

Philipps



Universität
Marburg

Applied Econometrics

Bernd Hayo



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 22–25 February 2021
 - 22 February: lecture 09.00–13.00
 - 23 February: lecture 09.00–13.00, tutorial: 14.15–16.45
 - 24 February: lecture 09.00–13.00, tutorial: 14.15–16.45
 - 25 February: lecture 09.00–13.00, tutorial: 14.15–16.45

Location

- Online, via BigBlueButton

Participants

- MAGKS doctoral students

Language

- Course language is English

Target group

- This course is targeted towards students interested in applying empirical methods as part of their research projects or as a solid preparation for an advanced technical course on econometrics.
- In the lecture part of the course, we *do* cover econometric theory, after all, this is a PhD-level course, but typically based on intuition rather than rigour.
- During the tutorials you learn to apply many concepts discussed in the lecture to real-world data using an econometrics 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.
- Thus, it covers many issues, which implies that, given the time constraint, speed of delivery will be high and depth of discussion on each individual issue has to be limited.
- However, there is always time for questions!
- The course combines lectures with practical applications based on real-world data.
- Typically, there will be intense hours of lecturing in the morning followed by practical applications in the afternoon.
- Since many issues cannot be discussed in (sufficient) depth, please consult the detailed lecture slides and/or follow up using the provided references 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 due to all sorts of reasons, notably bad time management by 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 contain the same contents and, hence, it is a matter of taste which one(s) you prefer.
 - Thus: Take a look at your library and choose a book YOU like.
 - Below is a list of books that I like and I tried to briefly indicate why.
 - This list may aid you in your search for a book that fits to your taste but it should not be seen as comprehensive in any way!
 - Please drop me a note if you find a book that you think is great and should 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 in 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, wide use of matrix algebra, and rather 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 issues, 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 this issue but not quite up to date any longer.

Panel data econometrics

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

- Well known, up to date, and comprehensive but perhaps not a compelling didactical 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, focus rather 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.

- Not essential, just a summary of the methodological literature in German.