

## Course description

### **“Advanced Econometrics”, 6 ECTS, 40 contact hours, 2-3 module 2016/2017**

#### **Instructor**

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#### **Outline**

The course is designed for first-year graduate (Master) students following the programs “Finance” and “Applied Economics and Mathematical Methods”. Its main goal is to familiarize the students with advanced methods of econometric research in economics and finance. In particular, the course accentuates the problem of endogeneity and the ways to address it in the analysis of cross-sectional and panel data. The course is of applied nature: The material is presented, whenever possible, in a non-technical way, examples of empirical studies published in leading international economics and finance journals are discussed, and the lectures are supplemented by exercises in the computer lab.

The topics covered include the review of the classical linear regression model, causes and consequences of endogeneity, instrumental variables methods, basic panel data techniques, difference-in-difference estimation techniques, as well as an overview of the matching models, regression discontinuity design and sample selection model. Computer exercises using the statistical software package “Stata” are an integral part of the course, which ensures that the students get hands-on experience of analyzing real world data.

The course consists of lectures (26 hours) and computer labs (14 hours). Both involve an extensive use of interactive methods of learning, in particular, discussions of the application of the methods and models studied during the course in contemporary research published in leading international economics and finance journals.

After the course, the students should have a firm grasp of the key econometric methods used in contemporary research, understand the causes and consequences of endogeneity, know the main methods for addressing this problem, and be able to apply the methods learnt when conducting own empirical analysis. The students should also be able to use the statistical package “Stata”, including its programming options (the so-called do-files).

Students’ progress will be measured by coursework, a mid-term exam and a final exam. The coursework will be evaluated using home assignments, which include both problem sets and computer exercises in Stata. They will account for 30% of the final grade. A mid-term written test (1 hour) will account for 20% of the final grade. A final written test (2 hours) will correspond to 50% of the final grade.

#### **Structure and content**

<b>Class 1 (Lecture 1)</b>	
Date: November 3, 2016 Time: 18.20-21.10 Room: 345	<b>Topic 1. Overview of the classical linear regression model (4 hours).</b> 1.1. Classical linear regression. Assumptions. Ordinary least squares (OLS) and its properties. 1.2. Multiple regression. Choice of regressors.

	<p>Reading: Wooldridge (2009), chapters 2-3.</p>
<b>Class 2 (Lecture 2)</b>	
<p>Date: November 10, 2016 Time: 18.20-21.10 Room: 345</p>	<p><b>Topic 1. Overview of the classical linear regression model, cont. (4 hours).</b> 1.3. Transformation of variables. Functional forms. 1.4. Categorical independent variables. 1.5. Interactions of independent variables.</p> <p>Reading: Wooldridge (2009), chapters 6-7.</p>
<b>Class 3 (Computer lab 1)</b>	
<p>Date: November 17, 2016 Time: 18.20-21.10 Room: 432/240</p>	<p><b>Topic CL1. Introduction to econometric package Stata (4 hours).</b> CL1.1. Basic capabilities of Stata. Basic commands. Do and log files. CL1.2. The grammar of Stata.</p> <p>Reading: Kohler and Kreuter (2005) chapters 1-3. Stata manual. Slides.</p>
<b>Class 4 (Lecture 3)</b>	
<p>Date: November 24, 2016 Time: 18.20-21.10 Room: 345</p>	<p><b>Topic 2. Causes and consequences of endogeneity (2 hours).</b> 2.1. Mains sources of endogeneity: omitted variables, reversed causality, measurement error in the dependent and independent variables.</p> <p>Reading: Wooldridge (2009), chapter 9. Wooldridge (2002), chapter 4.</p> <p><b>Topic 3. Instrumental variables methods (2 hours).</b> 3.1. The basics of the method. Estimation. Instrument validity (relevancy and exogeneity). Where do valid instruments come from? Examples. 3.2. Tests for instrument validity. The problem of weak instruments. Limitations of the IV methods.</p> <p>Reading: Roberts and Whited (2013), chapter 3 (crp. 511-518). Larcker and Rusticus (2010).</p>
<b>Class 5 (Computer lab 2)</b>	
<p>Date: December 1, 2016 Time: 18.20-21.10 Room: 432/240</p>	<p><b>Topic CL2. Introduction to econometric package Stata (4 hours).</b> CL2.1. Creating and changing variables in Stata. CL2.2. Commands of regression analysis. Hypothesis testing and model diagnostics.</p> <p>Reading: Kohler and Kreuter (2005), chapters 5, 8.</p>

	Stata Manual. Slides.
<b>Class 6 (Lecture 4)</b>	
Date: December 8, 2016 Time: 18.20-21.10 Room: 345	<b>Topic 4. Analysis of panel (longitudinal) data (4 hours).</b> 4.1. Examples of panel data. Fixed effects estimation. 4.2. Regressions with time fixed effects. 4.3. Random effects models. 4.4. Model diagnostics (Hausmann test, etc.).  Reading: Wooldridge (2009), chapters 13-14. Stock and Watson (2007), chapter 10 (стр. 349-382).
<b>Class 7 (Computer lab 3)</b>	
Date: December 15, 2016 Time: 18.20-21.10 Room: 432/240	<b>Topic CL3. Instrumental variables (IV) methods (2 hours).</b> 3.1. Commands of the IV methods. Diagnostic tests.  Reading: Cameron and Trivedi (2009), chapter 6. Stata Manual. Slides.  <b>Topic CL4. Analysis of panel (longitudinal) data (2 hours).</b> 5.1. Fixed- and random-effects models in Stata. 5.2. The Hausmann test.  Reading: Kohler and Kreuter (2005), chapter 8.6.2. Cameron and Trivedi (2009), chapter 8. Slides. Stata Manual.
<b>Class 8 (Lecture 5)</b>	
Date: tba Time: tba Room: tba	<b>Topic 5. Difference-in-difference (4 hours).</b> 5.1. The difference estimator. Single Cross-Sectional Differences After Treatment; Single Time-Series Difference Before and After Treatment. 5.2. Double Difference Estimator: Difference-in-Differences (DiD) estimator. 5.3. Testing the key assumption of the DiD.  Reading: Roberts and Whited (2013), chapter 4 (стр. 520-531). Stock and Watson (2007), chapter 13 (стр. 349-382). Wooldridge (2002), chapter 10 (стр. 468-485)
<b>Class 9 (Lecture 6)</b>	
Date: tba Time: tba Room: tba	<b>Topic 6. Overview of the matching models, regression discontinuity and sample selection models (4 hours).</b> 6.1. Matching models. Treatment effects and necessary identifying assumptions. Propensity score matching. 6.2. Regression discontinuity (RD) models. Sharp and fuzzy regression discontinuity designs. Identification of treatment effects in the sharp RD.

	6.3. The Heckman selection model.  Reading: Roberts and Whited (2013), chapters 5-6 (стр. 531-557). Cameron and Trivedi (2005), chapter 25.
<b>Class 10 (Computer lab 4)</b>	
Date: tba Time: tba Room: tba	<b>Topic CL5. The difference-in-difference estimator (2 hours).</b> 10.1. Applying the DiD estimator using Stata.  Reading: Cameron and Trivedi (2009), chapter 8. Slides. Stata Manual.  <b>Topic CL6. Overview of the matching and regression discontinuity and models (4 hours).</b> 10.1. Estimation of matching models in Stata 7.2. Estimation of regression discontinuity models in Stata  Reading: Slides. Stata Manual.

### Prerequisites

Students' knowledge of the foundations of econometrics is a key prerequisite for the successful completion of the course.

### Assessment

Students' progress is monitored during the course by **four home assignments** (which include problem sets and computer exercises in Stata).

All assignments will be evaluated of max 100%. They will be distributed in the class and will be due in approximately one week. Homework assignments are to be handed in **before class** on the day they are due. No late homework will be accepted.

After the first seven classes, there is a **mid-term written test** that accounts for 20% of the final grade.

At the end of the course there is a **final exam**, which is a closed book, closed notes test to be held in the classroom. The duration of the final is two academic hours.

Final grade consists of the following elements:

Home assignments	30% of the final grade
Mid-term test	20% of the final grade
Final exam	50% of the final grade

### Main reading list

- Wooldridge, Jeffrey M. (2009) Introductory Econometrics: A Modern Approach. 4<sup>th</sup> Edition. South-Western College Publ.
- Kohler, Ulrich and Kreuter, Frauke (2012) Data Analysis Using Stata, Stata Press.
- Cameron, A. Colin and Trivedi, Pravin K. (2009) Microeconometrics Using Stata, Stata Press.
- Roberts, Michael R. and Whited, Toni M. (2013) Endogeneity in Empirical Corporate Finance, In: George M. Constantinides, Milton Harris and Rene M. Stulz, Editor(s),

Handbook of the Economics of Finance, Elsevier, Volume 2, Part A, Pages 493-572.  
Available electronically via ScienceDirect.

### **Additional reading list**

- Atanasov, Vladimir A. and Black, Bernard S. (2015) Shock-based Causal Inference in Corporate Finance and Accounting Research. *Critical Finance Review*, 11-08. Available at the journal's web-site: <http://cfr.ivo-welch.info/>.
- Cameron, A. Colin and Trivedi, Pravin K. (2005). *Microeconometrics: Methods and Applications*. Cambridge University Press.
- Larcker, D. F., & Rusticus, T. O. (2010). On the use of instrumental variables in accounting research. *Journal of Accounting and Economics*, 49(3), 186-205.
- Stata Manual. Stata Corporation, 2012.
- Stock, James H. and Watson, Mark W. (2007) *Introduction to Econometrics*. Pearson Education, New York.
- Wooldridge, Jeffrey M. (2002) *Econometric Analysis of Cross Section and Panel Data*. MIT Press.