Home assignment # 2

(To be submitted on the lecture, Tuesday November 15, you may work alone or in groups of two, but copying from other groups will lead to zero points)

In this assignment, there is one computer exercise that is to be computed using Gretl. No other statistical software is allowed. You should present your results as a printout from the program (e.g. copy the output from Gretl to MS Word and print it out, or print it out directly from Gretl). When you are asked to comment your results, you can do so in the printout or on a separate sheet. Do not forget that when you are asked to test a hypothesis, it is not sufficient to present just the result of the test as it is presented in Gretl: you have to provide a clear conclusion whether you reject or not the null hypothesis, which has to be formally stated.

1. Your are given the following model

$$y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

   Assume that you want to test the following set of restrictions:

   (a) $\beta_2 - \beta_3 = 1$

   (b) $\beta_4 = \beta_6$ and $\beta_5 = 0$

   Construct models that incorporate restrictions (a) and (b), separately and together. Describe what test you will use to test the restrictions, including its distribution and parameters (i.e., describe how would you test: the restriction (a), the restrictions (b), and all of them together).

2. Imagine you are interested in the determinants of the revenues in shoe stores in Prague. Suppose you have specified the following model:

$$Rev_t = \alpha + \beta Inc_t + \delta Price_t + \theta Popul_t + \eta Weekend_t + \varepsilon_t \quad ,$$

   where Rev_t denotes the amount of revenues in the Prague shoe stores on a particular day t, Inc_t is per capita income in Prague, $Price_t$ is a price index for shoes relative to other goods in Prague, $Popul_t$ is number of people living in Prague, and $Weekend_t$ is a dummy variable for weekend days.

   (a) This specification recognizes that people might go shopping for shoes more often on weekends than on working days. Explain how would you test for such a hypothesis.

   (b) What are the predicted revenues (in terms of the coefficients of the model) for weekends and for working days?

(c) Explain how would you alter the specification to account for the fact that people may buy more shoes during the sales period, which is in January and July.

(d) If people have higher income, they buy more shoes on weekends (i.e., the effect of per capita income on revenues is larger on weekends compared to working days). Is this incorporated in your specification? If not, how would you do it? How would you test for the hypothesis that if people have higher income, they buy more shoes on weekends?

3. Use data *ceosal2.gdt* for this exercise. Consider an equation to explain salaries of CEOs in terms of annual firm sales:

$$\ln(salary) = \beta_0 + \beta_1 \ln(sales) + \beta_2 roe + \beta_3 neg\_ros + \varepsilon \quad ,$$

where

salary	...	CEO's salary in thousands USD
sales	...	firm's sales in millions USD
roe	...	firm's return on equity
neg_ros	...	dummy, equal to 1 if return on firm's stock is negative

(a) Define the variables you need and estimate the equation.

(b) What is the interpretation of the coefficients β_1, β_2, and β_3?

(c) Test for the presence of a significant impact of firm's sales on CEO's salary by hand (using only the estimated coefficient and the standard error from the Gretl output) and then compare your results to the results of this test in Gretl. Define the null and alternative hypothesis, the test statistic, its distribution, and interpret the results of the test.

(d) You wonder if the impact of firm's return on equity on the CEO's salary is indeed linear. You decide to test for the presence of a non-linear relationship, which you approximate by a third order polynomial of roe (i.e., $\alpha_1 roe + \alpha_2 roe^2 + \alpha_3 roe^3$).

   i. Define the null and alternative hypothesis, the test statistics and its distribution. Describe all specifications you need to be able to conduct the test, construct the necessary variables, and estimate these specifications in Gretl.

   ii. Calculate the test statistics by hand, compare to the critical value at 99% significance level, and interpret the results.

   iii. Conduct the test in Gretl and compare the results.