

Introductory Econometrics (5202-420 - MSc Economics)

Description

The purpose of the course is to familiarize you with core techniques in modern Econometrics. We extensively cover Ordinary Least Squares (OLS) estimation of the linear regression model, the econometric workhorse. We consider the properties of the OLS estimator and the main specification issues of the linear regression model both in a cross-section and a time series context. We further discuss important microeconomic methods such as instrumental variables estimation and models for binary dependent variables. Finally, we turn to important methods and concepts necessary to analyze economic and financial time series data. We cover stationary ARMA-models, dynamic regression models and (univariate) models for non-stationary time series.

While we spend some time with formal derivations, we focus on the essential ideas and intuition of the methods. The applications discussed in class provide hands-on experiences in implementing econometric estimators in Stata or R and interpreting empirical results. At the end of the course, you will understand the basics of empirical research and be able to conduct own basic empirical analyses. The course also provides the basis for further courses specializing in Microeconometrics or Time Series Econometrics.

The course consists of four hours of weekly lectures and two hours of weekly exercise sessions (4+2 SWS, 9 credits in total). The lectures and exercise sessions take place on campus.

Target Audience and Prerequisites

The course is designed for graduate students in Economics who are familiar with the topics generally covered in undergraduate Math and Statistics courses. In particular, the course assumes knowledge of basic concepts of calculus, matrix algebra (e.g. VE, app. A and WO, app. D), and probability theory and statistics (e.g. VE, app. B and WO, app. A-C). Moreover, an online review course in Statistics is available on ILIAS.

Assessment

Grading will be based on a 120 min. written final exam (on campus) covering topics discussed in the lecture and exercise sessions. Parts of the exam may require you to interpret output of statistical software packages and to comment on tables showing empirical results. You will have the possibility to improve your grade in the final exam with bonus points from the Statistics Review Course available on ILIAS. The details of the bonus program will be announced on ILIAS and in class.

Overview of Topics

1. Introduction (WO, app. B-C, ch. 1-2)
 - Motivation of Econometrics
 - Review of Key Concepts in Statistics
 - Simple Linear Regression Model
 - Idea of Method of Moments Estimation
 - Idea of Ordinary Least Squares Estimation
2. Linear Regression and Ordinary Least Squares (WO, ch. 3-8, app. E; VE, ch. 2-4)
 - Multiple Linear Regression Model
 - Estimation with Ordinary Least Squares (OLS)
 - Properties of the OLS Estimator
 - Inference
 - Further Issues on Specification, Estimation and Inference
3. Endogeneity and Instrumental Variables Estimation (WO, ch. 15; VE, ch. 5.1-5.4)
 - Sources of Endogeneity
 - Idea of the Instrumental Variables Approach
 - Two Stage Least Squares Estimation
 - Inference
4. Models for Binary Dependent Variables and Maximum Likelihood Estimation and (WO, ch. 7.5, 7.7, 17.1; VE, ch. 6.1 and 7.1)
 - Models for binary dependent variables
 - Idea of Maximum Likelihood Estimation
5. Introduction to Time Series Data (WO, ch 10, 11.1; SW, ch. 15.1)
6. Univariate Linear Time Series Models (VE, ch. 8.2, 8.6-8.7; SW ch 15.1, 15.2)
 - Autoregressive and Moving Average (ARMA) Processes
 - Forecasts and Forecasts Errors
 - Maximum Likelihood Estimation of ARMA Models

7. Nonstationary Time Series (WO, ch. 11.3, 18.2, 18.3; VE, ch. 8.3-8.4; SW, ch. 15.7, 15.8, 17.3, 17.4)
 - Deterministic Trends and Stochastic Trends
 - Testing for Unit Roots
 - Structural Breaks
8. Time Series Regressions (WO, ch. 12; VE, ch. 4.6-4.10; SW, ch. 15.4, 16)
 - Serially Correlated Errors
 - Dynamic Causal Effects
 - Vector Autoregressions
9. Panel Data Models (WO, ch. 13, 14)
 - Pooling Cross Sections across Time
 - Two-Period Panel Data Analysis
 - Fixed Effects Estimation

Course Materials

All lecture notes, problem sets, and additional materials will be posted on the ILIAS platform. The lecture notes summarize the key points covered in this course. To gain a deeper understanding of each topic we recommend you to participate regularly and actively in the lectures and exercise sessions, to prepare your own solutions to the problem sets, and to study the corresponding chapters in the textbooks according to the chapter references provided above.

Main Textbooks

Stock, James H. and Watson, Mark M. (2020): *Introduction to Econometrics*, Boston (MA): Pearson, fourth international edition. Abbreviated as SW.

Verbeek, Marno (2012): *A Guide to Modern Econometrics*, Chichester: John Wiley, fourth edition. Abbreviated as VE.

Wooldridge, Jeffrey M. (2018): *Introductory Econometrics: A Modern Approach*, Cincinnati (OH): Thomson South-Western, seventh edition. Abbreviated as WO.

You may use any edition of the books.

Alternative Textbooks

Wooldridge, Jeffrey M. (2012): *Econometric Analysis of Cross Section and Panel Data*, Cambridge (MA): MIT Press, second edition.