Econometrics I

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Purpose This course covers basic principles of econometrics as well as modelling cross-sectional continuous outcomes and time series. This includes understanding the basis for estimation and inference, familiarity with the main approaches to estimation, and knowing several important econometric models and techniques. Students will learn to model economic phenomena, estimate model parameters and test hypotheses regarding them. Students are also expected to learn the central tools that are used to examine and detect problems with different estimators and statistical techniques.

1. To gain familiarity with the main features of econometrics
   - a basic understanding of probability and statistical inference;
   - the ability to handle and describe empirical data;
   - knowledge of the most common approaches to estimation, the properties of these estimators and when to apply them;
   - the ability to detect and overcome shortcomings and problems in models and estimation methods in a real research setting.
2. To learn about particular types of models/estimation approaches and their special features
   - linear projection, least squares estimation, and extensions;
   - quantile regression;
   - simultaneous equations and instrumental variables;
   - generalized method of moments;
   - basic insights into time-series models.
3. To gain the ability to conduct applied econometric research independently
   - to describe and model economic data and phenomena;
   - to use suitable statistical and econometric software.

Time table and location The course timetable and the location of the lectures can be found here. See also the homepage.

The Lectures, by Markus Jäntti, are given on Tuesdays during weeks 4-11.

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Pre-requisites Mathematics II of the SDPE.

Courses in at least basic statistics and basic econometrics are helpful. Familiarity with matrix notation, matrix algebra and probability and statistical inference are useful. The textbook and its appendices review these areas and should be consulted prior to and during the course.

Literature The lecture notes are available on mondo before each lecture.

- The lectures follow primarily Bruce E Hansen (2017). *Econometrics*. Madison, WI: University of Wisconsin. URL: http://www.ssc.wisc.edu/~bhansen/econometrics/Econometrics.pdf.
- Other useful econometrics books (apart from your undergraduate lecture notes and book) include, but are not limited to:
  - Russell Davidson and James G MacKinnon (2004). *Econometric Theory and Methods*. Oxford: Oxford University Press
  - Jeffrey M Wooldridge (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, Massachusettes: MIT Press
  - William H Greene (2003). *Econometric Analysis*. Fifth. London: Prentice-Hall International Ltd [and editions]
  - A Colin Cameron and Pravin K Trivedi (2005). *Microeconometrics: Methods and Applications*. Cambridge: Cambridge University Press

Computing Demonstrations (both in lectures and homework solutions) are given in the statistical package **R**. The homepage lists under documentation a large number of longer and shorter guides to its use. A useful if longish guide to its use is William N Venables and Brian D Ripley (2002). *Modern Applied Statistics with S*. 4th ed. Statistics and Computing. New York: Springer-Verlag. A shorter book to get started is Dalgaard, (2002).

The use of **R** is not mandatory, but *strongly* recommended. Participants are allowed to use any suitable package for their course-work. The following are common other choices:

- stata
- eviews
- SAS
- matlab
- Gauss

Of these, `stata` is popular among econometricians. Eviews, in turn, is used a lot by time series econometricians. matlab and Gauss are advanced programming environments (not entirely unlike R; but commercial and in many respects very advanced).

Examination The examination consists of an exam at the end of course. *Only those are allowed to take the exam who have returned all homework assignments with a serious effort to solve them – meaning that there is a recorded attempt to solve all problems.* The homework assignments contribute toward the exam grade.

Table 1 Course content, textbook chapter and problem sets (preliminary)

Handout	Title	Hansen, (2017)	Homework
1.	Introduction	1	
2.	Conditional expectation and projection	2	1
3.	The algebra of least squares	3	2
4.	Least squares regression	4 (5)	2
5.	Asymptotic theory for least squares	6, 7	3
6.	Restricted estimation	8	3
7.	Hypothesis testing	9	4
8.	Bootstrap	13	4
9.	Regression extensions	12	5
10.	Quantile regression	12	5
11.	Endogeneity	10	7
12.	Generalized method of moments	11	6
13.	Time series	17, 18	6

Note: Mapping of chapters to homework is preliminary and subject to change.