market value, • cost realignment, • creating the basis for investor decisions.	• risk of error in estimating the value in the absence of an active market, • difficulty in verifying valuation, • high costs of obtaining information for valuation, • ease of manipulation of reporting data.

Source: own elaboration based on Gierusz (2011), Kaczmarczyk (2015) , Liang and Wen (2007).

Based on two main valuation models, four valuation concepts have been derived. In the IFRS Framework the following basic valuation concepts are listed (F 4.55):

- historical cost,
- current cost,

- net realizable (settlement) value,
- present value.

In order to properly measure the asset components at the balance sheet date, the effects of the change in their value should be taken into account. Value adjustments are made using revaluation write-downs. With appropriate write-downs, the right value will be – from this point of view of adopted valuation concepts – recovered. In addition to the current value and balance sheet value, the recoverable amount, the useful value is also used.

Selection of valuation methods has long been an instrument of accounting policy, considered one of the most effective. By the means of appropriately selected, permitted by law, valuation methods the items in the financial reports and, consequently, the financial position of an enterprise can be influenced. It is worth emphasizing that the solutions adopted by the entity in the field of balance sheet valuation, in general, directly affect the reported net financial result or components of other comprehensive income (Salvary, 1998, Sivakumar, Waymire, 2003). Valuation methods can also be used with particular intensity under certain conditions e.g. inflation. From the point of view of the possibility and magnitude of impact on the items of financial reports, the fair value model is much more effective. Historical cost in this respect gives relatively little opportunity. Accounting based on the fair value parameter is sometimes called the estimation era (Kim, Yoon, 2012).

3 Valuation methods adopted in IAS/IFRS and in Polish legal regulations – comparative analysis

The orientation of financial reports in line with investor's needs has been introduced in the international standards to a very large extent. In IAS/IFRS, fair value is used as a basis for valuation or as an option in the following areas (Gierusz, 2012; Dyląg, 2007; Michalczuk, 2009; Dyduch, 2010):

- intangible assets (IAS 38),
- property, plant and equipment (IAS 16),
- investment property (IAS 40),
- agricultural assets (IAS 41),
- financial assets and liabilities (IAS 39, 27),
- non-current assets available for sale (IFRS 5),
- employee benefits (IAS 19).

Additional areas of fair value application are:

- merger of entities in the form of acquisition,
- share-based payments.

The basic act regulating the accounting of economic entities in Poland is the Act of 29 September 1994 on Accounting (further referred AoA). The AoA contains the legal basis for the recognition, valuation, eligibility and disclosure of assets, liabilities and equity in accounting ledgers and in financial reports. In contrast to the IAS/IFSR, the AoA also contains templates of financial reports, according to which financial information about economic entities should be presented. The solutions included in the AoA are further specified in the Regulations. The Regulation which regulates methods of valuation of financial instruments is the Ordinance of the Minister of Finance of 12 December 2001 on detailed principles of recognition, valuation methods, scope of disclosure and presentation of financial instruments (Journal of Laws, No. 149). In the case of issues not explained in the AoA and in the regulations, the entity should follow the National Accounting Standards. In the absence of a suitable standard, accountants may use IAS/IFRS.

Some reporting entities in Poland are subject to IAS/IFRS. As of 1 January 2005, such obligations are borne by public companies and banks preparing consolidated financial reports (art. 4 of Regulation (EC) No. 1606/2002 of the European Parliament and of the

Council of 19 July 2002 on the application of international accounting standards (OJ of EU L 243, 11.09.2002, p.1; Polish special issue, Chapter 13, Vol. 29, page 609, as amended by the Regulation of the European Parliament).

Some entities have a choice of accounting law (AoA or IAS/IFRS). These are issuers of securities admitted, issuers intending to apply for or applying for admission to trading on one of the regulated markets of European Economic Area countries.

According to the AoA, fair value is allowed as an option alongside the historical cost model to the following statement of financial position items:

- financial investments,
- non-financial investments,
- financial liabilities.

The Regulation clarifies the principles for the valuation of financial instruments:

- financial assets – only fair value is allowed,
- loans granted and own receivables – fair value as an option alongside historical cost,
- financial assets held to maturity – fair value as an option alongside historical cost.

Fair value is also applied to the same extent as in the case of IAS/IFRS for consolidation of financial statements, business combinations and share-based payments.

4. Methodology – review of valuation methods adopted for selected groups of assets in WIG 30 enterprises listed on the Warsaw Stock Exchange

The largest Polish listed enterprises quoted on the WIG 30 index were surveyed. The WIG30 index has been published since 23 September 2013, based on the share portfolio value of the 30 largest and most liquid enterprises of the main stock market. The research is based on the qualitative analysis of consolidated financial reports of the capital groups for the years: 2014, 2015 and 2016. These are the entities that made IAS/IFRS obligatory for use to prepare financial statements. The research sample consists of 21 entities from sectors such as: energy, coal, fuel, gas, telecommunications, footwear, real estate, IT. The study examined the choice of valuation methods for assets and liabilities in areas where IAS/IFRS leaves the management with a choice in the valuation model.

For the purposes of the analysis, nine groups of components, subject to valuation, were identified: intangible assets, operating tangible assets, inventories, property investments, financial liabilities, financial assets available for sale, financial assets to maturity, loans granted and receivables, other financial assets valued at fair value through profit or loss.

5 Results

According to the accounting regulations, two valuation models, historical cost and fair value can be used for balance sheet valuation (IAS 39, 40). In the analyzed enterprises, with regard to the valuation of investments, especially non-financial ones, the variations in the models used can be noted.

The results of the analysis are shown in Table 2.

Table 2 Analysis of the reporting valuation models for selected WIG 30 capital groups

short name	operating intangible assets	operating tangible assets	inventories	non-financial investments/ property	financial liabilities	financial assets available for sale	financial assets to maturity	loans granted and receivables	other financial assets valued at fair value through profit or loss
ASSECO	HC	HC	HC	HC	AC	FV/HC	AC	AC	FV
BOGDANKA	HC	HC	LV	NDA	AC	NDA	NDA	AC	NDA
CCC	HC	HC	LV	NDA	NDA	FV	AC	AC	FV
CDPROJEKT	HC	HC	LV	FV/HC	NDA	NDA	NDA	HC	FV
CYFROWY POLSAT	HC	HC	LV	HC	AC/FV	NDA	NDA	AC	FV
ENEA	HC	HC	LV	HC	NDA	FV	AC	AC	FV
ENERGA	HC	HC	LV	HC	AC	FV	AC	AC	FV
EUROCASH	HC	HC	LV	HC	AC/FV	FV/HC	AC	AC	FV
GRUPA AZOTY	HC	HC	LV	FV/HC	AC/FV	FV	AC	AC	FV
GTC	HC	HC	LV	FV	AC	FV	NDA	AC	FV
JSW	HC	HC	LV	HC	AC	FV/HC	NDA	AC	FV
KGHM	HC	HC	LV	NDA	AC/FV	FV/HC	AC	AC	FV
LOTOS	HC	HC	LV	NDA	AC/FV	FV/HC	AC	AC	FV
LPP	HC	HC	LV	NDA	AC/FV	FV	AC	AC	FV
ORANGE	HC	HC	LV	NDA	AC/FV	FV/HC	NDA	AC	FV
PGE	HC	HC	LV	HC	AC/FV	FV	AC	AC	FV
PGNIG	HC	HC	LV	HC	AC/FV	FV	NDA	AC	FV
PKNORLEN	HC	HC	LV	FV	AC	NDA	NDA	AC	FV
PKPCARGO	HC	HC	LV	HC	AC/FV	FV/HC	AC	AC	FV
SYNTHOS	HC	HC	LV	NDA	AC/FV	FV/HC	NDA	AC	FV
TAURON	HC	HC	LV	NDA	AC/FV	FV/HC	NDA	AC	FV

FV - fair value
HC - historical cost (purchase price or manufacturing cost) with write-downs to sales market value or value in use
AC - amortized cost (adjusted purchase price)
LV - lower value (the lower of two values: cost of purchase or manufacturing cost and net realizable value)
NDA - no data available

Source: own elaboration based on consolidated financial reports for the period of 2014-2016

In the scope of operational tangible assets and intangible assets, the studied enterprises apply uniform principles of balance sheet valuation according to historical cost model. Operational tangible assets and intangible assets in all analyzed enterprises are valuated at purchase or manufacturing cost, less depreciation charges and impairment losses. In the analyzed reports, the enterprises present differently the procedure for valuation of impairment charges.

In essence, there are no discrepancies in the valuation of inventories that are measured at the balance-sheet date in accordance with the prudence principle, at the lower of the two values: purchase cost or net realizable value. The enterprise's reports do not always specify the valuation model. For example, the Asseco Poland report includes the principles for valuation of initial value and information that the group makes write-downs on the value of goods, depending on the date of the deposition of stock. Moreover, the report shows that annual analyzes are carried out whether the principles of making write-downs are consistent with the actual loss of value of inventories held. However, it is not

exactly clear how the valuation of the inventories is impaired and whether it is up to the price level of possible resale. It should be noted that the specific nature of the conducted economic activity influences the valuation model. For example, Orange identifies inventories sold in promotional offers (phones and subscriptions), which are shown at a lower value: purchase price and net recoverable value, taking into account expected future revenue from the subscription.

In the field of property investment 8 enterprises do not present valuation principles because of the absence of such assets. Among other capital groups, 9 of them value property investment according to the historical cost model, as operational tangible assets.

In terms of financial liabilities 3 groups do not present valuation principles in their consolidated reports. 12 capital groups identify the category of financial liabilities at fair value through profit or loss and other financial liabilities at amortized cost using the effective interest rate method. The remaining analyzed groups use only the amortized cost model, namely the adjusted purchase price. The amortized cost model is included in all analyzed reports with respect to valuation of loans and receivables.

The valuation of other financial assets of the studied groups depends on the qualification of particular groups of financial instruments. All analyzed groups, except for Bogdanka Group, identify financial assets at fair value through profit or loss.

As for financial assets available for sale, Bogdanka and Cyfrowy Polsat do not identify such asset category in their reports. In the reports of the CdProjekt Group and PKN Orlen, this category appears in the statement of financial position, but there are no valuation rules after initial recognition. 8 of the analyzed groups allow valuation of financial assets available for sale by the fair value model only. In the case of the remaining 9 capital groups for valuation of financial assets available for sale in the absence of an active market, valuation at purchase cost less impairment losses is applied.

The least information in the reports of the analyzed groups can be found in relation to assets held to maturity. In 10 capital groups, no such assets are identified at all. In other groups, the adopted valuation model is amortized cost.

6. Discussion and conclusions

The presented research results indicate gaps in the disclosures concerning entities and valuation methods adopted by them. Lack of detailed information in this regard hinders the proper interpretation of the data presented. At the same time, the dominant historical cost model used for operating assets can be observed. In the case of investment assets, there are variations in the methods used, but in this case, there can be noted a significant number of instances in which the historical cost model is used. This model also dominates in the case of valuation of loans and receivables. It should be emphasized that the examined groups of enterprises use IAS / IFRS as the legal basis for the preparation of consolidated financial statements. They are therefore able to use the fair value model on a much larger scale. The obtained results show that a dominant approach to valuation in the Polish capital groups in the WIG 30 index is a traditional method based on a historical cost. Polish legal solutions have introduced fair value to a much lesser extent than IAS/IFRS and relate almost exclusively to investment components. Fair value is not permitted for operating balance sheet items.

Such a state can be explained by the attachment to the traditional solutions which have been used in the Polish legal regulations for year and whose origins should be sought in German accounting.

The results also show that the selection of a valuation model is not considered a ‘strategic’ policy instrument by the managers of the surveyed enterprises. Fair value

significantly increases the potential for launching instruments that achieve the desired effect in the financial statements by management. Not using the opportunities that IAS/IFRS provide in this respect demonstrates the attachment to the prudent valuation principle in Poland.

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The future of value added tax in European Union in accordance with size criteria of business entities

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Abstract: *In current value added tax system applicable in the single market of European Union is cross border value added tax fraud expected to be responsible for fraud worth around 50 billion of euros and it bears significant administrative burdens with current fragmented rules (Ondrušová, 2015). The aim of the paper is to explore possible approaches to tackle current problems in the area of ongoing value added tax reform in European Union with focus on solutions comparable to already existing mini-one-stop-shop solution for certain e-commerce services and the impact of similar system used for goods delivered to consumers in the single market from one member state to other member state of European Union. Combination of mini-one-stop-shop approach with upholding of thresholds for intra-community value added tax registration in different member state for businesses established for purposes of delivery of goods on current levels would be a path worth of exploring further as minimizing of administrative burdens is vital part of aims stated in the documentation of VAT Expert Group assisting European Commission in the value added tax administration.*

Keywords: value added tax, size criteria, intra-community supply of goods and services

JEL codes: M40, M41, M48, M49, H25

1 Introduction

Each business entity operating in the area of European Union has to be registered for value added tax in domestic member state if total sales of goods and services which are not explicitly excluded from value added tax regulation reach certain value in 12 consecutive months. This value can be different in different member states of European Union. In some countries there is no stated threshold for value added tax registration and therefore any business entity has obligation to be registered for value added tax with no connection to its size criteria stated as an aggregate value of sales of goods and services in 12 consecutive months. Business entity can register as a value added tax payer also voluntarily in accordance with the regulation applicable in its domestic member state (Mateášová, 2016). Therefore we can recognize three basic types of business entities in accordance to the relation of its size criteria stated as an aggregate value of sales and obligation in accordance with value added tax system (Parajka, 2016). First type is a business entity not registered for value added tax even in its domestic member state, second type is a business entity registered for value added tax in its domestic member state voluntarily without reaching needed threshold to register and third and last type of a business entity is entity which reached domestic threshold for registration and has to be registered for value added tax in its domestic member state. There are also business entities which have higher value of sales of goods and services in 12 consecutive months as the threshold in their domestic member state, but goods and services provided by these companies are excluded from value added tax system in

accordance with the rules applicable in their domestic member state. Below in Table 1 is list of thresholds applicable in each member state of European Union and states of European economic area.

Table 1 Value added tax registration thresholds applicable in the year of 2017

STATE	Threshold	Currency
Austria	30000	EUR
Belgium	15000	EUR
Bulgaria	50000	BGN
Croatia	230000	HRK
Cyprus	15600	EUR
Czech Republic	1000000	CZK
Denmark	50000	DKK
Estonia	40000	EUR
Finland	10000	EUR
France	32600	EUR
Germany	17500	EUR
Greece	10000	EUR
Hungary	6000000	HUF
Ireland	37500	EUR
Italy	60000	EUR
Latvia	50000	EUR
Lithuania	45000	EUR
Luxembourg	30000	EUR
Malta	-	EUR
Netherlands	1345	EUR
Norway	150000	NOK
Poland	150000	PLN
Portugal	12500	EUR
Romania	220000	RON
Slovak Republic	49790	EUR
Slovenia	50000	EUR
Spain	-	EUR
Sweden	-	SEK
Switzerland	100000	CHF
United Kingdom	83000	GBP

Source: own elaboration

Value added tax rules and administration in European Union differ depending on the transaction partner, place of delivery and on the type of sold service or good. Business entity registered for value added tax selling goods or services to other business entity from the same member state will apply value added tax applicable in given member state. Business entity registered for value added tax selling goods or services to other business entity from different member state will not apply value added tax to value of sold goods or services. Business entity registered for value added tax selling goods or services to other business entity from different member state will apply its domestic value added tax rate if the consumption of goods or services happens in its domestic member state (for example accommodation services or services of restaurants). Of course according to legislature is possible to have also different approaches to tackling value added tax by business entities, the rules stated above are the most common in business practice in the cases of business to business transactions.

Business entity registered for value added tax selling goods (by mail order sales) to consumer from the same member state will apply value added tax applicable in given member state. Business entity registered for value added tax selling goods (by mail order

sales) to consumer from different member state will apply value added tax applicable in its domestic member state until it reaches certain threshold for registration for value added tax in member state of consumer. Business entity registered for value added tax selling services which are considered as telecommunication services, television and radio broadcasting services and electronically supplied services to consumer from different member state will apply value added tax rate applicable in the member state of consumer and therefore needs to either be registered as a value added tax payer in given member state or needs to use mini one-stop-shop scheme.

Mini one-stop-shop scheme was introduced into legislation in the year 2014 and possibility to register a business entity for this scheme opened up on October 1st 2014 (Mateášová, Vašeková, 2015). It allows business entity to sell specific services to consumers in different member states without need to register for value added tax in each member state where consumer of given services reside. In this case business entity applies value added tax applicable in the member state in which consumer resides or where consumption of services happens (Rafał, 2016). Business entity using mini one-stop-shop scheme therefore uses its value added registration number obtained from its domestic member state and does not need to register in all the member states where the consumption of its services happens. Business entity using mini one-stop-shop scheme therefore reports value added tax in value added tax return for its domestic member state and then within mini one-stop-shop scheme for value added tax collected by selling of specified services to consumers outside of its domestic member state. Below in the Table 2 is a list of standard value added tax rates in member states which are usually applied on services in mini one-stop-shop scheme.

Table 2 Standard value added tax rates applicable in the year of 2017

STATE	VAT rate
Austria	20%
Belgium	21%
Bulgaria	20%
Croatia	25%
Cyprus	19%
Czech Republic	21%
Denmark	25%
Estonia	20%
Finland	24%
France	20%
Germany	19%
Greece	24%
Hungary	27%
Ireland	23%
Italy	22%
Latvia	21%
Lithuania	21%
Luxembourg	17%
Malta	18%
Netherlands	21%
Poland	23%
Portugal	23%
Romania	19%
Slovak Republic	20%
Slovenia	22%
Spain	21%
Sweden	25%
United Kingdom	20%

Source: own elaboration

If a business entity sells goods (by mail order sales) to consumers in another member state and total value of sales to any given state reaches threshold set by that member state, it has obligation to register for value added tax in member state of consumption, charge and report value added tax in accordance with rules of given member state. If a business entity sells services to consumers in another member state and those services are not in the field of telecommunications, broadcasting and electronic services, applies value added tax rate applicable in domestic member state. As it is stated above there are different rules for different types of transactions between business entities and business entities and consumers or business which are not registered for value added tax, therefore are not considered as a taxable person in accordance with value added tax rules. Below in Table 3 is a list of thresholds of total sales in given member state by business entity selling goods (by mail order sales) for registration as a value added tax payer in that member state.

Table 3 Value added tax registration thresholds for distance selling of goods (by mail order sales) applicable in the year of 2017

STATE	Threshold	Currency
Austria	35000	EUR
Belgium	35000	EUR
Bulgaria	70000	BGN
Croatia	35000	EUR
Cyprus	35000	EUR

Czech Republic	1140000	CZK
Denmark	280000	DKK
Estonia	35000	EUR
Finland	35000	EUR
France	35000	EUR
Germany	100000	EUR
Greece	35000	EUR
Hungary	8800000	HUF
Ireland	35000	EUR
Italy	35000	EUR
Latvia	35000	EUR
Lithuania	35000	EUR
Luxembourg	100000	EUR
Malta	35000	EUR
Netherlands	100000	EUR
Norway	-	NOK
Poland	160000	PLN
Portugal	35000	EUR
Romania	118000	RON
Slovak Republic	35000	EUR
Slovenia	35000	EUR
Spain	35000	EUR
Sweden	320000	SEK
Switzerland	-	CHF
United Kingdom	70000	GBP

Source: own elaboration

As there are different rules of taxation for business entity operating with goods (by mail order sales) and operating with services and operating with specified electronical services, the administrative burden and costs of compliance with taxation rules should differ too. Value added tax in member states is not harmonized, so the obligations of business entity for each member state differ in the form of registration process, deadlines for reporting collected value added tax, periodicity or payment methods of value added tax by business entity which is registered in given member state.

2 Methodology and Data

The main method used in this paper is comparison based on the case study of two anonymized existing business entities, from which one sells electronic services and other one is selling goods by mail order sales. Both are established and operate in European Union and are selling their goods or services to consumers in more than 3 member states. Business entity selling services is already registered for mini one-stop-shop scheme since the beginning of the year 2015 and it is also registered for value added tax in domestic member state which is Slovak Republic. Consumers of this business entity are from member states as Slovak Republic, Czech Republic, Austria, Germany and Switzerland. Business entity selling goods is already registered as a value added tax payer in Slovak Republic, Czech Republic, Denmark and Sweden with need to register in Hungary, Poland and Romania, in the month of June 2017. Consumers of this business entity are from member state as Slovak Republic, Czech Republic, Austria, Germany, Belgium, Croatia, Cyprus, Denmark, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden and United Kingdom. Both business entities from above use automated invoicing systems and operate theirs business with consumers mainly via internet. For comparison of costs of administrative burden of value added tax related with requirements of given business entity can be used simple formulas stated below:

$\sum C_r=(t+f+p)*m$ (1)

- C_r – costs of registration,
- t – time spend by the process of registration expressed in monetary units,
- f – fees paid to public institution or notaries for issuing of needed documents,
- p – payment to partner organizations registering the business entity in given member state,
- m – number of member states where registration is needed in given year.

$\sum C_a=(t+f+a)*p$ (2)

- C_a – costs of administration after registration in given year,
- t – time spend by the process of reporting data for value added tax institution expressed in monetary units,
- f – fees paid to bank for payment of value added tax in different currency than EUR,
- a – payment for accounting services of reporting value added tax,
- p – periodicity of reporting for given year or number of reports for given year.

3 Results and Discussion

First step to calculate costs of registration and costs of administration of value added tax reporting for given business entities is to estimate the value of variables from the formulas above. For estimation of the value of variables data from accounting of business entities were used and for estimation of payment to a partner organization registering the business entity in given member state three different possible partners gave their offer for the service. Estimates are stated in Table 4 and Table 5 below.

Table 4 Estimated value of variables from formula C_r

Variable	Value in EUR
t	150
f	63
p	300

Source: own elaboration

Table 5 Estimated value of variables from formula C_a

Variable	Value in EUR
t	150
f	20
a	50

Source: own elaboration

Number of member states where registration is needed is estimated to 3 for year 2017 for business entity selling goods and number of reports of value added tax is estimated to 16 for business entity selling services and to 44 for business entity selling goods. Business entity selling services does not need to register in any member state, so to calculate costs in formula C_r is not needed. In Table 6 are stated final results for both of case study business entities.

Table 6 Costs of registration and costs of administration of value added tax in given business entity

Business entity	C_r	C_a	Variables in formula C_r	Variables in formula C_a
Business entity selling services	N/A	3520 EUR	N/A	{t(150)+f(20)+a(50)}*16
Business entity selling goods	1539 EUR	9680 EUR	{t(150)+f(63)+p(300)}*3	{t(150)+f(20)+a(50)}*44

Source: own elaboration

In the case we would decrease the number of reports send by the business entity selling goods to level of the business entity selling services, the costs of administration would be the same at the level of 3520 EUR, but registration costs are missing for the business entity selling services completely and those can be significant in dependence of the registration system and requirements of any given member states. From qualitative research of process of registration is very important to note that registration process in member states as Denmark or Sweden was rather easy and doable without the need of partner organization or need to visit country in person and all the needed information was prepared also in English and documents did not need to be translated by official translators to Danish or Swedish language. In case of registration for Czech Republic and Hungary the process is much harder without needed information provided in English and with the need to translate documentation into Czech Republic and Hungarian language.

4 Conclusions

Comparison of mini one-stop-shop scheme and regular registration for value added tax after reaching the threshold for selling goods (by mail order sales) shows us that extension of mini one-stop-shop scheme to all intra-community selling of goods (by mail order sales) to consumers with preservation of thresholds after which the business entity is required to apply value added tax of the member state of consumption would possibly save significant amount of costs and probably also bring more clarity into the system which is fragmented with different requirements from different member states.

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The Importance of Financial Management in Small and Medium-sized Entrepreneurship

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Abstract: *Current practice and researches show that the decisive factor of long-term success is the prioritization of effective financial management. However, enterprises, especially small and medium-sized enterprises, often confuse the principles of financial management with functioning accounting. Underestimating the role of financial management may be the reason for the impossibility of developing small and medium-sized enterprises. The main objective of this paper is therefore to evaluate the importance of financial management that SMEs attribute to the financial management aspects on their long-term development. The partial objective of the paper is to identify whether SMEs evaluating financial management as more important are more financially successful than SMEs evaluating financial management as less important. The fulfilment of the main and partial objective of the paper is fulfilled through methods of personal polling, selected methods of financial analysis and selected methods of statistical induction. The research is carried out on a selected sample of small and medium-sized enterprises based on selected restrictive criteria. The research has shown that small and medium-sized enterprises are undermining the importance of financial management and do not attribute the same strategic importance of financial management on their business development. At the same time, it was confirmed that SMEs evaluating financial management as more important are more financially successful (higher volume of assets, ROE and EAT) than SMEs that do not do so.*

Keywords: small and medium-sized entrepreneurship, financial management, financial strategy, financial analysis, methods of statistical induction

JEL codes: M20, M21, M29, G30, G39

1 Introduction

The area of small and medium-sized entrepreneurship (hereinafter SME) is emerging and gaining popularity with its increasing importance in the whole business field and economy (Cravo et al., 2015). Small and medium-sized enterprises represent 99% of European enterprises, which generate about 70% of all jobs and 60% of EU GDP. SMEs represent 99.84% of the total number of enterprises in the Czech Republic (MPO ČR, 2015). SMEs secure 59.39% of employment, participate in the performance and value added of more than 53.11%, creating GDP more than 37% (Srpová and Řehoř et al., 2010; MPO ČR 2015). According to regulation of the European Commission No. 70/2001, small and medium-sized enterprise is considered to be that enterprise employing fewer than 250 employees and its annual turnover does not exceed EUR 50 million and its assets do not exceed EUR 43 million.

This paper is primarily oriented on the area of small and medium-sized entrepreneurship in agricultural sector. The main reason for focusing on agricultural companies is the fact that not many researches were provided in this area and the financing of these selected companies is specified due to subsidies, donations and other financial interventions, which regulates agricultural market. "The agricultural sector is included among the very sensitive areas of the economy, as it has its specifics that must be respected, such as the seasonal character of production, a high level of dependence on natural conditions, as well as the production structure" (Aulová and Hlavsa, 2013, p. 24).

2 Theoretical Framework

Financial management is one of the important business activities associated with its development and anticipating the need for funds and choosing the most appropriate ways to get them. Financial management can be defined as a subjective economic activity engaged in obtaining a needed quantity of funds from various sources of funding, allocation of funds to various forms of non-monetary assets and the distribution of profit in order to maximize the market value of the company (Valach et al., 1999, p. 14). Strategic financial management consists of "financial strategies which are goals, patterns or alternatives designed to improve and optimize financial management in order to achieve corporate results" where financial strategy "represents a path to achieve and maintain business competitiveness and position a company as a world-class organization" (Salazar et al., 2012). The main financial objectives are usually based on maximizing of market value, optimizing of the capital risk, maintaining the financial stability including the liquidity, solvency, profitability or cash flow (Kalouda, 2009; Valach, 2006). Two main perspectives on financial management have been occurred: 1) management of costs, revenues and profit (its minimizing and optimizing) and 2) management of financial resources (its obtaining and allocation). The main tasks of financial management are following (Živělová, 2014): ***raising capital*** *for the current and future needs of the company and deciding on its structure;* ***deciding on allocation of capital*** *to ensure the ordinary activities of the company, the development of new products, new technologies, investing in machinery, buildings, inventory, securities, etc.;* ***deciding on the distribution of profit****, i.e. to use it for investments, payment of dividends or profit shares of the company, etc.;* ***record, analyze, check and manage the economic activity*** *of the company in such a way as to ensure its financial stability, etc*.

According to Nývltová and Marinič (2010, p. 13), financial management involves the following principles: principle of respecting the time factor, principle of cash flows, principle of net present value, principle of consideration of risk or principle of optimizing the capital structure. Růčková and Roubíčková (2012, p. 141) report that one of the fundamental problems of financial management is to set the total optimal amount of capital as well as choosing the right mix of financing its activities, i.e. capital structure. Modern financial management is based on the assumption to meet the main objectives of the company. The basic pillars of financial management are following (Synek et al., 1999): active use of financial resources and opportunities, defining financial strategies, high autonomy of decision-making at lower levels, application of financial management at all level of corporate management, creating plans and budgets in a close cooperation of all departments, conducting high quality analyses and implementation of the necessary measures. **The main stages of financial management** are following (Calandro and Flynn, 2007): 1) strategy formulation, or the determination of how to satisfy customer preferences in unique ways, 2) resource allocation, or the process of funding and staffing strategic initiatives that are tied to delivering customer satisfaction, 3) performance measurement, or an assessment of the relative success or failure of business activities. The practical applications of financial management can be distinguished into three main groups of decision-makings (Ogilvie, 2009, p.14): investment decisions, financing decisions and dividend decisions – which reflect the responsibilities of acquiring financial resources and managing those resources. **Tools of financial management** are following: *financial analysis, planning, optimizing the financial structure, financial criteria to evaluate the effectiveness of managerial decision-making, cash-flow management, management of receivables and liabilities, budgeting, controlling*. The general financial components of the financial management are the main **types of financial policies**: *investment policy focusing on the promotion of economic efficiency of investment projects; policy of financing (external and internal) business activities; policy of managing the assets and liabilities (credit policy); policy of inventory management; policy of cash flow and liquidity management; policy of operating result management; policy of cost control and profit*. (Máče, 2013; Petřík, 2007).

The main core of financial management is to set up and implement appropriate financial strategy. **Three steps to set up a successful financial strategy** are following (Mallete, 2006): Step 1 – *Establish appropriate financial capital structure, following which a determination would be made of the magnitude of its cash surplus;* Step 2 – *Understand whether a company is undervalued or overvalued in the market, by examining investors' expectations;* Step 3 – *Develop a financial strategy, to be proposed to the Board for approval, ensuring the company's operations are sufficiently funded, that financial balance is achieved*. According net working capital, three basic financing strategies are then distinguished to (Režňáková, 2012, p. 107-108): **aggressive financial strategy** – net working capital was is negative. The part of long-term assets is financed by short-term resources. These situations occur in a period of rapid business growth, extensive investment or withhold payments to suppliers; **conservative financial strategy** –the long-term sources of financing are used to finance seasonal fluctuations in current assets. Here, it is typical lax approach to inventory management and collection of its receivables or prompt payment of liabilities to suppliers; **balanced financial strategy** – consistency between the maturity of financial sources with a lifetime of assets in the company is ensured.

Literature review (2010-2016; Svatošová, 2015) about financial condition and performances of agricultural companies is not dedicated to this issue. Aulová and Hlavsa (2013) explored the positive or negative effect of selected determinants on the capital structure of businesses among the selected agricultural companies. Details about financing from EU funds have been recently provided among Czech agricultural companies (Homolka, Švecová, 2012). The research (Malá, 2011) has confirmed the less efficiency of organic agricultural companies that have to be subsidized. Čechura (2012) identifies the key factors determining the efficiency of input use and the total factor productivity development. Another research (Venclová, Salková, Koláčková, 2013) has confirmed that agricultural companies apply selected methods of employee appraisal. The research (Davidová, Latruffe, 2007) shows that corporate livestock farms are the most homogenous in terms of technical efficiency. Another research (Špička, 2014) is dedicated to the agricultural companies indirectly with the focus on the evaluation production efficiency and its determinants of mixed crop and livestock farming among the EU regions. The Slovakian research (Adamišin, Kotulič, 2013) found out business companies show a higher economic success evaluated through the selected economic indicators than cooperatives even with subsidies.

2 Methodology and Data

The main objective of this paper is to evaluate the importance of financial management that SMEs attribute to the financial management aspects on their long-term development. The partial objective of the paper is to identify whether SMEs evaluating financial management as more important are more financially successful than SMEs evaluating financial management as less important. The main research methods are: the method of personal polling in the form of quantitative research (i.e. questionnaire survey with the main managers or owners of the enterprises). The supplementary methods are selected methods of financial analysis based on the study of financial statements. Confirmation and rejection of the formulated hypotheses is performed by using selected methods of statistical induction (multiple regression analysis, Kruskal-Wallis test, Friedman test). Research was carried out between the selected SME sample from March to May 2017.

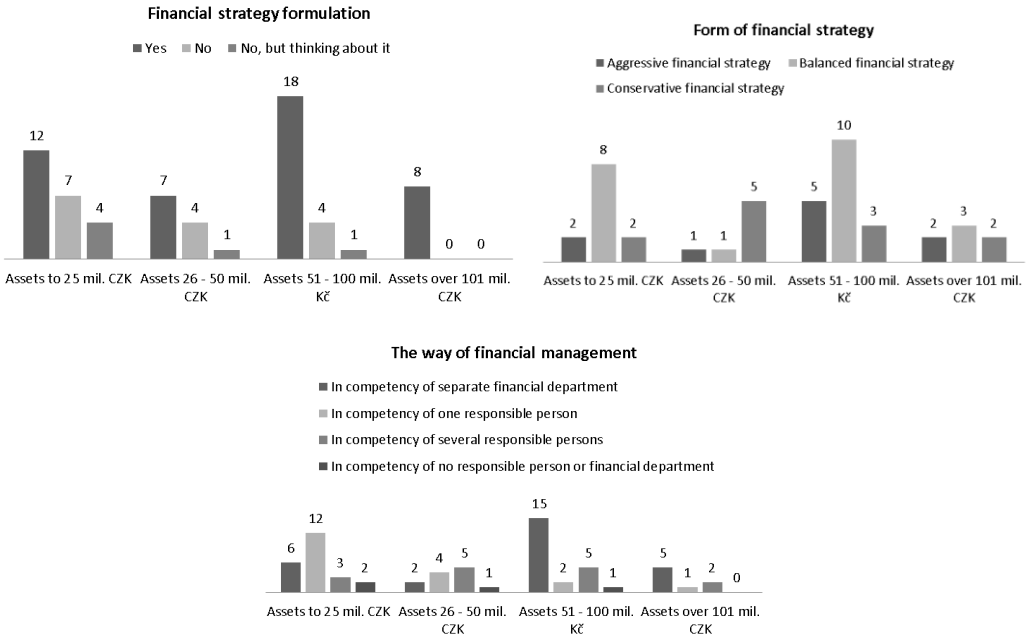
The survey of respondents included enterprises that meet the following criteria: enterprises belonging to SMEs (i.e. enterprises with 5 to 250 employees), headquarters in the Czech Republic, scope of business: CZ-NACE: 01 Plant and animal production, hunting and related service activities, legal form of enterprise: joint-stock company, existence of an enterprise on the market: minimum 5 years. Enterprises were selected with a help of the ARES database. The reason for selecting these restrictive criteria is the

presumption of the stability of these enterprises and the availability of information from annual reports and financial statements. Based on ARES database, a total of 92 enterprises were found, 11 of them were unwilling to participate, 5 of them were in liquidation. Finally based on these restrictive criteria, a survey consists of 66 enterprises.

3 Results and Discussion

The selected SME sample (N = 66 enterprises) has been divided according to volume of assets (23 SMEs to 25 million CZK, 12 SMEs 26 – 50 million CZK, 23 SMEs 51 – 100 million CZK and 8 SMEs over 101 million CZK). The results of questionnaire survey provided 68 % of selected SMEs have formulated financial strategy, where 22 % of them use aggressive financial strategy, 49 % of them use balanced financial strategy and 12 % of them use conservative strategy. In summary, 28 SMEs have financial management in competency of separate financial department, 19 SMEs in competency of one responsible person, 15 SMEs in competency of several responsible persons and only 4 SMEs have no responsible person or separate financial department for financial management or managing corporate finance. Details see in Figure 1, in which SME sample is divided according to volume of assets. Following Table 1 shows selected calculated variables from financial statement of SME sample using mean, median, modus, minimum, maximum, standard deviation. The average value of assets is over 58 million CZK, the average EAT is over 3 million CZK, net working capital 6,8 million CZK, ratio of equity and debts is 58:41, ratio of fixed assets and current assets is 54:46, current ratio is 6 (over a recommended value 1,5 – 2,5), ROE is on average 22 % and ROA on average 13 %.

Figure 1 Results of the survey (N = 66) – financial strategy formulation, form of financial strategy, the way of financial management according to volume of assets



Source: own work

Table 1 Descriptive statistics of SME sample

	Mean	Median	Modus	Frequency mode	Min.	Max.	Standard deviation
Assets	58412	47263.5	multiple	2	5632.0	265451	50349
Fixed Assets	32266	23555.0	multiple	2	2014.0	165741	31451
Current Assets	25923	17106.0	multiple	1	2850.0	99606	24139
Inventories	7974	5767.0	multiple	3	237.0	48265	9469

Receivables	12114	7206.0	multiple	2	369.0	71333	13421
Short-term financial assets	5835	2633.0	multiple	1	3.0	62596	9422
Equity	32710	24549.0	multiple	2	1299.0	120451	29370
Liabilities	25603	11121.5	multiple	1	798.0	255776	37428
Long-term bank loans	2120	523.5	0	25	0.0	50263	6564
Short-term bank loans	831	134.0	0	22	0.0	14521	2201
Short-terms liabilities	18194	7471.0	7410	2	47.0	152361	26662
Long-term liabilities	4152	1222.0	0	9	-52990.0	73563	13313
Reserves	307	0.0	0	42	0.0	5478	916
EAT (net profit)	3047	2073.0	multiple	2	-1024.0	10524	3288
E/A	58	61.6	multiple	1	3.6	97	24
L/A	41	37.9	multiple	1	3.3	96	24
FA/A	54	55.7	multiple	1	15.8	88	17
CA/A	46	44.2	multiple	1	11.3	84	17
Current Ratio	6	2.0	multiple	1	0.1	164	21
Quick Ratio	5	1.5	multiple	1	0.1	107	14
Cash Ratio	2	0.3	multiple	1	0.0	56	7
NWC	6899	4661.5	multiple	1	-57278.0	70890	21863
Level of Capitalization	1	0.8	multiple	1	-5.9	1	1
ROA	13	3.9	multiple	1	-6.3	97	21
ROE	22	8.3	multiple	1	-29.9	183	35

Source: own work based on financial statements (2015) of SME sample

The survey has also explored the order of importance of individual financial management tools (see Table 2). The monitored enterprises should rank from 1 to 9 individual financial management tools according to their importance for the business strategic development (1 - the most important, 8 - the least important). On average the most important tool is considered to be norms (material consumption; 5.24) and on average the least important tool is budgeting and financial analysis with a value 3.81. These results are then used for Shapiro Wilsk's test (see Figure 3).

Table 2 Mean of the order of individual financial management tools

	Mean of order of importance (in summary)	**Assets to 25 million CZK**	**Assets 26 – 50 million CZK**	**Assets 51 – 100 million CZK**	**Assets over 101 million CZK**
Break Event Point	4.56	4.69	4.83	4.52	3.88
Calculation	4.86	4.69	5.25	4.74	5.13
Budgeting	3.81	3.65	4.17	3.96	3.38
Financial Analysis	3.81	3.57	3.92	4.17	3.38
Optimizing Capital Structure	4.77	5	4.58	4.26	5.89
Tax shield effect	4.01	4.39	3.42	4.04	3.75
Financial Leverage effect	4.91	4.91	4.58	5	5.13
Norms (material consumption)	5.24	5.09	5.25	5.3	5.5

Source: own work in Statistica program

Table 3 shows the importance of individual components of financial management in the interval 1 - 5 (1 - the smallest importance, 5 - the greatest importance) that SMEs attribute to the financial management aspects on strategic development, again divided into the monitored categories. On average (3.19) the most important component of financial management is considered to be financial strategy formulation and

implementation and the least important component (2.89) is considered to be financial analysis and financial planning. When exploring SME sample according to volume of assets, the most important component (3) is considered to be financial planning followed by financial analysis (2.87) and the least important component (2.26) is considered to be financial controlling in category of SMEs with volume of assets to 25 million CZK. And for example in the category of SMEs with volume of assets over 101 million CZK, the most important component (4) is considered to financial controlling and the least important component (2.75) is considered to financial analysis and financial planning.

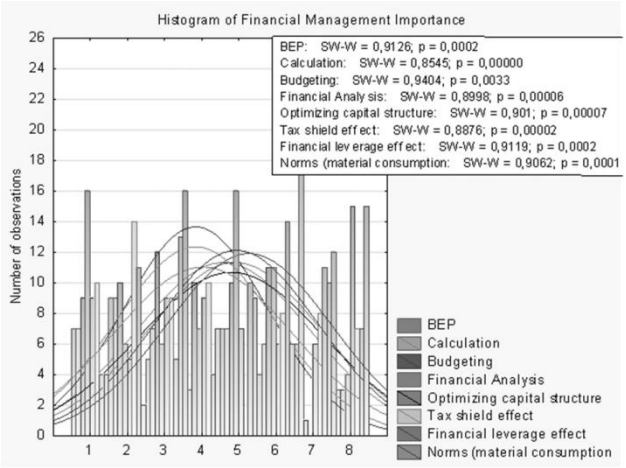
Table 3 Importance of individual components of financial management

	Mean of importance (in summary)	Assets to 25 million CZK	Assets 26 – 50 million CZK	Assets 51 – 100 million CZK	Assets over 101 million CZK
Financial analysis	2.89	2.87	3.5	2.83	2.25
Financial Planning	2.89	3	1.83	3.39	2.75
Financial strategy formulation and implementation	3.19	2.52	3.08	3.69	3.88
Financial Decision-makings	2.79	2.61	3.08	2.69	3.13
Financial Controlling	2.91	2.26	2.58	3.35	4

Source: own work in Statistica program

Subsequently, hypotheses are formulated and verified to support the main purpose of the whole survey (see Table 4). Verification of hypotheses is performed at the significance level α = 0.05. The confirmation or rejection of the hypotheses is decided on the basis of a comparison of the p-value, which is the minimum level of significance for which the zero hypothesis can be rejected. Figure 2 using Shapiro-Wilsk's test confirmed that the selection does not come from the normal probability distribution at a significance level α=0.05, since p ≤ α. Because the normality condition is not met, scatter analysis and correlation tests cannot be performed. For hypothesis testing, these nonparametric tests are selected: multiple regression analysis, Kruskal-Wallis test, and Friedman test. Verification of the hypotheses is carried out by using the Statistica program.

Figure 2 Box plot of selected variables (2015; N = 66)



Source: own work in Statistica program

Table 4 Hypotheses formulation and verification

Hypothesis	Hypothesis formulation	Method of hypothesis verification	Result of hypothesis verification
H1	There is a relationship between ROE and importance of individual components of financial management.	Multiple regression analysis	Not rejected
H2	There is a relationship between ROA and importance of individual components of financial management.	Multiple regression analysis	Rejected
H3	There is a relationship between volume of assets and importance of individual components of financial management.	Kruskall-Wallis ANOVA	Rejected
H4	All the financial management tools are equally important to businesses.	Friedman test	Rejected
H5	There is a relationship between volume of assets and the form of financial strategy.	Kruskall-Wallis ANOVA	Not rejected
H6	There is a relationship between volume of assets and the way of financial management.	Kruskall-Wallis ANOVA	Not rejected
H7	There is a relationship between volume of assets and form of financial strategy formulation.	Kruskall-Wallis ANOVA	Not rejected

Source: own work in Statistica program

A multiple regression analysis is used to verify the H1 and H2 hypothesis. The basis for ROE and ROA for all monitored enterprises was the annual report for 2015. The results for ROE are presented in Table 5. The hypothesis H1 has not been rejected. The aggregate p-value for ROE is 0.06870. It can be said that there is a relationship between the value of ROE and the importance of individual components of financial management. Hypothesis H2 was rejected, since p-value for ROA is 0.01308. We can conclude, there no relationship between the value of ROA and the importance of individual components of financial management

Table 5 Multiple regression analysis for ROE and ROA

	Regression Results with Dependent Variable: ROE R = 0.39175075 R2 =0.15346865 Modified R2 =, 08292437 F (5.60) = 2.1755 p <0.06870. Error estimate: 33.089					
	b*	**Standard error from b***	**b**	**Standard error from b***	**t(60)**	**p-value**
Financial analysis			-37.1202	25.63373	-1.44810	0.152795
Financial Planning	0.241684	0.122237	7.2492	3.66647	1.97717	0.052622
Financial strategy	0.338889	0.132518	10.1649	3.97483	2.55731	0.013094
Financial Decision-makings	0.028697	0.125411	0.9525	4.16266	0.22882	0.819784
Financial Controlling	0.078948	0.125840	2.6471	4.21930	0.62737	0.532797

Source: own work in Statistica program

The H3 hypothesis is tested by the Kruskal-Wallis test. Table 6 shows the test results for the financial analysis as an example. For the financial analysis p = 0.0598, for the financial planning p = 0.0017, for the financial strategy formulation and implementation p = 0.0005, for the financial decision-makings p = 0.5324 and for financial controlling is p = 0.0006. The H3 hypothesis has been rejected because for financial planning, financial strategy formulation and implementation and financial controlling $p \leq \alpha$. It can therefore be said that there is no relationship between volume of assets and importance of individual components of financial management.

Table 6 Kruskall-Wallis ANOVA (Assets and Importance of Financial Management)

	Kruskal-Wallis ANOVA based on order; Financial analysis (Assets and importance of FM) Independent (collation) variable: Assets Kruskal-Wallis test: H (3, N = 66) = 7.415543 p =0.0598		
Dependent variable: Financial Analysis	**Number of valid**	**Summary of order**	**Average order**
Assets to 25 million CZK	23	772.0000	33.56522
Assets 25 - 50 million CZK	12	529.0000	44.08333
Assets 51 - 100 million CZK	23	738.0000	32.08696
Assets over 101 million CZK	8	172.0000	21.50000

Source: own work in Statistica program

To verify the H4 hypothesis, Friedman's test is used, which is tested at a significance level of α = 0.05. After comparing the level of significance α with the p-value of 0.00168 (see Table 7), the zero hypothesis was rejected as $p \leq \alpha$. It can be argued that all the financial management tools are not equally important to businesses.

Table 7 Friedman test

	Friedman's ANOVA and Kendall Matching Coefficient (Importance of FM (order)) ANOVA chi-kv. (N = 66, sv = 7) = 23.03030 p =0.00168 Coefficient of Conformity =0.04985 Avg. R =0.03523			
	Average order	**Summary of order**	**Mean**	**Standard deviation**
Break Event Point	4.56	4.69	4.83	4.52
Calculation	4.86	4.69	5.25	4.74
Budgeting	3.81	3.65	4.17	3.96
Financial Analysis	3.81	3.57	3.92	4.17
Optimizing Capital Structure	4.77	5	4.58	4.26
Tax shield effect	4.01	4.39	3.42	4.04
Financial Leverage effect	4.91	4.91	4.58	5
Norms (material consumption)	5.24	5.09	5.25	5.3

Source: own work in Statistica program

The H5, H6, H7 hypothesis is tested by the Kruskal-Wallis test. For all tested hypotheses p = 0.3916. The H5, H6, H7 hypothesis has been not rejected because $p > \alpha$. It can be said that there is relationship between volume of assets and the form of financial strategy, after that there is relationship between volume of assets and the way of financial management and finally there is relationship between volume of assets and the financial strategy formulation.

4 Conclusions

The results of questionnaire survey provided 68 % of selected SMEs have formulated financial strategy, where 22 % of them use aggressive financial strategy, 49 % of them use balanced financial strategy and 12 % of them use conservative strategy. The average value of assets is over 58 million CZK, the average EAT is over 3 million CZK, net working capital 6,8 million CZK, ratio of equity and debts is 58:41, ratio of fixed assets and current assets is 54:46, current ratio is 6, ROE is on average 22 % and ROA on average 13 %. 94 % of SMEs have financial management in competency of financial department or responsible persons. It could be stated SME sample is in a good financial condition and most of them formulated financial strategy using at least basic principles of financial management. SMEs with volume of assets to 25 million CZK have EAT on average 3.871 million CZK, current ratio 3.96, ROE 47 % and ROA 29 %. This group of SMEs uses aggressive financial strategy. SMEs with volume of assets between 26 – 50 million CZK have on average EAT 2.468 million CZK, current ratio 17.75, ROA 5.92 % and ROE 9.13 %. This group of SMEs uses conservative financial strategy. SMEs with volume of assets between 51 – 100 million CZK have on average EAT 2.533 million CZK, current ratio 2.79, ROA 3.37 % and ROE 5.99 %. This group of SMEs uses balanced financial strategy. The SMEs with volume of assets over 101 million CZK have on average

EAT 3.024 million CZK, current ratio 6.24, ROA 2.14 and ROE 12.58 %. This group of SMEs uses balanced financial strategy. On average the most important tool is considered to be norms (material consumption; 5.24) and on average the least important tool is budgeting and financial analysis with a value 3.81. The survey confirmed that all the financial management tools are not equally important to businesses despite of the fact all the mentioned tools have the same priority of effective financial management (based on theory). The volume of assets has an impact of importance financial management components (on average SMEs with assets to 25 million CZK (2.65) evaluate these tools as the least important compared to SMEs with assets over 101 million CZK (3.2)). It could be stated higher volume of assets among SMEs, the higher importance is given for financial management activities (financial analysis, planning, strategy, decision-making, controlling). The survey also confirmed there is a relationship between ROE and importance of individual components of financial management. The survey also found out There is a relationship between volume of assets and the form of financial strategy, the way of financial management and the form of financial strategy formulation. The higher volume of assets, the higher probability of financial strategy formulation and implementation and comprehensive approach to the financial management (i.e. financial management is in competency on financial department or responsible persons). The research has shown that small and medium-sized enterprises are undermining the importance of financial management and do not attribute the same strategic importance of financial management on their business development. At the same time, it was confirmed that SMEs evaluating financial management as more important are more financially successful (higher volume of assets, ROE and EAT) than SMEs that do not do so.

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Comparison of banking rating systems

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Abstract: *The aim of the article is to compare several rating systems used by banks and their affiliates, especially in German-speaking countries and Central European countries. The research is focused on the rating of business entities, more precisely the corporate, (especially limited liability companies or joint-stock companies). In particular, two aspects of the rating of the corporate are highlighted in the rating system comparison, namely: (i) which quantitative indicators are used for the calculation of the hard-facts (quantitative analysis based on data from reports, especially balance sheets and profit and loss accounts); and (ii) how the soft-facts are included in the rating system (qualitative indicators usually based on a questionnaire). In addition, the hard- and soft-facts weights used to calculate the overall rating result are mentioned and whether these scales are always constant, or vary with a change in a certain quantity of the rated enterprise (usually the size). Also some other characteristics of individual rating systems are briefly mentioned, like the resulting rating scale used. The procedure of collecting empirical data, their assessment according to the criteria of verifiability and relevance and the application of the induction method was used and a generalization of conclusions was subsequently made. The result of the research shows, that concerning the quantitative indicators (i), the highest emphasis is put on the capital structure of an enterprise (whether in the form of Equity to Liabilities or Equity to Total assets) in all compared rating systems. Concerning the other indicators used for the calculation, the monitored rating systems are different, and the total number of indicators also differs (from 6 to 9). For soft-facts (ii) all rating systems agree on some of the queries (e.g. the sensitivity of the rated entity to market fluctuations), but otherwise the number and the topics of the queries overlap only partially.*

Keywords: Rating, Risk Management, Hard-Facts, Soft-Facts

JEL codes: G24

1 Introduction

Internal rating systems are currently an integral part of the risk management system of banks and non-banking financial institutions. In addition to the original purpose, which is the assessment of clients' creditworthiness, they also play an irreplaceable role in determining the capital adequacy of banks in compliance with the Basel II accord and the emerging Basel III accord respectively.

This article deals with the comparison of the internal rating systems used currently and / or in the recent past by three banks or banking groups originating from the German-speaking economic environment and regions. All the banks mentioned apply the IRB Approach for Basel II and use their rating tools for estimate the credit risk of their clients, expressed in the PD (probability of Default).

As the issue of rating systems is quite extensive, I focus only on selected matters of the rating systems mentioned here, namely: (i) which quantitative indicators are used for the calculation of the hard-facts (quantitative analysis based on data from reports, especially balance sheets and profit and loss accounts); and (ii) how the soft-facts are included in the rating system (qualitative indicators usually based on a questionnaire or interview).

Similar topic, but from different point of view studied Bakhtiari (2017). His paper focuses on the Standard and Poor's (S & P) credit rating of firms in the USA. Bakhtiari tried to find positive or negative correlation between the credit rating and productivity of companies. The findings of the paper point to size as to one major balancing factor for a

good rating result. With a focus on manufacturing, the evidence points to two types of companies getting an investment grade rating: (i) medium-sized productive firms (firms "driving the creative destruction" according to Bakhtiari) and (ii) very large but not so productive firms (too-big-to-fail and "resisting the creative destruction"). The Bakhtiari's results suggest that the substitutability of size and productivity in the ratings system is not recent and has been around for a long time. In this context, the effort to find the most important factors for the rating results and the potential change of the weights of these factors with size of the rated company make sense.

Berg and Koziol (2017) in their paper, covering 40 banks and 17,000 corporate borrowers from 2008–2012 in Germany, found three main results, related to banks' rating systems and their results. (i) First, the variability of PD estimates for the same borrower across banks is large. (ii) Second, bank fixed effects explain 5% of the variation in PD estimates across banks, while 95% of the variation is idiosyncratic (non-systematic and thus not affecting capital requirements). (iii) Third, there are various bank characteristics that explain the size of bank fixed effects, like that weaker-capitalized banks on average report lower PD estimates and that banks' reported PD estimates increase after significant capital increases. But as the authors emphasize, their results should be interpreted with care.

For the basic overview and historical background about credit rating agencies (I mention the agencies as source for external ratings in point 3.1 and use the Moody's scale for comparison in point 3.4) the paper of Jeon and Lovo (2013) can be recommended.

Danielsson (2002) and Danielsson, Song Shin and Zigrand (2004) show on the example of market risk and value-at-risk models (VaR), that if many players on the same market use the same or similar risk models, it could have very negative consequences. If many market participants apply the same or very similar strategy at the same time, it can make the fluctuation bigger and the situation worse. Although this study covers market risk and value-at-risk models, the degree of similarity can be an interesting question in different types of models too.

The most authors mentioned above use more statistical point of view, thus they usually do not analyze the internal structure of the rating systems / tools. I try to answer the question, how far the credit risk models (banks' internal rating models) are similar and what are the most important factors of rating results, with awareness of limits of available data (regarding the region, the number of monitored banks etc).

Fracassi, Petry and Tate (2016) were concerned with interesting question of how rating analyst subjectivity affects corporate debt pricing. In my paper, I can only briefly mention the soft-facts part of the rating systems (where there is the only potential space for rating analyst subjectivity), but I see this topic as possible direction for future studies.

2 Data and methodology

For comparison, documentation to the three rating systems used by three different banks (banking groups) from the German-speaking environment was available. Since some of these documents are confidential and have not been granted full disclosure, the results of the investigations are limited in some respects. It is also not possible to publish the names of the mentioned banks (banking groups). The data are anonymized accordingly, however, in order not to affect their value for the research. These three banking institutions and their rating systems are listed under A, B and C.

In all cases, the rating tool is used in a form of a software tool for Microsoft Windows OS.

The research is focused on the rating of business entities, more precisely corporate, (especially limited liability companies or joint-stock companies). It does not take into account the rating of natural persons or non-profit organizations, municipalities etc.

Excluded are also the banks, insurance companies, leasing companies etc. For all these entities the examined banks have special different modules in their rating systems.

The procedure of collecting empirical data, their assessment according to the criteria of verifiability and relevance and the application of the induction method was used and a generalization of conclusions was subsequently made.

3 Results and Discussion

The basic structure of the rating systems

The basic structure of all the three rating systems mentioned is very similar, as the Figure 1 show, just the names used for particular steps are different.

All three compared rating tools first produce the part of the rating, based on clients' financial statements (financial data). After possible other inputs like sector data, budgets etc., the financial statement rating becomes **quantitative or hard-facts (HF) rating**, as one of the two main sources for the final result. The second source is the **qualitative or soft-facts (SF) rating**, based on qualitative criteria, where usually the key account manager provides most of the information used (for details of the quantitative and qualitative indicators used see below - points 3.2 and 3.3).

In the next stage, the hard-facts rating and the soft-facts rating are integrated together, according to a given weighting formula. This formula differs slightly at the compared rating tools, reaching from 66 : 34 (HF : SF) up to 50 : 50. Two rating systems use fix weights for all their corporate client, the third system is more complex, with the weights varying with a change of the size of the rated company. The more turnover the rated company makes, the more weight the hard-facts have in counting the final rating. This is a logical solution: smaller companies are more endangered by one person's mistakes or loss (like death of the owner / CEO in one person), their processes (like accounting etc.) are usually less intensively checked by internal and external audits etc.

Using the weights, the hard-facts rating and the soft-facts rating result together in a **basic or automated rating**. Such credit rating is then manually reviewed for possible down- or (in some cases) upgrading, usually executed by the risk managers. Manual down- or upgrade can be made either by any person of the risk management team with the following supervision of team head or can be made by chosen person(s) only. Always the four eye principle (maker - checker) is kept. The possible reasons for downgrade can be for example the age of the financial statement (more than 18 or 24 months), high amount of doubtful receivables (not noticed in the financial statements, but known to the bank), qualified opinion report given by the auditor, non-trustworthy financial statements etc. The possible reasons for upgrade are more rare (e.g. a major new business contract, unique new technology...) and the possible upgrade is limited by maximal one or two points of the scale (see below). The possible downgrade is usually not limited, or it can downgrade the client directly to the worst non-default category of the rating scale.

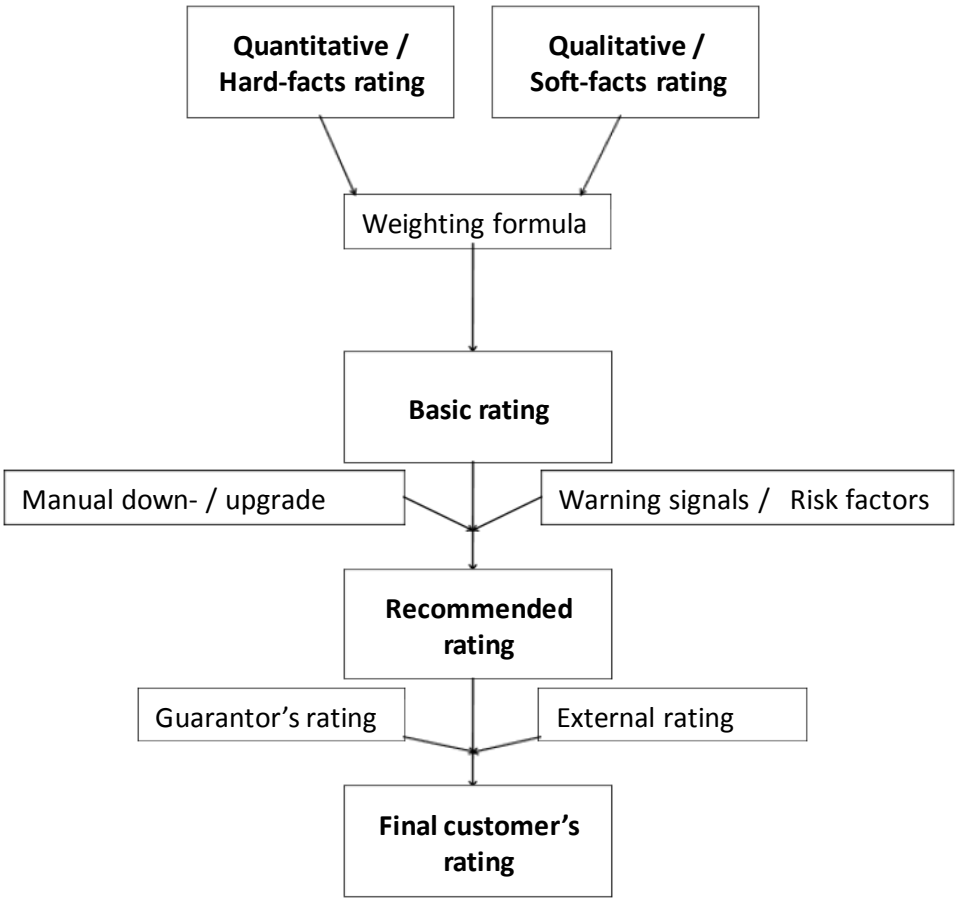
Next to the possible reasons for downgrade, all three banks compared use a fixed list of warning signals or risk factors. If one or more of them appear at the client, the rating must be downgraded. In one case, the warning signals are assessed by severity and the following downgrade can reach one, or two points of the rating scale, or can put the rating directly to the default category. The two other banks always downgrade the rating to the default category, if one (or more) of the warning signals appear. The warning signals include the non-fulfilled important payment obligations (over 90 days overdue for putting the rating to the default grade), fraud, insolvency proceedings and similar situations.

After the down- or upgrade or (the most common case) after non-use of this possibility, the basic rating becomes the **client's rating or recommended rating**, which can (or must under some circumstances), be modified by other guarantor's rating or external

rating, if existing. The banks use exact and similar-to-each-other rules, at what circumstances the rating of the guarantor or the external rating (usually made from one of the big rating agencies like Moody's or S&P) must be used.

When the last step (guarantor's rating or external rating) is made or skipped, the rating becomes **overruled rating** or **final customer's rating**.

Figure 1 The basic structure of the rating systems



Source: Author

Quantitative indicators (hard facts)

For comparison of quantitative as well as qualitative indicators, the overview scheme including all three rating systems was made by author of this paper. In some cases, the weight applies for two or three indicators together, which is represented by the merged and centered particular column in the scheme. Please note that the numbers of weights are rounded.

As the Table 1 shows, regarding the quantitative indicators (hard-facts), the highest emphasis is put on the Capital structure of the rated company. This applies to all three rating systems compared, whether in the form of Equity to Liabilities or Equity to Total assets. Two rating systems pair the Equity ratio with other one or two ratios respectively, concerning Liabilities.

Table 1 Quantitative indicators (hard facts). Please note that the numbers of weights are rounded.

Rating A			Rating B			Rating C		
-			Leverage	38%	(Current liabilities - Cash & Equivalents) / Total Assets	-		
Indebtedness	29%	(Trade payables + bank liabilities + notes payable) / (Liabilities + provisions)			(Trade payables + Notes payable + interest bearing liabilities) / (Liabilities - Advances)	-		
Equity ratio		Equity / Liabilities			Equity / Total assets	Capital structure	35%	Equity / Total assets
Financial Strength	24%	Operating Income / (Interest + similar expenses)	-			Interests coverage	23%	(EBT + Financial expenses) / Financial expenses
		(Profit or Loss of the Year + Depreciation and Amortization) / Liabilities	Debt coverage	9%	Cash Flow / (Liabilities - Advances)	Debt coverage by operating CF	9%	(Operating Income + Depreciation and Amortization + Financial expenses) / (Bank liabilities - Cash and equivalents - bank accounts)
Profitability	17%	(Operating Income + Depreciation and Amortization) / Sales	Profitability	25%	Ordinary profit / Sales	Profitability	8%	(EBT + Depreciation and Amortization) / Sales
-					(Net profit + Interest Expenses + Income Taxes + Depreciation) / Total Assets	-		
Growth	8%	(Sales (N) - Sales (N-1)) / Sales (N-1)	Growth	7%	Sales / Previous Year's Sales	-		
Liquidity	6%	(Cash + equivalents) / Working Capital	-			Liquidity	10%	(Cash and equivalents + bank accounts) / Working capital
Capital tied-up	16%	(Trade payables + notes payable) / Sales	Activity	10%	((Notes payable + Trade payables)*360) / Sales	Turnover of liabilities	15%	Trade payables / Sales
-			Productivity	11%	Personnel expenses / Sales	-		

Source: author by using banks "A", "B" and "C" rating manuals.

There are three other categories of quantitative indicators (hard facts), used in specific form in all three rating systems. These indicators are (i) Cash Flow to Liabilities (in two cases together with Income to Interest in slightly different form), (ii) Profit to Sales (in one case together with Profit to Total Assets) and (iii) Trade payables and Notes payable to Sales; all these indicators have important, but lower weight than the capital structure of the company.

In two cases, the indicators for Growth and for Liquidity are used, is slightly different forms. For the rating system B, where the most indicators (nine) occur, the unique one measures Personnel expenses against Sales with 10% weight (rounded).

Qualitative indicators (soft - facts)

The Comparison of qualitative (soft-facts) indicators is made by high-level categories, because of keeping the scheme uncluttered. The extent of this paper does not allow to perform a deeper analysis of this topic, too.

It should be mentioned, that in every high - level category (topic) more particular questions / opinions are concentrated. Answering of the questions and making of the soft-facts rating is usually a result of collaboration of key account manager / relationship manager / banker (which can be just different names for very similar positions in the banks) and the member of risk management team or Chief risk officer respectively. In all cases, the four-eye principle is kept, with respect to possible subjectivity of both involved persons, especially the key account manager / relationship manager / banker (who usually gets benefit for every deal made).

Anyway, the scheme shows apparently, that all the rating systems agree on some of the categories, but the similarity is lower than by quantitative indicators and the topics of the queries overlap only partially.

Table 2 Qualitative indicators (soft - facts). Please note that the numbers of weights are rounded.

Rating A		Rating B		Rating C	
Management	15%	Strategy	17%	Management	30%
Internal organisation (Accounting, Technology)	15%	-		Accounting	20%
				Qualifications of employees / Technology	10%
Market / Industry	15%	Influence / Market position	27%	Market incl. supplier and customer structure	30%
Relationship with the bank	40%	-		Relationship with bank	10%
Miscellaneous (Age of the company, Location...)	15%	Economic situation (general, influence on the company)	27%		
		Divergence from planning in last 3 yrs.	15%		
		Business expectations incl. bank's view	15%		

Source: author by using banks "A", "B" and "C" rating manuals

An interesting difference to mention is surely the category Relationship with the bank, which includes the period as well as the quality of the collaboration between the bank and the customer (thus the rated company). One of the rating systems take this indicator as the most important one with the weight of 40% (rounded), the second one makes do with 10% weight and the third one does not use this indicator at all (includes only problems in the relationship / previous collaboration with the customer as a warning signal, if existing). Even the later approach can make a good sense, considering the result of the rating process as a universal transferable number (which can, but does not need to be relevant in this situation).

Another noteworthy difference between the rating systems are the unique indicators of rating system "B", concerning the divergence from company's planning in last three years and the company's business expectations including the bank's own view and opinion to these expectations.

The scales of rating results

Concerning the scales used for the final rating result, the differences between the rating systems are rather unessential. This is rarely a surprise, if we take into consideration that all the rating systems have one common goal: to estimate the PD (probability of default)of particular customers of the bank between 0 and 100% for the following year. The rating systems also have to fulfill some given requirements in order to be accepted as a tool for counting the capital requirements of Basel II or Basel III respectively.

On the high end of the scale, the banks A and B use rating grades 1-1 and 1-2 or 1(AAAA) respectively for customers, who even do not have corresponding Moody's rating and PD. The bank B describes this category as clients with „no credit risk at all", which is

rarely a real situation. The bank A uses the first two grades just for sovereigns and another banks, thus even the best rated company clients can only get the grade 1-3, which corresponds with best grade of Moody's rating and real PD. Similar situation exists at the another two banks: the best company clients can reach he rating grade 1(AAA) or 1A respectively, but even such a result is more of theoretical case.

On the lower end of the scale, all the banks use special grades for default clients, corresponding with Moody's grade C. The bank A uses as much as eight particular grades (8-1 to 8-8) for separate reason for default (like insolvency proceeding, overdue payments, restructuring etc.). An experienced user of the rating system can thus easily see the reason for the default grade of the rating. The bank B distinguish three default grades (16, 17 and 18) by the estimated next progress of the client's situation. One grade represents the situation, where the bank believes in possible recovery of the transaction after restructuring. In the next grade the possible recovery is described as unlikely. The last grade is a definitive default of the transaction and the client, with no hope on recovery. The bank C use a method similar to bank A, but there are five grades of the default rating only. Another common feature for all three banks and their rating systems is, that the default rating grade (or more precisely any default grade) can be achieved only by existing risk factors (warning signals) or signs of default, but never by bad financial results or financial indicators only. The worst possible rating grade by financial statements only without any warning signals is 7 or 15 or 4E respectively.

Table 3 The scales of rating results. Please note that the PDs are rounded. Default (defined according to Basel II) = 90 days past due or unlikely to pay

Rating A	Rating B	Rating C	*Moody's*	*Indicative PD in 1 year*
1-1	1 (AAAA)			
1-2				
1-3	1(AAA)	1A	*Aaa*	
2-1			*Aa1*	*0,01%*
2-2	1(AA+)		*Aa2*	
2-3	1(AA)	1B	*Aa3*	*0,02 - 0,03%*
3-1	1(AA-)	1C	*A1*	
3-2	1(A+)	1D	*A2*	
	1(A)	1E	*A3*	
3-3	1(A-)	2A		
4-1	2	2B	*Baa1*	*0,11%*
	3	2C		
4-2		2D	*Baa2*	
	4	2E		
4-3	5	3A	*Baa3*	*0,4% - 0,5%*
5-1	6	3B	*Ba1*	*0,6% - 0,8%*
5-2	7	3C	*Ba2*	
	8			
5-3	9	3D	*Ba3*	
		3E		*1,8% - 2,8%*
6-1	10	4A	*B1*	*3% - 4%*
	11			
	12	4B	*B2*	
6-2	13			
6-2	14	4C	*B3*	
		4D		*9% - 15%*

7	15	4E	*Caa 1-3*	
7			*Ca*	*20%*
8-1 - 8-8	16	5A	*C*	*Default*
		5B		
	17	5C		
		5D		
	18	5E		

Source: author by using banks "A", "B" and "C" rating manuals

4 Conclusions

The result of the research shows, that the structures of compared bank's internal rating systems are very similar, based on integration of hard-facts rating based on quantitative indicators and soft-facts rating based on qualitative indicators, with possible following steps according to the client (e.g. existing or non non-existing guarantor, external rating etc.).

Concerning the quantitative indicators (i), the highest emphasis is put on the capital structure of a company (whether in the form of Equity to Liabilities or Equity to Total assets) in all three compared rating systems. Cash Flow to Liabilities, Profit to Sales and Trade payables and Notes payable to Sales are other indicators used universally; the other indicators used for the calculation differ in the systems, as well as the total number of indicators (from 6 to 9).

For soft-facts (ii) all rating systems agree on some of the basic categories (e.g. the quality of the management, market situation and sensitivity of the rated entity to market fluctuations etc.), but otherwise the number and the topics of the queries overlap only partially.

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Intangible Assets in Pharmaceutical Companies in the Czech Republic

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Abstract*:Due to the technical and scientific progress, the cost structure of business entities changes significantly. An important item of costs are costs associated with intangible assets such as software, patents, licenses, copyrights and goodwill. We can assume that the share of these assets in total assets of companies has changed over time. The paper is focused on the evaluation of the share of intangible assets in total assets of entities involved in chemistry in the Czech Republic. The analyzed sample of companies represents entities preparing financial statements in accordance with the Czech Accounting Legislation. The results are compared with the companies operating in the chemical industry and prepare their financial statements according to IFRS. The aim of this paper is to evaluate the materiality of this category, its structure and its changes over time and to identify possible reasons for this situation.*

Keywords: Intangible Assets, Fixed Assets, GDP, Goodwill, IFRS.

JEL Code: M41

1 Introduction

In the beginning of the 20th century, among the world's largest companies were manufacturing companies (US Steel, Jersey Standard, Pullman and American Tobacco). Their success rested with their physical assets: oil fields, railroads and factories. In the recent days besides these companies there are some new companies operating in quite different kinds of industries (Apple, IBM, McKesson, United Health, CVS Health). This situation is associated with a structural change from traditional manufacturing to new more innovation-intensive activities. As a potential source of innovation and productivity gains are identified intangible assets. The structure of companies´ assets has been changing since 80th of the 20th century. The share of intangibles in the total assets has increased from 5% in 1978 to the current 75-85 % of all assets in selected companies.

IAs – assets without material substance – become the main impetus in the creation of value in corporations. Despite of this fact, not all intangible items could be recognized as items of assets and could be reported in financial statements of companies. In terms of financial reporting by companies, this is bringing about a situation in which an increasingly large portion of elements which create value for a business, such as knowledge, technology and clients, are excluded from the balance sheet (B/S) pursuant to prevailing reporting practices. According to Lev, Daum (2004), intangible assets become a possible contributor to the disparity between accounting companies´ value and their market value. It is necessary to understand the criteria for intangible assets recognition is in the eyes of accounting systems.

The world´s most significant reporting systems define intangible assets in the following way:

International Accounting Standards Board (IASB) standard 38 (IAS 38) defines an intangible asset as: "an identifiable non-monetary asset without physical substance." This definition is in addition to the standard definition of an asset which requires a *past event* that has given rise to a resource that the entity *controls* and from which *future economic benefits* are expected to flow. Thus, the extra requirement for an intangible asset under IAS 38 is *identifiability*. This criterion requires that an intangible asset is separable from the entity or that it arises from a contractual or legal right. IAS 38 contains examples of intangible assets, including: computer software, copyright and patents.

The Financial Accounting Standards Board (FASB) Accounting Standard Codification 350 (ASC 350) defines an intangible asset as an asset, other than a financial asset, that lacks physical substance.

The world's accounting standard setters are considering how to address this issue in the most suitable way. In the interests of greater transparency and comparability in financial records, companies are encouraged to disclose information about all the assets that are used in the business, but not shown on the balance sheet. IAs can be categorized in two subgroups should be distinguished within Intangible Assets: recognized Intangible Assets and non-recognized Intangible Assets in bookkeeping and accounting.

On the other hand, the Czech Accounting legislation defines intangible assets in the decree 500/2002 Sb., as individual items with the useful life over one year (results of research and development, legal rights), and in the Czech Accounting Standards, Standard Nr. 13, in the common way for tangible and intangible assets.

The lack of physical substance is a defining characteristic of an intangible asset in all over-mentioned systems.

The inclusion in the balance sheet and measurement of intangible assets on the basis of prevailing reporting standards is fraught with complications. There are principles for assets recognition, pursuant to which such intangible assets are taken direct to the result. Also, the various categories of intangible production asset differ by type, so that it is not always possible to break them down for reporting purposes. According to Hussi (2004), the current reporting methods are not able to capture intellectual capital. This hidden part determines the future success of company. Investments in intellectual capital are reported as costs, they are reported as short-term expenses, even though they should be seen as essential investments from the new value creation perspective. Intellectual capital is complementary, not subordinate, to financial information. Intangible resources can include skills, human assets, information and organizational assets, and relational and reputational assets. These all represent what a firm has. Another class of intangible resource is capabilities or competences that represent what a firm does (Hill et al., 2007).

Another approach to IAs uses OECD (2011). OECD groups intangibles into three types: computerized information (such as software and databases), innovative property (such as scientific and nonscientific R&D, copyrights, designs, trademarks) and economic competencies (including brand equity, firm-specific human capital, networks joining people and institutions, organizational know-how that increases enterprise efficiency, and aspects of advertising and marketing).

There are studies concerning the role of IAs in the economy. The study carried out by the European Patent Office and the Office for Harmonization in the Internal Market (OHIM) published in 2013 and in 2015 using European Union (EU) data. The studies showed that about 39 % of total economic activity in the EU is generated by IP intensive industries. The study OHIM (2013) also concludes that European companies owning IP achieve considerably better economic performance than their competitors not owning IP. According to these studies especially ownership of patents, trademarks and designs is strongly associated with improved economic performance of individual companies.

With respect to conclusions of studies carried out on factors of companies´ success, the interest is moving from tangible to intangible factors due to the realization of the high potential of intangible resources (Hand, 2001, Zigan, Zeglat, 2010). The shift towards consideration of power of IAs and their contribution to companies´ economic growth is attracting attention of researchers (García-Ayuso, 2003, Volkov, Garanina, 2007, Jerman, Kavčič, Kavčič, 2010, Hussi, 2004, Gerpott, Thomas and Hoffmann, 2008, Boekenstein, 2009). Also Grüber (2014) concluded that major production inputs do no longer comprise of items, such as property, plant and equipment, but rather of brands, knowledge and other technological innovation and intangible values have continuously become significant value drivers of companies in today's economy, despite these facts, financial accounting and reporting still lacks to incorporate and to report such values properly.

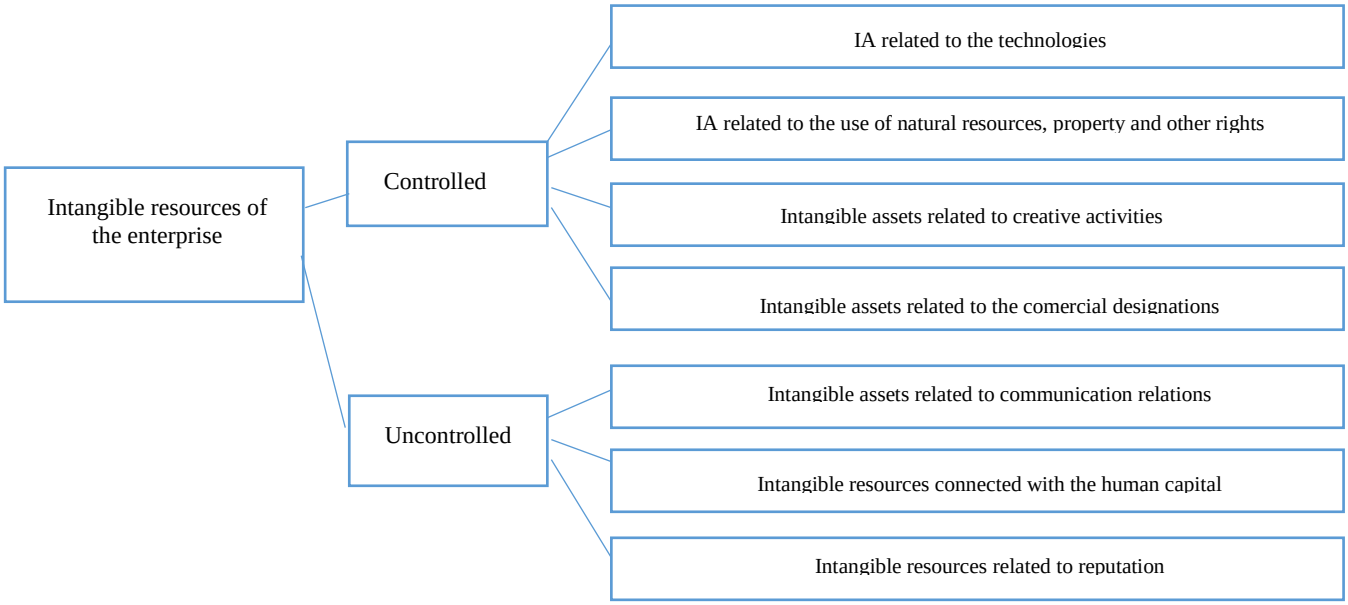
There are some studies concerning the significance of IAs within European companies (Nell, Tettenborn, Rogler, 2013, Jerman, Kavčič, Kavčič, 2010). Nell, Tettenborn, Rogler (2013) examine both the materiality of intangibles and the related disclosure quality under IFRS in the notes of firms on the German benchmark stock index DAX during the four-year period 2008-2011. The study of Jerman, Kavčič, Kavčič (2010) aims the significance of IAs in transition economies like Croatia, Slovenia, the Czech Republic, Germany and USA. The study is based on data of the period 2004-2008. The results of the study prove that intangibles constitute an important asset for traditional market economies, while it was not proven for post-transition and transition economies. Despite the fact that many analyses underline their growing significance in today's business environment.

Also the studies of Dunse, Hutchinson and Goodacre (2004), Edvinsson (2000) proved that a creation of the future value is significantly based on IAs such as IP and goodwill. A company's IAs — especially those related to internally generated information technology and other internally generated IAs — are not well reported on corporate balance sheets according to these studies. The vast majority of intangible spending is expensed, due to strict criteria for recognition of IAs in an accord with IFRS or US GAAP (Lev, Daum, 2004). There are some exceptions – goodwill arising in acquisitions, the other exception is a small portion of software or development costs (after fulfillment the criteria for recognition according to IAS 38 or Topic ASC 350-30). The special item of intangibles is goodwill which is recognized and reported only due to business combinations, in individual companies could not be recognized despite the fact that it is clear that there are some factors of success of the firm which could not be described by current accounting treatments.

Research has confirmed that, although most executives agree that intellectual capital is critical to the continued success of their businesses, their methods of measuring and managing these invisible enablers of performance are either poor or non-existent.

The importance of this special item of intangibles became apparent in mergers and acquisitions. Acquisitions reveal the hidden value of IAs (Boekenstein, 2009, Sedláček, Valouch, Hýblová, Křížová, 2014), that did not meet the criterion for their recognition previously. The results of Boekenstein's study (carried out for pharmaceutical sector) revealed that in mergers and acquisitions the total value of the acquired company increases approximately six times. The special approach to IAs reporting was considered also in the Exposure draft of Lease reporting, the rights connected to leased assets were considered as an IA (Svoboda, Bohušová, 2014), the final standard IFRS 16 does not work with this idea any more.

Figure1 Structure and classification of Intangible Assets in industrial enterprises



Source: own work based on literature survey

2 Methodology and Data

The purpose of this paper is to assess the role of intangible assets on the B/S of Czech companies operating in chemical industries – pharmaceutical industry. The selection of industry is based on conclusions of studies carried out - the significant power of IAs is expected (patents, licences, research and development).

Based on the conclusion of literature review, the aim of the paper is to evaluate the changes in the share of intangible assets during the past 10-year period and to asses a relation between intangible assets and company performance.

Intangible assets reporting of a sample of 71 Czech companies reporting according to the Czech accounting legislation operating in chemical industry (pharmaceutical production) are analysed. The sample covers all companies reporting according to the Czech accounting legislation operating in the chemical industry – production of pharmaceutical products (NACE 21).

The system ARES (Access to Registers of Economic Subjects) was used for companies according the NACE identification. ARES is an information system allowing a retrieval of information on economic entities registered in the Czech Republic. This system intermediates a display of data from particular registers of the state administration. The financial statement and their notes of identified companies published in the Public Register were processed. The research covers period from 2005 to 2015. The firms which did not publish the complete information in notes were excluded. The final dataset covered 60 firms (in total 660 firm-years). The average values were used for the analysis.

The development in total amount capitalized in intangible assets and the structure of the category IAs during the researched period was evaluated.

$$IABTi\ (IA\ in\ B/S\ Total) = \frac{Net\ amount\ of\ IA}{B/S\ Total} \qquad (1)$$

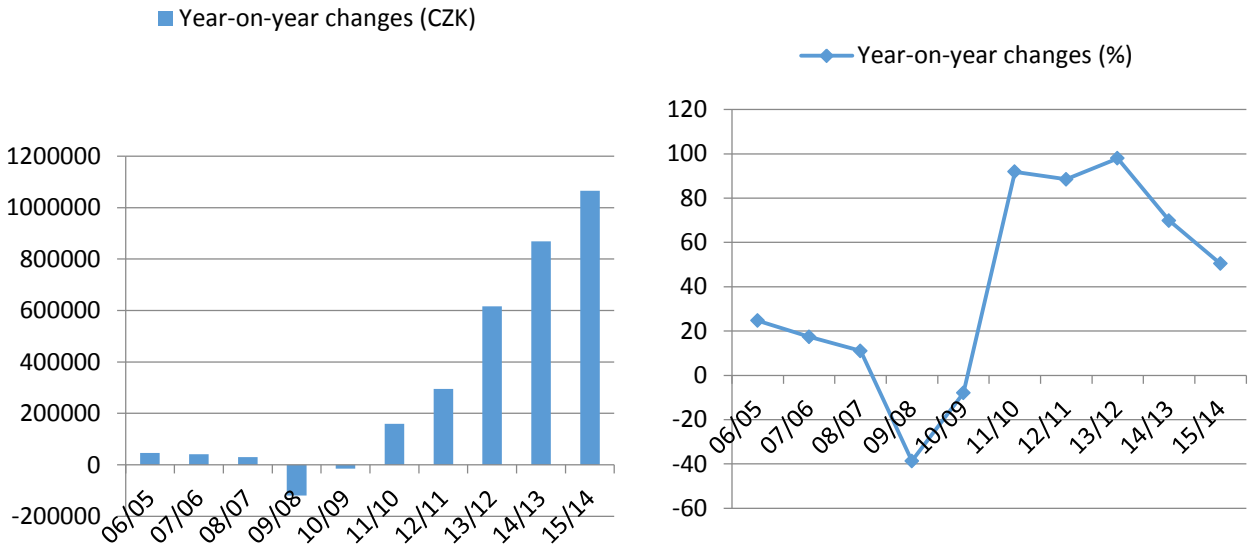
The impact of IAs on ratios describing the level of performance was analysed. Due to limited extent of the paper the figures and charts were used for presentation.

$$Return\ on\ of\ IAs = \frac{Operating\ Revenue}{IAs} \quad (2)$$

3 Results

The pharmaceutical industry is a subject of the research of IAs over the world. The high number of researches is concerned with companies reporting according to IFRS or US GAAP. However, the majority of the Czech companies are reporting according to the national GAAP. Due to this fact, the sample covers especially small and medium companies (only 2 companies operating in chemistry are reporting in accord to IFRS in the Czech Republic, they were subject of previous research). Based on the researched data set, there was revealed that the total value capitalized in IAs (according to the Czech Accounting legislation) is increasing during the whole period. The only exceptions are in the years 2009 and 2010, the slight decrease is supposed to be connected to the beginning of the economic crisis, as seen from Figures 2a, b.

Figure 2 Changes in value of IAs in CZK and in %



Source: own work based on annual reports

The average share of IAs in the B/S total is described in the Figure 3. The share of IAs in B/S total differs significantly in particular companies (from 0.0% to 69% in 2005, and from 0% to 77% in 2015). The results were compared to the general results of study of Jerman, Kavčič, Kavčič (2010) concerning the Czech Republic (publicly traded companies reporting according to IFRS) and to study Bohušová, Svoboda (2017) carried out in the Czech publicly traded companies. According to results of the fore-mentioned studies, the share for the companies was 6.01% for the year 2005 up to 6.40% in 2008 (Jerman, Kavčič, Kavčič, 2010), and from 8.67% in 2005 to 19.81% in 2008 (Bohušová, Svoboda, 2017).

The share of IAs in B/S total in pharmaceutical companies reporting according to CAL is lower in comparison to results fore-mentioned studies. It could be caused by the fact that the sample covers companies reporting according to CAL ie small and medium-sized entities. These companies have usually not such possibilities of increasing of equity or liabilities for financing investment to intangible assets in comparison to large listed companies. Despite this fact there are some differences in recognition and measurement of IAs reported according to CAL. The criteria for the recognition and measurement are so not as strict as in IFRS (R&D, start-up cost (till 2016), internally generated IAs. Due

to fore-mentioned different condition for doing business for different size of companies, the companies were sorted according to balance sheet total to micro, small, medium-sized and large groups. The criteria level is an accord to the Czech Accounting Act.

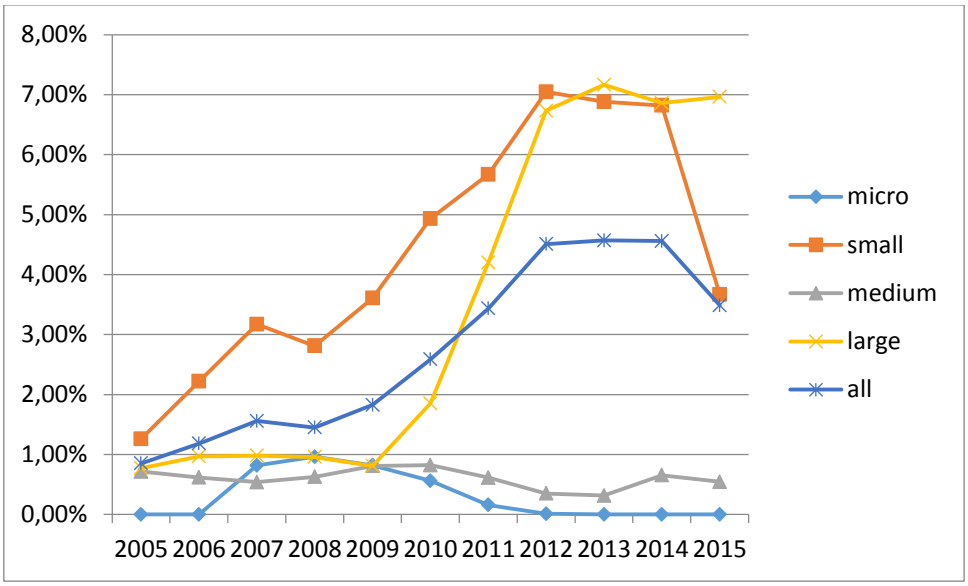
According to the results of number of studies carried out on publicly traded companies, the IAs are getting more significant in a span of time, as seen of the Table 1 and Figure 3, the results of the analysis of the IAs in the Czech pharmaceutical companies reporting according to CAL is in line with these conclusions (only exception 2015). The analysis made by Jerman, Kavčič, Kavčič (2010) proves that IAs are becoming more and more important for today's business environment, but there is still a significant difference between different types of economies. The detail analysis in Table 1 and Figure 3 describes the development of the particular categories of companies.

Table 1 Share of IAs in B/S total by categories in %

Type/Year	05	06	07	08	09	10	11	12	13	14	15
micro	0,00	0,00	0,82	0,96	0,82	0,56	0,16	0,01	0,00	0,00	0,00
small	1,26	2,22	3,17	2,81	3,61	4,93	5,67	7,05	6,88	6,82	3,67
medium	0,71	0,62	0,54	0,63	0,81	0,82	0,61	0,35	0,31	0,65	0,55
large	0,77	0,97	0,98	0,96	0,81	1,85	4,20	6,73	7,16	6,86	6,96
All	0,85	1,18	1,56	1,45	1,83	2,59	3,43	4,51	4,57	4,56	3,49

Source: own work based on annual reports

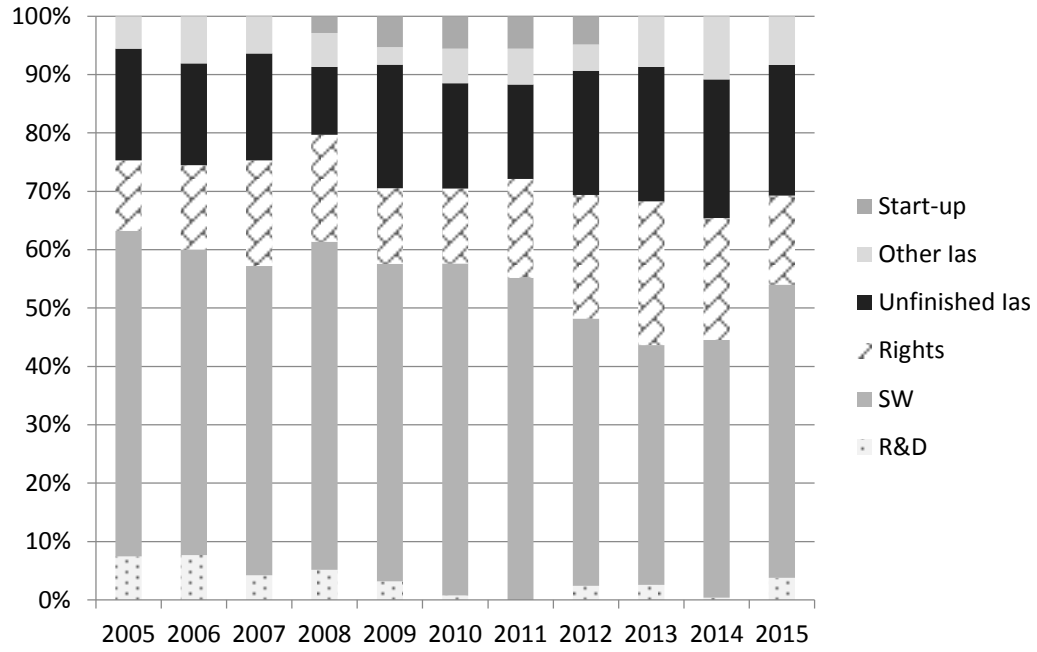
Figure 3 IAs/Balance sheet total



Source: own work based on annual reports

The closer analysis of the structure of IAs carried out revealed quite a different structure of the IAs in each company. The average structure of IAs in their development over time describes the Figure 4. It is evident that the most significant item of IAs is software (the share is from 55.8% in 2005 to 50.2% in 2015), followed by rights and patents (from 12.0% in 2005 to 24.6% in 2013) and results of research and development (from 0.02% in 2011 to 7.7% in 2006).

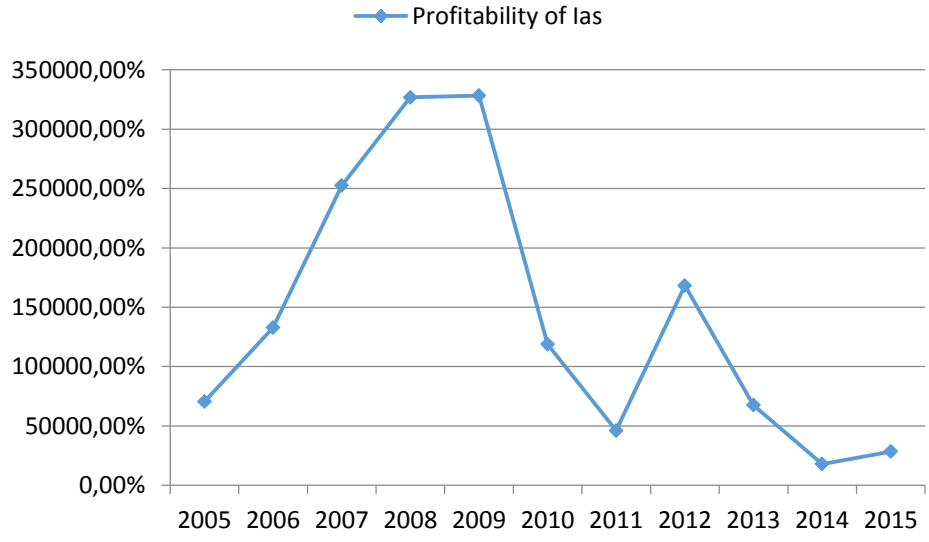
Figure 4 Average structure of IAs in %



Source: own work based on annual reports

Our research concerns the companies operating in the pharmaceutical sector in the Czech Republic and the importance of intangible assets in these companies. It is desirable to increase the Return on IAs indicator continuously. In the observed time series, this indicator has fluctuated considerably (Figure 5). Since the level of the indicator is affected in both by the amount of revenue and the amount of input IAs involved, the influence of the factors will be examined in a future research.

Figure 5 Return of IAs (%)



Source: own work based on annual reports

4 Conclusions

The paper is a part of research concerning the role of intangible assets in a performance of business companies and possible ways of measurement of their efficiency. The paper

concerns companies reporting to the Czech Accounting Legislation and the comparison to companies reporting according to IFRS. Recently, it has been proposed to extend the capitalization of intangibles to expenditure on research and development (R&D) in IFRS. There are not any treatments for reporting the majority of intangible capital (knowledge, human capital, education, training, market position, etc.) in financial statements of companies according to current financial reporting treatments.

The IAs category is getting more significant in a span of time. Based on results of analysis, the role of IAs in pharmaceutical industry increases. The most significant item in IAs structure is the structure of IAs in a software, followed by patent and licenses with increasing bias.

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Comparison between CreditMetrics™ and KMV

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Abstract: *The topic of this paper is comparison between Creditmetrics™ and KMV. The goal is to estimate the benchmarks for both the Creditmetrics™ model and the KMV model, and then compare these two models theoretically and diagrammatically. Credit risk is determined in a portfolio that consists of ten selected quoted companies in the Frankfurt Stock Exchange (FSE) with a total nominal value of 10 million euro and the time horizon is one year, from March 24th, 2016 to March 24th, 2017. Under the framework of Creditmetrics™ and KMV, credit risk associated with the portfolio is quantified in terms of the values of economic capital. After calculating the expected loss and the unexpected loss for the whole portfolio by Creditmetrics™ (at a 99,9% confidence level) and KMV, the values of economic capital, which is the difference between the expected loss and the unexpected loss, equal to 513 316 € and 870 370 €, respectively. The most essential difference between two models is that Creditmetrics™ is a backward-looking model, while KMV is a forward-looking model.*

Keywords: Economic capital, credit risk, Creditmetrics™, KMV, VaR

JEL codes: G11, G21, G24, G31

1 Introduction

Both the CreditMetrics™ model and the KMV model have enjoyed a widespread popularity in the credit risk management. The CreditMetrics™ model is originally envisioned by J.P. Morgan's Risk Management Research division in 1997, while the KMV model is originally proposed by a private company named KMV in 1990s and maintained by Moody's KMV nowadays. The project aims to estimate an effective benchmark for quantifying credit risk at a portfolio level under the framework of CreditMetrics™ and KMV, and to make a comparison between these two models graphically and theoretically. The description of CreditMetrics™ follows J.P. Morgan (1997); while the description of KMV follows Crosbie and Bohn (2002), Crouhy, Galai and Mark (2000), and Kealhofer and Bohn (2001).

2 Description of CreditMetrics™ and KMV methodology

In this section, we will describe both the CreditMetrics™ model and the KMV model in detail, including the basic parameters, the frameworks, and the procedure of calculating the economic capital theoretically.

CreditMetrics™

The CreditMetrics™ model is a tool for estimating the distribution of changes in the market value of a portfolio of credit exposures based on the data for migration rates, default rates, and spreads of borrowers. Roughly speaking, there are three main parts in the description of the CreditMetrics™ model, including risk management framework, credit quality correlation, and interpretation and application of results. Before we start, it is essential to know what is the VaR and the economic capital.

Value at risk (VaR) represents the maximum potential losses at a given confidence level, usually 99% but more frequently 99.5% or even 99.9%, over a specific time interval. It can be interpreted in two ways:

- losses from the portfolio of debt assets $\left(-\Delta\widetilde{\Pi}\right)$ set at a significance level of α, which is greater than the predetermined value losses (VaR), can be expressed as:
  $\Pr\left(-\Delta\widetilde{\Pi} \geq VAR\right) = \alpha$; (1)
- profits from the portfolio of debt assets $\left(\Delta\widetilde{\Pi}\right)$ set at a significant level of α, which is less than the predetermined value gains (-VaR), can be expressed as:
  $\Pr\left(\Delta\widetilde{\Pi} \leq -VAR\right) = \alpha$. (2)

Economic capital, which is the difference between unexpected losses and expected losses, represents an estimation of the amount of the required capital to maintain unexpected losses at a specific significance level. It can be computed when using the probability distribution of portfolio gains as:

$$Economic\ capital = VaR_{\alpha} - \mathrm{E}\left(-\Delta\widetilde{\Pi}\right), \quad (3)$$

where $\mathrm{E}\left(-\widetilde{\Pi}\right)$ is the mean value of the losses, VaR_{α} is determined so that the simulated values of the portfolio returns are ranked according to the order and the value of VaR at a specific significance level will be equal to *n*-th worst. However, with the opposite sign, it is possible to use the following formula mathematically:

$$n = \alpha \cdot N . \quad (4)$$

where *n* is the ordered number of the experiment and *N* is the number of scenarios.

In general, there are four steps to calculate the credit risk for a portfolio by using the CreditMetrics™ model. The first is credit rating migration. The CreditMetrics™ model assumes that each exposure has been assigned a rating either produced by rating agencies or referred to an internal rating. Besides, those rating grades are indicative of the default and migration probabilities for the subsequent year. Then, risk comes. It is important to estimate both the likelihood of default and the chance of migrating to any possible credit quality state at the same risk horizon.

The second is calculation of the present value of a bond. Values are determined at the risk horizon and there are usually eight revaluations in simple one-bond case because value should be calculated separately for each migration state. Moreover, the eight valuations can be divided into two categories – one is in the event of default, and other is in the event of upgrades or downgrades. In the first case (in the event of a default), the recovery rate is estimated depended on the seniority classification of the debt. Table. 1 summarizes the RRs in the state of default.

Table 1 Recovery Rates by Seniority Class (% of Face Value, i.e., "Par")

Seniority class	Mean (%)	Standard deviation (%)
Senior secured	53,80	26,86
Senior unsecured	51,13	25,45
Senior subordinated	38,52	23,81
Subordinated	32,74	20,18
Junior subordinated	17,09	10,90

Source: Carty & Lieberman [96a] – Moody's Investors Services

In the second case (in the event of upgrades or downgrades), the change in credit spread is estimated based on a straightforward present value bond revaluation. The present value (PV) of a bond can be calculated as:

$$PV = \frac{C}{(1+i)} + \frac{C}{(1+i)^2} + \cdots + \frac{C+M}{(1+i)^n}, \tag{5}$$

where *C* is coupon payment, *n* is number of payments, *i* is interest rate or required yield, *M* is value at maturity or par value, and *C+M* is nominal value.

The third is calculation of the discount rate. The discount rates can be determined for different rating categories and years. The calculation of these rates is based on the risk-free rate and the implicit expectations theory, which can be expressed as:

$$f_t = \frac{(1+r_t)^t}{(1+r_{t-1})^{t-1}} - 1. \tag{6}$$

The fourth is credit risk estimation, which aims at estimating the volatility or standard deviation of value due to credit changes for a single exposure. According to what we have already obtained from previous two steps, it is able to obtain the likelihoods of all possible outcomes and the distribution of value with each possible outcome.

Asset value model is based on the proposal that a company's asset value drives its credit rating changes and defaults. Because the value of a company's asset determines the ability to meet its obligations, and if the value of the company's asset is too much low to meet its obligations, the company will default. Let us parameterize the asset value process to model the change in company's asset value to evaluate its credit rating, namely the percent changes in asset value are normally distributed, the mean is denoted by μ, and the standard deviation is denoted by σ. Besides, given the fact that the value of μ will not influence the result of the exposition, we can assume $\mu = 0$ to make it easier. Use Z_{Def}, Z_{CCC}, Z_B, etc. to satisfy the situations in which if $R < Z_{Def}$, the company will default; if $Z_{Def} < R < Z_{CCC}$, the company will be re-rated to CCC; if $Z_{CCC} < R < Z_B$, the company will be re-rated to B; and so forth. Table 2 presents the transition probabilities of a BB-rated company as an example.

Table 2 Transition Probabilities and Thresholds for A BB-Rated Company

Rating	Probability from transition matrix (%)	Cumulative probability (%)	Threshold
Default	$\Phi(Z_{Derf}/\sigma)$=1,06	1,06	-2,30σ
CCC	$\Phi(Z_{CCC}/\sigma)-\Phi(Z_{Def}/\sigma)$=1,00	2,06	-2,40σ
B	$\Phi(Z_B/\sigma)-\Phi(Z_{CCC}/\sigma)$=8,84	10,90	-1,23σ
BB	$\Phi(Z_{BB}/\sigma)-\Phi(Z_B/\sigma)$=80,53	9,43	1,37σ
BBB	$\Phi(Z_{BBB}/\sigma)-\Phi(Z_{BB}/\sigma)$=7,73	99,16	2,39σ
A	$\Phi(Z_A/\sigma)-\Phi(Z_{BBB}/\sigma)$=0,67	99,83	2,93σ
AA	$\Phi(Z_{AA}/\sigma)-\Phi(Z_A/\sigma)$=0,14	99,97	3,43σ
AAA	$1-\Phi(Z_{AA}/\sigma)$=0,03	100,00	

Source: own calculation

Monte Carlo simulations, developed by Stanislaw Ulam and John Von Neumann, are designed to estimate the parameters of a particular probability distribution from the historical data and then the extraction of *N* simulated values for the risk factors. The Cholesky decomposition, also named Cholesky factorization, is commonly used in the Monte Carlo simulations. In the case of two variables only, A and B, the covariance matrix can be decomposed as:

$$\Sigma = \begin{bmatrix} {\sigma_A}^2 & {\sigma_{A,B}}^2 \\ {\sigma_B}^2 & {\sigma_B}^2 \end{bmatrix} = \begin{bmatrix} \sigma_A & 0 \\ \dfrac{{\sigma_{A,B}}^2}{\sigma_A} & \sqrt{{\sigma_B}^2 - \left(\dfrac{{\sigma_{A,B}}^2}{\sigma_A}\right)^2} \end{bmatrix} \cdot \begin{bmatrix} \sigma_A & \dfrac{{\sigma_{A,B}}^2}{\sigma_A} \\ 0 & \sqrt{{\sigma_B}^2 - \left(\dfrac{{\sigma_{A,B}}^2}{\sigma_A}\right)^2} \end{bmatrix} = AA'. \quad (7)$$

Similarly, the correlation matrix can be decomposed as:

$$\Sigma = \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ \rho & \left(1-\rho^2\right)^{1/2} \end{pmatrix} \cdot \begin{pmatrix} 1 & \rho \\ 0 & \left(1-\rho^2\right)^{1/2} \end{pmatrix}. \quad (8)$$

The following equations are often used to calculate individual elements of the Cholesky decomposition matrix:

$$p_{ii} = \left(\sigma_{ii} - \sum_{k=1}^{i-1} {p_{ki}}^2\right)^{\frac{1}{2}}, \qquad for\ i = 1, 2, \ldots, N, \quad (9)$$

$$p_{ij} = \left(\sigma_{ij} - \sum_{k=1}^{i-1} p_{ki} \cdot p_{kj}\right) \cdot {p_{ii}}^{-1}, \qquad for\ i = 1, 2, \ldots, N, \quad (10)$$

$$p_{ij} = 0, \qquad for\ i > j; i = 1, 2, \ldots, N, \quad (11)$$

where p_{ii} and p_{ij} are individual elements of the Cholesky decomposition matrix.

KMV

The KMV model is developed by the California-based company KMV in the 1990s. The acronym KMV comes from the last names of the three founding partners, namely Steven Kealhofer, Jogn Andrew McQuown, and Oldrich Vasicek. KMV is a straightforward extension of the Merton model, whose major contribution is the empirical testing and the implementation by using a large proprietary database. While CreditMetrics™ usually uses Moody's or Standard & Poor's statistical data to assign a probability of default, KMV calculate the expected default frequency (EDF), which refers to the actual probability of default during the forthcoming year(s).

There are mainly three steps in the derivation of the EDF, including estimation of the asset value, V_A, and the volatility of asset return, σ_A; calculation of the distance-to-default (DD); and calculation of the EDF.

The asset value and the volatility of asset return is estimated from the market value, the volatility of equity, and the book value of liabilities. Since the equity holders have the right, but not the obligation, to pay off the debt holders, and the residual claim on the remaining assets, the equity can be regarded as a call option on the underlying assets with a maturity (T) and a strike price (X) equal to the book value of the company's liabilities. This is known as the limited liability feature of the equity. Therefore, if the value of assets is sufficient to meet the liabilities, the shareholders will obtain a payoff that is equal to $V_T - X$; if the value of assets is insufficient, the shareholders will not exercise the call option, which means the payoff is zero.

According to the Black-Scholes (BS) option-pricing model, a special case of the Merton model, it is possible to illustrate the relationship between the market value of equity and the market value of assets by the following equation:

$$V_E = V_A \cdot \mathrm{N}(d_1) - Xe^{-rT} \cdot \mathrm{N}(d_2), \quad (12)$$

where V_E is the market value of the equity, r is the risk-free rate, and $\mathrm{N}(\cdot)$ is the standard normal cumulative density function, while d_1 and d_2 are defined as follows:

$$d_1 = \frac{\ln\left(V_A / X\right) + \left(r + \frac{{\sigma_A}^2}{2}\right)T}{\sigma_A \sqrt{T}}, \tag{13}$$

$$d_2 = d_1 - \sigma_A \sqrt{T}\,. \tag{14}$$

Moreover, the relationship between the equity and asset volatility and the relationship between V_A and σ_A is required to find a unique pair, which can be expressed as the following:

$$\sigma_E = \frac{V_A}{V_E}\mathrm{N}(d_1)\sigma_A, \tag{15}$$

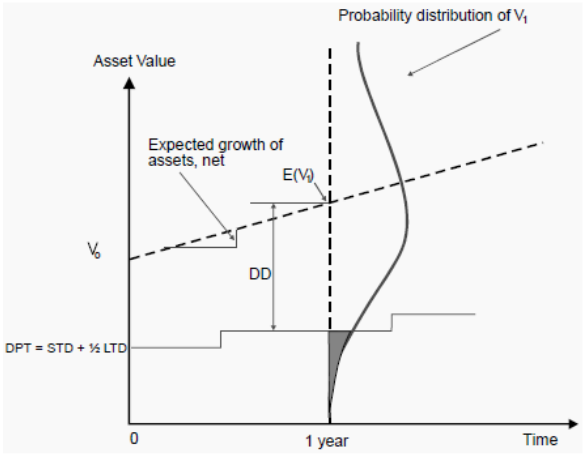
where σ_E denotes the volatility of the equity.

KMV implements an intermediate phase rather than calculate the probability of default directly. The intermediate phased is the calculation of the distance-to-default, as presented in Figure 1 in a graphic way, which is the number of standard deviations between the expected asset value and the default point. Instead of having only a single liability as the assumption in the Merton model, the company's debts are comprised of both short-term and long-term debt actually. Consequently, KMV innovates a new concept named the default point (DP), which can be expresses as

$$DP = STD + \frac{1}{2}LTD, \tag{16}$$

where STD and LTD denote short-term debt and long-term debt, respectively

Figure 1 Distance-to-default (DD)



Source: Crouhy, M., D. Galai and R. Mark. 2000. A comparative analysis of current credit risk models. Journal of Banking and Finance 24:59-117. 90p

As the definition suggests, the distance-to-default (DD) is calculated by:

$$DD = \frac{\mathrm{E}(V_A) - DP}{\sigma_A}. \tag{17}$$

The asset value, V_t, is assumed to obey a standard geometric Brownain motion (GBM) based on the Merton model as:

$$V_t = V_0 \exp\left\{\left(\mu - \frac{\sigma^2}{2}\right)t + \sigma\sqrt{t}Z_t\right\}, \tag{18}$$

where $Z_t \sim \mathrm{N}(0,1)$. Moreover, V_t follows a lognormal distribution with the expected value at time t, $\mathrm{E}(V_t) = V_0 \exp\{\mu t\}$. Then it can rewrite the equation of the DD as:

$$DD = \frac{\ln\frac{V_A}{DP_T} + \left(\mu - \frac{\sigma_A{}^2}{2}\right)T}{\sigma_A\sqrt{T}}. \tag{19}$$

The shaded area in Figure 1, which refers to the EDF, can be computed by:

$$PD = P[V_A \le DP_T] = \mathrm{N}(-DD) = N\left(-\frac{\ln\frac{V_A}{DP_T} + \left(\mu - \frac{\sigma_A{}^2}{2}\right)T}{\sigma_A\sqrt{T}}\right). \tag{20}$$

3 Results and Discussion

There is a portfolio consists of ten different quoted companies in the Frankfurt Stock Exchange (FSE) with a total nominal value of 10 million euro. The time horizon is one year, from March 24th, 2016 to March 24th, 2017. The basic information in Table 3 are used for the CreditMetrics™ model. Each bond, therefore, is represented equally in a nominal value of 1 million euro in order to avoid bias caused by high nominal values of some bonds. Besides, the basic information in Table 4 are used for the KMV model. All basic information can be accessed on the official website of the Frankfurt Stock Exchange.

Table 3 Basic Information of Bonds of the Selected Companies

Name	Ratings	Coupon	Nominal value	Maturity	Market price	Pcs.
Deutsche Post	A-	2,75%	1 000 €	10/2023	113,67%	1 000
E. ON	A-	5,80%	1 000 €	4/2018	106,69%	1 000
Metro	BBB-	1,50%	1 000 €	3/2025	100,01%	1 000
Volkswagen	A+	2,37%	100 000 €	9/2020	105,80%	10
NIKE	AA-	2,25%	2 000 €	5/2023	99,98%	500
Commerzbank	BBB+	0,08%	1 000 €	6/2023	97,34%	1 000
Bayer	A-	1,87%	1 000 €	1/2021	107,25%	1 000
Nestle Holdings	AA	4,25%	2 000 €	3/2020	104,26%	500
Danone	BBB+	3,00%	200 000 €	6/2022	101,54%	5
Oracle	A+	2,80%	2 000 €	7/2021	102,81%	500

Source: Frankfurt Stock Exchange (FSE)

Table 4 Basic Information of Stocks of the Selected Companies

Name	Market capitalization	Volatility of equity return	Default point
Deutsche Post	33 460 000 €	27,62%	7 420 000 €
E. ON	13 100 000 €	37,92%	24 828 500 €
Metro	8 900 000 €	31,03%	9 173 000 €
Volkswagen	60 880 000 €	46,66%	150 383 500 €
NIKE	85 940 000 €	58,91%	1 050 000 €
Commerzbank	7 580 000 €	36,73%	263 205 000 €
Bayer	74 580 000 €	29,92%	27 983 000 €
Nestle Holdings	207 400 000 €	19,04%	27 777 500 €
Danone	38 750 000 €	23,32%	15 121 000 €
Oracle	157 740 000 €	28,63%	23 802 500 €

Source: Frankfurt Stock Exchange (FSE)

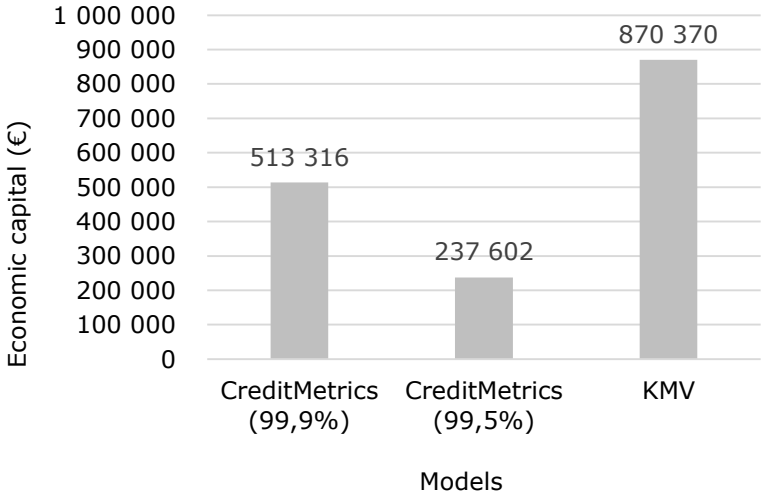
Table 5 and Figure 2 summarize the values of economic capital calculated by both the CreditMetrics™ model and the KMV model. The value of economic capital computed by KMV is much higher than that computed by CreditMetrics™. As shown in Table 5, the value of economic capital is 870 370 € under the KMV model, while those are 513 316 € and 237 602 € under the CreditMetrics™ model at the confidence levels of 99,9% and 99,5%, respectively. CreditMetrics™ assumes that all issuers within the same rating class are credit–homogenous, while KMV assumes that each issuer is specific. As mentioned previously, CreditMetrics™ and KMV are substantially different from each other in the simplifying assumptions when facilitating the implementations although both two models rely on the asset value model originally proposed by Merton. The values of economic capital computed by CreditMetrics™ and KMV are therefore quite different.

Table 5 Summary of Values of Economic Capital

Models	Expected loss	Unexpected loss	Economic capital
CreditMetrics™ (99,9%)	5 056 €	518 372 €	513 316 €
CreditMetrics™ (99,5%)	5 056 €	242 640 €	237 602 €
KMV	168 592 €	1 038 962 €	870 370 €

Source: Frankfurt Stock Exchange (FSE)

Figure 2 Values of Economic Capital by CreditMetrics™ And KMV



Source: Own calculation.

Both the CreditMetrics™ model the KMV model have enjoyed widespread popularity in the credit risk management. However, from the description and analysis above, two models are quite different on the basic idea of modelling. The main differences are summarized as the following:

- The measurement criteria of KMV, EDF, is mainly based on the data analysis of the changes of the market price of the stock issued by the company; while CreditMetrics™ focuses on the actual rating changes and the credit-migration probabilities of the company to measure the credit risk. This is one of the most fundamental differences between the two models.
- Because KMV is based on the market data, the market value of equity and the volatility of equity, it is possible to timely renew the input data corresponding to the changes of the market data and then obtain the new EDF. Consequently, KMV is a dynamic model that can provide a continuous credit monitoring process and reflect the current credit risk of the company. However, CreditMetrics™ highly relies on the credit rating, no matter the internal rating or the external rating, which usually remains static for a quite long period of time.
- Meanwhile, KMV is a forward-looking model, because the stock market reflects not only the company's historical and current economic conditions, but also the expectations of the company's future development by the investors. On the contrary, CreditMetrics™ is a backward-looking model because of the dependence on the historical data. KMV overcomes the shortcoming of the backward-looking method that history tends to repeat itself.
- KMV provides a cardinal measurement, which can reflect both the rank among the different credit ratings and the degrees of the variation; while CreditMetrics™ provides an ordinal measurement, which is only able to reflect the rank. KMV, therefore, is more accurate and good for the loan pricing.
- CreditMetrics™ fits the modern portfolio theory more because of the emphasis on the correlation among the companies' credit ratings. KMV, however, emphasizes the market data and the credit status of each single company, and fails to provide enough analysis of the correlation among the companies' credit ratings.

4 Conclusions

At a general level, it is essential to measure the diversification at a portfolio level in the bank portfolio management. The CreditMetrics™ model is an effective and sensitive measurement for assessing the changes of the portfolio's value associated with the credit rate migration and can be considered a static and backward-looking model. However, it assumes that all issuers within the same rating class are credit–homogenous, which is questioned by KMV. Besides, CreditMetrics™ is insensitive to the underlying changes of the market. Unlike CreditMetrics™, the KMV model is much more sensitive to company's specific characteristics and is a dynamic and forward-looking model. The most explicit advantage of KMV is that it removes the normally distributed assumption. However, among the criticisms, it oversimplifies the capital structure of the companies, and the relationship between the distance-to-default (DD) and the empirical EDF is usually open to question. Moreover, KMV is based on an implicit assumption that the portfolio is already well diversified. It may misestimate the value of economic capital if the portfolio is not diversified enough in the reality.

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The Tale of Twin Deficits: Which Comes First?

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Abstract: *This paper is aimed at contributing to the ongoing debate on the possible bi-directional relationship between government budget deficit and current account deficit in the European Union. While there is a bulk of empirical papers addressing the underlined question this paper takes the most recent time series covering longer time paper (2004Q1-2014Q4) and fairly large number of countries and shows that twin deficits still poised a problem with no clear evidence whether the causality goes from budget deficit to current account or vice versa. This study based on a Pairwise Granger test for all EU countries and indicates that the direction of the causality goes from current account deficit to budget deficit and not vice versa. Splitting the sample into "new EU" and "old EU" members, however, the results seem to suggest that the relationship turns bidirectional. The estimates based the VAR model and corresponding response functions seem to suggest fairly week relationship between budget and current account deficits.*

Keywords: twin deficit, current account balance, budget balance, VAR

JEL codes: F41, E6, H6

1 Introduction

Numerous papers have been devoted to addressing the dilemma that still persists in determining the relationship between government budget deficit and current account deficit. Most of the initial studies are grounded on the phenomenon of the twin deficits the US economy experienced in the 1980s. This was partly due to the tax reform that was advocated in line with the "supply-side" economic-policy emphasis at that time and later translated into mounting government budget deficit hand in hand with the current account deficit, triggering piles of articles to figure out the direction of the causality. The empirical studies are nonetheless far from being conclusive. The studies so far may be grouped into three lines of stand, from those that claim to have found no relationship between government budget deficit and current account deficit to those who claimed to have found only one directional relationship and to those who claim a bidirectional link between the two variables. The differences among studies are either due to the type of economy that is the subject of investigation and the time period of observation or the empirical strategies that are used to address the research question.

This paper makes an endeavor to contribute to the ongoing debate in two directions. First, the paper uses the data of EU member states during the time period that encompasses both the pre-crisis and the crisis period (2004Q1-2014Q4). Second, the paper also splits the sample into "new-EU" and "old-EU" members to take into account the potential impact a relatively stable economic-policy environment as well as the level of economic development on the co-movement of the government budget and current account balances.

The rest of the paper is organized as follows. Part two presents a brief summary of literature review followed by part three that discusses data and empirical approaches and the final part concludes.

2 A brief literature review

There is a general consensus that a current account deficit is associated with the saving-investment gap. Hence, current account deficit is a phenomenon of countries with higher level of domestic investment in comparison with national savings. The savings-investment gap can be expressed using a simple macroeconomic identity (eq. 1). The saving-investment gap reflects both the gap in the private sector ($S_p - I_p$) and public sector ($S_g - I_g$) of an economy.

$$S - I = (S_p - I_P) + (S_g - I_g) = (S_p - I_p) + (T - G) \quad (1)$$

Rearranging the equation, one can obtain the link between the twin deficits, where current account mirrors the gap between saving and investment of the private sector and government budget deficit (eq. 2).

$$CA = (S_p - I_p) + (T - G) \quad (2)$$

The hypothesis of twin deficit is rooted in the possible endogeneity that exists between current account deficit (CA) and government budget deficit (T-G) and suggests the direction of the causality is not perfectly clear. The relationship would go from higher public finance deficit to higher current account deficit but a reverse causation is hard to rule out. From a policy perspective, it is necessary to understand the causes of a current account deficit. As is argued, current account deficit may reflect the saving-investment gap keeping public finance gap constant. However, from the perspectives of economic policy it is also critical to figure out whether the deficit was caused by an increase in investment or a decrease in savings in the economy. Likewise, it is equally necessary to explore whether the current account deficit is transitory or a long-term issue and if the deficit has been anticipated or not (Sachs, 1981). A current account deficit that is triggered by increasing productive investment activities and financed via foreign savings should not give rise to unsustainable current account deficit in the long term. Analogically a deficit triggered by a decrease in savings would lead to unsustainable current account deficit.

The empirical literature on the direction of causality does not offer unified results either. The empirical studies are either based on a single country analysis or panel of countries. In one of the first empirical works, Abell (1990) estimates the VAR system with a number additional independent variables and concludes that the link between budget deficit and current account deficit is insignificant and that government budget deficit does not trigger current account deficit, while recognizes a possible indirect relationship via interest rates, exchange rate and capital flows. Almost a decade later, Miller and Russek (1999) empirically investigate the post-World War II evolution of current and budget deficits in the United States and confirm the phenomenon of secular relationship between budget and current account deficits but only under flexible exchange rate regime. However, their study does not find any long-term relationship between current account and government budget deficits. From a different perspective, Fidrmuc (2003) finds the phenomena of twin deficits in several EU member states, albeit cross-country variation in the 1980s and 1990s. Beetsma et al (2007) using the data of selecting EU countries conclude that budget deficit can worsen current account deficit with a time lag of two years. Similarly, Siranova (2013) concludes the negative impact of budget deficit on current account balance for Euro Area countries in light of the financial crisis.

Taking the twin hypothesis argument from the perspective of the Ricardian Equivalence hypothesis the results are quite mixed. The Ricardian Equivalence Hypothesis (REH) opposes the twin deficit hypothesis on the ground that the private sector is forward looking in terms adjusting savings to government expenditure (Barro, 1974). Some authors claim to have evidence in favor of the underlined hypothesis (Hatchison and Pigott, 1984; piersanti, 2000, among others), while others do not find any evidence for the Ricardian Equivalence hypothesis (Rewald and Ulan, 2002). In recent paper, Alka

Obadić, Tomislav Globan and Ozana Nadoveza (2014) apply a VAR model for selected new EU members and conclude that the twin hypothesis does not hold for these economies. The variation in the empirical results esteem mainly from variation in empirical strategies as well as sample selection. As Bartolini and Labiri (2006) rightly point out part of the reasons why studies have failed to offer consistent results is also due to either less number countries in the data or shorter time periods that do not give significant variation of time.

3 Data and Empirical Specifications

The data in this paper consists of the government budget deficit (DEF) and current account deficit (CA) compiled from the IMF World Economic Outlook (2017) and encompasses the time period 2004Q1-2014Q4. The data include 18 EU member states for which data was available for the entire period excluding three outliers (Greece, Portugal and Slovenia) that have recorded extremely high level of government budget deficit. The data is divided into three samples. The first sample (all) consists of all the 23 countries and the second sample ("old EU") takes into account only the data of advanced EU member states in order take into account both the relatively stable economic-policy environment as well as the level of development of these economies. The third sample ("new EU") includes new EU members. Both the current account and budget deficit are deflated by GDP in order to account for the size variation across countries.

Table 1 Descriptive statistics

	BUDGET	**CA**
Mean	-2.485622	-0.184442
Median	-2.200000	-0.200000
Maximum	10.90000	12.90000
Minimum	-22.40000	-25.60000
Std. Dev.	4.178667	5.914608
Skewness	-0.446781	-0.693447
Kurtosis	4.114746	4.124074
Jarque-Bera	79.26315	123.7625
Probability	0.000000	0.000000

Source: author's computations

Empirical specifications

In this paper, we first checked for the time series properties of our data during the period under consideration using a panel unit root test. The results seem to suggest both current account (CA) and budget deficit balance (BUDGET) contain unit roots, therefore one cannot test for cointegration as the variables are not non-stationary in levels and stationary in first difference. We conducted the usual panel root test based on various methods (Levin, Lin & Chu, Im, Pesaran and Shin and ADF - Fisher Chi-square, and PP - Fisher Chi-square). The results seem to suggest one cannot reject the unit root null at conventional significance levels for these two variables (Table 2). Accordingly, we followed the unrestricted the unrestricted Vector Autoregressive (VAR) model instead of our initial intention of running a cointegration test (König, K. Horvát, P, Ostrihoň, F. (2013).

Table 2 Panel unit root test: Summary

	Budget balance		Current account balance	
Test type	Level	First difference	Level	First difference
Levin, Lin & Chu t	0.56909 (0.7154)	6.67212 (1.0000)	-1.03000 (0.1515)	-21.6281 (0.0000)
Im, Pesaran and Shin W-stat	-2.54017 (0.0055)	-22.4075 (0.0000)	-0.81962 (0.2062)	-30.8702 (0.0000)
ADF - Fisher Chi-square	56.7453 (0.0152)	355.981 (0.0000)	40.4924 (0.2787)	495.361 (0.0000)
Time span	2004Q1-2014Q4	2004Q1-2014Q4	2004Q1-2014Q4	2004Q1-2014Q4
Cross-sections	18	18	18	18
No. of obs.	846	846	846	846

* The numbers in parentheses are standard errors.

Source: author's computations

Panel Vector Autoregression Model (VAR)

We followed the following simplified VAR model in order to investigate the link between government budget balance and current account balance.

$$BUDGET_t = \alpha_0 + \sum_{i=1}^{p} \delta 11, iBUDGET_{1-i} + \sum_{i=1}^{p} \delta 12, iCA_{1-i} + \ell_{i,t} \quad (3)$$

$$CA_t = \beta_0 + \sum_{i=1}^{p} \delta 11, iCAD_{1-i} + \sum_{i=1}^{p} \delta 12, iBUDGET_{1-i} + \ell_{i,t} \quad (4)$$

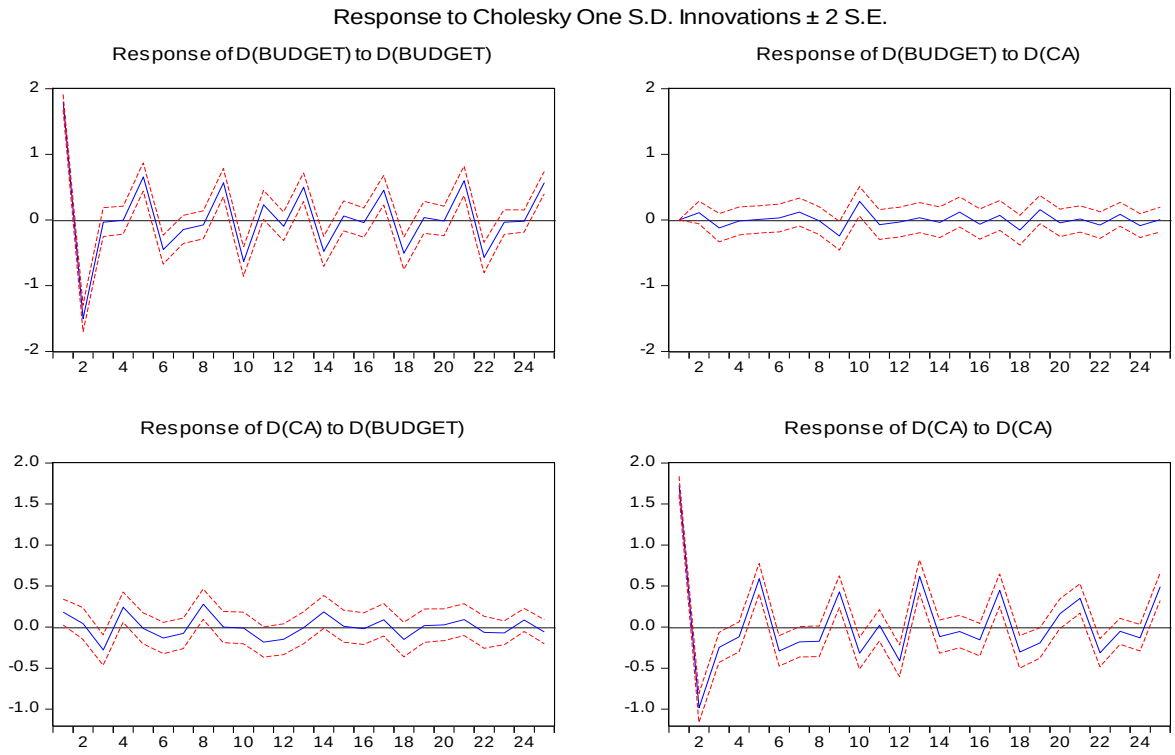
Lag structure

We choose p (the number of lags) based on final prediction error (FPE), Akaike information criterion (AIC), and sequential modified LR test statistic (each test at 5% level). In our case, the time periods are quarterly data. This may of course show the presence of autocorrelation.

Impulse response function

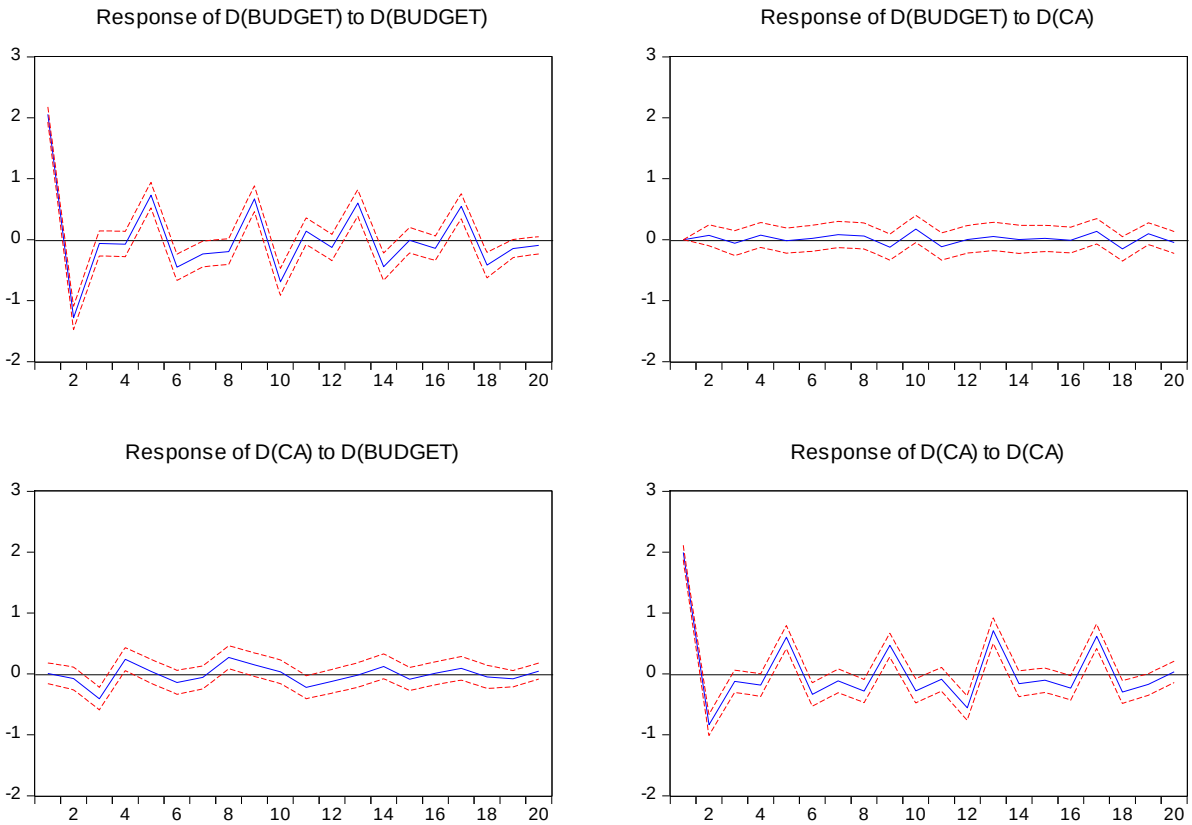
After VAR we ran impulse response function for full sample as well as for "old EU" and "new EU" member states. Since autocorrelation has been detected in the levels we report the impulse response functions based on differenced data.

Figure 1 Impulse response for full sample (2004Q1-2014Q4)



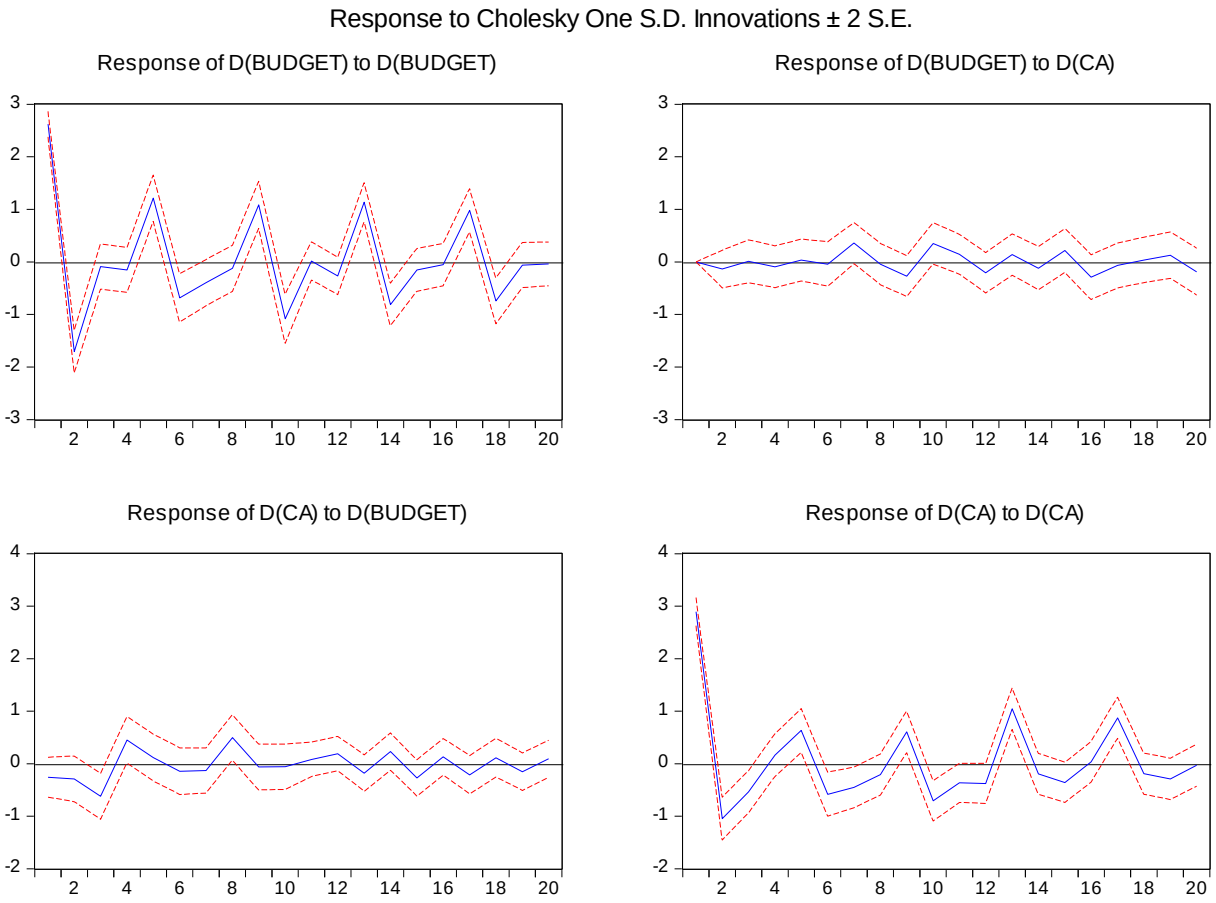
Source: Author's computations

Figure 2 Impulse responses for "Old-EU" (2004Q1-2014Q4)



Source: Author's computations

Figure 3 Impulse responses for "New-EU" (2004Q1-2014Q4)



Source: Author's computations

4 Results

For the full sample, the impulse response functions seem to suggest current account triggers budget deficit, while the impact of current account deficit on current account seems fairly small. This is in line with the results we obtained from a simple granger causality, which indicate the causality runs from current account to budget balance and not the other way around. For both the "old-EU" and "new-EU" the results from granger causality seem to suggest there is a bidirectional causality between budget balance and current account balance, hence confirming the hypothesis of twin deficit. However, the results from the VAR and the corresponding response functions do not confirm the phenomenon of the twin deficit.

The impulse response functions for "old-EU" sample seem to suggest while there is bidirectional causality but the causality that runs from current account to budget balance seems to be slightly stronger. The results seem to be fairly the same for "new-EU" members. However, the responses are stronger compared with "old-EU" group. It is also worth to notice that the responses of both current and budget balances to their own lags are rather shaky and unstable. These results have also been confirmed by previous empirical studies on selected Easter European economies (Ganchev, Stavrova, and Tsenkov, 2012). We also present (see the appendix) a show case of two countries (Slovakia and Germany) with different dynamics of current and budget balances. While the granger causality test in both cases suggests bidirectional causality between the two variables, the results from the VAR model are far from being certain.

Nonetheless, there is some work to be done regarding the time series properties of the data that include autocorrelation, seasonality and additional explanatory variables, which may potentially yield better results.

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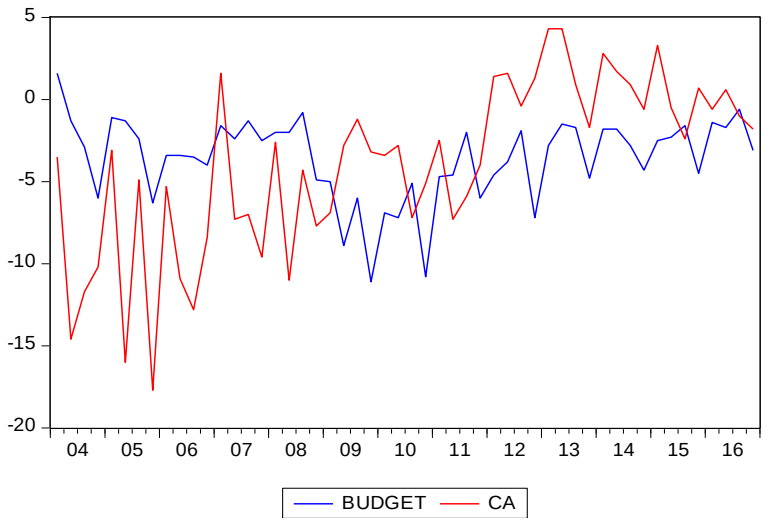
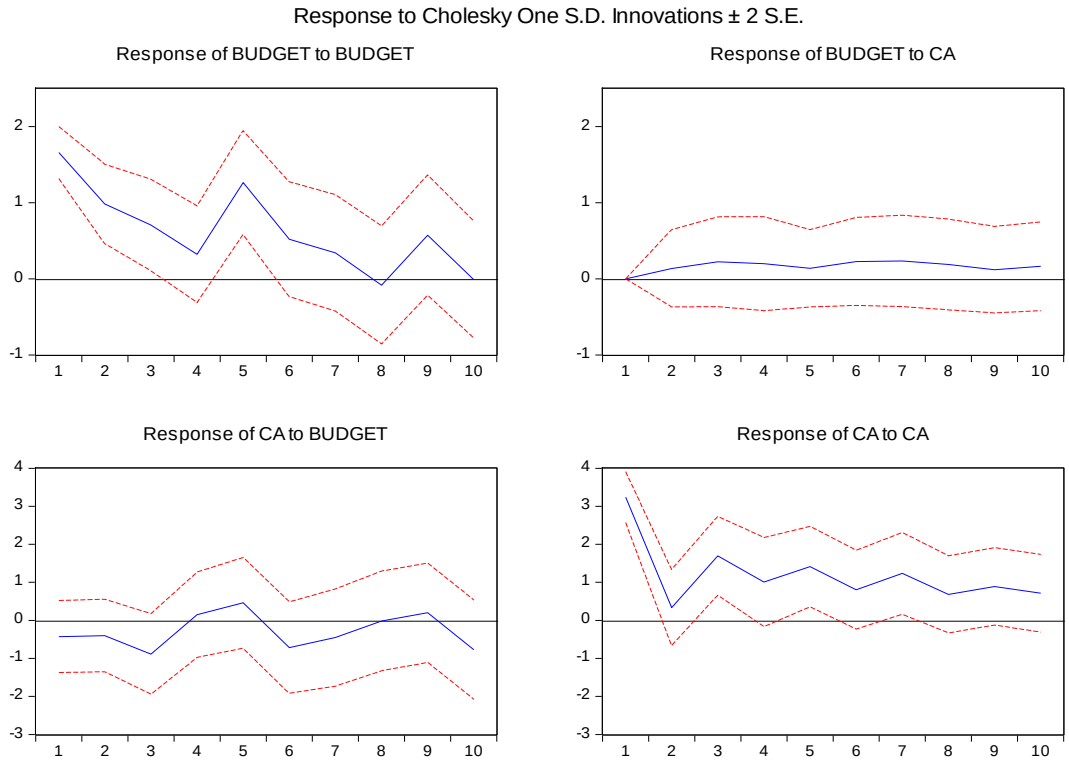
Appendix

A sow case: two economies with different dynamics of budget and current account balances.

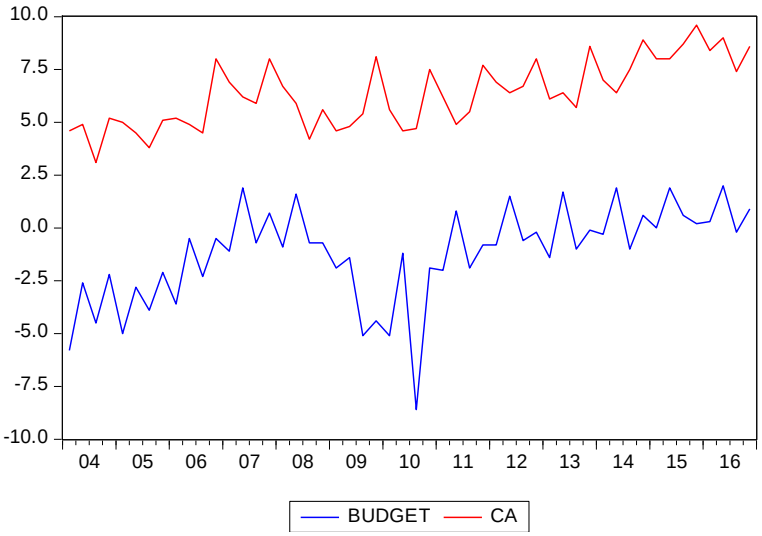
Figure 4 Slovak Republic



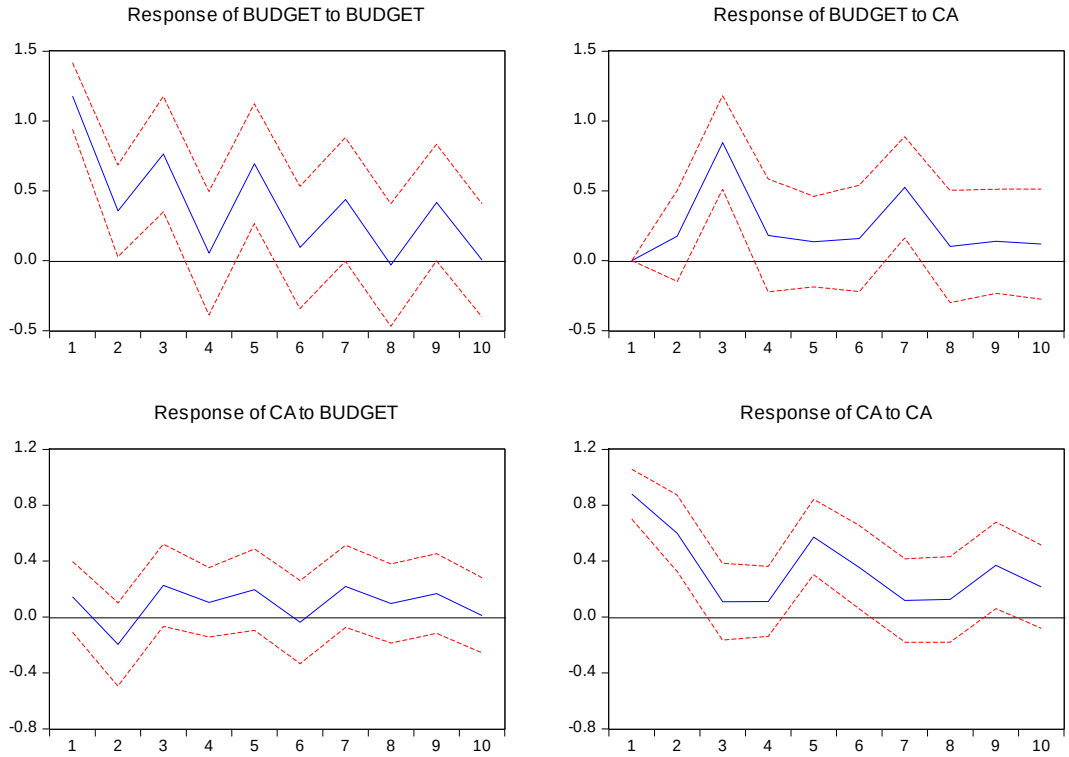


Source: author's computations

Figure 5 Germany



Response to Cholesky One S.D. Innovations ± 2 S.E.



Source: author's computations

Identifying and Managing Construction Risks in the Public Sector

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Abstract: *The paper aims to outline some issues related to risk identification in implementation of investment projects in the public sector, with the focus on distribution of risk in projects carried out under public-private partnerships (PPP). In particular, it is an attempt to find out which types of risks Polish public investors are exposed to when performing construction undertakings, as the right identification of construction risk is a prerequisite for sound management when conducting public investment projects. The paper contains a review of scholarly literature.*

Keywords: construction, risk management, public projects, public-private partnership, public sector

JEL codes: D81, H4, L7, P35

1 Introduction

Both in theory and in practice, risk in the construction industry should be regarded not only as a strictly technical category (industry-specific risk profile), but also as an economic and legal category. The cross-disciplinary character of the construction risk makes it difficult to come up with one explicit definition. Such attempts, however, have been made in the scholarly literature by a number of authors: Burtonshaw-Gunn (2009), Smith et al. (2007), Walker and Greenwood (2002), Weatherhead et al. (2005), Holland (2006), Sklar (2007), Saporita (2006), Hickman (2002), Tworek (2012), Tworek (2009), Boussabaine and Kirkham (2004), Revere (2003), Tworek (2014), Tworek and Myrczek (2015), Tworek (2013), Dallas (2006), Tworek (2010b). When it comes to investment projects in the public sector, it should be noted that there are four basic subcategories of risk, namely the risk of time, price, quality and safety (Walewski et al. 2003; Schieg, 2007; Cristóbal, 2009; Tworek, 2012). It is also important not to ignore other subcategories of the construction risk, including the political risk (Tworek, 2015) and, most of all, the legal risk (Hickman, 2002), which is closely related to the regulations governing public procurement contracts (Act, 2015). All these types of risk make up an overall picture of risk exposure in the construction industry and should be properly managed, with the use of specific methods, techniques and tools (Tworek, 2012). Another important thing is that the construction risk tends to be perceived differently by different actors involved in investment and construction process, such as a public investor, a contractor, an architect as well as other participants, e.g. a bank which finances a project. Therefore, there is a need for complete integration of construction project participants as only such an approach is likely to ensure effective management of risk, on one hand, and of the entire investment process, on the other hand. In practical terms this is particularly important when performing projects under public-private partnerships (PPP), which „(...) may be defined as an undertaking of public benefit, carried out by cooperating private and public entities, with combined institutional and capital involvement and more or less joint division of risk to be faced in and gains to be generated from this undertaking" (Moszoro, 2005). The distribution of risk is emphasized in the Polish legal regulations (Act, 2009) which apply to public-private partnerships (Adamek-Hyska and Tworek, 2010). Under the Polish law, the subject of public-private

partnership is joint execution of a project, based on the distribution of tasks and risks between the public entity and the private partner (Adamek-Hyska and Tworek, 2010).

Therefore, the paper aims to outline some issues related to risk identification in implementation of investment projects in the public sector, with the focus on distribution of risk in projects carried out under public-private partnerships (PPP). In particular, it is an attempt to find out which types of risks Polish public investors are exposed to when performing construction projects. These issues have become particularly relevant in Poland due to the fact that a number of projects have been carried out under such partnerships over the last few years. This form of cooperation in investment and construction processes, however, has been popular worldwide for many years now and widely discussed in the literature on the subject: Moszoro (2005), Adamek-Hyska and Tworek (2010), Yescombe (2007), Akintoye et al. (2003), Pretorium et al. (2008), Regan (2011), Ke et al. (2010), Korbus and Strawiński (2006). At present China is undoubtedly a leader in this area as they have carried out huge and numerous investment projects in the public sector. The significance of this topic also results from the fact that one of the main reasons behind decisions to execute projects in this way is the diversification of risk. Appropriate risk identification is a prerequisite for effective management of public investment projects and the paper attempts to present a synthetic outline of the selected issues in the field.

2 Methodology and Data

This paper is part of a research project entitled: „Risk in public management. Stage I and stage II (scientific potential 2016-2017). The project is carried out by the Department of Public Management and Social Sciences, the University of Economics in Katowice, Poland, with Piotr Tworek, Ph.D., as the project leader.

3 Results and Discussion

Due to numerous investment projects performed in the public sector in Poland in the years of 2004-2016 (Tworek, 2011) „(...) some attempts have been made in order to establish the legal framework for risks which occur when projects are executed under Public-Private Partnerships (PPPs) (Tworek, 2013). The Regulation of the Minister of Economy, dated 21 June 2006, on risks related to projects executed under public-private partnerships (Regulation, 2006) was published to specify the types of risks which have to be taken into account by the public investor, as well as the private partner, when performing an investment project" (Tworek, 2013). In practical project management the following types of risk have to be considered: „(...) risks related to the construction (a risk resulting in a change in construction costs and deadlines, alteration or extension within the scope of the project, operation of assets which have already been put in use and, in particular, the risks of: a delay in completion of construction works, in compliance with the conditions specified in work completion standards, a rise in costs, inconsistencies in the specification for the selection of a private partner, the impact of external factors, solutions in project documents which are not fit for purpose, the emergence or the use of new technologies in the project, occurrence of physical or legal faults which adversely affect the value or usefulness of an asset); risks related to availability (the method, quality or quantity of services provided under a public-private partnership contract and, in particular, the risk related to: inability to deliver the contracted volume of services, inability to provide services of a specific quality, a lack of compliance with safety standards or any other industrial standards, a rise in costs, the method and quality of work performed in order to deliver services, inappropriate qualifications of workforce, availability and quality of funds or assets needed to execute the project, occurrence of technological changes); risks related to the demand (a change in demand for specific services, in particular the risk related to: the emergence of competition, cyclical demand, a change in prices, the use of obsolete technologies, the appearance of new market trends); risks related to the project preparation (costs and

duration of a bidding process and, in particular, the risk related to: availability of information about a planned project, the introduction of changes to the specification for selection of a private partner, the method and quality of the selection procedure, a decision to abandon a project); the market risk related to the availability of funds for the project execution (the risk which affects the cost, amount, quality and timing of funds provided in order to finance the project and, in particular, the risk related to: inability to acquire the specific amount of funds, the inability to acquire funds by specific deadlines, changes in prices, due to the emergence of competition, due to logistics, due to the labour market); the political risk (a risk of changes in politics, which affect the undertakings carried out under public-private partnership); the legislative risk (a risk of changes to legal regulations, which may affect the undertakings carried out under public-private partnership); the macroeconomic risk (the risk which affects the economic situation and, in particular, the risk related to: inflation, changes in interest rates, exchange rates or demographics, the pace of economic growth); the regulatory risk (the risk of changes in regulations applicable to systems of payments for a given type of public services, which may affect the project costs or lead to some changes in the scope of rights and obligations of the parties involved in the project); the risk related to return on investment (the risk which may affect the level of revenues to be generated from the investment project and, in particular, the risk related to: the compensation system of the private partner under the project, changes to the valid pricing mechanism, changes due to the implementation of a payment collection mechanism under the project); the risk of force majeure; the risk connected with resolution of disputes (the risk which may affect the manner and effectiveness of resolution of a dispute on the execution of a contract under the public-private partnership); the environmental risk (the risk leading to an obligation to take actions in order to improve the condition of the natural environment before the commencement of an investment project or the risk of the project having adverse impact on the natural environment); the project location risk (the risk which may affect the accessibility of the area on which the project is to be executed and, in particular, the risk connected with the legal status of the real property, archaeological discoveries or any other discoveries connected with the cultural heritage, due to the existing infrastructure, availability of workforce); the risk connected with transfer of assets (the risk which may affect the conditions and deadlines for the transfer of assets under the project and, in particular, the risk related to: the condition of assets before the transfer, flow of information on assets involved in the project, the performance of obligations and the exercise of rights related to the transfer, receivables or any other right attached to a given asset, the need to transfer the workforce); the risk connected with the final value of assets (the risk related to the value of tangible assets at the time of completion of the public-private partnership); the risk connected with a lack of social acceptance (the risk of protests and opposition from local communities, in particular, when implementing and executing infrastructural projects under the public-private partnership)" (Regulation, 2006). These are the types of risks which are most common in the Polish construction industry and may be a starting point for the development of an effective risk identification tool in public projects, e.g. a checklist. This risk identification method, however, seems not to be so popular in the Polish construction industry. The results of the empirical research show that only 7% of the largest Polish constructors take advantage of a checklist when identifying risk (Tworek, 2010a). Also, only 7% of respondents use a public debate in their practical activities (Tworek, 2010a). The best results in identification of potential risk sources are obtained from actual inspections on construction sites (18% of respondents) and an interview with key project participants (48% of respondents) (Tworek, 2010a). It should be noted here that due to another amendment to the Polish construction law, the Regulation referred to above is no longer valid. Nonetheless, public investors still use the taxonomy of risks proposed there. The empirical results given in Table 1 below show what this issue looks like in the construction sector in China.

Table 1 Risk Allocation in China's Public-Private Partnership (PPP) Projects

Case no. /Risk	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Change in law	×		×											×		
Permits and approvals				×												
Political decisions				×			×				×					
Public protests				×												
Indecisive government	×	×			×	×	×		×	×	×				×	
Force Majeure	×				×											
Financial risk					×											
Insufficient funding						×		×				×				×
Competition								×	×			×				×
Risk related to utilities on the construction site													×			
Changing demand								×	×	×		×				×
Change in customs duties										×						
Corruption															×	

Case 1	Jiangsu wastewater treatment plant
Case 2	Changchun Huijin wastewater treatment plant
Case 3	Shanghai Dacheng basin
Case 4	Beijing basin no.10
Case 5	Hunan power plant
Case 6	Tianjin Shuanggang garbage burning plant
Case 7	Quingdao Veolia wastewater treatment plant
Case 8	Hangzhou Bay bridge
Case 9	Fujian Xinyuan Minjiang bridge no. 4
Case 10	Shandong Zhonghua power plant
Case 11	Chinese – French Basin of Guangdong Lianjiang
Case 12	Fujian Quanzhou Citong bridge
Case 13	Wuhan Tangshunhu wastewater treatment plant
Case 14	Shanghai Yan'an (E) tunnel
Case 15	Shenyang basin no. 9
Case 16	Pekin Jingtong dual carriageway

Source: Ke et al. (2010)

As can be seen above, Table 1 presents sixteen infrastructural projects carried out in China, covered by the research, with the most significant types of risks which occurred during their execution (Tworek, 2013). In Poland this problem looks quite similar. In the Polish construction sector as many as 76% largest contractors experience difficulties in keeping a healthy cash flow balance (Tworek, 2012). The empirical research shows that the risk contractors most frequently face is the one related to the financing of their construction project (Tworek, 2012). This is largely about the problems of public and private investors to make payments in due time. The problems with organisation of the project execution are faced by 16% of respondents and 12.5% of them pointed out to the risk of acts of god (force majeure risk) (Tworek, 2012). It should be added that according to the Guidelines of the European Commission, the basic types of risks under PPP can be divided into the following groups: firstly, the income risk; secondly, the risk connected with the selection of a private partner; thirdly, the risk of construction works; fourthly, the exchange risk; fifthly, the risk connected with correct performance of

contracts and public regulation of public-private projects; sixthly, the political risk; seventhly, the risk connected with the need to meet environmental requirements; eighthly, a risk of hidden defects; ninthly, the risk of (a lack of) public acceptance; tenthly, the risk of a loss of public control over provision of services; eleventhly, the risk of hidden protectionism (Korbus and Strawiński, 2006). This issue is illustrated in Table 2.

Table 2 Risk Allocation between PPP (Public-Private Partnership) parties in countries in the EU including Poland

Types of risk	Risk allocation		
	Public entity	Private partner	Joint
Project development risk	×		
Construction planning risk		×	
Social acceptance risk	×		
Project location risk	×		
Accessibility risk		×	
Demand risk		×	
Environmental risk	×		
Dispute resolution risk			×
Force majeure risk			×*
Regulatory risk		×	
Macroeconomic risk		×	
Political risk		×	
Market risk		×	
Financial risk		×	
Legislative risk	×		
Construction risk		×	
Revenue risk		×	
Service provision management risk		×	
Post-cooperation infrastructure quality risk	×		
Final asset value risk			×

* *PPP parties tend to transfer this type of risk onto an insurer*

Source: Korbus (2005)

The European Commission, when describing the risk of public acceptance, gives a number of examples of projects disrupted due to a lack of public acceptance (Adamek-Hyska and Tworek, 2010). Such a risk is often linked to payment of compensation by public authorities which, in turn, reduces the budget and badly affects the positive image of a public-private partnership (Adamek-Hyska and Tworek, 2010). In Poland the usual consequence is litigation.

4 Conclusions

Risk in the construction sector has its own unique profile (Tworek, 2010b). In particular, it is related to the execution stage of civil engineering, water and specialised construction projects. However, the risk management process – to be effective and run smoothly – must start with correct identification of risk (Tworek, 2016). Any mistakes made at this stage of the risk management process may lead to subsequent errors in risk assessment and, consequently, incorrect selection of methods or risk responses (Tworek, 2013). Therefore, public investors first need to be able to identify potential risks in order to commence the execution of a public project. In particular, risks on the part of the

construction project investor comprise, first of all, „(...) the investor's risk from an architect, secondly, the investor's risk from the contractor, i.e. the risk connected with a stage in the construction process and resulting in a change in costs and deadlines for the project execution (e.g. a risk of a delay in completion of construction work, inconsistency between performed work and established standards, a rise in construction costs), a risk of an insufficiently precise contract; thirdly, the investor's risk from the project location; fourthly, a risk arising out of the investor's business activities; fifthly, the force majeure risk; sixthly, the investor's risk from third parties' activities (e.g. a risk of an absence of social acceptance, protests and resistance of local communities during the implementation and execution of an investment project); seventhly, the political risk, the legal risk and the country risk (e.g. in the area of politics, e.g. a risk of changes in politics, which affect the undertakings of a specific type, changes in legal regulations); eighthly, the investor's financial risk (e.g. payment backlogs), the macroeconomic risk, which affects the economic situation (e.g. the risk of inflation, changes in interest rates, exchange rates, the risk related to planned revenues from the undertaking; ninthly, the investor's technical risk (e.g. a risk of insufficient control over the quality of and the progress in works); tenthly, other types of the investor's risks (e.g. a risk related to resolution of disputes on the execution of a contract for construction works, the risk related to the condition of natural environment, leading to an obligation to take actions in order to improve the condition of the natural environment before the commencement of an investment project or the risk of the project having adverse impact on the natural environment)" (Grzyl and Apollo, 2011). To protect oneself against such risks, the public investor may arrange insurance. According to the empirical research conducted in this respect in Poland, only 11.8% of the largest construction and assembly companies claim that in their experience insurance for investment projects is mainly arranged by investors (Tworek, 2013). In Poland contractors who would like to win contracts in tender procedures often have to include the construction insurance cost in their quotations, as required by public investors (Tworek, 2013). The investment and construction market in Poland is currently the (public and private) investor's market, more than the contractor's one. Summing up, no matter how risk is understood and defined in the construction sector, in practical project management attention should be paid to three most essential facts: firstly, there is a variety of risk identification methods which may be freely chosen and applied by the public investor, depending on a situation and their needs; secondly, risk identification methods have their advantages and disadvantages; thirdly, different methods bring different effects (Tworek, 2010b). Risk identification is the first and most important stage in the entire risk management process (Tworek, 2016). It would be advisable to use the methods which are available in international risk management standards in order to identify risks in public project management in an effective manner (Tworek, 2013). The main benefit offered by the methods derived from the standards is their universal character.

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Healthcare benefits: luxury or necessity goods? EU countries case revisited

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Abstract: *The aim of presented research is to analyse, whether healthcare services are luxury or necessity goods, taking into account several differences (income, healthcare's financing system) between European countries. We have posed the following hypotheses: (H1): the character of healthcare services is affected by the level of national income; (H2): the character of healthcare services is affected by the model of healthcare financing. We have employed data coming from 28 European countries, covering the years 2004-2014. Data were obtained from Eurostat Database and OECD Health Data. Using the LS and WLS methods, we can conclude that: (1) in richer Europeans countries healthcare services are luxury goods; (2) in poorer European countries healthcare services are necessity goods; (3) in countries, where healthcare services are finance based on Beveridge system, healthcare benefits are necessity goods, while (4) in countries, where Bismarck system is employed – healthcare services are luxury goods. We have also found, that both in "poor countries" and "Beveridge countries" subgroup, the reduction of income inequalities, as well as the lowering of the ratio of people at risk of poverty, decrease the level of healthcare spending, while in the subgroup of "rich countries", as well as in "Bismarck countries" this influence is entirely opposite.*

Keywords: healthcare services, healthy life years, income elasticity, demand, luxury good, necessity good

JEL codes: I10, I14, I15

1 Introduction

Health benefits are one of the most important public goods in most states, not only due to some humanitarian motives, but also its influence on economic development. Depending on the adopted model of healthcare financing and the level of socio-economic development, a range of benefits, that are financed, or guaranteed, by the state, would obviously be different, however, with the increasing prosperity of societies, usually improved access to healthcare services can be observed, especially for people with lower economic status. This process is, usually, strongly supported by public bodies, being a part of public health policy. Of course, this intervention is justified, if we consider the healthcare benefits as necessity goods, which, in certain situations (sickness, accident)

citizens must buy, regardless of the current financial situation. If, however, we believe that healthcare is a luxury, whether such intervention is justified?

The aim of this research is to analyse, whether healthcare services are luxury or necessity goods, taking into account several differences (income, healthcare's financing system) between European countries.

It seems, that results presented in the literature are rather consistent. Many authors confirmed, that healthcare services are necessity goods – among them Dreger and Reimers (2005) and Okunade and Suraratdecha (2000), using data form 21 OECD countries, Sen (2005) who analysed 15 OECD countries or Costa-Font, Gemmill and Rubert (2009, 2011) using meta-analysis method. Also Khan (et al., 2016) found, using data from SAARC countries, that healthcare benefits should be assessed as a necessity good, as well as Yavuz, Yilanci and Ozturk (2013) - in the case of Turkey.

On the other hand, based on our first study in this area[24], we concluded, using data from 26 EU countries, covering the years 2004-2014, that healthcare benefits are, in fact, luxury goods for European citizens. This different results, and, actually, quite opposite characteristic of healthcare services encourage us to study this phenomenon more profoundly. We based on Kujawska and Kordalska (2011) observations, who found, using data from 39 European countries, that though, on the level of whole sample healthcare is luxury good, but in countries characterized by lower-than-average income it should be assessed as necessity one. Also Okunade and Suraratdecha (2000) detected important differences between countries. Inspired by observations, presented above, we have posed the following hypotheses:

H1: the character of healthcare services is affected by the level of national income.

H2: the character of healthcare services is affected by the model of healthcare financing.

The hypothesis H1 refers to the assumption, that the level country wealthiness may affect the nature of the health benefits – in poorer countries those kind of services are, with higher probability, the character of necessity good (Kujawska and Kordalska, 2011), (Khan et al., 2016), (Yavuz, Yilanci & Ozturk, 2013).

The hypothesis H2 seems to be the more interesting and innovative, on its grounds there is the assumption, that the nature of the healthcare benefits can derive from the system of healthcare financing (Bem & Michalski, 2015), (Szczygiel, Rutkowska-Podolowska & Michalski, 2015), (Gavurova, Grof & Vagasova, 2017), (Michalski, 2017), (Soltes & Gavurova, 2016).

2 Methodology and Data

A luxury good this is a good, for which demand increases, more than proportionally as income rises, and, while, in the case of a necessity good, demand increases proportionally less than income. That means, that income elasticity for luxury goods is higher than 1, while for necessity goods – should be lower than 1.

The hypotheses require the analysis on national level. We have employed data coming from 28 European countries, covering the years 2004-2014. Data were obtained from Eurostat Database and OECD Health Data.

We have estimated 5 econometric models, using the method of least squares estimation. In order to measure the level of health care expenditure (HCE) we have employed one dependent variable: total health expenditure per capita (THCEPC), while for income, as the main explanatory variable – gross domestic product per capita (GDPPC), due to the fact, that most studies confirmed, that income per capita was the most important

[24] The paper entitled: "Are health care services luxurious goods?" presented during The Annual Conference on Finance and Accounting, ACFA 2017, 26.05.2017

determinant of per capita expenditure on health (Sen, 2005). All variables are expressed in PPP USD.

Apart from GDP, in the study we have employed additional explanatory variables, representing population's state of health and population's socio-economic status. These were: healthy life years, accordingly for men and women (HLYm, HLYf) and health state self-assessment (HSA) for both sexes – in order to measure population's state of health (Ucieklak-Jeż & Bem, 2015 a,b). Population's socio-economic status was described by: the ratio of people at risk of poverty or social exclusion, by age and sex (PRP) and Gini coefficient (GINI), which measure income inequality in societies, by analysing the statistical dispersion of wealth distribution of a nation's residents (Bem, Ucieklak-Jeż, Prędkiewicz, 2014).

In order to verify the H1 hypothesis, we split the research sample, based on GDP per capita, into groups: the group of richer European countries (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland and United Kingdom) and the group of poorer countries (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia). In order to prove the H2 hypothesis, 28 European countries were divided into two groups, representing two main models of healthcare financing: Birmarck's model (Austria, Belgium, Czech Republic, Estonia, France, Netherlands, Lithuania, Luxembourg, Germany, Poland, Slovakia, Slovenia, Hungary, Malta, Romania, Bulgaria) and Beveridge's model (Switzerland, Denmark, Finland, Greece, Spain, Iceland, Latvia, Norway, Portugal, Sweden, Cyprus).

3 Results and Discussion

During the first step of our study, we have confirmed, that income elasticity of demand for healthcare services is higher than 1. We have estimated, that when GDP per capita grows by 1%, healthcare expenditures per capita would grow by 1,15%. That also means, that HCE grows faster than income. It is also interesting, that when Gini coefficient (GINI) rises by 1% - THCEPC grows by 0,14%, and when the ratio of people at risk poverty (PRP) grows by 1% – THCEPC decreases by 0,18% (table 1). Obtained model is well fit and its parameters are highly statistically significant (table 1, table 2, table 3).

Table 1 Estimation of model's parameters for dependent variable THCEPC

	Coefficient	**Standard error**	**t-Student**	**p-value**	
const	-3,51389	0,589297	-5,9629	<0,0001	***
l_HLYf	-0,195708	0,0547714	-3,5732	0,0005	***
l_HLYm	0,241837	0,0656952	3,6812	0,0003	***
l_PRP	-0,180094	0,0482057	-3,7360	0,0003	***
l_GDPPC	1,15257	0,0495496	23,2609	<0,0001	***
l_HSA	-0,322366	0,187212	-1,7219	0,0870	*
l_GINI	0,141781	0,0509739	2,7814	0,0061	***
Austria	0,0606724	0,0157936	3,8416	0,0002	***
Belgium	0,0679269	0,0186975	3,6330	0,0004	***
Croatia	-0,326261	0,0438985	-7,4322	<0,0001	***
Cyprus	-0,238722	0,0315379	-7,5694	<0,0001	***
Denmark	-0,425272	0,0383231	-11,0970	<0,0001	***
Estonia	-0,164831	0,0207459	-7,9452	<0,0001	***
Finland	0,151907	0,0140482	10,8133	<0,0001	***
France	0,120752	0,0235899	5,1188	<0,0001	***
Germany	0,101668	0,033097	3,0718	0,0025	***
Hungary	-0,0957132	0,0293649	-3,2594	0,0014	***

Italy	-0,237465	0,0267252	-8,8854	<0,0001	***
Latvia	-0,250724	0,0312246	-8,0297	<0,0001	***
Lithuania	-0,547589	0,0435472	-12,5746	<0,0001	***
Malta	0,0722404	0,023546	3,0681	0,0025	***
Netherlands	-0,25872	0,032441	-7,9751	<0,0001	***
Norway	-0,191695	0,0190289	-10,0739	<0,0001	***
Portugal	-0,335255	0,0342619	-9,7850	<0,0001	***
Romania	-0,0722059	0,0305209	-2,3658	0,0192	**
Slovakia	-0,12447	0,0325385	-3,8253	0,0002	***
Slovenia	-0,0943117	0,0257411	-3,6639	0,0003	***
Spain	-0,101027	0,0268767	-3,7589	0,0002	***

Table 2 Basic statistics for weighted data

Residual sum of squares	188,1565	Final prediction error	1,077710
Coefficient of determination R-squared	0,994354	Adjusted R-squared	0,993413
F(27, 162)	1056,693	p-value for test F	8,2e-168
Credible interval	-268,6721	Akaike Information Criterion	593,3441
Schwarz'Bayes- Criterion	684,2608	Hannan-Quinn Criterion	630,1731

Table 3 Basic statistics for the original data

Average value of dependent variable	7,544892	Standard deviation of the dependent variable	0,545587
Residual sum of squares	0,516115	Residual standard error	0,056444

In order to verify the H1 hypothesis we have analysed the research sample again, but split into two subgroups: poorer European countries (table 4, table 5, table 6) and richer ones (table 7, table 8, table 9).

Table 4 Estimation of model's parameters for dependent variable THCEPC ("poor countries")

	Coefficient	**Standard error**	**t-Student**	**p-value**	
const	−0,118686	1,2398	−0,0957	0,9241	
l_HLYf	−0,274396	0,100977	−2,7174	0,0089	***
l_HLYm	0,360133	0,130873	2,7518	0,0081	***
l_PRP	−0,387736	0,0793088	−4,8889	<0,0001	***
l_GDPPC	0,87471	0,104124	8,4006	<0,0001	***
Czech Republic	−0,349566	0,0514023	−6,8006	<0,0001	***
Estonia	−0,43798	0,0395827	−11,0649	<0,0001	***
Latvia	−0,164666	0,0314406	−5,2374	<0,0001	***
Lithuania	−0,201959	0,0321422	−6,2833	<0,0001	***
Poland	−0,197306	0,0226819	−8,6988	<0,0001	***
Romania	−0,345978	0,0282413	−12,2508	<0,0001	***
Slovakia	−0,129387	0,037741	−3,4283	0,0012	***

Table 5 Basic statistics for weighted values ("poor countries")

Residual sum of squares	61,66331	Final prediction error	1,078637
Coefficient of determination R-squared	0,979880	Adjusted R-squared	0,975704
F(11, 53)	234,6521	p-value for test F	7,67e-41
Credible interval	−90,51831	Akaike Information Criterion	205,0366
Schwarz'Bayes- Criterion	231,1293	Hannan-Quinn Criterion	215,3318

Table 6 Basic statistics for the original data ("poor countries")

Average value of dependent variable	6,903891	Standard deviation of the dependent variable	0,283189
Residual sum of squares	0,197707	Residual standard error	0,061076

Table 7 Estimation of model's parameters for dependent variable THCEPC ("rich countries")

	Coefficient	**Standard error**	**t-Student**	**p-value**	
const	−4,41397	0,469073	−9,4100	<0,0001	***
l_PRP	0,13879	0,0264079	5,2556	<0,0001	***
l_GDPPC	1,1102	0,0514043	21,5974	<0,0001	***
l_GINI	0,16824	0,0544433	3,0902	0,0025	***
Austria	0,0304037	0,0125863	2,4156	0,0173	**
Cyprus	−0,428497	0,0417333	−10,2675	<0,0001	***
Finland	−0,182163	0,0213467	−8,5336	<0,0001	***
France	0,10617	0,018223	5,8262	<0,0001	***
Germany	0,0803885	0,0201636	3,9868	0,0001	***
Greece	−0,0950958	0,0407757	−2,3322	0,0215	**
Luxembourg	−0,518736	0,0436471	−11,8848	<0,0001	***
Netherlands	0,111373	0,021007	5,3017	<0,0001	***
Portugal	−0,201785	0,0340388	−5,9281	<0,0001	***
Slovenia	−0,0789924	0,0422008	−1,8718	0,0639	*
Spain	−0,141312	0,0287429	−4,9164	<0,0001	***
Sweden	−0,200728	0,0309387	−6,4879	<0,0001	***
Portugal	−0,0702446	0,0152002	−4,6213	<0,0001	***

Table 8 Basic statistics for weighted data ("rich countries")

Residual sum of squares	122,8309	Final prediction error	1,051943
Coefficient of determination R-squared	0,974068	Adjusted R-squared	0,970330
F(16, 111)	260,5848	p-value for test F	4,05e-80
Credible interval	−178,9860	Akaike Information Criterion	391,9719
Schwarz'Bayes- Criterion	440,4564	Hannan-Quinn Criterion	411,6714

Table 9 Basic statistics for the original data ("rich countries")

Average value of dependent variable	7,883520	Standard deviation of the dependent variable	0,290661
Residual sum of squares	0,313087	Residual standard error	0,053109

We have find, the income elasticity of demand for healthcare services is quite different. While in "rich countries" the growth of GDP by 1% stimulates the growth of THCEPC by 1,11%, in the group of "poor countries" the strength of this influence is significantly lower – THCEPC would grow only by 0,87%. That allow us to adopt the H1 hypothesis – we can not only confirm the important difference but also conclude, that income elasticity in poorer countries is lower than 1, while in richer ones – higher than 1.

Additionally in "poor countries" the growth of PDP stimulates more noticeably the decrease of THCEPC than on the level of the whole research group (0,38% comparing to 0,18%). In the group of "rich countries" the direction of relationship between PRP and THCEPC, as well as between GINI and THCEPC is opposite.

In order to verify the H2 hypothesis, we have analysed the research sample once again, but split into another two subgroups: countries where the healthcare financing system bases on Bismarck model (table 10, table 11, table 12) and countries which employed Beveridge system (table 13, table 14, table 15).

Table 10 Estimation of model's parameters for dependent variable THCEPC (Bismarck model)

	Coefficient	**Standard error**	**t-Student**	**p-value**	
const	-4,05277	0,587352	-6,9001	<0,0001	***
l_GINI	-0,483709	0,0926897	-5,2186	<0,0001	***
l_HSA	1,34323	0,300316	4,4727	<0,0001	***
l_HLYf	-0,332083	0,133919	-2,4797	0,0146	**
l_HLYm	0,44415	0,165967	2,6761	0,0085	***
l_GDPPC	1,12094	0,0409019	27,4054	<0,0001	***

Table 11 Basic statistics for weighted values (Bismarck model)

Residual sum of squares	94,37547	Final prediction error	0,909865
Coefficient of determination R-squared	0,974448	Adjusted R-squared	0,973327
F(5, 114)	869,5020	p-value for test F	5,38e-89
Credible interval	-155,8600	Akaike Information Criterion	323,7200
Schwarz'Bayes- Criterion	340,4449	Hannan-Quinn Criterion	330,5121

Table 12 Basic statistics for the original data (Bismarck model)

Average value of dependent variable	7,480404	Standard deviation of the dependent variable	0,612326
Residual sum of squares	4,691359	Residual standard error	0,202860

We have found, that in countries where the healthcare system in financed based on the Beveridge model the growth of GDP by 1% cause the increase of THCEPC by 0,99%, while in the countries, where the Bismarck model is employed – the same growth of GDP stimulate the growth of THCEPC by 1,12%. That allow us to adopt the H2 hypothesis – we can conclude that the system of healthcare financing influence significantly the character of healthcare services. We can also observe that the patterns for others models' parameters in Beveridge are closer to the group of "poor countries" while, in the case of Bismarck countries – rather like in "richer countries".

Table 13 Estimation of model's parameters for dependent variable THCEPC (Beveridge model)

	Coefficient	Standard error	t-Student	p-value	
const	−3,73503	0,975647	−3,8283	0,0003	***
l_GINI	0,486149	0,141538	3,4348	0,0010	***
l_HLYm	0,206312	0,0483819	4,2643	<0,0001	***
l_ PRP	−0,253954	0,0837921	−3,0308	0,0035	***
l_ GDPPC	0,991986	0,0794519	12,4854	<0,0001	***

Table 14 Basic statistics for weighted values (Beveridge model)

Residual sum of squares	64,66831	Final prediction error	0,997445
Coefficient of determination R-squared	0,930666	Adjusted R-squared	0,926400
F(4, 65)	218,1236	p-value for test F	6,69e-37
Credible interval	−96,55286	Akaike Information Criterion	203,1057
Schwarz'Bayes- Criterion	214,3482	Hannan-Quinn Criterion	207,5714

Table 15 Basic statistics for the original data (Beveridge model)

Average value of dependent variable	7,655442	Standard deviation of the dependent variable	0,386097
Residual sum of squares	0,952929	Residual standard error	0,121080

Research results have confirmed, that health services, in the countries of the European Union, at least in analysed period and on the level of the whole sample, were luxury goods – along with increasing wealth, the share of spending on health increases. Our results are consistent with observations of Getzen (2000), who, using meta-analysis confirmed that at macro-level health services are luxurious good. On the other hand, we have fully confirmed Kujawska and Kordalska (2011) findings, who found, that that overall income elasticity in UE countries is higher than one, while for poorer countries – is lower than 1. There have been a number of studies which suggest, that material status affects a health state and overall well-being. Health issues has many personal or idiosyncratic emotional and lifestyle ramification (Ortenburger et al., 2017; Ortenburger et al., 2017; Wąsik et al., 2016; Szerla et al., 2017). Poverty has many faces.

When taking into consideration only the group of poorer countries, our findings are consistent with previous research, which identified healthcare services as necessity goods (Dreger & Reimers, 2005), (Okunade & Suraratdecha, 2000), (Sen, 2005), (Costa-Font, Gemmill & Rubert, 2009), (Costa-Font, Gemmill & Rubert, 2011), (Khan et al., 2016) (Yavuz, Yilanci & Ozturk, 2013).

4 Conclusions

Our study suggest, that in richer countries healthcare services are luxury good – when income grows more prosperous societies seem to spend higher part of wealth on healthcare benefits. In poorer European societies healthcare services have still a character of a necessity good – when income grows the ratio of healthcare spending to total spending should be lower. We can also observe, that, generally, the reduction of income inequalities causes the increase in expenditure on health. On the other hand when the ratio of people at risk of poverty and social exclusion grows, the volume of expenditure on healthcare benefits decrease, because fewer people can afford to buy them. These dependencies are visible at the level of the total sample and in the group of poorer countries. It is very interesting, that in the group of richer countries, both the increase of income inequalities and the ratio of people at risk of poverty stimulate the

growth of healthcare spending. This phenomenon definitely requires further studies, which would include also sources of financing.

The most important findings concern the different patterns of healthcare demand in different financing models. We can confirmed, that in the Beveridge system healthcare services should by assessed as necessity goods – while wealth increase societies set lower part of income apart for healthcare benefits. As in the group of poorer countries the reduction of income inequalities, as well as the lowering of the ratio of people at risk of poverty, decrease the level of healthcare spending. In this especially important, because in from group (Switzerland, Denmark, Finland, Greece, Spain, Iceland, Latvia, Norway, Portugal, Sweden, Cyprus) only Latvia is a part of the "poor country" subgroup.

The analyses of "Bismarck" subgroup (Austria, Belgium, Czech Republic, Estonia, France, Netherlands, Lithuania, Luxembourg, Germany, Poland, Slovakia, Slovenia, Hungary, Malta, Romania, Bulgaria), although the different level of GDP in this group, leads to quite opposite findings. In this countries healthcare services should be perceived as luxury goods and the redistribution process rather stimulate the growth of healthcare spending. This might suggest, that the construction of the healthcare financing system is much more important predictor, than the level of national income.

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Performance of Czech hospitals: comparison with ideal solution

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Abstract: *Healthcare system is in general considered as an important consumer of state expenses. Therefore the attention should be paid to its performance. For modelling the financial situation, models predicting financial distress are frequently used. They are usually based on monitoring financial indicators. Specific area of health care consists of hospitals that can have various legal forms. In the paper, we compare selected hospitals based on The Technique for Order Preference by familiarity to Ideal Solution (TOPSIS). The aim of the paper is to create list of hospitals ranked according to their performance. Additionally, we aim to identify if, how and why the position of hospitals changed in consecutive years. In the paper we consider data from the Czech Republic. Based on the analysis we can read if some strong differences exist in performance of hospitals. Results can eventually help the hospital management in looking for improvements in the process of decision making.*

Keywords: hospitals, performance, TOPSIS

JEL Classification: I11, C6

1 Introduction

Financial health assessment is carried out in all businesses. An atypical example of businesses are hospitals, which, due to their nature, are classified into the non-profit sector. From the point of view of the chosen legal form, they can be business entities. Maximum use of inputs leads to desirable outputs. The diagnosis of financial health is carried out regularly in enterprises and the interest is mainly on the companies themselves through the adoption of managerial decisions leading to the achievement of the stated goals. Financial management requires a correct decision and a decision taken at the right time. This is done by financial analysis tools, whose outputs can be used to set the performance management. The performance of the company is well described in both Czech and foreign literature (Fibírová and Šoljaková, 2005; Frolick and Ariyachandra, 2006).

Performance management is a continuous process that leads to increasing performance within an organization (Wagner, 2009). The issue can lie in a way of measuring performance. According to Aguinis (2011), the systems are exclusively evaluated and the result is not incorporated into the management strategy, the findings are not realized. If the enterprise wants to effectively manage its performance, it must have a defined model of management, parameters, indicators and performance goals it wants to achieve (Mitáček, 2015). The best-known method of enterprise performance management is the Balanced Scorecard (Kaplan and Norton, 1996), which evenly decomposes goals and measures into four aspects: financial, customer, internal processes and learning and growth.

The aim of the paper is to create list of hospitals ranked according to their performance. Additionally, we aim to identify if, how and why the position of hospitals changed in consecutive years.

2 Methodology and Data

Data from hospitals for the period 2012-2015 were used to perform the analysis. The data matrix was filled with secondary data that was obtained from the annual hospital reports found on hospital websites and financial statements (MFČR, 2017). Due to the preservation of the breadth of data collection in the time series, the number of data obtained from all hospitals were not complete in all analysed years. Out of the 90 original hospitals from which financial data were collected in various years, complete data was collected from 29 hospitals, which stands for 32 % of the potential hospital sample and 15.4 % of the total number of hospitals in the Czech Republic. There are 188 hospitals in the Czech Republic since 2012. In 2012-2013, there were 188. The number increased to 189 in 2014 and to 187 hospitals in 2015 (ÚZIS, 2017).

First of all, the individual balance sheet and income statement items were collected:

EBIT, Sales, Net Profit, Depreciation, Total debt, Total Assets, Employee benefit expense

Several financial indicators characterizing profitability and indebtedness (Table 1) were designed and analyzed to find out the results. The selection of indicators is based on previous research (Hajdíková and Pevná, 2014). Authors dealing with the use of financial indicators most often use the EBIT and EAT indicators. Hospitals mostly report the positive EBITDA and their EBIT is often negative. The use of the ROS indicator was considered because the analyzed hospitals are working in different legal and organizational forms and this indicator differs for businesses with different activities. Taking into account the analyzes performed, this indicator was included in the analysis. In the final selection, the included payroll productivity indicator is significant because personnel costs are the main cost category in the hospital sector. When choosing the leverage ratio and monitoring the hospital's debt, it was decided to use the measurement of the level of short-term and long-term debt (Hajdíková, 2016).

Table 1 Overview of surveyed indicators

Indicator	Meaning	Description
U1	EBIT/operating income	The impact of the cost structure (ROS)
U2	Net profit + depreciation / total debt	EAT to total debts
U3	Operating income (sales) / total assets	Activity indicator
U4	Cost of employee benefits / operating income (sales)	Wage productivity

Source: own processing

Subsequently, the research problem was analyzed using the TOPSIS method (Hwang, C.L., Yoon, K., 1981).

The TOPSIS method is used for creating the rank list of hospitals according to their performance. The principle of the TOPSIS method is to arrange the alternatives (e.g. hospitals) in relation to their distance from the ideal and basal alternative (see e.g. Fiala, 2008). The method results from the criterion matrix $Y = y_{ij}$ that represents evaluations of alternatives *i* according to criteria *j*.

To ensure the comparability of the data in matrix it needs to be normalized - values in the normalized criterion matrix R correspond to the relation

$$r_{ij} = \frac{y_{ij}}{\sqrt{\sum_{i=1}^{p} (y_{ij})^2}} \qquad (1)$$

where $i = 1, 2, \ldots, p$ and $j = 1, 2, \ldots, k$. By multiplying each column of R by corresponding weight of criterion (v_j) the weighted criterion matrix W is created (based on formula $w_{ij} = r_{ij} \cdot v_j$).

Then both ideal and basal solutions can be identified. For the ideal solution $A = (A_1, A_2, \dots, A_k)$ it holds that $A_j = max_i(w_{ij})$ in case of benefit criteria and $A_j = min_i(w_{ij})$ in case of cost criteria, where $j = 1, 2, \dots, k$. The basal solution $B = (B_1, B_2, \dots, B_k)$ is identified according to $B_j = min_i(w_{ij})$ for benefit criteria and $B_j = max(w_{ij})$ for cost criteria, where $j = 1, 2, \dots, k$.

Distance of alternative from the ideal solution d_i^+ and from basal solution of d_i^- computed by using the Euclidean metric is given by:

$$d_i^+ = \sqrt{\sum_{j=1}^{k}(w_{ij} - A_j)^2}, where\ i = 1, 2, \dots, p \quad (2)$$

$$d_i^- = \sqrt{\sum_{j=1}^{k}(w_{ij} - B_j)^2}, where\ i = 1, 2, \dots, p \quad (3)$$

Relative closeness to the ideal solution is then computed as $c_i = \frac{d_i^-}{d_i^+ + d_i^-}$, where $i = 1, 2, \dots, p$. The higher the closeness, the better the alternative.

3 Results and Discussion

In order to achieve the objective of this paper, calculations of the selected indicators were carried out in all the analyzed years (2012-2015) for a selected sample of hospitals. Using the TOPSIS method, optimization is chosen based on the principle of minimizing the distance from the ideal variant (the variant achieving all the best possible criteria) – i.e. maximizing the closeness to the ideal variant, and maximizing the distance from the basal variant (the variant having all the criteria at the lowest stage in all criteria). The more the value of the relative distance indicator is close to zero, the closer is the variant to the basal variant. For values of the indicator approaching one, these values approximate to the ideal variant (see Figure 1).

Figure 1 Relative distance indicator with a graphical interpretation

Hospital	2012	2013	2014	2015	
ALMEDA a.s Neratovice	0,781004507	0,78169161	0,612615905	0,654628475	
Oblastní nemocnice Kolín, a.s.	0,431503261	0,571514413	0,728162454	0,655915249	
Jindřichův Hradec	0,256297062	0,55140925	0,621936583	0,628674152	
České Budějovice	0,328425191	0,61902309	0,705679498	0,676437666	
nemocnice Český Krumlov	0,314434863	0,623182946	0,648671492	0,396992546	
Prachatice	0,317137941	0,623430518	0,653504115	0,635545777	
Strakonice	0,266514336	0,505916864	0,608404097	0,624448368	
Tábor	0,312945395	0,598885978	0,648385867	0,643154241	
Domažlická nemocnice, a.s.	0,307220935	0,462431767	0,619440874	0,661345962	
Klatovská nemocnice, a.s	0,257104912	0,562173818	0,67854933	0,64342794	
Nemocnice následné péče LDN Horažďovice, s.r.o.	0,291203913	0,673527731	0,647472147	0,644255954	
Nemocnice Sušice o.p.s.	0,338818182	0,452082674	0,212202045	0,508480342	
Rokycanská nemocnice, a.s.	0,32135802	0,643015848	0,59143429	0,640422273	
Stodská nemocnice, a.s	0,301281874	0,62999361	0,595294583	0,571044961	
Nemocnice Kadaň s.r.o	0,324735596	0,15682086	0,64898708	0,75160552	
Česká Lípa	0,127595695	0,256524331	0,624720626	0,668822552	
Hradec Králové	0,332890397	0,61996679	0,628900924	0,615925055	
Jesenická nemocnice	0,340573443	0,538629782	0,675986252	0,681704237	
Fakultní nemocnice Ostrava	0,341266819	0,622049131	0,66354783	0,63173627	
nemocnice Boskovice	0,395502107	0,441123627	0,662184079	0,686387204	
Nemocnice Milosrdných bratří Brno, p.o	0,26052654	0,580832438	0,559906848	0,623356191	
Tišnov p.o	0,174057244	0,384015882	0,450589672	0,4647251	
Městská nemocnice Hustopeče	0,237899174	0,138566393	0,423521094	0,461670808	
Krajská nemocnice T.BATI, a.s.	0,064739814	0,181895694	0,607409261	0,617164621	
Kroměřížská nemocnice a.s.	0,212812578	0,208653363	0,709351252	0,67923892	
Vsetínská nemocnice, a.s.	0,14093439	0,339281862	0,644173691	0,692923043	
nemocnice Havlíčkův Brod, p.o	0,251754444	0,567834685	0,547595085	0,616952257	
nemocnice Jihlava p.o.	0,259865329	0,559823778	0,562101581	0,593620443	
nemocnice Pelhřimov, p.o	0,295744312	0,589231925	0,563821218	0,570111042	

Source: own calculations

After that, comparison of hospitals was done using one of multivariate methods (Kubickova & Jindrichovska, 2015). Namely, a simple sum of a sequence. The results are shown in Table 2. For each criterion (here the relative distance indicators) the organizations are ordered based on a value of particular criterion. The hospital with the best value of given criterion is assigned the first position, the next in order is assigned second position, etc. This is done for all criteria under consideration. After that the assigned values are summed up and it holds that the lower the total sum, the better the result of the hospital.

Table 2 Ranking and overall ranking

Hospital	2012	2013	2014	2015	sum	rank
ALMEDA a.s Neratovice	1	1	18	10	30	3
Oblastní nemocnice Kolín, a. s.	2	13	1	9	25	1
Jindřichův Hradec	22	17	16	17	72	19
České Budějovice	8	9	3	6	26	2
nemocnice Český Krumlov	12	6	10	29	57	14
Prachatice	11	5	8	15	39	7
Strakonice	18	19	19	18	74	20
Tábor	13	10	11	13	47	9

Domažlická nemocnice, a. s.	14	20	17	8	59	16
Klatovská nemocnice, a. s	21	15	4	12	52	13
Nem. násl. péče LDN Horažďovice, s. r. o.	17	2	12	11	42	8
Nemocnice Sušice o. p. s.	6	21	29	26	82	24
Rokycanská nemocnice, a. s.	10	3	22	14	49	11
Stodská nemocnice, a. s.	15	4	21	24	64	17
Nemocnice Kadaň s. r. o	9	28	9	1	47	9
Česká Lípa	28	25	15	7	75	21
Hradec Králové	7	8	14	22	51	12
Jesenická nemocnice	5	18	5	4	32	4
Fakultní nemocnice Ostrava	4	7	6	16	33	5
Nemocnice Boskovice	3	22	7	3	35	6
Nemocnice Milosrdných bratří Brno, p. o.	19	12	25	19	75	21
Tišnov p. o.	26	23	27	27	103	28
Městská nemocnice Hustopeče	24	29	28	28	109	29
Krajská nemocnice T. BATI, a. s.	29	27	20	20	96	27
Kroměřížská nemocnice a. s.	25	26	2	5	58	15
Vsetínská nemocnice, a. s.	27	24	13	2	66	18
Nemocnice Havlíčkův Brod, p. o.	23	14	26	21	84	26
Nemocnice Jihlava p. o.	20	16	24	23	83	25
Nemocnice Pelhřimov, p. o.	16	11	23	25	75	21

Source: own processing

4 Conclusions

The contribution determines the ranking of the examined hospitals from the point of view of financial health according to selected indicators in determining the optimal value for the examined period. The research was conducted on the basis of a secondary data analysis that was collected from the financial statements and internal resources of the hospitals for the period 2012-2015. The TOPSIS method found the optimal value of each examined hospital in years. The development of selected indicators in the time series is presented graphically. Using the ordering method, a unique order of subjects was determined. The first place was the Regional Hospital of Kolín, a. s. The second place was the hospital České Budějovice and third place occupied ALMEDA a. s. Regional Hospital Kolín, a. s. can be considered from the surveyed sample as a hospital with the optimal results. The hospital, as well as ALMEDA a. s. Neratovice, is located in the Central Bohemia Region. České Budějovice Hospital is based in the South Bohemian Region. Most hospitals in the first three positions have legal form a. s. and are owned by the county. In the third hospital, Almeda a. s. Neratovice, the main shareholder is VAMED MEDITERRA a. s. The range of services provided are very similar to the hospitals in Kolín and České Budějovice. The analysed hospitals have basic departments such as surgery, gynecology, ENT, internal medicine departments and others. Significant differences are among the first hospitals in terms of their size, measured by the number of doctors, the number of beds and the number of employees. The largest hospital is the hospital in České Budějovice with 447 doctors, 1190 beds and 2557 employees. The second place is the Kolín Hospital, a. s. with 188 doctors, 663 beds and 1109 employees. Almeda Hospital in Neratovice has 36 doctors, 74 beds and 133 employees. Because only financial ratios have been examined in the paper, it is possible that other quantified data may influence the ranking of hospitals. In further research, it is necessary to focus on

non-financial indicators that can be obtained and expressed quantitatively as well. Possible limitation of performed analysis may also involve assigning the same importance (weights) to the individual financial indicators in TOPSIS. Thus the next step in exploration of the hospital performance contains looking for more suitable weights of given indicators. Further refinement of empirical findings employs the collection of data from a larger sample of hospitals and the extension of research to other time periods.

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Analysis of the Czech state-funded institutions accounting data

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Abstract: *This paper deals with starting points of possible economic analysis carried out within the Czech state-funded institutions. State-funded institutions represent the most frequent organizationally-legal type of accounting units operating in the Czech non-profit sector and dispose of significant financial sources. Their accounting outputs, primarily financial statements, are harmonized and prepared in a unified form from 2011. Statements are a subject to authorization by the founder but not an external audit. The paper concentrates on one type of these units, i.e. the state-funded institutions that are founded by the state, more precisely particular Czech ministries. For purposes of this paper the state-funded institutions were selected according to their prevailing CZ NACE (International classification of economic activities) and further analysed and compared. It seems that financial statements and other supplemental data create suitable database for possible economic analyses. As the main data sources besides scientific articles and relating legal regulations, financial accounting data from the server Monitor administered by the Ministry of Finance of the Czech Republic were used. Description, analysis, comparison, and synthesis of main findings were used as basic scientific methods in the paper.*

Keywords: state-funded institution, contributory institution, financial reporting, state administration

JEL codes: H83, H11, H50

1 Introduction

State-funded institutions (alternatively called contributory organizations) represent economic subjects that operate within the non-profit sector. This sector may be understood as a part of national economy which does not operate primarily to create a profit and which may encompass both public and private organizations (Pestoff, 1995). Non-profit sector in the Czech Republic includes traditionally various organizationally-legal types of subjects, among them also above mentioned state-funded institutions. They may be founded either by the state entities (for example ministries), or municipalities. Founded by the state they usually provide elemental functions such as defence, health care or security for public or individuals. Organizations founded by municipalities then provide rather services for specific region or municipality. General legal framework of the state-funded institutions founded by the state is created by the Act No 219/2000 Coll., on the Property of the Czech Republic and the Representation of the Czech Republic in Legal Relations, as amended. Basic financial principles are regulated by the Act No 218/2000 Coll., on Budgetary Rules and Amendments to Some Related Acts (Budgetary Rules), as amended.

For financial reporting purposes these subjects are included into a group of subjects called in Czech "vybrané účetní jednotky" (selected accounting units) that are obligated to reveal their financial statements in prescribed form from 2011 on regular basis (closely see for example Vodáková, 2012). Before 2010 financial reporting of non-profit organizations varied across organizationally-legal types in the Czech Republic and financial accounting was organized mainly on the cash basis. In 2005 the Czech Republic similarly as other developed countries has decided to shift to the accrual basis also in the non-profit sector. Accounting reform was planned as a part of a complex public finance reform recommended also by European Commission and other international or

supranational subjects. The whole process is known as a new public management (Hood, 1991) that should implement business-like elements to management of the public sector. From the beginning this process had its supporters (Box, 1999, Pina and Torres, 2002, Lüder and Jones, 2003) but also opponents (closely see Carlin, 2005). Nevertheless some academic disputes the process continues till nowadays.

It can be stated the Czech Republic successfully implemented the accrual basis formerly used mainly by businesses also to the public (or non-profit) sector accounting and harmonized accounting rules across various parts of the public (or non-profit) sector till 2010. As a consequence accounting data of various organizationally-legal types of subjects may be comparable and able to consolidate them. An important step forward means also increase of accounting data transparency. Financial reports are published electronically from 2011 also for various analytical purposes. On the other hand some studies suggest that gathering and publishing of accounting data still remain rather an administrative procedure without any wider utilization for managerial purposes (for example Sangers, 2012).

2 Methodology and Data

This paper deals with an attitude to economic analysis of the state-funded institutions that were founded by the state, more specifically particular Czech ministries. The aim of the paper is to examine some starting points and possibilities of economic analysis carried out in the state-funded institutions mainly with accounting outputs utilization.

The paper follows in our former research directed to the state-funded institutions and their accounting data. It was verified that Czech ministries manage 205 state-funded institutions in total at present while character of their activities, subordination, size, property structure, number of employees, location and other factors vary significantly (closely see Vodáková, Krč, 2017). We further examined basic characteristics of units including their prevailing activities. For this purpose we utilized CZ NACE (Classification of Economic Activities) that is compatible with EU NACE and divided all units into relating NACE groups. In this paper we continue in previous research by selecting one specific NACE section, i.e. NACE 86 – medical care because it is the second numerous group with 47 units (almost 23 % of all units across several ministries) so that our findings could be further applicable.

In the first part of the survey we reflect some theoretical starting points as relevance and reliability of input data, homogeneity of examined sample and proper analytical tools. In the second part we analyze and compare several possible economic indicators and their trends, i.e. net income as an example of absolute measure and two key analytical indicators of financial performance (KAU) as relative measures. Reasons are evident: net income represents complex, relevant and easily accessible indicator of economic activities and KAU were recommended by the Government of the Czech Republic as sufficient accounting indicators of performance (MF ČR, 2013). Though from methodological point of view their ability of performance measurement may be debatable construction of KAU is simple, data for computation are easily accessible and information capability of KAU is satisfactory because they reflect important expense groups. In fact they represent simple ratios comparing expenses to number of employees.

KAU1 is constructed as a ratio of salaries and wages to number of employees and it is calculated in mil Czech Crowns per employee per year. As wages and salaries represent one of the most important expense this indicator is definitely weighty. KAU2 is a ratio of controllable operational expenses to number of employees and it is calculated again in mil Czech Crowns per employee and year. As controllable expenses are identified consumption of material, energies, repair and maintenance, travel expenses, services, other operational expenses. In our opinion these ratios may serve as a good starting point of any more sophisticated analyses.

On the base of our former knowledge we formulated following research questions:

- May available accounting and other published outputs serve as a proper source of information for potential economic analyses and comparison within the state-funded institutions?
- What criteria and tools would be beneficial to use as a starting points of potential analyses?
- What are middle-term time trends in development of three selected indicators?

Because of limited extent of the paper and relatively vast and heterogeneous sample of the state-funded institutions the survey was limited to institutions founded and managed by the Ministry of Defense with prevailing activity relating to NACE section 86. Our sample now includes 4 units, i.e. Military university hospital Prague (ÚVN Praha), Military hospital Brno (VN Brno), Military hospital Olomouc (VN Olomouc), and The Institute of aviation medicine, Prague (ÚLZ). Net income and KAU 1 and KAU 2 are analyzed and compared in middle-term time horizon of 5 years (period 2012 – 2016).

In the paper we used description for explanation of previous situation and the current state in the state-funded institutions, analysis and comparison mainly for exploration of used analytical indicators development, and synthesis for summarization of main findings and formulation of recommendation and relating questionable points. As main data sources monographs, scientific papers and relating legal regulations were used. In analytical part of the paper Monitor database administered by the Ministry of Finance of the Czech Republic was used.

3 Results and Discussion

This chapter summarizes main findings of the paper. The first part concentrates on data accessibility, examined sample and possible analytical tools from theoretical point of view. The second part comments current development of selected indicators that may characterize economic activities of the state-funded institutions within 2012 and 2016.

Theoretical starting points of the state-funded institutions analysis

Input data. As it was stated before the state-funded institutions reveal electronically a set of statements on a regular basis. This set includes basic characteristic, financial statements and financial report. Financial statements are prepared either as a full version that includes 5 statements or as a shorten version with 3 statements. Full version is prepared only if the accounting unit accomplishes two criteria, i.e. total assets 40 mil Czech Crowns or higher and total revenue 80 mil Czech Crowns or higher. Criteria must be fulfilled for two subsequent accounting periods. Full version includes statement of financial position, statement of financial performance, notes, cash flow statement, and statement of changes in owner´s equity. Last two statements are not included in shorten version. Financial statements must be prepared consistently on the accrual basis, strictly in prescribed form and authorized by the founder. On the base of our survey we have found that only 86 state-funded institutions, i.e. 42 % reveal financial statements in the full version. Majority of units (119, i.e. 58 %) report shorten version of financial statements. This fact of course could limit any analysis based on cash flow and owner´s equity indicators however other statements may be used for analytical purposes as usual.

As for reliability of financial statements it can be stated that act. No. 563/1991 Coll. on Accounting, as amended excludes all selected accounting units from the obligation to verify their financial statements by external audit which may be questionable because authorization as it was stated before is prescribed only by the founder though a certain role of external control plays the Czech Republic Supreme Audit Office at present. This situation however is relatively common also in other countries and partly criticised (for example see Lüder and Jones, 2003) because these units may dispose of relatively significant sources. We have verified that 203 units, i.e. 99 % had their financial

statements authorized by the founder for period 2015. This fact may have certain positive influence on credibility of analysed data.

Besides financial statements the state-funded institutions prepare financial report that encompass two parts, the first one includes expenses and revenue data, the second one data concerning salaries and wages, transfers or number of employees that may be used for calculation of key analytical indicators of financial performance introduced by the Government of the Czech Republic in 2013 to evaluate performance of the Czech state administration units. To summarize this text extract it may be stated that in our opinion published data may serve as a relevant source of information for analyses of both external and internal users.

Examined sample. Basic sample of all 205 state-funded institutions that are founded by Czech ministries represents heterogeneous group of units that vary by subordination, size, type of activities and other factors. To compare their data mutually it would be desirable to divide them into homogenous groups. As classification criterion could be used size defined by several accounting or budgetary indicators such as total assets, total revenue, expenses, income, expenditures, or number of employees. But some indicators (such as net income for example) need not be necessarily influenced by size of a unit, especially in the case of the non-profit subject. Further possibility is dividing analyzed units according to the founder, however in this case some groups would be too small to compare them effectively because number of units founded by particular ministries vary significantly, moreover some subjects may have a unique character.

Probably the best solution means in our opinion dividing units into groups according to their relating NACE. For purposes of general analysis would be probably sufficient NACE sections, for deeper analysis and comparison should be used more detailed NACE classification. Main advantage of NACE criterion lies in possibility of cross-departmental or even international comparison and taking into consideration specifics of particular public sector activities. Besides a combination of NACE criterion and size of unit may be used eventually.

Analytical tools. There exist relatively wide evidence concerning analytical tools utilization in the non-profit sector. On the other hand it refers to the public administration mostly. The state administration seems more resistant to any economic tools utilization though it consumes important financial sources (OECD, 2008). And even if any tools are utilized provable evidence of their positive economic consequences is rather missing (see for example Sangers, 2012). Among more frequently applied tools may be included reporting, financial analysis, controlling, benchmarking or others. As more complex tool may be beneficial balanced scorecard that works also with non-financial criteria. Last years in the Czech state administration (the Ministry of Defense or the Ministry of Interior) an intention appears to implement controlling (Vodáková, Krč, 2017). In our opinion it would be reasonable to start at least with a set of simple absolute or relative indicators with possibility of their gradual development. Besides, some of these indicators may be used later within a process of implementation any more sophisticated tool such as controlling or even balanced scorecard. Next section of the paper demonstrate utilization of three simply applicable economic indicators.

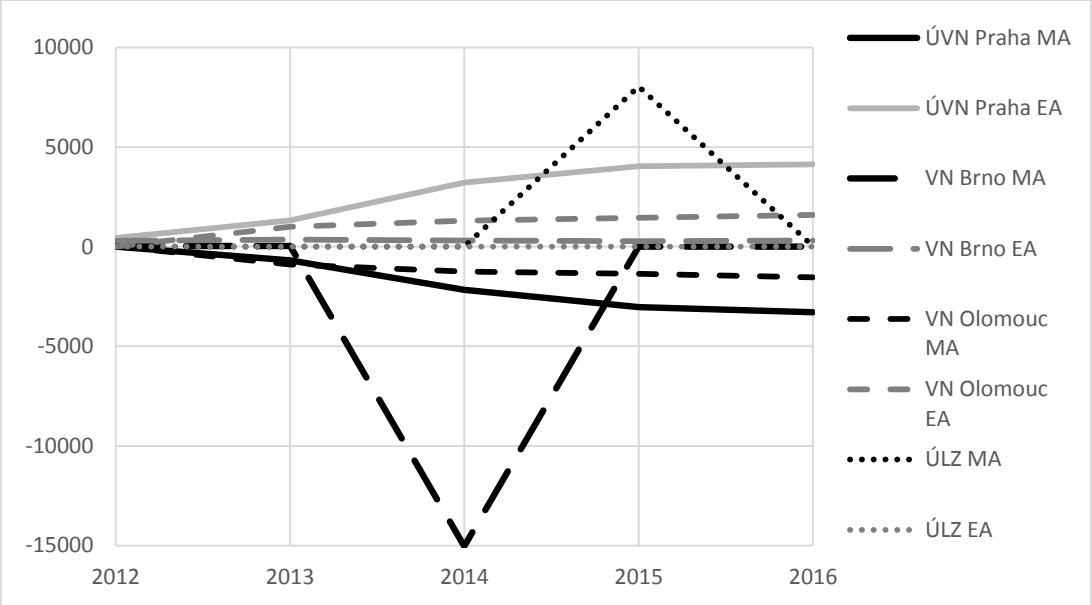
Current trends in selected economic indicators development

Net income from the main and economic activities was selected as the first illustrative indicator that may be used for mutual comparison and trend analysis within a group of subjects with relating NACE. The reason is evident: nevertheless all specifics of the non-profit sector organizations it still represents a complex indicator of their economic activities and it is also easily reachable. For purposes of any relevant analysis of course a scope of compared absolute indicators should be much larger however because of limited length of the paper only net income is presented here.

As Decree No. 410/2009 Coll. to Act. No. 563/1991 Coll. *on Accounting* prescribes net income must be presented separately for main activities and economic (side, or business) activities in the statement of financial performance. As main activities are regarded activities for that accounting unit was constituted and they should correspond to relating NACE. Public sector organizations generate income from main activities through rendering services to public or realization of projects. In the case of selected state-funded organizations, as main activities are regarded mostly rendering of complex medical care (preventive, diagnostic, therapeutic, medical, advisory), i.e. NACE section 86. Economic activities include business, complementary or side activities that enable to utilize sources more effectively and to contribute to improvement of the total net income. If economic activities occur loss, it should be a signal either to change price calculations or limit economic activity, notably in the longer-term time horizon. As economic activities, in the case of four selected units, rental, transportation, alimentation, laundry or maintenance for foreign clients are regarded.

Figure 1 illustrates net income development in 4 selected units within period 2012 – 2016. Net income from economic activities (grey lines) oscillates above zero in all cases which is positive. In the case of VN Olomouc and ÚVN Praha it has even a growing tendency in last years. The highest values of net income from economic activities were recorded in ÚVN Praha in 2016 (4.1 mil Czech Crowns) and 2015 (4.0 mil Czech Crown). On the other hand ÚLZ shows no net income from economic activities.

Figure 1 Net income from main and economic activities (thousands Czech Crowns)



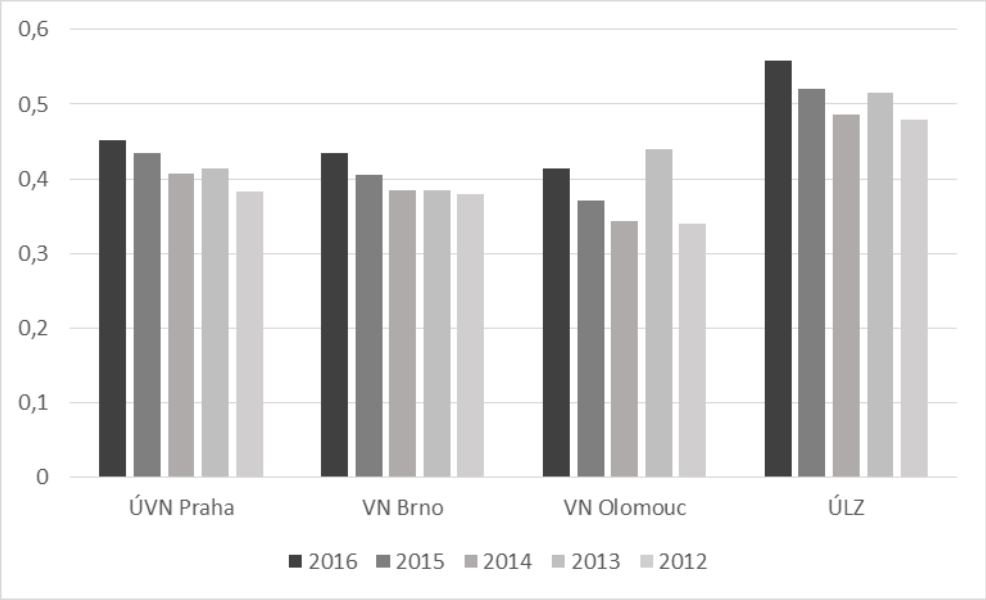
Source: own, based on the Ministry of Finance of the Czech Republic data (Monitor 2017)

Net income from main activities (black lines) demonstrates a very specific development in particular units in time. Absolutely it oscillates between – 15.1 mil Czech Crowns (VN Brno in 2014) to 8.0 mil Czech Crown (ÚLZ in 2015). ÚVN Praha occurs losses from 2013 while these losses shows increasing trend in medium-term time horizon. Similar development may be observed in VN Olomouc, trend is declining from low net profit in 2012 to gradually growing loss in 2016 (1.5 mil Czech Crowns). On the other hand VN Brno recorded relatively balanced net profit development in analyzed time period except of 2014 when slightly high loss (15.1 mil. Czech Crowns) was recorded. In other years low net profit was presented. ÚLZ recorded either zero or low net profit in analyzed period, year 2015 with relatively high net profit (8.0 mil Czech Crowns) excepted. Closer analysis of revenue and expenses suggests that main reason of net income from main activities extraordinary fluctuation lies in transfers. Their drawing projects to revenue and

expenses which influence significantly from year to year. Besides, increasing net loss is influenced by growing expenses not accompanied by relevant growth of revenue.

Positive finding concerns a mutual relation of net income from main and economic activities. Almost in all cases of analyzed subjects and time it was proved that net loss from main activity was compensated by net profit from economic activity so that the total result was recorded as profit. There was only one exception described above (VN Brno in 2014). It may be concluded that net income from economic activities really served to compensation of losses recorded in main activities.

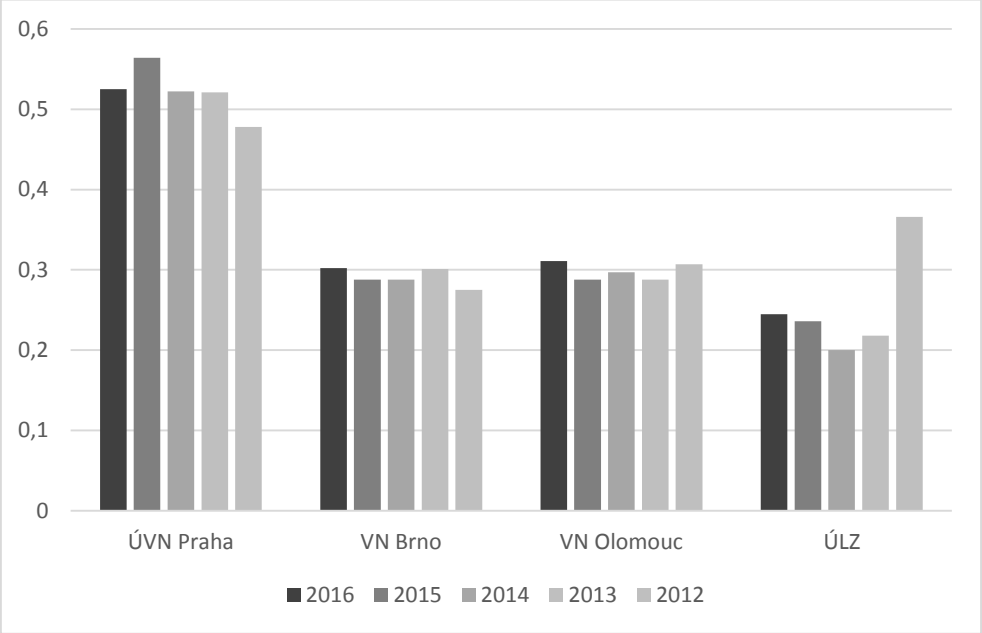
Figure 2 KAU 1: Ratio of salaries and wages expenses per employee



Source: own, based on the Ministry of Finance of the Czech Republic data (Monitor 2017)

As relative measures two key analytical indicators of financial performance described in chapter 2 were chosen. Values of KAU1 for period 2012 – 2016 are shown in Figure 2. They implies that highest values of the ratio were recorded by ÚLZ, absolutely highest value in 2016 (0.559 mil Czech Crown per employee and year), the second highest in 2015 (0.52 mil Czech Crown per employee). The lowest values of the ratio were presented by VN Olomouc in 2012 (0.34 mil Czech Crown per employee) and 2014 (0.344 mil Czech Crown).

Figure 3 KAU 2: Ratio of controllable operational expenses per employee



Source: own, based on the Ministry of Finance of the Czech Republic data (Monitor 2017)

Development trend of KAU1 is rather growing; highest values were recorded in 2016 by all analyzed units. As the number of employees was relatively stable in examined period a growth of the ratio was caused mostly by an increase of salaries and wages. In my opinion the ratio may serve for analytical purposes well. It is simple, transparent and comparable among various subjects not only with similar NACE. Input data are accessible for external and internal users, KAU1 may be further modified or divided according to needs of analysts. For example it may be divided into external and internal expensiveness. In the case of selected hospitals it may not play any important role but in other cases it may be useful. KAU1 may be also further worked out to lower level of management, i.e. divisions, departments, and so on.

As the second relative indicator above described KAU2 was chosen. Its values for period 2012 – 2016 are shown in Figure 3. As these values implies with exception of ÚLZ development of the ratio is relatively stable in analyzed period of time with slight growth. The highest values of the ratio were recorded in ÚVN Praha (0.564 mil Czech Crown per employee in 2015, 0.525 mil Czech Crown in 2016 and 0.522 mil Czech Crown per employee in 2014). These values are almost double in comparison with other units. The lowest values were reported by ÚLZ and they fluctuated from 0.2 mil Czech Crowns in 2014 to 0.366 mil Czech Crowns in 2012. Also this indicator may be used comfortably for mutual comparison, trend analysis or standard setting purposes. For deeper analysis it may be further decomposed according to particular expense groups or their combinations.

4 Conclusions

Czech ministries have founded and manage 205 state-funded institution with differing subordination, size, activities or location. Nevertheless their considerable variability it is possible to analyze and mutually compare their economic results thanks to standardized accounting outputs and other quantifiable data that are accessible to both internal and external users from 2011. The main source of data represents financial statements that are required to be authorized by the founder but not liable to external audit. For purposes of any analysis seems advantageous to divide units firstly into homogenous groups according to their size or subordination. In our opinion probably the most

beneficial would be utilization of NACE classification that would enable interdepartmental or even international comparison. Besides more sophisticated methods a set of several simple financial indicators would be helpful as the first step. Among others it could be any complex measure as for example net income, or a set of key analytical indicators of financial performance introduced by the government in 2013. For purposes of this paper KAU1 and KAU2 were monitored for period 2012 – 2016. Any more detailed analysis of course would require larger research sample and a set of indicators which could be an object of further research.

Acknowledgments

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Non-pension privileges in Poland – the impact of professions on taking financial decisions

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Abstract: *In Poland there are many occupational privileges. The groups benefiting from these privileges in Poland include miners, teachers, uniformed services and farmers. This study found that these professional groups make different financial decisions from those made by professionally non-privileged persons. In terms of saving money for financing current needs, they save far less frequently than others. The reason may be their better financial situation, stability of employment, or the multiplicity of forms of support received from the employer (mainly the State), which is the result of having a privileged profession. The aim of the article is to present the non-pension privileges existing in Poland as well as indicate that the beneficiaries of these privileges make financial decisions that differ from those made by other professional groups. The article uses data from 11,740 households with 35,279 members examined within the 'Social Diagnosis 2015' survey. The logistic regression method was applied (with the use of the IBM SPSS Statistics 24 software) while attempting to reach the research aim of this study.*

Keywords: privileges, profession, financial awareness, savings,

JEL codes: D14, D31, H55, J32

1 Introduction

In Poland there are numerous non-retirement occupational privileges. These privileges differ in nature. All of them generate costs for the employer or the Polish state, however, they provide benefits for the user. In order to provide a full picture of them, it should also be pointed out that some of these solutions are not unfounded privileges, but only a due compensation resulting from a certain distinctiveness of a particular occupational group. What are the sources of this distinctiveness? Probably, it may stem from social solidarity and can be regarded as a kind of contribution of a given occupational group to the functioning of society (Rorty, 1985). Ultimately, these professions, due to the benefits received, differ from the majority. They use certain benefits that will be discussed in this work.

When analysing the issue of privileges in subject literature, pension privileges are the ones that are most frequently referred to. These privileges are predominantly analysed for the sake of eliminating occupational privileges (Armeanu, 2010; Inglot, 2016). Unfortunately, non-pension privileges are not examined in fact, not to mention their cross-sectional examination in terms of several professional groups.

In this context it is worth noting that Krupa and Walczak (2016) and Friedberg and Webb (2006) pointed to the influence of the profession on financial decisions taken. In addition to the profession itself, financial decisions are influenced by gender, age, education, place of residence and income (Ford and Kent, 2009; Worthington, 2006; Guiso and Jappelli, 2008, Pieńkowska-Kamieniecka, 2016). Renneboog and Spaenjers (2012) also pointed out that religious households consider themselves more trusting, and have a stronger bequest motive and a longer planning horizon.

In view of the above, the aim of the study is to present the non-pension privileges existing in Poland as well as to indicate that their beneficiaries make different financial decisions. Based on that, the following research hypothesis was formulated:

H1: possessing current savings varies depending on the occupation.

2 Methodology

In the scope of non-pension privileges, the binding Polish legal acts were subjected to dogmatic and legal analysis. The analysis of the presented source data on saving was made using the logistic regression model (Hosmer, Lemeshow and Sturdivant, 2013). It allowed to, with the use of the IBM SPSS Statistics 23 software, determine the impact of individual characteristics of household (or of household's head) on the propensity to have current savings. The findings are presented in Table 1. The dependent variable (having current savings) in the model was dichotomous, *i.e.*, binary. The variable took the following form:

$$Y = \begin{cases} 1, \text{in case that the event happens} \\ 0, \text{otherwise} \end{cases}$$

The logit model for dichotomous variable Y is determined by the following dependence (Hosmer, Lemeshow and Sturdivant, 2013):

$$E(Y|x) = \pi(x) = \frac{e^{\beta_0+\beta_1 x}}{1+e^{\beta_0+\beta_1 x}} \quad (1)$$

In order to verify the research hypothesis set, the respondents were divided into four privileged occupational groups (the 'occupational' variable). The breakdown was made due to the occupation performed currently or in the past. Out of all participants covered by the study (N = 11705), the following were distinguished:

1) teachers (N=458),
2) miners (N=493),
3) uniformed services (firefighters, policemen, military men) (N=331) and
4) farmers (N=1541).

In the case of the 'income' variable, which was originally contained between PLN 100 and PLN 30,000, the answers received were divided by 1,000. For this reason, the interpretation of this variable will refer to changes by one unit, *i.e.*, one thousand PLN. Due to their age, respondents were divided into five age groups (generations).

The research presented in the article comes from a representative study conducted in Poland in 2015 by the Social Diagnosis study. In 2015, this study examined 11,740 households with 35,279 members and 24,324 individual members of those households aged 16 and over. In order to widen the interpretability of the study, households were compared with heads of these households (Belke, Dreger and Ochmann, 2015; Aktas et al., 2010, 1-30).

Table 1 Descriptive statistics for the independent variables

Variable	Variable description	Nature of the variables
Occupational	Occupational group	1 = others
		2 = teachers
		3= miners
		4 = uniformed services
		5 = farmers
People	How many people live in household?	people

Income	What personal monthly net income (in PLN) have you been receiving during the last three months?	PLN
Church	On average, how often in a month do you take part in a church service or other religious meetings?	number
Age	Age	1 = 'Matures' (born before 1945)
		2 = 'Baby Boomers' (1946–1964)
		3 = 'Generation X' (1965–1976)
		4 = 'Generation Y' (1977–1993)
		5 = 'Generation Z' (1994-)
Financial	What is your satisfaction with the financial situation of the household?	1 = very happy
		2 = quite satisfied
		3 = rather dissatisfied
		4 = unhappy
		5 = very unhappy
Residence	Place of residence	1 = Cities > 500k
		2 = Cities 200-500k
		3 = Cities 100-200k
		4 = Towns 20-100k
		5 = Towns < 20k
		6 = Rural areas
TV	Do you have paid TV at home?	0 = no 1 = yes
Gender	Gender	0 = women 1 = men

Source: own study

3 Results and Discussion

The work presents four professional groups in Poland which benefit from the most numerous non-pension privileges. These are as follows:

- teachers,

- miners,

- uniformed services,

- farmers.

Undoubtedly, one may be tempted to indicate a wider group of professions, such as, for instance, judges, prosecutors and priests, who also benefit from certain privileges. However, these privileges are not as numerous as the ones indicated in the text. In addition, in case of judges and prosecutors, the privileges generally come down to the level of remuneration as well as to the pension privilege that is not taken into account in this work.

First, the privileges of only several groups will be indicated. Employees paid by the State budget in Poland (Act of 1997) are entitled to an extra bonus salary (one months extra pay). Its value is set at 8.5% of the total remuneration received by the employee during the calendar year. Due to the amount actually paid out to employees (100/8.5≈12), corresponding to the amount of one monthly salary, it is referred to as the thirteenth salary or 'a thirteenth'. These are teachers that obtain this benefit. Theoretically, miners, police officers, military men and other members of uniformed services are not eligible to this benefit. However, miners, as well as military men and policemen, can count on an additional cash bonus paid under separate regulations. In case of miners, the so-called 'the Miners' Charter' that has been valid from 30 December 1981 guarantees such a benefit (Act of 1981) to employees of mines paid out on the occasion of the miner's day (4th of December). Furthermore, under the same law, miners are entitled to the so-called '*Barbórkowe* bonus' that can be called their 14th annual salary. Miners also have the right to the free coal allowance (8 tonnes of coal a year). This allowance can be received in-kind or in cash equivalent (which happens most frequently). The price of coal is subject to change, however, taking into account a coal price amounting to a few hundred zlotys per tonne, it can be stated that miners receive their 15th annual salary in the form of in-kind coal allowance. Regulations governing the payment of the free coal allowance are defined in the agreements concluded between the Management Board of the relevant mine (or union of mines) and trade unions. On the other hand, based on Art. 83 of the Act on the Military Service of Professional Soldiers (Act of 2003), a professional soldier holding a professional military service for the whole calendar year acquires the right to an additional annual salary equal to 1/12 of the basic salary plus allowances. In addition, military men are entitled to cash equivalent for uniforms and clothing not issued in-kind, including spending on cleaning of uniforms and clothing (Act of 2015). This allowance ranges from 2,302 to 4,460 PLN and is paid annually. In spite of its purpose - uniforms - the allowance, in fact, has been transformed into an additional annual salary.

Soldiers leaving military service (*e.g.*, due to their retirement) also benefit from a Golden handshake payment (Act of 1995, Act of 2016). There is even a special calculator for calculating this payment available on the Agencja Mienia Wojskowego (the Military Property Agency) website. This value depends, among other things, on the number of years of service, grade or family size. According to the calculations, this allowance may amount up to 665,646.72 PLN (as of March 10, 2017). When analysing privileges that are exclusive for teachers, it is important to point out the most well-known and most frequently criticized one, *i.e.*, different weekly working time. In accordance with the Teachers' Charter (Act of 1982), for most teachers it is 18 teaching hours per week. However, this is the actual time of running didactic classes and does not include preparation time for lessons or organizational responsibilities. Also, once every seven

years teachers have the right to take health leave. During this period, they retain the right to their monthly basic salary, service premium, and other employee benefits, including social benefits.

In addition, in 1972 (Act of 1972) the regulation was passed that sets out (Article 43):

a) Teachers employed in rural areas and housing estates as well as in towns with no more than 2,000 inhabitants have the right to free housing in the workplace ...
b) If the National Council cannot provide a free flat to a teacher, they are obliged to pay this teacher an appropriate allowance (called a Rural area housing allowance).
These regulations though slightly modified have been in force until today. The change relates, for example, to the number of residents of a place where the Rural area housing allowance remains in force - at present it is 5,000 inhabitants. On September 1, 1983, another monthly allowance was introduced benefiting also teachers – the allowance for persons who are employed in rural areas (called a Rural allowance). It amounted to 10% of the basic monthly salary and the only criterion for granting it is the fact of working in a rural area (Act of 1982). Teachers who start working are also entitled to an allowance equal to two monthly basic salaries paid to the teacher (a Golden hello payment).

Similar to teachers, miners have reduced working time, too. Based on the Miners' Charter (Act of 1981), miners work underground up to 7.5 hours per day. According to the Act of 4 March 1994 on Employee Social Benefits Fund (Act of 1994), employers employing more than 20 employees and employers operating in the form of budgetary units and self-government budget institutions are obliged to create such a fund (privileges for teachers and miners). As indicated, this privilege also applies to employees working in the private sector, in companies with more than 20 employees. Therefore, this is not a privilege reserved only for the analysed occupational groups. Military men and other militia formation workers are not covered by this fund, since according to the law, it is not created in their units. However, under separate regulations, they have the right to a number of benefits, such as, for instance, a Golden hello payment or annual holiday pay. These benefits may be considered as approximate to those awarded to persons benefiting from the social fund.

The farmer occupation is completely different, so the privileges in this case are completely different. Farmers do not pay income tax. Regardless of the level of income earned, they are charged only a small agricultural tax. Farmers, as the only professional group in Poland, have the right to the refund of excise duty on purchased fuel (Act of 2006) for agricultural production. They also benefit from subsidies for insurance premiums paid for plant cultivation and livestock (Act of 2005) as well as for subsidized agricultural credits. The Polish state pays for both investment and replacement loans to support farmers in the event of natural disasters.

Table 2 Non-pension privileges in Poland

Privilege	Teachers	Miners	Uniformed services	Farmers
Bonus salary (one months extra pay)	+	+	+	-
Additional cash bonus	-	+ *	+	-
Shorter working time	+	+	-	-
Seniority	+	+	+	-
Rural allowance	+	-	-	-
Rural area housing allowance	+	-	-	-
Health leave	+	-	-	-
Golden hello	+	-	+	-
Golden handshake	-	-	+**	-

Exemption from income tax	-	-	-	+
Reimbursement of excise duty on fuel purchased	-	-	-	+
Subsidized production insurance (crops and animals)	-	-	-	+
Subsidy for loan interest rate payments	-	-	-	+
Company Social Benefits Fund	+	+	+***	-

Note: *the so-called 'Barbórkowe bonus'; ** only for military men; *** for uniformed services equivalent benefits.
Source: own study

There are many factors that can affect financial awareness and financial decisions. As indicated in Table 3, exercising a privileged profession influences the decision to save for current needs. Privileged professionals are less likely to save for this purpose. Why?, because, according to Dardanoni (1991), 'savings. . . arise as a precaution against future income risk'. In turn, due to their privileges, these people have little income risk, so they do not save for current needs. In case of miners, the chances of making savings in their households are 34.3% smaller. However, in case of uniformed services, they are 32.1% smaller (in case of teachers and farmers, the result is similar, however, the variable is insignificant) than in case of other non-privileged respondents.

An interesting cognitive result was obtained with regard to the number of people per household. The increase in the number of people in the household by one person increases the chance of having savings for current needs by 9.9%. Undoubtedly, this results from a rational decision, which in a larger household means the need to increase the level of savings for current needs. In smaller farms, current needs are smaller, so these savings occur in a lower number of households.

Increasing nominal income negatively affects the chances of having such savings. Why? People with higher earnings do not need to save for current needs. Affluent people can do well when current expenses appear unexpectedly. Probably, in case of other forms of saving, for instance, for old age - increasing income increases savings. On the one hand, these people can afford to make additional savings, on the other hand, however, the solutions in force in Poland do not guarantee high pensions in the future. Accordingly, the obligatory regulations oblige, especially the rich, to save, (Chamon, Liu and Prasad, 2013; Kowalczyk-Rólczyńska and Rólczyński, 2016; Pieńkowska-Kamieniecka and Walczak, 2016). The assessment of one's own financial situation has a similar impact to that of the nominal income. Farms which are very dissatisfied with their own situation, if compared to the satisfied ones, are 83.5% more likely to have current savings.

Younger people are less likely to save for current consumption. These individuals are more likely to make a use of the present day, often even without thinking about unforeseen current expenses. In case of savings for current needs, 'Residence', 'Gender', or 'TV' are insignificant variables.

Table 3 Estimates of logit model after dropping out insignificant variables – the analysed dependence: 'savings for current needs'

	Variable	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
Occupational	**1 = others (base)**			12.372	4	.015	
	2 = teachers	-.043	.133	.104	1	.747	.958
	3= miners	-.420	.150	7.806	1	.005	.657
	4 = uniformed services	-.387	.177	4.757	1	.029	.679
	5 = farmers	-.084	.094	.792	1	.373	.920

People		.094	.020	21.314	1	.000	1.099
Income		-.096	.022	19.928	1	.000	.908
Church		-.027	.010	7.596	1	.006	.974
Age	**1 = 'Matures' (base)**			24.948	4	.000	
	2 = 'Baby Boomers'	-.086	.074	1.368	1	.242	.918
	3 = 'Generation X'	-.266	.093	8.111	1	.004	.767
	3 = 'Generation Y'	-.515	.117	19.400	1	.000	.598
	5 = 'Generation Z'	-1.827	1.063	2.953	1	.086	.161
Financial	**1 = very happy (base)**			52.872	5	.000	
	2 = happy	.040	.139	.082	1	.775	1.041
	3 = quite satisfied	.126	.138	.835	1	.361	1.135
	4 = rather dissatisfied	.549	.152	13.141	1	.000	1.732
	5 = unhappy	.548	.161	11.597	1	.001	1.729
	6 = very unhappy	.608	.199	9.371	1	.002	1.836
Const.		-.498	.173	8.301	1	.004	.608
N= 5,279; Log likelihood = 6,793.076; Nagelkerke's R-squared = 0.049 Cox–Snell's R-squared=0.036; Chi-square (16) =193.112 (0.000); HL test =9.149 (0.330)							

Source: own study based on Social Diagnosis (2015)

4 Conclusions

In Poland there exists numerous non-pension privileges. They take different forms. Some of them are monetary in nature, such as, for instance, extra pay or allowances related to work experience. Some of them are indirectly related to one's earnings, *e.g.*, shorter working time. Each privilege, however, is ultimately related to additional costs for the employer, which is often the Polish state. This means that the actual income of persons performing the aforementioned occupations is significantly different from the monthly basic salary.

The presented privileges apply to many professions. Undoubtedly, their full analysis requires a comprehensive characterization of the profession and the factors that have affected the introduction of particular privileges. Some of them, as a result of such an analysis, would not be defined as a privilege but as a legal distinction resulting from the specifics of the profession. This indication in the summary is intended to signal the complexity of the problem discussed in this work.

The content of the work indicated that the type of occupation affects the tendency to make savings on a current basis. Persons performing privileged occupations are less likely to save for current needs than other professional groups. Due to their privileges, these people do not have to save for this purpose. Current needs do not pose a problem for them for which they would need to save, in case of need. The income earned has a similar effect on the level of savings. Better-paid people also save less for current needs.

Based on the research conducted, there is no reason to reject the hypothesis of the impact of occupation on the level of current savings. Based on the research done, one more conclusion can be drawn. Income, which theoretically increases the volume of savings, in the case of savings for current needs has a negative impact. One may point out that a common saying 'rich people save more' seems to be irrelevant. Consequently, when conducting research on the issue of saving, it is important to focus on specific savings motives, and not on the level, purposes and motives of saving in a broad sense.

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The selected issues of tax legislation on the use of estimation method based on expenses for physicians' income calculation in the case of tax fraud in Poland

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Abstract: *The aim of this article is to determine the possibility of using the rules concerning the based on taxpayer's expenses method of income estimation in case of tax fraud committed by physicians doing business. The descriptive study including critical attitude to the tax acts and literature was used to solve the research problem. The income of physicians who commit the tax fraud can be determined on the basis of methods of tax base estimation regulated in Tax Ordinance or as the income of not revealed sources of incomes regulated in Personal Income Tax. Most of the statuary methods of estimation of the tax base rather cannot be used for income estimation of physicians. The changes in 2016 in the tax law on the provisions of not revealed sources of incomes can be seen positively. The new rules are more precisely than the old ones which were claimed as unconstitutional. However, there are doubts if the based on expenses of taxpayer method can be applied in a situation when the physician claims receiving the sources from the business. The based on taxpayer's expenses method should be indicated as one of the methods of income estimation regulated in Tax Ordinance. It could be determined in more detail in the provisions like provisions of not revealed sources of incomes. The conclusions of paper could be used by the legislator.*

Keywords: combating tax fraud, income taxes, the estimation of tax base, health care institutions

JEL codes:H26, H25, H24, K34, I18

1 Introduction

Tax frauds are getting more and more important issue. Especially the tax frauds in VAT are discussed as public finance problem. However, the problem of tax frauds concerns also income taxes. Tax frauds in income taxes are involved with different kinds of business activity including the medical professions as well. The effect of such activity is the possibility to decrease their prices of medical services. It makes the economic conditions of doing business more difficult for the honest taxpayers or even can make them going bankrupt. Therefore they need to be protected from unfair competition from health institutions which cut their tax liabilities in not a legal way. The provisions foresee varieties of instruments which should help the tax administration to reduce the scale of gray economy. One of such instruments is the income estimation of the taxpayer. The provisions point out different methods of tax base estimation. One possible method to establish the taxpayer's income is the estimation based on expenses of the taxpayer. The provisions on not revealed sources of incomes in Personal Income Tax foresee to use such a method. The rules concerning this method in PIT were changed in 2016.

The aim of this article is to determine the possibility of using the rules concerning the based on taxpayer's expenses method of income estimation in case of tax fraud committed by physicians doing business.

The descriptive study including critical attitude to the tax acts and literature was used to solve the research problem.

2 Methodology and Data

The descriptive study including critical attitude to the tax acts and literature was used to solve the research problem.

3 Results and Discussion

Tax evasion is a part of economy all over the world. Tax frauds are also an important issue in Poland. The scale of shadow economy in Poland shows the Table 1.

Table 1 The scale of shadow economy in Poland as percentage of GDP in years 2012-2016

	2012	**2013**	**2014**	**2015**	**2016**
The scale of shadow economy, %	21,1	19,9	19,5	19,2	19,7

Source: Ptak (2017).

The data in Table 1 show that tax frauds are an important problem in Poland. The scale of shadow economy accounts for around 20 % of GDP in Poland. Therefore it is need to be combated. The provisions foresee varieties of instruments which should help the tax administration to reduce the scale of gray economy. One of such instruments is the income estimation of the taxpayer.

The discussion on the estimation based on expenses of the taxpayer in Poland requires firstly analysis of provisions of Tax Ordinance Act and Personal Income Tax.

Generally, the Tax Ordinance Act allows tax authorities to estimate the tax base of the taxpayer in cases like (Adamiak et. al. 2012; Durczynska 2014):

- there are no tax books or other data necessary to determine the tax base,
- the taxpayer has breached the conditions entitling him or her to lump-sum taxation taxpayers' taxable incomes,
- the data resulting from the tax records do not allow the taxable base to be determined.

The Tax Ordinance Act provides tax authorities with a list of six tax base estimation methods they can use. These are (Dzwonkowski 2016):

- the internal comparative method,
- the external comparative method,
- the inventory method,
- the production method,
- the cost method,
- the type of income as a percentage of turnover.

The indicated in the provisions methods are not the only ones the tax administration may apply. In the literature following methods of tax base estimation as 'non-statutory' methods are presented (Schneider, 2007; Brzeziński B. et al., 2007; Kosikowski, Etel, 2013):

- determination the turnover figure from information sources,
- determination the percentages of particular products in total production,
- determination the percentages of some goods in the total turnover of the company,
- analysing the formulas used to make particular products,
- estimation business expenses in relation to turnover,
- examining the consumption of electricity,
- estimation a company's incomes based on its expenses,
- investigating net profits,
- utilising an econometric model of costs.

One of the methods indicated in the literature is estimation a company's incomes based on its expenses. In the case of natural persons, this method is called the estimation a taxpayer's incomes based on its expenses.

The Personal Income Tax states that if it is not possible to calculate income (loss) on the basis of the tax records, the value of income (loss) is estimated. The provisions indicate revenue ratios which can help to calculate income, but they should be used for the foreign companies (PIT, Art 24b). It means the rules and methods of income estimation established in the tax ordinance should be applied.

Moreover, the provisions had foreseen the use of an estimation income of taxpayer method based on its expenses in Personal Income Tax in the case of not revealed sources of incomes (taxation of income not covered by disclosed sources or income from undisclosed sources; revenues unmatched by the disclosed sources or derived from undisclosed sources).

The Polish Personal Income Tax distinguishes different sources of revenues of natural person. It includes for example revenues from doing business, employment relationship, and other sources. One kind of other revenues is income from undisclosed sources. This is a special procedure to determine the tax liabilities when the property and expenditures of the taxpayer are higher than his income (Dzwonkowski, 2009). It also a way to combat tax fraud. The effect of determining the income as not revealed sources of incomes is applying the 75% tax rate (Bartosiewicz, Kubacki, 2015).

However, the rules in PIT concerning not revealed sources of incomes have not been described precisely. It caused lots of commentaries on this provisions. The literature data concentrated very often on procedural issues (Dzwonkowski, 2009; Pietrasz 2007; Strzelec, 2015).

Moreover, the Constitutional Tribunal stated the provisions as unconstitutional as the provisions did not meet legislative requirements predicted for tax regulations. Admittedly, Constitutional Tribunal reprieved its ruling till February 2016 so the tax administration had been able to assess tax liabilities by the use of this unconstitutional provisions till the time limited in by the Constitutional Tribunal (Kubacki, 2014).

Due to fact that Constitutional Tribunal reprieved the ruling on revenues unmatched by the disclosed sources or derived from undisclosed sources till February 2016 the parliament established new provisions. They were implemented in the beginning of 2016.

They concern following issues (Marciniuk, 2016):

- the definition and the way of establishing revenues unmatched by the disclosed sources or derived from undisclosed sources,
- the day of arising of tax obligation moment,
- the way of calculating the tax base,
- the level of tax rate and the way of its establishment,
- the procedure questions including the proof's burden.

New provisions define the revenues unmatched by the disclosed sources and derived from undisclosed sources. The revenues unmatched by the disclosed sources or derived from undisclosed sources are higher than the expenditure diminishes by the taxable revenues (incomes) or revenues (incomes) exempted from the taxation. To the taxable revenues (incomes) or revenues (incomes) exempted from the taxation are included such revenues (incomes) which were earned before the incurred expenditure. So the income from the disclosed sources, income from the disclosed sources but indicated by the taxpayer in not a proper level is treated as covered by disclosed sources. The revenues unmatched by the disclosed sources and derived from undisclosed sources comprise the income from sources not disclosed by the taxpayer or not determined by the tax administration (Marciniuk, 2016).

The provisions define expenditure for the not revealed sources of incomes (Strzelec 2016b). Firstly, the value of assets accumulated in the tax year is recognized as the expenditure. If it is impossible to determine the tax year in which the expenses and value of assets are accumulated, it means the expenditure is equal to the level of expenses incurred by the taxpayer during the tax year (Mariański, Nowak-Piechota 2016).

According to law the provisions of PIT are not applied to revenue arising from activities that cannot be the subject of a legally enforceable agreement. Sometimes, the taxpayers used this provisions to avoid the taxation. In the case of not revealed sources of incomes, they maintained they had earned the income from activities that cannot be the subject of a legally enforceable agreement (for example prostitution). Since, the amendment in 2016 the taxpayer has to prove that he earned the income from activities that cannot be the subject of a legally enforceable agreement (if he claims so) (Marciniuk, 2016).

The provisions define the day of arising of tax obligation moment. The day of arising of tax obligation is on the last day of the tax year when the revenues were determined as the revenues unmatched by the disclosed sources or derived from undisclosed sources are higher than the expenditure diminishes by the taxable revenues (incomes) or revenues (incomes) exempted from the taxation. The tax can be assessed in the period of 5 years (Marciniuk, 2016).

The way of calculating the tax base is defined as the surplus of expenditure above the taxable revenues (incomes) or revenues (incomes) exempted from the taxation. If there are more than one surplus the tax base is the total amount of such surpluses (Marciniuk, 2016).

The level of the tax rate is determined as the 75% lump-sum tax imposed on the revenues (PIT art. 25e).

The next issue is the procedure questions including the proof's burden. Generally, the procedures established in the Tax Ordinance should be applied in the case of not revealed sources of incomes. The provisions in PIT states that the proof's burden on the indicating of revenues (or incomes) equaling the expenditures is imposed on the taxpayer. However, this rule is not applied in the case of incomes which are known for the tax administration, also from its records, databases or other public data (Strzelec 2016a).

As the rule, the new provisions are commented positively. In particular, they were implemented including the adoption of remarks of the Constitutional Tribunal (Strzelec 2016a; Mariański, Nowak-Piechota 2016).

As the literature data shows the proceeding using the calculation of the income based on expenses can be applied to different professions. The Ministry of Finance had indicated some professions which belong to the higher risk level of tax fraud and should be controlled more thoroughly. Moreover, according to the Ministry of Finance, the tax provisions in case of not revealed sources of incomes should be applied by the tax administration. Among those professions, the physicians were indicated as well (Strzelec, 2015). However, there is a lack of papers discussing the possibility of using the rules concerning the based on expenses method of income estimation in case of tax fraud by physicians doing business especially after the changes in PIT in 2016.

Following discussion assumes that physician doing business had committed tax fraud and this fact was discovered by the tax administration. The question is if there is the possibility of using the rules concerning the based on expenses method of income estimation in case of tax fraud.

Analysing the use of provisions in case of not revealed sources of physicians' incomes at least two different cases should be indicated.

- the physician does not want to indicate the sources of his revenues,

- the physician claims to receive the sources from the business.

The first issue concerns case when the physician does not want to indicate the sources of his revenues (or his explanations are not true). The tax administration during the control had discovered that the property and expenditures of the physician were higher than its income. Of course, it is very likely the income was earned from doing business but another possibility is money earned from employment relationship (but also paid unofficially). However, the tax administration is not always able to prove that the income was earned exactly from taxpayer's business. The tax administration has to proof that the tax records are not reliable or correct. If tax authorities do not manage to indicate the source of income, it means the provisions of not revealed sources of incomes should be applied. In such a case the based on expenses method of income estimation is applied. The tax administration has to obey the rules established in the PIT on the not revealed sources of incomes discussed in this article. However, in the case of estimation of physician's income, another question can appear. The Polish tax system gives the physicians (also nurses) the opportunity to pay lamp-sum taxes. Such a kind of a tax is Tax card. In the case of this tax, there are following conditions which have to be fulfilled by the taxpayer: the range of supplied service, the limits in employment and the usage of other subjects' service, no conduction of specific kinds of taxpayer's or spouse's activity. The tax base and tax rate are calculated in simplified form. The tax depends on the number of working hours of a taxpayer in a month. The tax rate is increasing if the number of working hours in a month increases as well. The more hours the physicians are doing their business the more tax they have to pay. The taxpayers do not have to keep any tax books for income calculation purposes.

The taxpayer may try to explain that his earned money in the past, and bought the property from his savings. It would be very difficult for tax authorities to prove that income was not earned in the past, especially when the taxpayer did not have to use tax records. Such explanations are possible only if the physician had chosen the tax card in the past.

The next case is the situation when the physician claims receiving the revenues from doing business. Then, the question arises if the tax administration is allowed to use the estimation based on expenses of the taxpayer. There are no doubts that the estimation methods indicated directly in the Tax ordinance can be applied. However, it is not always possible to use them all. Following statuary methods of estimation of the tax base rather cannot be used for income estimation of physicians (Witczak, 2016):

- the inventory method,
- the production method,
- the cost method,
- the 'income as a percentage of turnover' method.

Following statuary methods of tax base estimating can be used for income estimation of physicians:

- the internal comparative method,
- the external comparative method.

However, we may indicate the obstacles of using the internal comparative and the external comparative method for estimating of income in health institutions (Witczak, 2016). One important obstacle is the professional secrecy. It is not the aim of the article to discuss this issue in more detail. Nevertheless, such discussion in separate articles is advisable. So if the statuary methods of the tax base estimation are not always applicable the estimation based on expenses of the taxpayer is to be considered. It could be very helpful for tax administration to use the based on expenses of taxpayer income estimation method as one of other methods not indicated in the provisions. However, there are doubts whether such a method of tax base determination could be named as the estimation. According to Schneider (Schneider, 2007), this method is one of the tax base estimation method. However, there are opinions not accepting the assessment of

not revealed sources of incomes as an estimation method determining the tax base (Dzwonkowski, 2009; Pietrasz, 2007). According to Strzelec (Strzelec, 2011), in the assessment of not revealed sources of incomes the tax base estimation foreseen in the Tax Ordinance Act can be used. It means the assessment of not revealed sources of incomes is not an estimation itself. It would be the obstacle using the income based on expenses method. Although for example, the German provisions foresee the calculation of the income based on expenses as one of the income estimation methods (Carlé, 2006). However, the German tax law does not include separate provisions on not revealed sources of incomes. The solution similar to the German tax law is advisable. The step further should be taken. The based on taxpayer's expenses method should be indicated as one of the methods of income estimation regulated in Tax Ordinance. It could be determined in more detail in the provisions like provisions of not revealed sources of incomes.

4 Conclusions

The income of physicians who commit the tax frauds can be determined on the basis of methods of tax base estimation regulated in Tax Ordinance or as the income of not revealed sources of incomes regulated in Personal Income Tax. The methods indicated in Tax ordinance are not always able to be applied in the case of physicians doing business. Then, the provisions of not revealed sources of incomes could be applied in the case of tax fraud. The changes in 2016 in the tax law on the provisions of not revealed sources of incomes can be seen positively. The new rules are more precisely than the old ones which were claimed as unconstitutional. They foresee the based on expenses of taxpayer method as the way to determine the taxpayer's income. However, the changes do not solve question concerning the physician claims receiving the sources from the business. There are doubts if the based on expenses of taxpayer method can be applied in such a situation. It is advisable to change the law. The based on taxpayer's expenses method should be indicated as one of the methods of income estimation regulated in Tax Ordinance. It could be determined in more detail in the provisions like provisions of not revealed sources of incomes.

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Assessing financial condition of municipalities using taxonomic methods

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Abstract: *The goal of this paper is to develop a concept of assessing* and comparing *financial condition of municipalities (communes) using taxonomic methods and implement this concept into communes of Lower Silesia region in Poland. To analyze financial condition of the municipalities authors proposed 14 financial indicators which fall into four categories: related to incomes (four indicators), related to expenditures (four indicators), related to current balance (two indicators) and related to debt (four indicators). Selection of indicators was based on the revision of the literature, guidelines for municipalities, conducted local and international researches and best practices discussing financial condition of local governments. These indicators were calculated for all Lower Silesia municipalities (169 communes) for the year 2015. In order to group similar municipalities, in terms of financial conditions, authors created rating scale. The scale includes five categories and their qualitative description. Among all indicators, using merit and statistic methods, those were chosen which best show the financial condition of examined objects. Subsequently the degree of similarity was computed based on chosen dissimilarity coefficients. Finally communes were split into ordered clusters that present similar financial condition and assigned to previously prepared rating scale. Developed concept allows to compare financial condition of the municipalities, to draw conclusions about sources of incomes as well as usage of financial resources and potential of development. It is also a very useful indicator for investors.*

Keywords: municipalities financial condition, financial indicators, municipalities rating, taxonomic methods

JEL codes: H7, C8

1 Introduction

The financial condition of a municipality reflects the municipality's ability to provide public services (Partick, Trussel, 2011). Problem of defining and evaluating financial condition of local government has been a topic of concern in literature, legislation and guidelines for local governments. Groves and Valente (1994) defined financial condition as a government's ability to: generate enough cash to pay its current liabilities (cash solvency), generate enough revenues over its normal budgetary period to meet its expenditures and not incur debts (budgetary solvency), to pay all the costs of doing business in the long run (long-run solvency) and to provide services at the level and quality that are required for the health, safety, and welfare of the community and that its citizens desire (service-level solvency). Maher and Nollenberger (2009) describe financial condition as an organization ability to maintain existing service levels, withstand economic disruption, and meet the demands of growth and decline. Following Groves and Valente they state that financial condition can be described by cash solvency, budgetary solvency, long-run solvency and service-level solvency. Similar definition, based on the mentioned four levels of solvency is adopted by Wang et al. (2007). According to DiNapoli (2008) financial condition may be defined as the ability of a local government to

balance recurring expenditure needs with recurring revenue sources, while providing services on a continuing basis. The Governmental Accounting Standards Board (GASB, 2012) defines a government's financial condition as a government's ability and willingness to meet its financial obligations and commitments to provide services.

In this article financial condition is understood as the ability of the local government to meet its obligations as they come due and to finance the services its constituency requires (Mead, 2001) and is analyzed in three dimensions of solvency: budgetary solvency, long-run solvency and service-level solvency. A community in good financial condition generally maintains adequate service levels during fiscal downturns, identifies and adjusts to long-term economic or demographic changes, and develops resources to meet future needs. Conversely, a community in fiscal stress usually struggles to balance its budget, suffers through disruptive service level declines, has a difficult time adjusting to socioeconomic forces, and has limited resources to finance future needs (DiNapoli, 2008).

There is no single measure that fully captures the financial condition of a local government. Rather, governments need to take a comprehensive approach that focuses on both external and internal fiscal indicators that are easy to measure, evaluate and understand. Ideally, a financial indicator system should be comprehensive enough to match the complexity of the analyzed government, operationally manageable and should unable local governments to produce regular, reliable reports for decision making (DiNapoli, 2008).

Selection of indicators, which can be used for analyzing financial condition of local governments has been the subject of broad researches. In 1981 Groves, Godsey and Shulman worked out a set of financial indicators which included six categories: revenues, expenditures, earnings, debt structure, unfunded liabilities, and condition of capital plant and approximately 30 related financial ratios. This model was next developed by Groves and Valente in 1986 and 1994 and Groves, Valente and Nollenberger in 2003. The revised version of the model includes seven categories: revenues, expenditures, operating position, debt, unfunded liability, capital plant, community needs and resources and is often a primary source for indicators selected by local governments in the USA to asses their financial condition. One of the most commonly used studies on local government financial condition is Brown's 10-point test. It is based on 10 ratios, that are considered useful for assessing four basic financial factors for a city: revenues, expenditures, operating position and debt structure (Brown, 1993). Wang et al. (2007) in their study suggested 11 indicators to measure four dimensions of solvency. Polish Ministry of Finance worked out a system of 14 indicators which are used by local governments for evaluating their financial condition. Indicators follow into three groups: budget indicators, indicators per capita and debt indicators.

It must be underlined that several factors make analyzing the financial condition of local government difficult: there are few standards against which local government finances can be measured with confidence, financial difficulties emerge gradually and incrementally, it is difficult to compare one local government against another because of differences in populations, enrolments or other demographic characteristic, and there is a lack of "useable" and "understandable" dissemination vehicles and formats that can be used to assess financial condition (Petro, 1998).

The goal of this paper is to develop a concept of assessing and comparing financial condition of municipalities using taxonomic methods and implement this concept into municipalities of Lower Silesia region in Poland. To analyze financial condition of the communes authors proposed 14 financial indicators. In order to group similar municipalities, in terms of financial conditions, authors created rating scale. Among all indicators, using merit and statistic methods, those were chosen which best show the financial condition of examined objects. Subsequently the degree of similarity was computed based on chosen dissimilarity coefficients. Finally communes were split into

ordered clusters that present similar financial condition and assigned to previously prepared rating scale.

2 Methodology and Data

As it was mentioned above financial condition is understood as the ability of the government to meet its obligations as they come due and to finance the services its constituency requires (Mead, 2001) and is analyzed in three dimensions of solvency: budgetary solvency, long-run solvency and service-level solvency.

Development of the idea for evaluating and comparing financial condition of local governments consists of a few steps: choosing a complex phenomenon, determining the set of objects and the set of variables substantively related to the analyzed complex phenomenon, identifying preferential variables, describing pattern and/or anti-pattern object, deciding on variable normalization, selecting the distance measure, interpreting results (Walesiak, 2008). Initially authors selected a sample of local governments for analysis. The sample used in this study includes all municipalities (169) of Lower Silesia Region. Financial data for communes cover the year 2015. Next 14 indicators were chosen. They can be assigned to one of four categories: related to incomes (four indicators), related to expenditures (four indicators), related to current balance (two indicators) and related to debt (four indicators). Selection of these indicators was conducted using different criteria. First, attention was paid on the theoretical validity (merit criteria). Authors analyzed literature, recommendations for municipalities, local and international researches and best practices discussing financial condition of local governments. Second, availability of data was crucial to construct indicators and ensure the possibility of updating the model it in the future. Third, indicator's relevance to the commune's government interest was considered. Finally, selected indicators should be easily understood by local officials and the public and unable to produce regular, reliable reports for decision making.

Financial data applied in the analysis were collected from budgetary statements, which Polish communes are obliged to supply to Regional Chamber of Accounts and Central Statistical Office of Poland. The financial indicators primary used in this analysis are presented in the Table 1.

Table 1 Indicators used to measure financial condition

ID	Indicator	Dimension	Category
i1	**Total revenues/Population**	Service solvency	Related to incomes
i2	**Own revenue/Total revenue**	Budget solvency	Related to incomes
i3	**Tax revenue/Total revenue**	Budget solvency	Related to incomes
i4	**Capital expenditure/Total expenditure**	Budget solvency	Related to expenditures
i5	**Expenditure on wages/Current expenditures**	Budget solvency	Related to expenditures
i6	**(Current balance)/Total revenue**	Budget solvency	Related to current balance
i7	**Total liabilities/Total revenues**	Long-run solvency	Related to debt
i8	**Total liabilities/Population**	Long-run solvency	Related to debt
i9	**Debt servicing/Total revenue**	Budget solvency	Related to debt
i10	**Debt servicing/Own revenue**	Budget solvency	Related to debt
i11	**(Current balance + capital revenue)/Capital expenditures**	Budget solvency	Related to current balance
i12	**Debt servicing/Current**	Budget solvency	Related to expenditures

	expenditures		
i13	**Capital expenditures/Population**	Service solvency	Related to expenditures
i14	**PIT+CIT/Own revenues**	Budget solvency	Related to incomes

Source: own study

From indicators presented in the Table 1 a few were selected (statistical criteria) based on the coefficient of variation. It is a way to measure the extent of variability in relation to the mean of the population (municipalities):

$$V_j = \frac{s_j}{\bar{x}_j}, \qquad j = 1..m \tag{1}$$

where:

s_j – standard deviation of j variable,

$\bar{x}_j$ – arithmetic mean of j variable

m – number of variables.

Table 2 presents values of above mentioned coefficient of variation as well as weights which were assigned to each of the indicators. For all indicators with value of coefficient of variation below 25% authors assigned weight 0%. It was determined arbitrarily, based on subjective criteria. Finally three out of 14 indicators have been removed from further research (i2, i5 and i14).

Table 2 Weights assigned to indicators based on coefficient of variation

Indicator ID	**i1**	**i2**	**i3**	**i4**	**i5**	**i6**	**i7**
Coefficient of variation	26%	21%	27%	54%	12%	61%	52%
Weight	3,8%	0,0%	3,9%	7,9%	0,0%	9,0%	7,6%
Indicator ID	**i8**	**i9**	**i10**	**i11**	**i12**	**i13**	**i14**
Coefficient of variation	62%	84%	92%	57%	91%	76%	24%
Weight	9,2%	12,3%	13,4%	8,4%	13,3%	11,2%	0,0%

Source: author's compilation

All variables used for description of communes are measured on metric scale. Since the adopted indicators are measured on incomparable scales, normalization of variables has been done by standardization.

Each of the indicator was characterized as stimulant or destimulant. Nominants were not distinguished. Table 3 shows results of this step.

Table 3 Preferential variables distinguished among indicators

	Variables
Stimulant	i1, i3, i4, i6, i11, i13
Destimulant	i7, i8, i9, i10, i12

Source: own study

Subsequently, the concept of the pattern of development and measure of development as a method of linear ordering (Hellwig, 1972) was adopted to the conducted research. Initial data matrix $[x_{ij}]_{n\times m}$ (where x_{ij} – the value of the j-th variable on i-th object), after rejecting three out of fourteen indicators, had dimension $n \times m$, where n is the number of objects (municipalities) and m is the number of chosen variables (indicators). To the set of objects pattern object was added, which is an upper pole of development; it means, that for this object values of all indicators were chosen from the best possible.

That resulted in a final data matrix $[x_{ij}]_{n'\times m}$ with dimension $n' \times m$, where $n' = n + 1$.

The next step was to select the distance measure, which takes into account weights of variables. There is a complex catalogue of that kind of measures among which one can find *inter alia*: Manhattan distance, Euclidean distance, Minkowski distance, Canberra distance (Cox and Cox, 2001) or Generalized Distance Measure (GDM) (Walesiak, 2002). In this paper authors focused on the GDM, based on a generalised correlation coefficient which is well known in statistical literature (Kendall, 1955). It is given by the following equation (Walesiak, 1999):

$$d_{ii'} = \frac{1}{2} - \frac{\sum_{j=1}^{m} w_j a_{ii'j} b_{i'ij} + \sum_{j=1}^{m} \sum_{i''}^{n} w_j a_{ii''j} b_{i'i''j}}{2\left[\sum_{j=1}^{m} \sum_{i''=1}^{n} w_j a_{ii''j}^2 \cdot \sum_{j=1}^{m} \sum_{i''=1}^{n} w_j b_{i'i''j}^2\right]^{\frac{1}{2}}} \tag{2}$$

where:

w_j – weight of j-th variable,

$i, i', i'' = 1..n'$ – number of object,

$j = 1..m$ – number of variable.

The biggest advantage of this measure is, that it can be used for variables measured on different scales. In equation (2) for variables measured on the metric scale, the following substitution is applied:

$$\begin{aligned} a_{ikj} &= x_{ij} - x_{kj} \text{ for } k = i', i'' \\ b_{i'lj} &= x_{i'j} - x_{lj} \text{ for } l = i, i'' \end{aligned} \tag{3}$$

where:

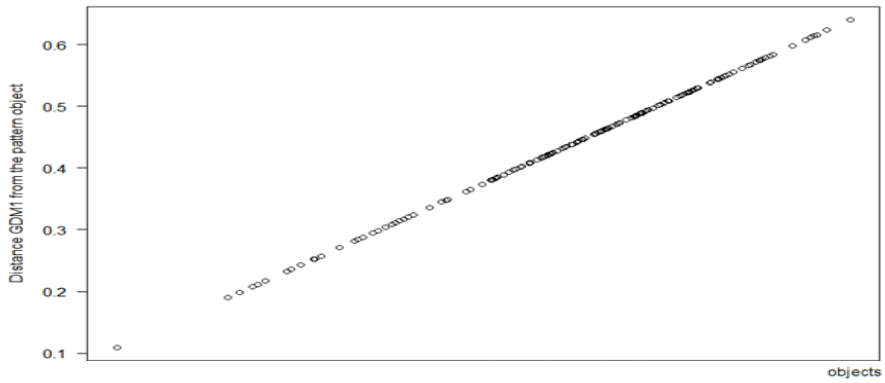
$x_{ij}(x_{i'j}, x_{i''j})$ – the value of the j-th variable on i-th (i'-th, i''-th) object.

Finally the distance between pattern object and the rest of all objects has been measured.

3 Results and Discussion

The linear ordering of 169 objects was carried out in terms of 11 indicators describing financial condition of those objects. The *pattern.GDM* function of the *clusterSim* package applied in R program was used (Walesiak and Dudek, 2017). The configuration of 169 municipalities was presented in a two-dimensional space in Figure 1.

Figure 1 Graphical presentation of linear ordering of 170 objects containing 169 municipalities and pattern object referring to Lower Silesian municipalities financial condition



Source: authors' compilation

Each municipality was marked with random sequential numbers. Because of the wide range of objects, the x axis is not clearly readable, so the above chart is only an

illustration showing how close objects were situated. It also shows, that division of objects into clusters is not clear. Table with computed data was prepared for further analysis. Due to the volume of the article this table will not be presented.

Selected for assessing financial condition indicators can serve as the basis for intergovernmental comparisons. Peer comparison is useful for splitting local governments into clusters that present similar financial condition and highlight position of the entity. In order to group and grade local governments according to their financial condition authors created rating scale. The scale was divided into five categories related to financial condition. The maximum distance (1,00) has been divided equally into 5 intervals:

- from 0 (pattern object) to 0,2 (included): category "superior" (A),
- from 0,2 to 0,4 (included): category "strong" (B),
- from 0,4 to 0,6 (included): category "average" (C),
- from 0,6 to 0,8 (included): category "poor" (D),
- from 0,8 to 1,0 (included): category "the worst" (E).

It was also possible to use maximum computed distance (0,64) as the worst category (instead of "1,0"), but in opinion of authors of this paper, it would make the research too individually as well as the rating concept unclear. There is no reason to consider the municipality distant the most from the pattern, as the municipality with the weakest rating in general.

Table 4 shows number of municipalities included in each category.

Table 4 Number of municipalities by category

Category	No. of municipalities in each category
A	3
B	42
C	118
D	6
E	0

Source: authors' compilation

4 Conclusions

The paper proposed to evaluate the financial situation of Lower Silesian municipalities by comparing them with pattern object (upper pole of development). The best category includes three out of 169 communes. The penultimate category includes six municipalities. Any commune received the worst rank.

Municipalities qualified to the best category (Katy Wroclawskie, Kobierzyce, Twardogóra) have some similar (other than financial condition) features:

- close neighborhood of the city of Wroclaw (capital of the Lower Silesia),
- they are easy accessible – located close to European routs, two of them are located near Wroclaw International Airport,
- most of the population is in working age,
- they are leading regions in terms of the number of companies with foreign capital invested.

We can as well distinguish common features of municipalities which fell into the category D (Jemielno, Jelenia Gora, Mirsk, Pielgrzymka, Kudowa Zdroj, Gluszyce):

- they are located in the significant distance from Wroclaw,
- they are situated on the protected landscape areas or nature reserves cover part of their territory,
- most of their population is in a post working – age,

- important part of their area is covered by agricultural areas and forest.

In authors' opinion, the presented method was just a preliminary part, a trial of preparing complex rating for municipalities in general, referring to their financial condition. Further research should focus on searching better idea for dividing results into clusters (equal intervals are not enough for the complexity of this phenomenon). Variation in time should also be included (financial data for communes used in the research covered the year 2015).

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Effectiveness of Financing the Public Expenditures on Health Care

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Abstract: *The human capital and the person value are the main factors of economic growth and government prosperity in the knowledge-based economy. During the "age of human capital" in the study of public finance management issues, it is necessary to place emphasis on the person and his characteristics. Qualitative characteristics of the human capital are indicators of public health. Therefore, one of the most important state problems is the assessment of effectiveness of government expenditure on health care financing that is the aim of the paper. The complex indicator is based on specially criteria developed system (fertility, mortality, incidence, disability) that allows to create a numerical evaluation of health care public investment effectiveness and to draw conclusions about the quality of public health, the medical care development, training, medico-improving technologies in Russian Federations' regions. The system of quantitative indices includes a group of health care resource provision indicators and a group of health care availability and quality indicators. Using the methods of economic, system analysis, mathematical statistics and solution optimization makes it possible to identify and select factors that affect the resource provision, accessibility and quality of health care. For technique approbation the official open databases of the Federal State Statistics Service, the Ministry of Finance and the Fund of obligatory medical insurance of the Russian Federation for 2015 have been used. The practical implementation of the proposed technique (on the example of the Russian Federations' regions) gives a chance to range territories on effectiveness of public health care financing. Monitoring and analysis of the numerical region rank allow to adopt effective financial decisions at the state level that improve the quality and accessibility of health care, placing emphasis on the human capital, the person value in the knowledge-based economy for prosperous development of the state.*

Keywords: human capital, public health care, effectiveness, public finance management, complex indicator

JEL codes: H51, I15, I18, I38, E24

1 Introduction

Over the years, scholars in many countries around the world have been paying special attention to the issue of assessing the efficiency of spending public funds for health care (Arrow, 1963; Anderson and Poullier, 1999; Getzen, 2000; Berger and Messer, 2002; Alfonso and Miguel, 2005; Bokhari et al., 2007; Blomqvist, 2011; Tae and Shannon, 2013; Kulkarni, 2016). This interest is due to the fact that public health is one of the key parameters determining human capital (Blomqvist, 2011). As many authors have noted (Anton and Onofrei, 2012; Bitran, 2012; Bokhari et al., 2007; Novignon et al., 2012), the lack of financing of the health care sector and low efficiency of public policy in the health care field are particularly acute in developing countries.

Crisis phenomena periodically occurring in the world economy aggravate these problems even more (Anton and Onofrei, 2012). As a result, despite of increasing public expenses for health care, their efficiency remains low (Anton and Onofrei, 2012; Chakraborty et al., 2013).

When assessing the efficiency of public expenses for health care many authors traditionally analyze such parameters as population life expectancy, infant mortality rate, surplus of births over deaths, sufficiency of medical institutions for population, etc.

The results of studies by a large number of scholars (Anton and Onofrei, 2012; Novignon et al., 2012) come to a conclusion that the differences in indicators characterizing population health in many developing countries of the world, as well as in Eastern European countries are conditioned by various levels of GDP and overall expenses for health care. These results also coincide with the results of other researchers (Rajkumar and Swaroop, 2008; Bhalotra, 2007). The methodological principles, which these researches were based upon (Anton and Onofrei, 2012; Rajkumar and Swaroop, 2008; Bhalotra, 2007), are related to the use of a regression analysis of structured statistical data and econometric approaches (Gerdtham and Jonsson, 2000).

At the same time, a number of studies (Kulkarni, 2016; Alfonso and Miguel, 2005; Berger and Messer, 2002; Bokhari et al., 2007; Tae and Shannon, 2013) rebuts the direct correlation between public expenses for health care and population health indicators and shows contradictory results.

So, using the health care production function and regression analysis Kulkarni (2016) showed that there is a direct interrelation between the health indicators and GDP per capita, as well as between the literacy level of the adult population and personal expenditures of the population of the BRICS countries with developing economy. The author also found out that an increase of the amount of expenses for public health care in the BRICS countries cannot ensure improvement of the population health indicators, unless the system of financing of health care institutions is significantly improved. The research also confirmed the conclusion that in developing countries, where per capita income is low, a non-selective increase of public expenses for health care with high net cost may have an adverse effect on the health care efficiency. A possible reason for this abnormality may lie in the fact that the marginal profit from increasing public expenses may be lower than the costs due to high taxes. The empirical results of a study carried out in relation to the BRICS countries show negative correlation between the expenses for public health care and children mortality rate. So, an increase in public expenses is not enough to achieve the desired improvement of results regarding population health (see also Getzen, 2000).

To assess public expenses for education and health care Alfonso and Miguel (2005) applied the non-parametric statistics methods. The authors developed an indicator of the efficiency of public expenses for education and health care, that allowed to rank the OECD countries by the efficiency levels. Alfonso and Miguel (2005), as well as Kulkarni (2016), came to a conclusion that different GDP per capita level or adult population education level in the studied developed countries to a greater extent conditions different results of assessing the health care or education efficiency, than an efficient public policy. In this regard many authors (Anderson et al., 2000; Thomson et al., 2009; Stabile and Thomson, 2014) highlighted the change of the role of public expenses in improvement of population health indicators in developed countries.

In their work (Berger and Messer, 2002) the authors also showed that an increase of medical insurance coverage in twenty OECD countries to a greater extent has an impact on mortality reduction, than the level of public expenses for health care. Strenghtening the role of additional private medical insurance as one of the grounds of improving population health indicators was also highlighted in the work (Rebba, 2014).

At the same time, Bokhari et al. (2007) using an econometric method studied the interrelation of public expenses for health care per capita and average per capita income and the two indicators characterizing population health: children aged under 5 mortality and maternal mortality. The authors managed to find out that there was a reverse interrelation between these indicators, which was confirmed by negative indicator values of elasticity between the two above specified indicators and budgetary expenses for

health care. Similar results regarding the interrelation of infant mortality and public expenses were received by Tae and Shannon (2013). However, based on the results of the study by Tae and Shannon (2013), the elasticity of the expected life expectancy at birth and the public expense level in seventeen OECD countries was positive.

The objective of this work is to study the efficiency of public financing of health care in regions of the Russian Federation using a methodology developed by the authors, by differentiating the regions by the quality level of managing public finances in the health care sector, as well as by assessing the impact of the public financing policy in the health care field on key indicators of the population life and health.

2 Methodology and Data

The authors of this article suggested a methodology of assessing the efficiency of the public policy of the Russian Federation regions health care financing using econometric approaches and mathematical statistics methods. The methodology meets the ease of use requirements conditioned by the accessibility of source information, since the assessment is based on the analysis of the official data from open databases of the Federal State Statistics Service, the Ministry of Finance and the Federal Compulsory Medical Insurance Fund of the Russian Federation for 2015. This methodology was approved based on the data on 85 regions of the Russian Federation as of 2015.

To this end, 47 indicators were considered, which were divided into two groups. The first group characterizes health care resource support. In particular, the first group indicators include the following ones:

- Gross regional product per capita across the constituent entities of the Russian Federation,
- Subventions from the budget of the Federal Compulsory Medical Insurance Fund to budgets of territorial compulsory medical insurance funds in relation to the number of insured persons,
- Subventions of constituent entities of the Russian Federation from the federal budget for health care in relation to the number of population,
- Expenses for health care of consolidated constituent entities of the Russian Federation in relation to the number of population,
- Receipt of funds to the budget of territorial compulsory medical insurance funds in relation to subventions from the Federal Compulsory Medical Insurance Fund,
- Subventions from Federal Compulsory Medical Insurance Fund in relation to the gross domestic product by constituent entities of the Russian Federation,
- Average wage of doctors and health care workers with higher medical or another higher education,
- Sufficiency of medical personnel per 10,000 residents,
- Sufficiency of hospital beds per 10,000 people (including the beds of day-patient facilities),
- Sufficiency of medical institutions for population (per 10,000 residents) and others.

The second indicator group is represented by indicators reflecting health care affordability and quality. The indicators of this group include:

- The number of insured persons in relation to the number of population,
- The number of population per one doctor as of the end of a year,
- The share of institutions having day-patient facilities in medical institutions,
- Hospitalization level (ratio of the number of people hospitalized by emergency ambulance services to 1,000 persons of population),
- The share of working-age population in the overall population,
- Population life expectancy,
- Infant mortality,

- Surplus of births over deaths,
- The number of abortions per 100 births and others.

The above mentioned indicators were grouped by their impact on the efficiency of the Russian Federation regions health care financing system.

Using expert assessment methods in relation to each analytical indicator the authors revealed the limit standard values of these indicators for a conditionally reference region with high (region 1) and low (region 2) quality level of managing public finances in the health care sector. Formation of the two sets of threshold values of indicators (region 1 and region 2) allows to split the aggregate of analyzed regions into three groups: regions with a high level of efficiency of the public policy of health care financing, regions with a low level of such efficiency and regions that, falling in the value interval between the first two groups, demonstrate moderation in managing public finances in the health care sector.

Further, the authors of this study carried out a standardization of the above mentioned indicators and determined an integral indicator of the efficiency of the public policy of the Russian Federation regions financing. The essence of the standardization is that during assessing the level of managing public finances in the health care sector the calculated indicators may have various dimension, importance or weight. In this regard, the authors used a method based on linear conversion of initial indicators: so, the values of standardized indicators will fall within the specified interval from 0 to 1. Such standardization will result, on the one hand, to loss of dimension, however, on the other hand, the structure of changes in certain indicators is preserved, which makes it possible to compare them and to display in a unified coordinate system. To carry out the standardization process indicators are classified by two groups of impact on the efficiency of the Russian Federation regions health care financing system: an increase in value of one indicators results in decrease of the quality of managing public finances in the health care sector, and an increase in value of other indicators results in increase of the quality of managing health care public financing. Calculation of standardized indicators is carried out according to the following formulas.

Minimizing indicators group:

$$Z_{ij}^{*} = \frac{Z_{ij} - Z_{i\min}}{Z_{i\max} - Z_{i\min}}, \quad 0 \le Z_{ij}^{*} \le 1. \tag{1}$$

Maximizing indicators group:

$$Z_{ij}^{*} = \frac{Z_{i\max} - Z_{ij}}{Z_{i\max} - Z_{i\min}}, \; 0 \le K_{ij}^{*} \le 1. \tag{2}$$

where Z_{ij} is the calculated value of the i^{th} coefficient of the system of health care public financing efficiency indicators in the j^{th} region,

Z_{ij}^{*} is the standardized indicator of the i^{th} coefficient of the system of health care public financing efficiency indicators in the j^{th} region,

$Z_{i\max}$ - the highest calculated value of the i^{th} coefficient,

$Z_{i\min}$ - the lowest calculated value of the i^{th} coefficient.

To receive a numerical comprehensive assessment of the efficiency of public financing of health care in regions the authors added the suggested methodology with a calculation of

an integral standardized indicator ($Z^{*health\ care}_{complex\ j}$). This indicator is calculated as the sum of coefficients included in the criteria system used to assess the quality level of health care public financing in regions of the Russian Federation including the two groups of indicators.

$$Z^{*health\ care}_{complex\ j} = \sum Z^{*}_{ij} \quad (3)$$

where $Z^{*health\ care}_{complex\ j}$ is of the quality level of managing public finances in the health care sector of the j^{th} region.

The received value of this indicator is compared with a corresponding value of the integral standardized indicator reflecting the standard value for a region, relating to a group with high, medium and low level of the efficiency of regional health care public financing. The lower the value of the integral standardized indicator of the quality of managing public finances in the health care sector in regions ($Z^{*health\ care}_{complex\ j}$), the more efficient is the carried out public policy of health care financing in such regions. It allows to rank regions by value $Z^{*health\ care}_{complex\ j}$, with simultaneous splitting them into groups (high, medium and low quality level of managing public finances in the health care sector).

The second part of the research involves studying the efficiency of public financing of health care by analyzing the interrelation of standardized indicators of health care resource support groups and standardized indicators reflecting health care affordability and quality in regions of the Russian Federation. When carrying out this part of the research, the authors used a regression analysis.

3 Results and Discussion

Practical implementation of the suggested methodology covered 85 regions of the Russian Federation and allowed to rank the territories by the effectiveness of health care public financing as of 2015. Ranking was carried out based on the integral standardized indicator of the quality of managing public finances in the health care sector in regions. A rating of regions by the quality level of managing public finances in the health care sector in 2015 is shown in Table 1. Leading regions in each of the above specified quality levels of managing public finances in the health care sector in regions are shown in Table 1. The Table 1 demonstrates that regions with high quality level of managing public finances in the health care sector are absent.

Table 1 Rating of regions of the Russian Federation by quality level of managing public finances in the health care sector in regions, 2015 (a fragment)

Region of the Russian Federation	**Indicator value** $Z^{*health\ care}_{complex\ j}$	**Place in the rating**
Regions with medium quality level of managing public finances in the health care sector		
Kamchatka region	37.59	1
Khanty-Mansiysk Autonomous District	38.34	2
Murmansk region	38.50	3
Yamalo-Nenetsk Autonomous District	38.84	4
Magadan region	40.62	5
Sverdlovsk region	41.19	6
Kostroma region	41.54	7

Chelyabinsk region	42.14	8
Moscow region	42.38	9
Rostov region	42.54	10
Regions with low quality level of managing public finances in the health care sector		
Tomsk region	46.30	31
Primorye region	46.38	32
Republic of Karelia	46.55	33
Republic of Chuvashia	46.75	34
Republic of Komi	46.81	35
Penza region	47.04	36
Republic of Bashkortostan	47.16	37
Belgorod region	47.28	38
Saratov region	47.43	39
Republic of Buryatia	47.64	40
…		
Tver region	51.42	72
Ivanovo region	51.64	73
Evreiskaya Autonomous District	51.77	74
Pskov region	51.87	75
Tula region	52.30	76
Lipetsk region	52.35	77
Bryansk region	52.36	78
Republic of Mordovia	52.43	79
Republic of Kalmykia	53.86	80
Republic of Mari El	54.46	81

Source: authors' calculations based on the data of the Federal State Statistics Service, the Ministry of Finance and the Federal Compulsory Medical Insurance Fund of the Russian Federation

The received results of determining a numerical value of a region rank will allow to make at the governmental level efficient financial decisions in relation to specific regions of the Russian Federation, which will foster the improvement of the health care quality and affordability, while focusing on the human capital.

Some most interesting results of assessing the closeness of interrelation between standardized indicators of health care resource support groups and standardized indicators reflecting health care affordability and quality in regions of the Russian Federation are shown in Table 2.

Table 2 Results of a regression analysis of the closeness of interrelation between standardized indicators of life expectancy, infant mortality and health care resource support indicators, 2015 (a fragment)

Health care resource support indicators	**Life expectancy standardized indicator**			**Infant mortality standardized indicator**		
	α	**β**	**R^2**	**α**	**β**	**R^2**
Gross regional product per capita across the constituent entities of the Russian Federation	0.58	0.58	0.0004	0.17	0.10	0.01
Public expenses for health care of regions of the Russian Federation in relation to the number of population	0.52	0.22	0.11	0.24	0.14	0.03

Average wage of doctors and health care workers with higher education	0.69	-0.17	0.06	0.32	-0.07	0.01
Sufficiency of hospital beds per 10,000 people	0.28	0.70	0.53	0.13	0.32	0.09
Sufficiency of medical institutions for population	0.31	0.60	0.32	0.22	0.11	0.01

Source: authors' calculations based on the data of the Federal State Statistics Service, the Ministry of Finance and the Federal Compulsory Medical Insurance Fund of the Russian Federation

The data in Table 2 show that the differences in life expectancy and infant mortality levels in regions of the Russian Federation can be explained to a greater extent by various degree of sufficiency for population of various regions of hospital beds per 10,000 people, sufficiency of medical institutions for population, than by the level of gross regional product per capita and expenses for health care. The received results coincide with the results received by Kulkarni (2016) and demonstrate that to improve the population health and life quality, which are ones of the most important components of the human capital, an increase in public expenses is not enough (see also Getzen, 2000). One needs to improve the system of financing of medical institutions itself, as well as to increase the affordability of the whole set of medical services for population; financing of innovations in medicine and their further implementation in the practice of medical institutions is also important.

4 Conclusions

Public health indicators are ones of the key components of the human capital. In this regard, as assessment of the efficiency of financing of public expenses for health care plays an important role when assessing the population life and health indicators.

The study conducted by the authors in this work allows to come to a number of important conclusions. Firstly, the efficiency of health care financing depends largely on the quality of managing public finances by territorial authorities. The methodology, developed by the authors, of a comprehensive assessment of the efficiency of public policy of health care financing, allowed to rank the territories by the effectiveness of health care public financing. It is expected that a regular monitoring of regional ranks will encourage taking effective financial decisions aimed at improvement of health care quality and affordability.

Secondly, the authors carried out an assessment of the interrelation of the developed standardized indicators of life expectancy, infant mortality and health care resource support indicators. The authors found out that the amount of expenses for health care to a lesser extent impacts on the life expectancy and infant mortality indicators in regions, than the directions of spending such funds. In particular, the most strong interrelation of life expectancy and infant mortality was established with the standardized indicator of sufficiency of hospital beds per 10,000 people. The received results coincide with conclusions received by other researchers (see, for example, Kulkarni, 2016; Getzen, 2000). An increase in the population health indicators is possible through reforming the system of financing of medical institutions aimed at increasing of affordability of medical services and development of innovations in medicine.

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Personal income tax redistribution: new possibilities for fiscal federalism in Russia

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Abstract: *The purpose of this study is to develop a calculation mechanism for differentiation of personal income tax revenues among three budget levels: Federal, regional and local, instead of currently existing administrative distribution mechanism, which does not take into consideration real economic capacity of the territories. The authors tested the following hypothesis: return of tax revenues differentiation between Federal, regional and local budget levels within the framework of economic model, taking into consideration a number of differentiating criteria, developed with allowances made for regions social and economic indexes, will allow to tie territories taxable capacity with social and economic peculiarities of their development. Methods of factor analysis, time-series analysis allowed to test the algorithm built for dividing tax revenues, confirming their relevance and significant value. We evaluated each criteria received for 83 regions of the Russian Federation for the period of 2010-2014 and identified the possibility of splitting revenues from personal income tax between the Federal, regional and local budgets. Nizhny Novgorod region, one of the regions of Russian Federation, was taken as an example in the course of study. As the result of this study the authors exposed 4 groups of personal income tax possible distribution among three budget levels. Check-up analysis showed, that the model, offered by the authors of this research for consideration, allows to increase territories tax potential, the level of their own revenues, financial stability of these territories, and it can be used in the countries with federal form of government. Replacement of existing mechanism of tax revenues administrative distribution according to budget levels for differentiating calculation mechanism would create additional incentives for development of the economy in regions, which will encourage the implementation of justice concept in tax assessment.*

Keywords: tax redistribution , personal income tax, tax revenues, budget, fiscal federalism

JEL Classification: H21, H61, H77, H230

1 Introduction

The issue of tax proceeds differentiation among budget levels became one of the most challenging issues in the 21st century for Federative States. Taxes are not only the main source of budget revenues, but are the basis of financial stability, independence of each budget level and of the State in general (Creedy, 2010; Oates, 2006; Yashina et al., 2017). Representatives of unitary states also joined the research in this area within the last five years (Rattso and Stokke, 2017). In many developed countries in North America and Europe the distribution of tax proceeds among budget levels takes place in accordance with proportionate established level of tax rate (territorial and unified federal tax rate components are distinguished (Creedy, 2010). The size of territorial component depends on the region development degree, its distance from financial and administrative centers (Hassan and Bogetić, 1996; Jackson and Brown, 1994; Jenderny, 2016). However, regulatory documents do not contain the information on mathematical (calculated) justification of such a division, gradation of tax rates is conventionalized, it depends on subjective approach of financial institutions and Governments of specific countries (De Rooy, 1982; Naseem and Reesor, 2011; Yashina et al., 2017).

2 Methodology and Data

That is why the purpose of our study is to create calculation mechanism of tax differentiation among budget levels, with personal income tax taken as an example (income tax, employment tax). To achieve this purpose, we: developed econometric model of personal income tax redistribution, including three budget levels – federal, regional and local; improved differentiating indexes system, presented in the earlier published articles (Yashina et al., 2017); chose integrated index to compare data in temporal series; calculated indexes for 1 138 randomly selected municipal settlements of 83 territorial entities of Russian Federation (this equals 5% of the total number of municipal settlements in Russia) for the period from 2010 until 2014 in accordance with official data of Federal Revenue Service and Federal Office for National Statistics of Russian Federation; using theory of weights, we conducted distribution of personal income tax proceeds on percentage basis among federal, regional and local budgets in the regions of Russian Federation; conducted mathematical check of the developed algorithm. Personal Income Tax is a budget revenue generating tax. According to economists and scientists opinions, income tax (personal income tax in Russia) - is the major tax, that covers the highest amount of taxpayers, and it is the most productive tax as well (the change in approach in its collection reflects on the amount of the State revenue really fast) (De Rooy, 1982; Ferrando et al., 2012; Gómez et al., 2014; Montero and Picón, 2010; Yashina et al., 2017). In this regard, the rational distribution of its proceeds can have major impact on budgets revenue. It is necessary to mention, that up until now the detailed distribution algorithm is still not developed. Scientific researchers and economists just offer various indexes, that could be taken into consideration within such an algorithm, though the systemized approach to the issue of tax distribution still does not exist. While distributing personal income tax among budget levels the scientists suggest to take into consideration: the size of tax potential of the region (Gómez et al., 2014; Jenderny, 2016); territories investment activity (Hassan and Bogetić, 1996; Perese, 2011); population social needs (Pereira and Pereira, 2014); population wealth (Yashina et al., 2017). Scientific literature research showed, that, despite of the three-level authority system existence in Federative States, the issue of mathematical distribution of income tax among three levels of the budget was not brought up yet. Taking into consideration the results, obtained by foreign researchers, as well as the results, obtained in the course of our own studies, we formulated the following hypothesis. We suggested that:

- personal income tax has to be distributed among three levels of the budget (federal, regional and local) on the basis of calculation mechanism, taking into consideration a number of differentiating criteria.

In the course of study on distribution of personal income tax proceeds among federal, regional and local budget levels, we developed calculation methods for 9 differentiating criteria:

1) Tax Base EQuality Indicator (TBEQI) - the ratio of the tax base and tax amount of individual taxpayers registered in the territory of each region.

2) Tax Base Immensity Indicator (TBII) - is the ratio of the tax base to the amount of tax revenues in the region. The second option is calculation in relation to overall income in the region.

3) Tax Base Stability Indicator (TBSI) - the share of tax in the main indicator of a country's development – in GDP.

4) Tax Base Efficiency Indicator (TBEI) - the ratio of the amount of the additional payments received in the course of tax audits and the amount of tax paid.

5) Tax Base Disbalance Indicator (TBDI) - the ratio of personal income tax and regional budget expenditures.

6) Well-Being Indicator (WBI) - the ratio of the tax base and a level of incomes of the population in a particular region.

7) Tax Base Mobility Indicator (TBMI) - the ratio of the tax base and the number of organizations in the region.

8) Social Tension Indicator (STI) – the ratio of the tax base and the number of employable population.

9) Activity Indicator (AI) – the ratio of the tax base and the population number of municipal settlement.

The two last indicators specify mobility indicator from the social point of view. During the time of our reseach it was important for us to determine, how invariable is each indicator for each specific municipal settlement in the course of several years. For each indicator temporal series were built, taking into consideration the data, used for its calculation. To expose the dynamics of the series received, variation coefficient was used, which reflected data point dispersion degree, and which allowed to evaluate the block of data for consistency. We used generally recognized statistical border at 33.3% as a boderline case. If the value received was below the borderline, then the aggregate was considered to be consistent, if not – non-homogenious. In our case consistency indicates data stability, used when calculating the criteria. Stable data provide tax allocation according to a certain criteria to the subject budget. Data instability can indicate the necessity of additional control and centralization. Accordingly, in this case it is necessary to allocate the tax to a higher budget level (for example, regional level) (Yashina et al., 2017).

3 Results and Discussion

For the study, we adopted as an axiom the results, obtained in a previous study, of dividing income tax between the regional and federal levels (Yashina et al., 2017). According to our division algorithm, which was created and mathematically proven on the error, the regions of the Russian Federation were divided into 8 groups according to the size of the tax deductions - table 1.

Table 1 Groups of regions of Russian Federation according to the share of personal income tax revenues to the Federal budget and regional budgets

Group	The recommended share of revenues to the Federal budget	Recommended share of the revenue to the regional budgets	Regions	The current ratio of revenues to the Federal budget and regional budgets
1	4.5% - 14.5%	85.5% - 95.5%	Regions: Ivanovo, Smolensk, Tula, Tver, Ryazan', Yaroslavl', Archangelsk, Murmansk, Vologda, Rostov, , Samara, Saratov, Ul'yanovsk, Kurgan, Tumen', Novosibirsk, , Chita Autonomous areas: Republics: Tatarstan, Kareliya , Agigeya, Kabardino-Balkariya, Severnaya Osetiya, Mariy-El, Udmurtiya, Chuvashiya, , Khakassia, Saha Territoties: Krasnodar, Stavropol', Altay, Primorskiy, Khabarovskiy	0% to the Federal budget, 85% to the regional budgets (except for some types of activities)
2	14.5% - 24.5%	75.5% - 85.5%	Regions: Nizhny Novgorod ,Vladimir, Kaluga, Kostroma, Belgorod, Kursk, Kaliningrad, Leningrad, Novgorod, Pskov, Orenburg, Sverdlovsk, Irkutsk, Amur, Magadan, Sakhalin,	

			Evreiskaya Cities: Moscow, Sankt-Petersburg Territories: Krasnoyarsk, Kamchatka, Khanty-Mansiisk Republics: Kalmykiya, Buryatiya,Tyva
3	24.5% - 34.5%	65.5% - 75.5%	Regions: Omsk, Tomsk, Orel, Tambov Republics: Dagestan
4	34.5% - 44.5%	55.5% - 65.5%	Regions: Lipetsk, Vologda, Astrakhan`, Kirov, Chelyabinsk Republics: Ingushetiya, Komy, Chechnya
5	44.5% - 54.5%	45.5% - 55.5%	Regions: Penza Republics: Karachaevo-Cherkessia, Mordoviya, Altay, Bashkortostan
6	54.5% - 64.5%	35,5%- 45.5%	-
7	64.5% - 74.5%	25.5% - 35.5%	-
8	74.5% - 84.5%	15.5% - 25.5%	Autonomous area: Chukotka, Yamalo-Nenec

Source: authors

For each of 83 Russian regions the percentage of deductions in the regional budget was taken into consideration, which is represented by a fragment of the table 1. To illustrate how this algorithm works, let's take a look at Nizhny Novgorod region. According to table 1 average income tax division between the regional and federal level looks like 80% (in the regional budget) to 20% (federal budget). For research purposes we conventionally assigned to federal level 20% of income tax revenues and continued research in the direction of the division of the remaining 80% tax between the regional and local level. We calculated 9 mentioned above indicators for the period of 2010-2014. Then the variation coefficient is an integral indicator time series was calculated. An example of the calculation is one of Russian municipalities of Nizhny Novgorod region - the city of Nizhny Novgorod, is presented in table 2.

Table 2 The value of indicators defining the theoretical criteria for the distribution of personal income tax for the city of Nizhny Novgorod and the value of the variation coefficient for 2010-2014

Indicator	**Tax period (year)**					**Coefficient of variation, %**
	2010	**2011**	**2012**	**2013**	**2014**	
TBEQI	0.78	0.65	0.69	0.92	0.71	37.4
TBII	0.27	0.21	0.17	0.14	0.29	32.4
TBSI	0.10	0.10	0.09	0.04	0.12	21.1
TBEI	0.88	0.67	0.69	0.23	0.73	36.2
TBDI	0.51	0.38	0.54	0.76	0.52	33.6
TBMI	0.47	0.64	0.35	0.78	0.81	35.9
WBI	0.32	0.39	0.44	0.35	0.49	28.9
STI	0.42	0.56	0.39	0.61	0.70	38.3
AI	0.56	0.47	0.44	0.51	0.50	33.1

Source: authors

According to Table 2, variability of the following indicators: Tax Base Immensity Indicator (TBII), Tax Base Stability Indicator (TBSI), Well-Being Indicator (WBI) amounted to less than 33.3%, which means the possibility of tax proceeds distribution in favor of the city of Nizhniy Novgorod, and as for the other indicators, it showed that the tax proceeds distribution was in favor of Nizhniy Novgorod region, as variability of other indicators was more than 33.3%. To achieve this we use the theory of determining weight indicators (Fishborn Formula). For the compilation of the weighting system we transposed indicators in descending order of importance. For us the significance of descending would mean the removal of the threshold values in 33.3%. Bearing in mind that the lower the coefficient of variation, the more stable the system is, it will be enough for us to arrange the values of coefficients for each subject in ascending order. After that we can take advantage of the proposed formula for calculating the weight of each indicator:

$$a_i = \frac{2 \times (n - i + 1)}{n \times (n + 1)} \quad (1)$$

where a_i- the i-th indicator weight, *i*-the number of indicator for a specific region, *n* - is the number of indicators.

Then, for personal income tax distribution between regional and local budgets on the basis of the weights of each indicator, we added weghts of those coefficients, that are attributed to regional or local levels of suggested budgets. The results, received for the city of Nizhniy Novgorod, are shown in Table 3.

Table 3 The value of the weights coefficients of variation for the city of Nizhny Novgorod. Match the value of indicators and budget levels for the city of Nizhniy Novgorod

Indicator	The coefficients of variation, %	Weight of the coefficient	Recommended level of budget
TBSI	21.1	0.200	Local budget
WBI	28.9	0.178	
TBII	32.4	0.156	
AI	33.1	0.133	
TBDI	33.6	0.111	Budget of the region
TBMI	35.9	0.089	
TBEI	36.2	0.067	
TBEQI	37.4	0.044	
STI	38.3	0.022	

Source: authors

Acording to Table 3, by adding weights of indicators, attributed to one budget level, we have:

Share of tax proceeds to Regional budget =13,3%+11,1%+8,9%+6,7%+4,4%+2,2%=46,6%

Share of tax proceeds to Local budget = 20%+17,8%+15,6%= 53,4%.

If we take into consideration, that 80% of personal income tax proceeds make it to consolidated budget (regional and local budgets) of the subject (Nizhniy Novgorod region) according to the result of previous research, then the real flow of revenue is:

To the regional budget=80%*46,6%=37,28%,

To the local nudget = 53,4%*80%=42,72%.

Thus, according to the results of conducted research, we suggest for Nizhniy Novgorod region to redistribute personal income tax proceeds among the budgets in the following

way: 20% to Federal budget, 40% to regional budget and 40% to the local budget. Similar calculations were conducted for all regions of Russian Federation, all the data received is presented in Table 4.

Table 4 Distribution of personal income tax between levels of budget (fragment)

	The share of income		
Name of region/municipality	**To the Federal budget**	**To the budget of the region**	**To the local budget**
Voronezh region/city of Voronezh	50.00%	25.00%	25.00%
Moscow region / city of Moscow	50.00%	45.00%	5.00%
Orel region / city of Orel	10.00%	60.00%	30.00%
Tula region /city of Tula	30.00%	40.00%	30.00%
Vologda region / city of Vologda	40.00%	35.00%	25.00%
Kaliningrad region/ city of Kaliningrad	15.00%	55.00%	30.00%
Republic of Dagestan /city of Mahachkala	85.00%	10.00%	5.00%
Republic of Ingushetiya /city of Magas	60.00%	25.00%	15.00%
Orenburg region / city of Orenburg	20.00%	50.00%	30.00%
Perm territory / city of Perm	55.00%	40.00%	5.00%

Source: authors

Using Sturges formula and statistical dispersion formula, we studied municipal settlements, (1 138 settlements) in Russian Federation, that we divided into 10 groups with dispersion of proceeds – 2,5%, Table 5.

Table 5 Groups of regions of Russian Federation according to the share of personal income tax revenues to the local budget and regional budgets (fragment)

Group	**The recommended share of revenues to the local budget**	**Cities**	**The current ratio of revenues to the local budgets and regional budgets**
1	5% - 9%	Moscow, Krasnodar, Stavropol, Perm, Yaroslavl`	15% (max) to the local budget, 85% [max] to the regional budgets
2	9% - 13%	Vladimir, Kaluga, Kostroma, Belgorod, Kursk	
3	13% - 17%	Omsk, Tomsk, Nadim, Lipetsk, Sankt-Petersburg	
4	17% - 21%	Chelyabinsk,Penza, Ufa, Kirov, Irkutsk, Amursk	
5	21% - 25%	Salehard, Voronegh, Novgorod, Pskov, Murmansk	
6	25% - 29%	Ivanovo, Smolensk, Tver, Penza, Rostov, Samara	
7	29% - 33%	Tula, Ryazan`,Archangelsk, Orenburg, Kaliningrad,	
8	33% - 37%	Novosibirsk , Saratov, Ul'yanovsk, Kurgan, Tumen	
9	37% - 41%	Khabarovsk, Kaluga, Krasnoyarsk,	
10	41% - 45%	Nizhny Novgorod, Tambov, Vladivostok	

Source: authors

Using the same approach, we divided all the subjects of Russian Federation in 8 groups, with 7% dispersion of proceeds. The financial bodies of the territories can use tables 1 and 5 (full version) data for individual division of personal income tax proceeds or to use different extended groups of territorial division. Thus, according to the results of our previous research (Yashina et al., 2017), we also distinguished two big groups of personal income tax proceeds possibile division between federal and reginal levels (10% to 90% and 20% to 80%). Municipal settlements can be divided into 4 big groups, with

the maximm number of settlements as the main criteria (10%, 15%, 25%, 35%). As the result we have 8 groups of personal income tax division among three levels – Table 6.

Table 6 Groups of regions of Russian Federation according to the share of personal income tax revenues t the local budget and regional budgets (fragment)

Group	The recommended share of revenues to the			Cities
	Federal budgets	regional budgets	local budgets	
1	**10%**	**80%**	**10%**	Mahachkala, Yakutsk, Kaliningrad,
2	**10%**	**75%**	**15%**	Yaroslavl`,Magas
3	**10%**	**65%**	**25%**	Orel, Vologda, Orenburg, Sankt-Petersburg
4	**10%**	**55%**	**35%**	Khabarovsk, Kaluga, Krasnoyarsk
5	**20%**	**70%**	**10%**	Moscow, Yaroslavl`, Ekaterinburg
6	**20%**	**65%**	**15%**	Omsk, Tomsk, Nadim,
7	**20%**	**55%**	**25%**	Voronezh, Novgorod, Pskov, Murmansk
8	**20%**	**45%**	**35%**	Nizhny Novgorod, Tambov, Vladivostok

Source: authors

To check the results obtained, we used fuzzy majority principle, as well as conducted approximation error check. According to fuzzy majority principle, to determine weight coefficients a system was built for 9 variability indexes. To achieve this we chose basic function of weight determination, that accepts only two borderline values 0 (0%) или 1 (100%), that is F(0)=0 и F(1)=1, second degree polynomial $f(x) = ax^2 + bx + c$, and took into consideration an assumption, that the meaning of the first weight coefficient in our case corresponds to the weight, received by using Fisburn formula, which is 20%. While solving the issue, we found fixed multipliers and got weight values, similar to the ones, presented in Table 3. Thus, as in the case of weight determination according to Fisburn formula using fuzzy majority principle, the ratio of personal income tax proceeds for Nizhniy Novgorod region has to be distributed among the budgets approximately in the following proportions: 20% to the Federal budget, 40% to the regional budget, and 40% to the local budget. Since Fisburn model is not economically founded, we checked the data received through multiple regression equation. Then, using the tabular format of significance level (F-тест), composed by Fisher at different degrees of freedom, we determined the value of the built model. According to calculations, using the data received earlier, at significance level $\alpha = 0,0005$, factual significance (F) will amount to 24,91, that is higher than table factual significance ($F_{tabl} = 3,44$), that is why the equation of regression is statistically significant, as the built model as a whole. For reliability assessment we calculated average relative error of approximation as:

$$A = \frac{1}{9} * \sum_{j=1}^{9} \left| \frac{y_j - y_j^*}{y_j} \right| * 100\% \approx 0,48723\% \qquad (2)$$

Approximation error within 5-7% attests of good model fitting to given data. Since in our case A<5%, it is possible to say, that the model, built by the authors, has a fair accuracy.

4 Conclusions

The results, that were received, allow us to claim, that formulated hypothesis of the possibility of personal income tax redistribution in Russia among three budget levels on the basis of calculation mechanism, which takes into consideration a number of differentiating criteria, is proved to be true. The suggested algorithm, which uses statistical methods, allowed us to determine weight values in order to distribute personal income tax among regional and local budgets. The results of our study made the

suggestions of Jenderny, 2016; Montero and Picon, 2010; Naseem and Reesor, 2011 of the necessity to create calculation mechanism in distribution of tax proceeds to be more specific. Our conclusions partially confirm the conclusions, received by De Rooy, 1982; Creedy, 2010; Pereira and Pereira, 2014, about the fact, that personal income tax has to be left at the Federal budget's disposal in order for the State to conduct its social policy. On the other hand, they reject these conclusions, as we proved the effectiveness of personal income tax three-level distribution. Check-up analysis showed, that the model, offered by the authors of this study for consideration, allows to increase territories tax potential, the level of their own revenues, financial stability of these territories, and it can be used in the countries with federal form of government. Replacement of existing mechanism of tax revenues administrative distribution according to budget levels for differentiating calculation mechanism would create additional incentives for development of the economy in regions, which will encourage the implementation of justice concept in tax assessment. As a continuation of our research, we plan to develop an algorithm, that will allow to conduct not only gradual paired differentiation of tax proceeds among the three levels of the budget, but a simultaneous one. The calculation algorithm of personal income tax differentiating among the three levels of the budgets (federal, regional and local), suggested by us, can be used by federal and regional financial bodies of power for independent determination and validation of tax proceeds possible division among the budget levels.

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Assessment of Changes in the Trend of Interdependences between the Capital Market of Germany and the Markets of Poland, the Czech Republic and Hungary

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Abstract: *The subject of the article concerns the identification of a common factor (latent variable) describing the interdependence system for selected capital markets. Within the study we conducted an analysis of the correlation between the capital market of Germany and the markets of Poland, the Czech Republic and Hungary. The values of conditional correlations derived from the DCC-GARCH model were used to evaluate the interdependence between the capital markets. Then, based on the established interdependencies between the markets, a cointegration analysis was carried out. The degree of integration of conditional correlation series using the Phillips-Perron test was tested. Based on the Johansen procedure, a long-term system of linkages between the capital markets was determined. The identification of the cointegration process for the interdependence system was an argument for identifying a common factor on the basis of the affirmative factor analysis. The common factor reflects the leading direction of changes in the interdependence system between the German capital market and the markets of Poland, the Czech Republic and Hungary. The estimation of the square trend parameters for the identified common factor allowed us to determine the direction of change in the interdependence system between the examined capital markets. The results obtained confirmed that the increase in the level of interdependence was due to the global financial crisis and the slow stabilization of the analyzed markets.*

Keywords: capital markets interdependence, DCC-GARCH model, conditional variance, conditional correlation, confirmatory factor analysis

JEL codes: G12, G15, C58

1 Introduction

As a result of globalization progresses, there is a systematic increase in the interdependence between capital markets. This phenomenon is primarily due to the growing fundamental relationships whose structure and strength are disturbed by the transmission of shocks of different scales. When analyzing international relations, one can conclude that the dynamics of interdependence is constantly changing in the financial markets, which is particularly dynamic in the context of deep economic disturbances. Equally, when examining interdependence of capital markets, the importance of the period of stability ('tranquility') and the period of increasing instability ('crisis') are often highlighted. In times of tranquility, we are most likely to deal with the transmission of shocks that result from the majority of fundamental relationships. The existing market

clearing mechanisms allow shocks to be eliminated and markets returned to the state of relative equilibrium. In times of crisis, in turn, it is possible to generate shock transmissions, which are largely caused by factors that go beyond the existing fundamental linkages. A change is also possible in the fundamental linkages themselves, caused by these factors. Finally, under crisis there can often be noticed a growing correlation between capital markets, which in itself can be an interesting empirical problem. This issue creates the background to the analysis performed in this article, where a study of interdependence will be conducted between selected capital markets. The analysis of interdependence in capital markets had been addressed in numerous international empirical studies (Arshanapalli et al., 1995; Bekaert and Wu, 2000; Pericoli and Sbracia, 2003; Vychytilová, 2015; Fałdziński et. al., 2016; Heryán and Ziegelbauer, 2016; Meluzín and Zinecker, 2016; Vukovic et al., 2017).

Occurrence of crisis situations on financial markets can have a significant impact on changes in the functioning of the global economy, since shocks transmissions cannot be offset by the existing interdependence between markets. In the selected crisis period successive shocks, in addition to triggering a disturbance in the functioning of financial markets, may undermine the functioning of real economies (see: Gawrońska-Nowak and Grabowski, 2016; Glinka, 2016, Lenart et al., 2016; Balcerzak, 2016). Indeed, as a result of the recent global financial crisis, the financial market has not only declined, but the socio-economic situation of most economies significantly changed (Miklaszewicz, 2016; Lajtkepová, 2016; Balcerzak, and Pietrzak, 2016a; Pietrzak and Balcerzak, 2016a). Although the United States were the source of the global financial crisis, European economies suffered from it to a greater degree. In the EU countries there was a slowdown in foreign direct investment and in the level of enterprise investment. This has had a negative impact on the level of competitive potential of European economies and on the labour market (Kowalczuk, 2016; Murawska, 2016; Hadaś et al., 2016).

The major objective of the article is to identify the interdependence system between the capital markets of Germany, Poland, the Czech Republic and Hungary. The achievement of the assumed objective enabled us to distinguish a common factor which as a latent variable describes the formation of interdependencies for selected capital markets. The results of the analysis of global changes indicated that during the global financial crisis of 2007-2010 there was a significant increase in the interdependence between the studied markets.

2 Methodology and Data

The study carried out deals with identifying the system of linkages between the German capital market and the markets of Central and Eastern Europe (within the Visegrad Group). Despite substantial differences in the potential of Visegrad economies, global financial investors still treat them as a relatively homogeneous group, which is most often included into the emerging markets category. The study uses time series for the following stock indices: DAX (Germany), WIG (Poland), BUX (Hungary), PX (Czech Republic) for the years 2004-2014. Data was downloaded from the financial web site of 'yahoo' (http://www.finance.yahoo.com).

The DCC-GARCH model was used to identify the connections between the capital markets of Germany, Poland, the Czech Republic, and Hungary. In the DCC-GARCH model, in addition to equations for conditional variance, there are also conditional correlation equations (see: Engle 2002, 2009; Balcerzak et al. 2016; Szumilo et al., 2017). A correct identification of interdependence will allow to assess the strength of mutual interdependencies between the markets and to characterize changes in linkages over time. In order to establish a model specification, the AR-GARCH model was estimated based on return rates for individual stock indices. The selection of the best model specification for a single index was based on information criteria. For the DAX and BUX indexes, the model specification was established in the form of GARCH(1,1) model, and

for the PX and WIG indices, the model specification was AR(1)-GARCH(1,1). Therefore, the DCC-GARCH model specification can be written as follows (Engle, 2009):

$$\begin{aligned}
&\mathbf{Y}_t = \boldsymbol{\mu}_t + \boldsymbol{\varepsilon}_t,\ \boldsymbol{\varepsilon}_t \big| \mathbf{F}_{t-1} \sim t(0, \mathbf{H}_t, v),\ \mathbf{H}_t = \mathbf{D}_t \mathbf{R}_t \mathbf{D}_t,\\
&\mathbf{R}_t = \mathbf{Q}_t^{*-1} \mathbf{Q}_t \mathbf{Q}_t^{*-1},\\
&\mathbf{Q}_t = (1-\alpha-\beta)\mathbf{S} + \alpha(\mathbf{z}_{t-1}\mathbf{z}_{t-1}^{'}) + \beta \mathbf{Q}_{t-1},\\
&\mu_{i,t} = \gamma_{i,0} + \gamma_{i,1} y_{i,t-1},\ h_{i,t} = \omega_{i,1} + \alpha_{i,1}\varepsilon_{t-1}^2 + \beta_{i,1} h_{i,t-1}
\end{aligned} \tag{1}$$

where: $\mathbf{Y}_t$ - multivariate process, t - conditional t-distribution with *v* degrees of freedom, $\boldsymbol{\mu}_t$ - the conditional mean matrix, $\mathbf{H}_t$ - the conditional variance matrix, $\mathbf{R}_t$ - conditional correlation matrix, $\mathbf{Q}_t$ - quasi correlation matrix, $\mu_{i,t}$ - *i*-th equation of the conditional mean, $h_{i,t}$ - *i*-th equation of the conditional variance, $\alpha, \beta, \gamma_{i,0}, \gamma_{i,1}, \omega_{i,1}, \alpha_{i,1}, \beta_{i,1}$ - parameters of equations.

The next stage of the study was to check the stationarity of conditional correlation processes using the Phillips-Perron test. Having made a stationary analysis, cointegration was tested for conditional correlation processes. The cointegration analysis based on the Johansen procedure enabled us to ascertain whether interdependencies between the markets form a specific long-term linkages system (see: see: Engle and Granger, 1987; Boswijk and Doornik, 2004; Johansen, 1988; Zinecker et al., 2016; Pietrzak et al., 2017).

In the last step, a common factor was identified with the use of conditional correlation values corresponding to the market linkages in a given group. The values of a common factor reflect in a synthetic way the leading direction of changes for the interdependence system between selected capital markets. Confirmatory factor analysis was used to isolate the common factor (see: Loehlin, 1987; Bollen, 1989; Balcerzak and Pietrzak, 2016b, 2016c; Pietrzak and Balcerzak, 2016b).

3 Results and Discussion

According to the assumed research objective of the article, the analysis of the structure of relations between the capital markets of Germany, Poland, the Czech Republic, and Hungary using the DCC-GARCH model was conducted in the first step of the study. DCC-GARCH model parameters for DAX, WIG, BUX, and PX indexes are presented in Table 1. In case of the equations for conditional correlation and conditional variance only autoregressive parameters for the DAX and BUX indexes were statistically insignificant at the 5% significance level. The parameter *v* of the degrees of freedom of t-Student distribution as well as the parameters of the conditional correlation equation obtained in the second step of estimation are statistically significant. The conditions for the sum of the parameters α1, β1 and the sum of the parameters α, β are also satisfied.

As a result of the estimation of DCC-GARCH model parameters (for more details see Table 1) it was possible to determine the conditional correlation values for further pairs of indices. Analysis of the conditional correlation process allows assessing the strength of interdependencies between the examined capital markets as well as the identification of the upward or downward trends.

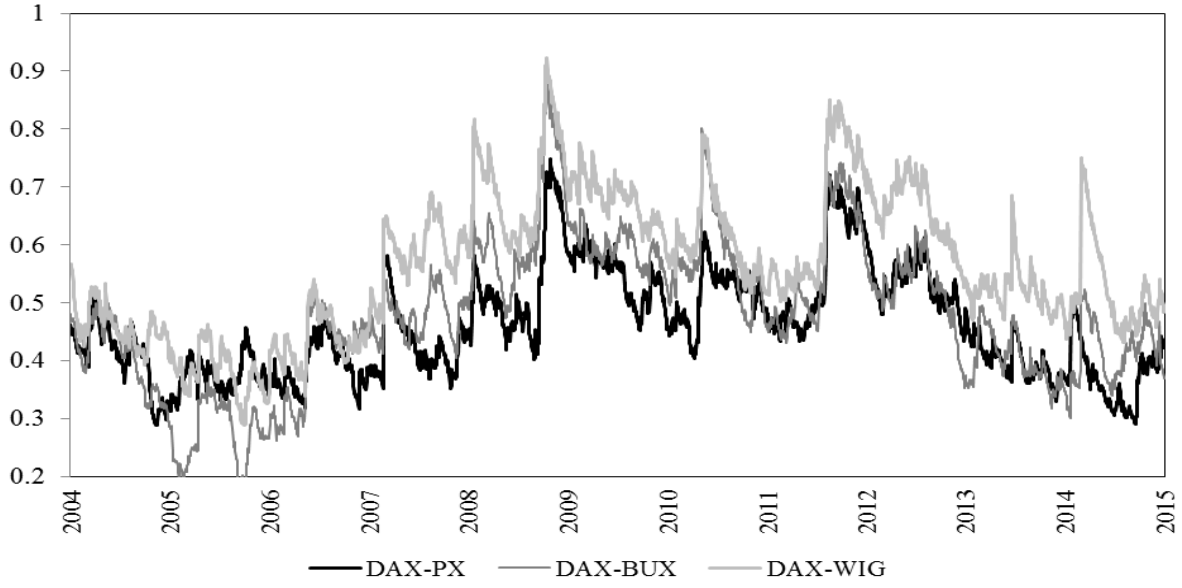
Table 1 DCC-GARCH model parameter estimation results.

The conditional variance equations					
Parameter	Estimate	p-value	Parameter	Estimate	p-value
γ_0 (DAX)	0.083	~0.000	γ_0 (BUX)	0.050	0.012
γ_1 (DAX)	-0.007	0.902	γ_1 (BUX)	0.027	0.172
ω_1 (DAX)	0.030	0.001	ω_1 (BUX)	0.040	0.001
α_1 (DAX)	0.097	~0.000	α_1 (BUX)	0.088	~0.000
β_1 (DAX)	0.886	~0.000	β_1 (BUX)	0.897	~0.000
γ_0 (WIG)	0.068	0.005	γ_0 (PX)	0.098	0.005
γ_1 (WIG)	0.060	~0.000	γ_1 (PX)	-0.002	0.002
ω_1 (WIG)	0.014	0.009	ω_1 (PX)	0.023	0.007
α_1 (WIG)	0.063	~0.000	α_1 (PX)	0.093	~0.000
β_1 (WIG)	0.928	~0.000	β_1 (PX)	0.897	~0.000
V	9.353	~0.000	-	-	-
The conditional correlation equation					
Parameter	Estimate	p value	Parameter	Estimate	p value
α	0.018	~0.000	β	0.957	~0.000

Source: own estimations

Figure 1 shows the conditional correlations between the DAX index and the BUX, PX 50 and WIG indices. Analysis of correlation shows that the interdependence between the German capital market and the Czech, Polish and Hungarian markets are similar. The strongest interdependence was noted between the German market and the Polish market. The weaker interdependencies can be found between the capital market of Germany and the Hungarian and Czech markets. It can be said that in the period under scrutiny, shock events in the neighboring German capital market are moving in a similar fashion to the Czech, Polish and Hungarian stock exchanges. This means that valuation of quotes on each of the examined capital markets is heavily dependent on the situation on the German capital market.

Figure 1 The interdependence system between selected capital markets



Source: own estimations

In the next step we investigated the degree of integration of conditional correlation processes for selected pairs of markets. For this purpose, the Phillips-Perron test was repeated and the test results for the time series examined are shown in Table 2 (see Phillips and Perron, 1988). The obtained results show that all the conditional correlation processes under investigation are integrated to the first degree. The identification of variability in variance may indicate the vulnerability of the examined capital markets to shocks from other markets and the long-term impact of shocks on the formation of interdependencies. Consequently, the Johansen procedure was carried out in the further part of the analysis, verifying the cointegration between the selected conditional correlation processes. The results are shown in Table 2. The test results for the number of cointegrating vectors indicate the presence of two cointegrating vectors.

Table 2 Results of analysis of integration and cointegration

Analysis of integration – Phillips–Perron test				
Indices	Time series	Test statistics	p-value	Order of integration
DAX, BUX	Levels	-0.747	0.392	I(1)
	Differences	-53.375	0.001	
DAX, PX	Levels	-0.629	0.444	I(1)
	Differences	-55.586	0.001	
DAX, WIG	Levels	-0.635	0.442	I(1)
	Differences	-53.665	0.001	

Analysis of cointegration - Johansen procedure				
Number of cointegrating vectors	Max-Eigenvalue test		Trace test	
	Test statistic	p-value	Test statistic	p-value
None	43.103	0.001	25.396	0.003
At most 1	17.707	0.006	17.270	0.004
At most 2	0.437	0.571	0.437	0.572

Source: own estimations

The last stage of the study consisted in conducting a confirmatory factor analysis (see: Bollen, 1989; Pietrzak and Balcerzak, 2016b). Based on the conditional correlation series for the pairs of indices (DAX, PX), (DAX, WIG), (DAX, BUX), a common factor was identified. This factor, as a latent variable, reflects in a synthetic way the synergy between the German market and the selected markets in Central and Eastern Europe. The results of the analysis are presented in Table 3, where the occurrence of only one factor was pre-assumed. All standardized evaluations are greater than 0.9, indicating the correct co-generation of the factor by all three conditional correlation processes. In this way, one factor explaining the evolution of conditional correlations for selected stock indices was determined for the interdependence system.

Table 3 Confirmatory factor analysis

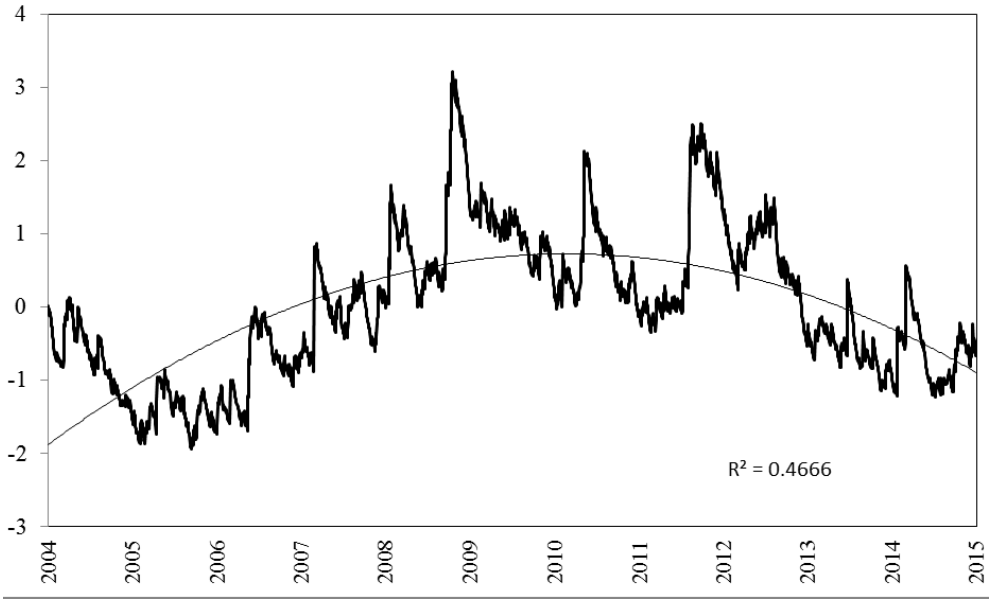
Correlation	**Parameter**	**Estimate**	**Standardized estimate**	**Factor Score Weights**	**p-value**
DAX-PX	α_1	1.000	0.962	0.012	-
DAX- WIG	α_2	1.486	0.931	0.011	~0.00
DAX-BUX	α_3	3.213	0.918	0.023	~0.00

Source: own estimations

The values of the common factor were obtained as the sum of products of values of Factor Score Weights (given in Table 3) and the values of the conditional correlations

between the markets. Analysis of the common factor value makes it possible to assess the interdependence system between selected capital markets (see: Figure 2). The volatility of the common factor allows two regularities to be identified. Firstly, there is a period of a systematic increase in interdependencies between markets. This period falls on the years of the common financial crisis in the period 2007-2012. Secondly, one can see a weakening of the level of interdependence between the capital markets after 2012 and the transition of these markets to a period of tranquility. These facts are confirmed by the shape of the square trend line model the parameters of which are estimated based on the value of the common factor. The model is correct in terms of statistical properties, the trend model parameters were found to be statistically significant, and the degree of matching the model to empirical data was 46.66%.

Figure 2 The common factor values and the square trend line



Source: own estimations

4 Conclusions

The paper examines the correlation between the capital market of Germany and the selected markets in Central and Eastern Europe. The observed systematic growth of interdependence between the capital markets is the result of the progressive globalization process. The study covered the interval 2004-2014, including a period of the global bull market preceding the speculative bubble burst on the US real estate market, the biggest global financial system volatility (2007-2010) in recent decades, and the period of a gradual return of the markets to the so-called 'normal functioning'.

Within the assumed objective, the system of interdependence between the capital markets of Germany, Poland, the Czech Republic and Hungary was identified. The use of the DCC-GARCH model allowed the obtainment of values of conditional correlation processes that describe the interdependencies between markets. Based on the conditional correlation processes for the selected pairs of indices (DAX, PX) (DAX, WIG) (DAX, BUX), the degree of integration was investigated and the cointegration analysis was performed. The determination of the cointegration between the conditional correlation processes was a justification for identifying a common factor. This factor, as a latent variable, describes in a synthesized way the interdependence of the system of selected capital markets. The results of the analysis of change directions in the common factor indicated that during the global financial crisis of 2007-2012 there was a significant increase in the interdependence between the studied markets. A transition of these markets to the period of tranquility following 2012 was observed. The study

confirmed that under a crisis financial markets are most likely to note an increase the level of interdependence between markets.

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