

# Applied Econometrics

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# Objectives

- Introduction to empirical research in economics using 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 will aid in understanding 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 27 February to 2 March 2017
  - 27 February: lecture: 09.00–13.00, tutorial: 14.15-16.45
  - 28 February: lecture: 09.00–13.00, tutorial: 14.15-16.45
  - 1 March: lecture: 09.00–13.00, tutorial: 14.15-16.45
  - 2 March : lecture: 09.00–13.00

## Location

- Philipps-Universität Marburg, School of Business & Economics, left-hand side computing room (U25IB) in the wooden building behind Universitätsstr. 25

## 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 will be 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. Instrumental Variable Estimation
4. Alternative Test Principles (Wald, LM, LR-tests)
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 and IV
- 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 lots of 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*, 2<sup>nd</sup> ed., Palgrave-McMillan.

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

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

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

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

- Lucid introduction to many important econometric issues.

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

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

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

- Basic econometric theory and applications using Eviews.

## More advanced general econometrics books

Baltagi, B. (2011), *Econometrics*, 5<sup>th</sup> 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*, 7<sup>th</sup> 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*, 2<sup>nd</sup> ed., Cambridge University Press.

- Comprehensive book on microeconometrics.

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

- Classic survey book on this issue but not quite up to date any longer.

## Panel data econometrics

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

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

Hsiao, C. (2014), *Analysis of Panel Data*, 3<sup>rd</sup> 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.



