

12E002

9 ECTS

## Statistics and Econometrics

### Overview and Objectives

This is an introductory course in econometrics. The course is designed to cover the basic procedures of econometrics, including an introduction to time series. This material will be extensively covered in the following courses of the econometric sequence. The approach of the course is to introduce many econometric methods and discuss estimation procedures. The first part of the course deal with the statistical underpinnings of econometrics and it is more theoretically oriented. The second part emphasizes applications and interpretation of the results. The final objective is for students to know what method to apply in each case, and what assumptions are needed for correct inference in each situation. The third part provides an introduction to Time Series models and procedures. The course also prepares students for the two follow-up courses Microeconometrics and Time Series Econometrics.

### Course Outline

#### Part I: Core methods (20 hours)

Introduction  
Linear regression: least squares estimation and small sample properties  
Linear regression: inference  
Asymptotic theory  
Maximum likelihood estimation  
Introduction to GMM

#### Part II: Other econometric methods and applications (20 hours)

Generalized least squares  
Instrumental variables estimation  
Introduction to panel data  
Randomized and natural experiments  
Introduction to binary choice models

#### Part III: Introduction to Time Series (20 hours)

Stationary and Non-stationary Processes  
Autoregressive and Moving Average Processes  
Likelihood Methods for ARMA Processes: Estimation, Asymptotics and Hypothesis Testing  
ARIMA Processes and Unit Roots Tests  
Vector Autoregressions: Definition, Impulse response functions, Variance decompositions and Estimation  
Conditional Heteroscedasticity and univariate GARCH models (time permitting)

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### Required Activities

There will be a weekly take home problem set. You may work in small groups (3-4 people) but every student has to hand in an individual set of solutions.

### Evaluation

Grades will be based on the problem sets (25%) and a final exam (75%)

### Materials

#### Software

The basic econometric software for this course is STATA. Students who want to use the software to understand better the theory are encouraged to write their own programs using matrix calculation languages like MATLAB, GAUSS or MATA.

Harvey, Andrew C. (1993), *Time Series Models*, 2nd ed., MIT Press.

Lutkepohl, Helmut and Markus Kratzig (2004), *Applied Time Series Econometrics*, Cambridge University Press.

#### Readings and Reference Material

Any textbook in econometrics covers the topics that will be developed in the course. References to specific material or applications will be given during lectures. You can choose your favorite textbook. The two companions are not self-contained textbooks but useful to help with the intuition behind the formal derivations. The level of the course will be closer to the basic textbooks than to an advanced book.

*Advance textbooks (use only to check specific results)*

Cameron and Trivedi (2005), *Microeconometrics: methods and applications*.

Wooldridge, J. (2010), *Econometric Analysis of Cross Section and Panel Data* (2<sup>nd</sup> edition).

Hamilton, James (1994), *Time Series Analysis*, Princeton University Press.

#### *Introductory textbooks*

Goldberger, A. (1991), *A course in econometrics*, Harvard University Press.

Stock and Watson (2010). *Introduction to econometrics* (3<sup>rd</sup> edition).

Wooldridge (2009). *Introductory econometrics: a modern approach* (4<sup>th</sup> edition).

#### *Companion textbooks*

Kennedy (2008). *A guide to econometrics* (6<sup>th</sup> edition).  
Angrist, J. and J. S. Pischke (2009), *Mostly harmless econometrics: an empiricist's companion*.

Enders, Walter (2003), *Applied Econometric Time Series*, Wiley.