Dr. Willi Mutschler
M.Sc. Manuel Stapper
Summer term 2018

Westfälische
Wilhelms-Universität
Münster

Econometrics II

– Comprehension Exercises –

Exercise 1

The food expenses y_t of $n = 150$ households are regressed on household income x_t and squared household income x_t^2. You should investigate if there is heteroskedasticity. There are three groups: The poorest third of the households, the middle third and the richest third. Regressions for the first and third group yield the following sums of squared residuals:

$$S_{\hat{u}\hat{u}}^{I} = 0.00838$$
$$S_{\hat{u}\hat{u}}^{III} = 0.07346.$$

a) What might be a problem with classical OLS estimation in this situation?

b) Perform a suitable test to check if the aforementioned problem is present.

c) How would you proceed if the above test suggests the problem is present?

Exercise 2

Consider the model

$$y = X\beta + u \qquad \text{with} \qquad u \sim N(0, \Omega)$$

with the GLS estimator

$$\hat{\beta}_{GLS} = (X'\Omega^{-1}X)^{-1}X'\Omega^{-1}y.$$

a) Show that $\hat{\beta}_{GLS}$ is still unbiased if X is stochastic but independent of u. You may assume that the matrix Ω is non-stochastic and known.

b) Which conditions must be satisfied to ensure consistency of the estimator?

Exercise 3

Consider the simple linear regression model

$$y_t = \alpha + \beta x_t + u_t.$$

a) Explain why an OLS estimation of the coefficients yields inconsistent estimators if the regressor is correlated with the error term.

b) Is x_{t-1} a valid instrument if a large (small) error in $t-1$ tends to be followed by a large (small) error in t?

Exercise 4

a) In a regression model with errors that are non-normally distributed, what concept is the justification for tests to give valid results at large samples?

b) Describe the principle of the *Law of Large Numbers* in your own words.

c) State the null hypothesis of the *White-Test*. What is the advantage of it compared to the *Goldfeld-Quandt-Test*?

d) Is there a way to deal with possible heteroscedasticity without using the aforementioned tests?

e) When not using a computer for the one-sided *Durbin-Watson-Test*: Why is a lower and upper quantile for the distribution of test statistic needed?

f) What values of a test statistics indicate positive/negative autocorrelation at a *Durbin-Watson-Test*?