**SYLLABUS: BAVARIAN GRADUATE PROGRAM IN ECONOMICS**
**Advanced Econometrics: March 2-7, 2014**

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**Goal:** This course covers estimation of linear and nonlinear econometric models. The estimation methods include ordinary least squares, generalized least squares, instrumental variables (including generalized method of moments), nonlinear least squares, maximum likelihood estimation, and quasi-maximum likelihood estimation. The focus will be on applications to cross section data and panel data but will include consideration of time series data.

**Background:** I will assume a working knowledge of probability and statistics – including manipulations involving conditional expectations and the basic limit theorems, such as the law of large numbers and the central limit theorem. It is important to have facility with matrix algebra, including how matrix algebra can be combined with probability and statistics. At a minimum, students should feel comfortable with Appendices A through D in my introductory econometrics book (see reference below). These appendices can be obtained without charge from

http://www.ichapters.co.uk/shop/content/wooldridge81629_0324581629_01.01_toc.pdf

**Daily Schedule**

9:00-10:30 First Lecture
10:30-11:00 Coffee Break
11:00-12:30 Second Lecture
12:30-14:00 Lunch
14:00-15:00 Extra Lecture Time
15:00-16:30 Problem Set
16:00-16:30 Coffee Break
16:30-18:00 Discussion of Problem Sets and Review
18:00-19:00 Free Time
19:00 Dinner

**Course Outline**

The slides for the course are grouped into what I think are natural topics rather than what we will necessarily cover during a particular lecture session. Consequently, the material for some slides may spill over into a lecture later in the same day. However, 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

· Ordinary Least Squares: Algebraic, Finite Sample, and Asymptotic Properties; Applications to Cross Section and Time Series Data

· Generalized Least Squares and Feasible GLS: Applications to Cross Section and Time Series

Day 2

· Instrumental Variables and Two Stage Least Squares: Asymptotic Properties; Testing Endogeneity and Overidentification; Weak Instruments; Applications to Cross Section and Time Series Data

· Generalized Method of Moments: Asymptotic Properties; Optimal Weight Matrix; Optimal Instruments

Day 3

· Linear Panel Data Models: Estimation and Inference Using Pooled OLS, Random Effects, Fixed Effects, First Differencing; Robust Inference; Comparision of Estimators and Testing Key Assumptions.

· Linear Panel Data Models: Instrumental Variables Methods; Unbalanced Panels

Day 4

· Nonlinear Estimation: M-estimation and Asymptotic Properties; Nonlinear Least Squares; Maximum Likelihood Estimation; Applications of NLS

· General Nonlinear Estimation with Panel Data; Joint MLE and Pooled MLE; Correlated Random Effects Approaches to Unobserved Heterogeneity; Robust Inference for Pooled MLE and quasi-MLE

· Bootstrapping with Cross section Data and Panel Data

Day 5

· Limited Dependent Variable Models: Logit and Probit (Binary and Fractional Responses); Tobit; Count Data Models

· Introduction to Nonparametric and Semiparametric Estimation

**Course Material**

I will make available lecture notes, slides, problem sets, and Stata data sets. The "lecture notes" in some cases are merely expanded versions of the slides. I include the material in the interests of continuity as you study the notes on your own.

**Textbooks**

For the first two days of the course I will be drawing on material from a variety of sources, including my own (unpublished) lecture notes. Greene and Hayashi contain the material on OLS and GLS presented at an advanced level. The treatment in Wooldridge (2009, Appendix E) is terse but has several of the important derivations.

For panel data and nonlinear models I will rely mainly on Wooldridge (2010). The other texts have nice treatments of many of the topics. Cameron and Trivedi is an especially good reference for bootstrapping and nonparametric estimation.

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

W.H. Greene, *Econometric Analysis*, Prentice Hall, 7th edition, 2012.

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

J.W. Wooldridge, *Introductory Econometrics: A Modern Approach*, Southwestern, 4th edition, 2009.

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