Introduction to Econometrics Homework 1

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1   Guidelines

- This homework needs to be hand in by email (rombouts@essec.edu) before we start working on maximum likelihood estimation.

- You need to send one clearly written report in pdf format which answers all questions point wise. Send also your R-script (if you use R). Use R-Markdown, which allows you to embed the answers and the code in one pdf document, if you want to improve your reporting skills.

- Work in groups of at most 3.

- When you are asked to do a test, then write the null and alternative hypotheses, the value of the test statistic and the 5% critical value (or p-value).

2   Explaining individual wages

We model individual wages using a cross-sectional data set of 1472 observations. The dataset is called BWAGES and the variables we use are:

- wage: hourly wage rate in euros per hous

- male: 1 if male, 0 if female

- educ: education level, 1 = primary school, 2 = lower vocational training, 3 = intermediate level, 4 = higher vocational training, 5 = university level

- exper: experience in years

QUESTIONS:

1. Compute standard descriptive statistics for the variables in this study.

2. Compute dummy variables for the educ variable: educ1=1 if primary school, 0 otherwise; educ2=1 if lower vocational training, 0 otherwise, ...

3. Estimate the following model by OLS:

$$wage = \beta_0 + \beta_1 male + \beta_2 educ1 + \beta_3 educ2 + \beta_3 educ3 + \beta_4 educ4 + \beta_5 exper + \varepsilon \quad (1)$$

4. Interpret the coefficients.

5. Why is there no educ5 in the model?

6. What is the expected salary for a man with university level education?

7. Using standard z-tests, are the explanatory variables significant?

8. Is there a significant constant salary difference between men and woman?

9. Add squared experience as an additional variable in your model and estimate it again.

10. From the previous question, interpret the impact of experience on salary.

11. Is the impact of experience on salary significant? Perform a test.

12. Until now the effect of gender was assumed constant, no matter the education or experience level. Write down a model that explicitly allows for differences between men and woman.

13. Estimate this new model and interpret the coefficients.

14. Test for differences between men and woman in this general model.

15. Demonstrate empirically that the sum of squared residuals (SSR) for this general model is equal to the SSR of the model explaining wage by the educ dummies and the experience variables fitted to the sample of men + the SSR of the same model fitted to the sample of woman.

16. Test for heteroskedasticity of the residuals in (1) that might arise from the fact that men and woman have difference residual variance.

17. If in the previous question the test rejects, then perform weighted least squares.

18. Compute White standard errors for (1) and compare them with the OLS standard errors found in question 2.

19. Test if the distribution of ε in (1) is Gaussian.

20. If the previous question rejects, what are the consequences for the tests performed in this study?

3 EXTRA FOR THE FAST (for fame only)

Find a recent dataset of your choice and perform a multiple regression analysis to it.