



This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 825215 (Topic: ICT-35-2018 Type of action: CSA). All material presented here reflects only the authors' view. The European Commission is not responsible for any use that may be made of the information it contains.

MUNI

M U N I

Market Risk in Financial Robo-Advisory

FINancial supervision and TECHnology compliance
training program – SUPTECH WORKSHOP III

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SupTech workshops

Topics	Applications	Associated risks
Big Data	P2P finance	Credit risk Fraud detection Systemic risk
Artificial Intelligence	Robo-advisory Asset management Cognitive computing	Market risk Compliance Risk profile matching (MiFID) Cyber and operational risks
Blockchain	Crypto-assets and exchanges	Market risk Cyber and operational risks ICO's fraud detection Money laundering

Robo Advisors (RAs)

Automated investment platform that uses quantitative algorithms to manage investors' portfolios and is accessible to clients online

Reasons for **rapid growth** of RAs:

- new generation of clients
 - well educated, receptive of digital technologies
 - prefer to have active and ongoing control over their investments
 - rely on the information from multiple sources rather than individual financial advisors
- the advantages of RAs over traditional financial advisors
 - much **lower costs** in comparison with traditional advisors
 - approximately the **same returns**
 - low or minimum investment entry
 - option to control, customize and construct portfolios from multiple devices
 - transparent workflow and monitoring systems
 - availability of advanced **quantitative methods of portfolio management and optimization**
- the large-scale financial processes (concentration of global wealth, adoption of FinTech in Asia, etc.)

Classification of Robo Advisors

1. Online access to traditional “manual” asset management services
 - **online questionnaires** and proposals
2. Automated portfolio management
 - entire **online investment/portfolio management**
 - selection of the instrument universe
 - automated portfolio optimization
 - periodic portfolio rebalancing
 - online performance reporting

Workflow of Robo Advisors

1. Asset universe selection

- creating a representative set of instruments covering different classes and types
- selecting low-cost and risk efficient instruments (selection criteria – expense ratio, total costs, liquidity, replication method, correlation)
→ all RAs use **ETFs** (with minor exceptions)
- tax-loss harvesting - offsets capital gains with capital losses to minimise tax payments

2. Investor profile identification

- **online questionnaires** (risk tolerance, investment objectives and horizon) based on the information on age, income, savings and previous investment experience
- inadequate recommendations? (incomplete assumption, incomplete information, inaccuracy of responses)

Workflow of Robo Advisors

3. Asset allocation / portfolio optimization

- sample portfolios
- constant portfolio weights
- Modern Portfolio Theory approach
- modifications of Modern Portfolio Theory (e.g., VaR and CVaR)
- sensitivity analysis (stress testing)?

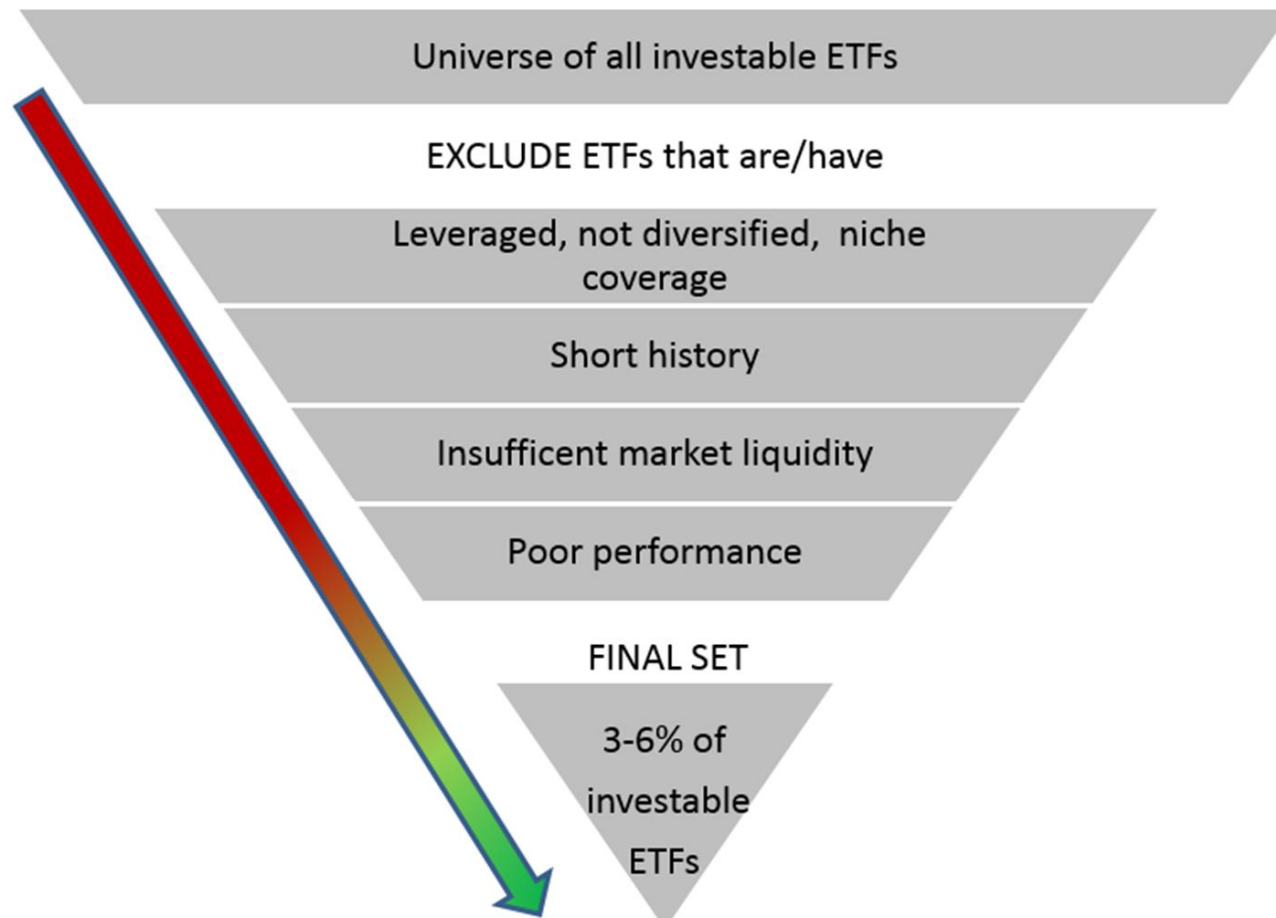
4. Monitoring and (daily) rebalancing

- event driven (even calendar-driven)
- threshold-based (usually 3-5% drift from target)
- optimized dividend and cash-flow reinvestment
- clients changing their preferences?

5. Performance review and reporting

- online only
- automatically by e-mail (monthly/quarterly)

RA selection of ETFs



Source: Deutsche Bank Research

Supervision of RAs

- Disclosure of information for clients to clearly understand RA's investment practices and potential conflicts of interest
- Explanation of how RA handles operational and market risk both in normal times and in distressed market conditions
- Disclosure of information about operational aspects of RA services, i.e. regarding the assumptions and limitations of the optimization algorithm for portfolio allocation and rebalancing
- Ensuring that RA recommendations and strategies are suitable for their clients
- Example: *Wealthfront Investment Methodology White Paper*

Course "Artificial Intelligence in Finance" at MUNI

- Background Training in Modern Portfolio Theory
 - Statistical analysis of asset returns
 - Common portfolio optimization techniques
 - Network analysis application for asset selection and allocation
 - Neural networks
 - *Hands-on coding examples*
- 4 use-cases in robo-advisory technologies
- Background Training in Natural Language Processing
- Presentations of Czech Fin-Techs

IS MUNI – study materials

The screenshot shows the IS MUNI web application interface. At the top, there is a browser window with the URL <https://is.muni.cz/auth/>. The main header features the MUNI logo and a search bar with the text "vyhledat v ISu". Below the header, there is a navigation menu on the left labeled "MOJE APLIKACE" with options: Pošta, Učitel, Rozvrh, Školitel, Student, Předměty, Publikace, and Studium. The main content area is a grid of application tiles:

- POŠTA**: Poslat dopis, Nastavení, Hromadný e-mail
- KALENDÁŘ**: Můj rozvrh
- OBCHODNÍ CENTRUM**: Správa OC, Přehled objednávek, Moje objednávky
- UČITEL**: Moji studenti, Dopis, Známký
- ŠKOLITEL**: Moji studenti, Hodnocení, Rozpisy
- PUBLIKACE**: Moje publikace, Repozitář
- VÝVĚSKA**: Poznánky, Inzerce
- DISKUSE**: Blogy
- SOUBORY**: Dokumenty, Předpisy MU, Úschovna

On the right side, there is a "Život na MU" section with a "MASARYKOVA UNIVERZITA" logo and a "Volba rektora 2019" announcement. Below this, there is a "Pokládejte dotazy kandidátům na rektora" section with a "Diskuse" button and "Dotazy z roku 2011". There is also an "IS TIP" section with a "Položky v menu na přání" section and a "Více" button. At the bottom right, there is a "MU a zahraniční instituce" section with a profile picture of a man.

R and R Studio - online

The screenshot displays the R Studio interface with four main components highlighted by text boxes:

- R script:** The editor window shows R code for biomass calculation per tree across various plots in Kalimantan. The code includes data loading, variable assignment, and plotting functions.
- R console:** The console window shows the execution of R commands, including merging data frames and calculating biomass estimates.
- R environment:** The Environment pane shows the global environment with variables like 'hil.trees', 'kal.plot', 'kalimantan', and 'lsi.plots'.
- Graphical output:** A box plot titled 'Biomass estimation per plot with different models' showing biomass (Mg/ha⁻¹) for various plots. The y-axis ranges from 100 to 500 Mg/ha⁻¹.

Access to R Server

join at <https://uem1.euba.sk/rstudio/auth-sign-in>

login: **cnb##** (numbers from 01 to 15)

password: **fintech01**

Dataset

27 Vanguard ETFs

- 3 government bond ETFs (all US: long-term, intermediate term, short-term)
- 3 corporate bond ETFs (all US: long-term, intermediate term, short-term)
- 2 real estate ETFs (1 US, 1 international)
- 19 equity ETFs (FTSE Europe, FTSE Pacific, FTSE Emerging Markets, S&P500, US sectoral, US small-cap, mid-cap, growth, value)

Workshop evaluation

<https://www.fintech-ho2020.eu/free/app/evaluation-suptech-prague-3>

Please fill in the evaluation form:

- Role: National Supervisor
- Scale evaluations
- Comments