

Advanced Econometrics

Instructor:

Prof. Bernd Fitzenberger, Ph.D.

Lectures/PC Exercises:

Tue, 8.30-10, SPA 1, 202

Tue, 14-16, SPA 1, 22 and 025 (PC-Pool)

There will be 4 PC Pool exercises in the semester (Tue, 14-16, SPA 025):

Exercise 1 May 7

Exercise 2 May 28

Exercise 3 June 25

Exercise 4 July 2

The deadlines for the homeworks are:

Homework 1: June 4

Homework 2: July 2

Homework 3: July 9

Description of Course:

This course provides a rigorous review of basic linear regression and techniques both for cross-sectional and panel applications. The course then covers further topics which are important in applied econometric analysis based on individual level data and longitudinal data. These topics include a discussion of the asymptotic theory for nonlinear estimation techniques (MLE, Nonlinear Least Squares), discrete choice models, limited dependent variables models, and linear quantile regressions. The course provides an up-to-date treatment at the level of Wooldridge's textbook on "Econometric Analysis of Cross Section and Panel Data". The course will regularly discuss the causal interpretation of econometric estimates. The focus of the course is both on understanding the methodological concepts and on how to apply them. Students will learn to implement the estimation methods using the econometric package Stata.

Course Outline:

0. Introductory material: Linear Algebra, Statistics and Probability Theory, Asymptotics

1. Review of the linear Regression Model for Cross-Sectional Data

References: WO Chapters 1–6, CT Chapters 4, 21, 22, AP Chapters 2–4

1.1 Preliminaries: Conditional Expectations in Econometrics, Causal Analysis, Linear Projections

1.2 OLS: Asymptotic Theory, Robust Standard Errors, Partitioned Regression, Gauss-Markov-Theorem, Testing

1.3 Instrumental Variable Regression

2. Machine Learning Approaches to Regression: Penalized Regression and Regression Tree

Reference: MS

3. System Estimation by OLS and GLS, Linear Panel Data Models, System IV and GMM

Reference: WO Chapters 7, 10, AP Chapter 5

4. Nonlinear Least Squares and Maximum Likelihood

Reference: WO Chapters 12, 13

5. Binary Response Models and Limited Dependent Variables

Reference: WO Chapters 15, 17

6. Linear Quantile Regression (QR)

References: KO, AP Chapter 7, WO Chapter 12.10, CT Chapter 4.6

6.1 Introduction to linear quantile regression: Distance function, Asymptotic distribution, Properties of the estimator, Interpretation as Method-of-Moments Estimator,

6.2 Decomposition Analysis with Quantile Regression and Unconditional Quantile Regression

Main References:

- **AP: Angrist, J. D. and J.-S. Pischke** (2009): Mostly Harmless Econometrics – An Empiricist's Companion, Princeton University Press.
- **CT: Cameron, A. C. and P. K. Trivedi** (2005): Microeconometrics – Methods and Applications, Cambridge University Press.
- **GR: Greene, W.** (2008): Econometric Analysis, 6th ed., International Edition, Prentice Hall.
- **KO: Koenker, R.** (2005) Quantile Regression. Econometric Society Monograph, Cambridge University Press, Cambridge.
- **MS: Mullainathan, S. and J. Spiess** (2017). Machine learning: an applied econometric approach. Journal of Economic Perspectives, 31(2), 87-106.
- **WO: Wooldridge, J. M.** (2010): Econometric Analysis of Cross Section and Panel Data. 2nd edition, Cambridge, MA: MIT Press (see also: <http://mitpress.mit.edu/books/econometric-analysis-cross-section-and-panel-data>).

Exam: written exam (90 min), two exam dates

Requirements: Knowledge of econometrics at the level of the courses “Econometric Methods” (First Master course) or “Econometrics I” (BDPEMS).

Further Information: There will be problem sets with theoretical and empirical exercises which will be assigned as voluntary homeworks for Master students and as mandatory homeworks for PhD students. Homeworks are to be submitted by groups of 2-4 students. The homeworks will be corrected for all students and the same number of credits will be given for all group members. However, the homeworks do not count as part of the final grade for master students. PhD students must obtain at least 50% of all possible credits for the graded homeworks in order to be able to write the final exam but the final grade for the PhD students will only be based on the final exam.

Further references, particularly regarding Machine Approaches to Regression, Quantile Regression and the applications, will be given in the course. The basic estimation techniques will be implemented in the PC Pool using the econometric package Stata.