Universität Marburg

Applied Econometrics

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Objectives

- Introduction to empirical research in economics using a variety of statistical methods.
- Presentation of important elements of standard multivariate regression analysis, time-series econometrics, and discrete choice, as well as a discussion of econometric methodology.
- Practical examples help participants understand the theoretical parts of the course.
- After attending the course, participants should be able to make educated comments on other people's empirical work and undertake their own empirical research projects.

Time

- The course takes place 15−18 February 2027
  - 15 February: lecture 14.15–18.00
  - 16 February: lecture 09.00–13.15, tutorial 14.15–18.00
  - 17 February: lecture 09.00–13.15, tutorial 14.15–18.00
  - 18 February: lecture 09.00–13.15, tutorial 14.15–18.00

Location

- *Lecture*: University of Marburg, room 209 on second floor, Universitätsstr. 24
- *Tutorial*: University of Marburg, computing room located behind Universitätsstr. 25.

Participants

- MAGKS doctoral students

Target group

- This course is designed for PhD students interested in using empirical methods as part of their research projects or as a solid preparation for an advanced technical course in econometrics.
- In the lecture part of the course, we *do* cover econometric theory, after all, this is a PhD level course, but it is typically based on intuition rather than rigour.
- In the tutorials, you will learn to apply many of the concepts discussed in the lecture to real world data using an econometric software program (Stata).

Prerequisites

- It is very helpful to have a basic understanding of algebra, statistics, and econometrics.

Structure of course

- The course provides a broad overview of key areas of econometrics as used in many economic applications.
- The course combines lectures with practical applications based on real world data.
- As such, it covers many topics, which means that, given the time constraints, the speed of delivery will be high and the depth of discussion on each topic will have to be limited.
- However, there will always be time for questions!
- Typically, there will be intensive lectures in the morning followed by practical applications in the afternoon.
- As many topics cannot be discussed in (sufficient) depth, please consult the detailed lecture slides and/or the references provided if you are interested in a particular topic.

Contents

I. Introduction: Some Principles of Empirical Research

II. Bivariate and Multivariate Regression Models

1. Desirable Characteristics of Estimators
2. Method of Ordinary Least Squares
3. Hypothesis Testing
4. Multivariate Regression
5. Diagnostic Testing
6. Dummy Variables
7. Hands-on Exercises

III. More General Methods

1. Restriction Testing and Estimation
2. Maximum-likelihood Estimation
3. Alternative Test Principles (Wald, LM, LR-tests)
4. Instrumental Variable Estimation
5. Hands-on Exercises

IV. Time-Series Econometrics

1. Stationary Time Series

1. Time-dependent Stochastic Processes
2. Autoregressive Processes
3. Moving Average Processes
4. ARMA Processes
5. ML Estimation of an ARMA process
6. Evaluating Model Adequacy
7. Model Selection
8. Hands-on Exercises

2. Dynamic Econometric Models

1. Autoregressive Distributed Lag Models
2. Vector Autoregressive Models
3. Granger-Causality
4. Hands-on Exercises

3. Nonstationary Time Series

1. The Random Walk and its Implications
2. Discovering Nonstationarity
3. Cointegration
4. Error-correction Models
5. Vector Error-correction Models
6. Hands-on Exercises

V. Discrete Choice Models

1. Introduction
2. Probit/Logit Models
3. Model Evaluation
4. Ordinal Probit/Logit Model
5. Hands-on Exercises

VI. Panel Data Models

1. Pooling Data
2. Fixed Effects Estimator
3. Random Effects Estimator
4. Hands-on Exercises

VII. Econometric Methodology

1. The ‘Classical’ Approach to Econometrics
2. Leamer’s Critique: Robust Bounds
3. Sims’ Critique: VAR
4. Hendry’s Critique: General-to-Specific Modelling
5. Angrist and Pischke’s Critique: Empirical Research Design

Planned time allocation

- Monday
  Chapters I and II
- Tuesday
  Chapters II, III
- Wednesday
  Chapters IV and V
- Thursday
  Chapters VI and VII

- Note that this may change for all sorts of reasons, notably poor time management on the part of the lecturer…

Reading List

- Some remarks on the references:
  - There are many books on econometrics. In fact, there seems to be an almost infinite number of textbooks covering the basic methods.
  - Basically, most of these books cover the same ground, so it is a matter of taste which one(s) you prefer.
  - So, take a look at your library and choose a book that YOU like.
  - Below is a list of books that I like, together with a brief explanation of why I like them.
  - This list may help you in your search for a book that suits your tastes, but it should by no means be considered comprehensive.
  - Please drop me a line if you come across a book that you think is excellent and deserves to be on the list.

Basic econometrics books

Asteriou, D. and S. G. Hall (2011), *Applied Econometrics, 2nd* ed., Palgrave-McMillan.

- Practice-oriented introduction with Eviews, Microfit and Stata examples.

Kennedy, P. (2008), *A Guide to Econometrics*, 6th ed., MIT Press.

- Good at explaining core concepts using intuition rather than maths.

Maddala, G.S. and K. Lahiri (2009), *Introduction to Econometrics*, 4th ed., Wiley.

- Lucid introduction to many important econometric issues.

Stock, J.H. und M. Watson (2013), *Introduction to Econometrics*, 3rd ed., Pearson.

- Perhaps not always outstanding, but I like some sections, e.g. the one referring to instrumental variable estimation.

Studenmund, A.H. (2013), *Using Econometrics: A Practical Guide*, 6th ed., Addison Wesley/Pearson.

- Basic econometric theory and applications using Eviews.

More advanced general econometrics books

Baltagi, B. (2011), *Econometrics*, 5th ed., Heidelberg: Springer.

- Bridges the gap between introductory and more advanced books.

Davidson, R. and J.G. Mackinnon (2004), *Econometric Theory & Methods*, Oxford University Press.

- More advanced but well-written with helpful geometric interpretations.

Greene, W.H. (2011), *Econometric Analysis*, 7th ed., Prentice Hall.

- Broad coverage, extensive use of matrix algebra, and fairly rigorous presentation. The writing style is somewhat dry, though.

Hayashi, F. (2001), *Econometrics*, Princeton University Press.

- Rigorously develops standard estimators, such as OLS or ML, as special cases of GMM estimators.

Hendry, D. F. (1995), *Dynamic Econometrics*, Oxford University Press.

- Comprehensive treatment of the topic, with useful applications.

Time series econometrics

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

- Very comprehensive with reference character. Difficult to read!

Lütkepohl, H. (2006), *New Introduction to Multiple Time Series Analysis*, Springer.

- Very good textbook covering many topics, particularly strong on VARs and (co-) integrated time series.

Discrete choice models

Cameron, A.C. and P. K. Trivedi (2010), *Microeconometrics*, 2nd ed., Cambridge University Press.

- Comprehensive book on microeconometrics.

Maddala, G.S. (1983), *Limited-Dependent and Qualitative Variables in Econometrics*, Cambridge University Press.

- Classic book on the subject, but not quite up-to-date anymore.

Panel data econometrics

Baltagi, B. (2013), *Econometric Analysis of Panel Data*, 5th ed., Wiley.

- Well-known and comprehensive, but perhaps not a compelling didactic approach.

Hsiao, C. (2014), *Analysis of Panel Data*, 3rd ed., Cambridge University Press.

- Good treatment of estimation theory, but lacking in practical applications.

More application-oriented books

Berndt, E. (1991), *The Practice of Econometrics*, Addison-Wesley.

- Excellent text that combines the discussion of economic theory with empirical applications, focusing more on microeconomic applications.

Patterson, K. (2000), *An Introduction to Applied Econometrics*, St. Martin's Press.

- Focus on macroeconomics/time series with many serious applications.

Econometric methodology

- Some important contributions

Angrist, J. D. and J.-S. Pischke (2010), The Credibility Revolution in Empirical Economics, *Journal of Economic Perspectives* 24, 3-30.

- Supporters of meticulously crafted empirical research designs.

Hendry, D. F. (1993), *Econometrics: Alchemy or Science?*, Oxford: Blackwell.

- Collection of essays, extensive defence of general-to-specific modelling.

Leamer, E. E. (1983), Let's Take the Con Out of Econometrics, *American Economic Review* 73, 31-43.

- Powerful critique of conventional econometric practice from a Bayesian point of view, proposes extreme-bounds analysis as an alternative.

Sims, C. A. (1980), Macroeconomics and Reality, *Econometrica* 48, 1-48.

- Criticises typical macroeconomic studies and provides an alternative in the form of vector autoregressions (VAR).

Hayo, B. (1997), Alternative methodologische Ansätze in der Ökonometrie: Eine Einführung, *Allgemeines Statistisches Archiv* 81(3), 266-289.

- Just a summary of the older methodological literature in German.