Exam for the lecture

"Econometrics II“

for students in the M.Sc. programmes
summer term 2018

08.10.2018

Please fill in using block letters:

Seat location:

Name: *Surname*		Vorname: *Name*	
Studiengang *Course of study:*		Geburtsort: *Place of birth*	
Matrikelnummer: *Student ID*		Bachelor University:	

Declaration:

PLEASE SIGN!!!

I hereby declare that I am able to be examined.

____
Signature:

Preliminary remarks:

- Write down your name and enrolment/matriculation number on all paper sheets provided for answers by the examiner.
- To write down your answers, use only the paper provided by the examiner.

Result: (TO BE FILLED IN ONLY BY THE EXAMINER!)

Problem	1	2	3	4	5	Home Assignment	Σ
Points earned							
Grade							

Kiel,

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Professor Dr. Jens Boysen-Hogrefe

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Examination in Econometrics II

(Summer Term 2018)

October 8, 2018 , 8.30 - 9.30

Preliminary remarks:

1. Please read these instructions carefully!
2. At the beginning of the exam, fill in the cover sheet and hand in after the exam is finished!
3. You are permitted to use the following auxiliary tools:
   (a) a non–programable pocket calculator,
   (b) **the formulary for Econometrics II without notes!**
4. **Conduct each test at the 5% level**.
5. Write your name and enrolment (matriculation) number on every sheet of paper!
6. Don't use a pencil!
7. The exam problems are printed on 2 pages plus 2 double sheets for answers. Check your exam for completeness!
8. Round your solutions to 4 decimal places.
9. You have 60 minutes in total to answer the exam questions.

Good luck!

Part 1 - Cross Section (21 credits)

1. Consider the exponential regression model where $E(y_i|\mathbf{x}_i) = \mu(\mathbf{x}_i) = e^{\mathbf{x}_i\boldsymbol{\beta}}$ and the distribution of y_i conditional on $\mathbf{x}_i$ is the exponential distribution,

$$f(y_i|\mathbf{x}_i, \boldsymbol{\beta}) = \frac{1}{\mu(\mathbf{x}_i)} \exp\left(\frac{-y_i}{\mu(\mathbf{x}_i)}\right). \tag{1}$$

Remember that this distribution has the property that $Var(y_i|\mathbf{x}_i) = [E(y_i|\mathbf{x}_i)]^2$.

   (a) (**2P**) Write down the conditional log likelihood function for observation i.

   (b) (**4P**) Derive the score with respect to $\boldsymbol{\beta}$ for observation i. Show directly that the score has conditional mean zero.

   (c) (**2P**) Derive the Hessian with respect to $\boldsymbol{\beta}$ for observation i.

   (d) (**5P**) Show that the conditional information matrix equality holds.

2. Consider the following model:

$$y_i = \beta_0 + (\beta_1 x_{1i}^{1/\beta_3} + \beta_2 x_{2i}^{1/\beta_3})^{\beta_3} + u_i, \tag{2}$$

where x_{1i}, x_{2i} are input factors (in logs), y_i is output (in log) and u_i is white noise with mean zero and variance σ^2. Using a sample of size N you want to test the null hypothesis H_0: $\beta_3 = 1$.

   (a) (**3P**) Which test is the easiest to use in this particular situation? Why?

   (b) (**3P**) Explain the testing principle chosen in (a) graphically.

   (c) (**2P**) Suppose that the null hypothesis above is not rejected and $\hat{\beta}_1 = 0.11$. Interpret $\hat{\beta}_1$!

Part 2 - Time Series (39 credits)

3. (**13P**) Consider the regression model $y_t = \beta x_t + u_t$, where $u_t = \rho u_{t-1} + \varepsilon_t$ and ε_t is white noise with mean zero and variance σ_ε^2. The regressor x_t is generated by $x_t = \alpha x_{t-1} + \gamma y_{t-1} + w_t$, where w_t is white noise with mean zero and variance σ_w^2. The covariance between ε_t and w_t is denoted by $\mathrm{E}(w_t\varepsilon_t) = \sigma_{w\varepsilon}$. Assume the parameter values are such that x_t, y_t, and u_t are stationary. Additionally, you know that $\mathrm{E}(x_t u_t) = \frac{(1-\rho^2)\sigma_{w\varepsilon} + \gamma\rho\sigma_\varepsilon^2}{(1-\rho^2)[1-(\alpha+\gamma\beta)\rho]}$.

   (a) (**5P**) Show the convergence of the OLS estimate $\hat{\beta}$ step by step!

   (b) (**8P**) Under which conditions is the OLS estimator of β applied to $y_t = \beta x_t + u_t$ consistent? Derive and shortly explain them!

4. You are given the following regression results (T=250):

$$\hat{y}_t = \underset{(0.0529)}{0.536} + \underset{(0.0145)}{0.245}\,t + \underset{(0.013)}{0.932}y_{t-1} + \underset{(0.134)}{0.9033}\Delta y_{t-1} + \underset{(0.102)}{0.361}\Delta y_{t-2} - \underset{(0.001)}{0.043}\Delta y_{t-3}.$$

   (a) (**9P**) Perform an ADF-test at the 5% level. Carefully state null and alternative hypotheses, characterize y_t under each hypothesis and derive a test decision.

   (b) (**4P**) For which shortcoming of the DF test does the ADF test correct? How does this work intuitively? Answer briefly!

5. Suppose that short term and long term interest rates are I(1). A graphical inspection suggests that they seem to be tied together in the long run even though there are large temporary deviations. A regression of the long term interest rate (LT) on the short term interest rate (ST) (both are given in percent), $LT_t = \beta_0 + \beta_1 ST_t + \varepsilon_t$, delivers the following results:

Model 1: OLS, using observations 1978:1–2004:4 (T = 108)
Dependent variable: LT

	Coefficient	Std. Error	t-ratio	p-value
const	1.97181	0.146506	13.4589	0.0000
ST	0.863890	0.0179190	48.2109	0.0000

Mean dependent var	8.395402	S.D. dependent var	3.017254
Sum squared resid	42.48695	S.E. of regression	0.633104
R^2	0.956384	Adjusted R^2	0.955972
$F(1, 106)$	2324.288	P-value(F)	6.30e–74
Log-likelihood	−102.8669	Akaike criterion	209.7338
Schwarz criterion	215.0981	Hannan–Quinn	211.9088
$\hat{\rho}$	0.877578	Durbin–Watson	0.244529

   (a) (**5P**) Explain in a few sentences the concept of cointegration between two I(1) processes.

   (b) (**4P**) Based on the regression output, what can be said about cointegration between ST and LT? Shortly explain your answer.

   (c) (**4P**) Suppose ST and LT are cointegrated. Interpret the estimated slope parameter. Are you able to check for statistical significance of this parameter in your regression output? Why or why not?