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.

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Time

- The course takes place 17–20 February 2025
  - 17 February: lecture 14.15–18.00
  - 18 February: lecture 09.00–13.15, tutorial 14.15–15.45
  - 19 February: lecture 09.00–13.15, tutorial 14.15–17.30
  - 20 February: lecture 09.00–13.15, tutorial 14.15–17.30

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

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Target group

- This course is designed for 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.

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Structure of course

- The course provides a broad overview of key areas of econometrics as used in many economic applications.

- 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!

- The course combines lectures with practical applications based on real world data.

- 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.

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Contents

Hayo: Applied Econometrics

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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

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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

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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

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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…

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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.

  - Thus: Take a look at your library and choose a book that YOU like.

  - Below is a list of books that I like and I have tried to briefly explain why.

  - This list may help you in your search for a book that suits your tastes, but it should in no way be seen as comprehensive.

  - Please drop me a line if you find a book that you think is great and should be on the list.

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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.

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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.

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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.

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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.

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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 methodological literature in German.

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