Home assigment # 4

(Deadline 10.12.2016, 23:59, no late submissions will be accepted, please scan your solution and send it to 171922@mail.muni.cz)

1. For this exercise, use the data in *fertil.gdt* file. It contains information about a sample of women in Botswana: their education (variable *educ*), their age (variable *age*), and the number of children they have (variable *children*).

   (a) Estimate the model
   $$children = \beta_0 + \beta_1 educ + \varepsilon \quad ,$$
   interpret the coefficient β_1.

   (b) Conduct the Breusch-Pagan test for heteroskedasticity. Does its result justify the use of robust standard errors? If yes, reestimate the model using these robust standard errors and comment on the difference with respect to the model estimated by simple OLS.

   (c) Redefine the model as
   $$children = \beta_0 + \beta_1 educ + \beta_2 age + \beta_3 age^2 + \varepsilon$$
   and estimate it.

      i. Does age have a significant impact on number of children of Botswana women? State the hypothesis, and compute the test statistics by hand. Interpret the results and compare it to the results of the test in Gretl.

      ii. Do you find justification for the inclusion of *age* in quadratic form? [Hint: State the four specification criteria and argue if they are satisfied for the quadratic in age.]

      iii. How does the coefficient β_1 change when compared to part (a)? Does this signal any bias in the model from part (a)? Where does it come from? Explain the sign of this bias.

   (d) Do you think the coefficient β_1 from the model in part (c) may suffer from some omitted variable bias? What variable(s) could be missing in the model and how would the coefficient β_1 change if they were included in the regression? (What is the sign of the potential bias in coefficient β_1?)

   (e) Conduct the RESET test of the model from part (c) and interpret the results.

2. Suppose following investment model was estimated with quarterly data from 1997-2009 (standard errors in parenthesis):

$$\underset{}{I_t = } \underset{(1.10)}{7.70} + \underset{(0.23)}{0.55}\, Y_t + \underset{(0.12)}{0.63}\, Q_{t2} + \underset{(1.03)}{1.55}\, Q_{t3} + \underset{(0.74)}{2.13}\, Q_{t4} \quad ,$$

$$n = 64 \quad , \quad R^2 = 0.72 \quad ,$$

where I_t is the investment in period t, Y_t is the GDP in period t, and dummy variables Q_{ti} are equal to 1 in the i-th quarter and zero otherwise ($i = 2, 3, 4$). Denote the coefficients associated with the dummies δ_2, δ_3 and δ_4.

(a) What restriction on these parameters would lead to the model:

$$I_t = \beta_0 + \beta_Y Y_t + \delta q_t + \varepsilon_t \quad ,$$

where $q_t = 0$, 1, 2, 3 in the first, second, third and fourth quarters respectively? Briefly discuss this restriction. [Hint: To find the restrictions, compare the coefficients of the two models (restricted and unrestricted) for each quarter.]

(b) Test the restriction if the regression R^2 of the restricted model was 0.68.

(c) Explain how would you test for presence of AR(4) autocorrelation of the error term in this model. Describe all steps that you need to take to conduct the test, the null and alternative hypothesis, and the test statistics.