R300 Advanced Econometric Methods

Aims and Objectives
This module serves as an introduction to fundamental econometric techniques at the graduate level. The goal is to prepare students for working on their Ph.D. Upon completion of the module students should be able to (i) interpret and understand econometric research of others and (ii) confidently use econometrics to analyse their own data.

Prerequisites
Students are expected to be familiar with elementary concepts of probability and statistics at the level of Casella, G.C. and R.L. Berger, *Statistical Inference*, Cengage Learning, 2008. The course also makes use of matrix algebra, calculus (integration and differentiation), and optimization.

Contents
This module covers the following topics:
1. Estimation and Inference with random sampling
   1.1. Sampling, sample statistics, properties of the sample mean, asymptotics
   1.2. Evaluation of estimators
   1.3. Parametric models — maximum likelihood
      1.3.1. General theory and examples
      1.3.2. Application to classical linear regression model
      1.3.3. Application to some nonlinear problems
   1.4. Semiparametric models — generalized method of moments
      1.4.1. General theory and examples
      1.4.2. Application to linear and nonlinear regression models (ols, gls)
      1.4.3. Application to instrumental-variable models (simultaneous equations, 2sls)
   1.5. Nonparametric estimation
2. Estimation and inference with time series data
   2.1. Concepts
   2.2. Linear processes (arma)
   2.3. Non-stationary processes (unit roots)
3. Estimation and inference with panel data
   3.1. Fixed and random effects
   3.2. Linear models
   3.3. Incidental parameters and some nonlinear problems

The short course *Stata for dissertations* is available for students and, although optional, is highly recommended.
The module R301 *Econometrics II*, offered in Lent, deals in greater detail with microeconometrics—and with discrete-choice modelling in particular—and with time series analysis.

**Organization**

This module takes place in Michealmas Term and consists of 27 hours of lectures, supplemented with 16 hours of classes. The chief aim of the classes is to go over the problem sets.

**Readings**

Lecture slides and notes will be made available through Moodle. No single textbook is followed. The topics dealt with are discussed in the following textbooks:


A technical compendium on the asymptotic theory behind least-squares estimation in linear models is


**Assessment**

The examination for this module consists of a three-hour written exam that takes place in May.