University of Mainz Summer School
Advanced Econometrics
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Overview: This course covers advanced topics in econometrics for cross section and panel data applications. The emphasis is on nonlinear models, although missing data and attrition problems are usually applied to linear models. Most of the topics are covered in my MIT Press book, *Econometric Analysis of Cross Section and Panel Data*, 2e.

The readings below are from my book. I will be using lecture slides and illustrating the methods using Stata.

The format is two lectures before lunch, one lecture after lunch, and then an extended practical session where the students will work through some methodological questions as well as empirical exercise. I will reserve time to go over at least some of the answers, and I will post all solutions.

Background: I will assume you have had a course in econometrics that covers linear models for cross section and panel data, and that you feel comfortable with matrix algebra and probability and statistics. In addition, you should feel comfortable with basic limited dependent variable models, such as probit, logit, and Tobit, in a cross sectional setting. I will keep the theory and derivations will be limited. Instead, the focus during lectures will be on the assumptions underlying each method and the consequences of relaxing those assumptions.

Monday-Friday Daily Schedule:

8:30-10:00 First Session (Lecture)
10:00-10:30 Coffee Break
10:30-12:00 Second Session (Lecture)
12:00-13:30 Lunch
13:30-15:00 Third Session (Lecture)
15:00-15:30 Coffee Break
15:30-17:30 Fourth Session (Problem Session)

Course Outline

Depending on the pace of the course, we not cover all of the material in the slides. Material will not spill over into later days: each day we will start fresh on the listed topics. This structure will allow us to stay on track to finish the fundamental material in the course.

Day 1
- Overview of MLE
- Quasi-MLE
- Pooled MLE with Panel Data
- Correlated Random Effects
- General Theory of Nonlinear GMM

Day 2
- Fractional Response Models
  - Endogenous Explanatory Variables
  - Panel Data
- Count and Exponential Models
  - Endogenous Explanatory Variables
  - Panel Data

Day 3
- Multinomial Response Models
- Probabilistic Choice Models
  - Endogenous Explanatory Variables
  - Panel Data
- Ordered Response Models
  - Endogenous Explanatory Variables
  - Panel Data
- Unbalanced Panels

Day 4
- Data Censoring
- Sample Selection
- Inverse Probability Weighting
- Attrition

Day 5
- Treatment Effects with Endogenous Interventions
  - Instrumental Variables Methods
  - Control Function Methods
- Duration Models
  - Grouped Duration Data

Course Material

I will make available lecture slides, problem sets, and Stata data sets. The slides are based on my MIT Press book, but sometimes with extensions.

Textbooks

A.C. Cameron and P.K. Trivedi, *Microeconometrics: Methods and Applications*, Cambridge University Press, 2005.

W.H. Greene, *Econometric Analysis*, Prentice Hall, 8th edition, 2018.

F. Hayashi (2000), *Econometrics*, Princeton University Press.

J.W. Wooldridge, *Introductory Econometrics: A Modern Approach*, Southwestern, 6th edition, 2016.

J.M. Wooldridge, *Econometric Analysis of Cross Section and Panel Data*, MIT Press, 2nd edition, 2010.