Economics 273  
Course Outline  
Professor Frank A. Wolak

Advanced Econometrics I  
TuTh&F 1:15-3:05  
Fall 2005-2006

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This course has two goals. The first is to provide students with a working knowledge of asymptotic statistical methods. The second is to apply these statistical concepts to study the large-sample properties of all commonly used econometric models. The first half of the course focuses on deriving the large-sample properties of estimators defined as the solution to an optimization problem, under a variety of assumptions for the true data generation process. These large-sample results are applied to the maximum likelihood and nonlinear least squares estimators. Extensions to the case of nonlinear instrumental variables estimators, including the generalized method of moments estimator, are then presented. Various asymptotic testing procedures are derived for this general modeling framework.

The remainder of the course is devoted to several topics on the frontier of econometric theory research. The first is simulation estimation. Simulated maximum likelihood and simulated method of moments estimators will be presented and their large-sample properties discussed. The basics of non-parametric econometric techniques (specifically, kernel-based and spline-smoothing methods) and their large-sample properties will then be presented.

Students are expected to read the assigned papers before each lecture.

Useful Textbooks:


COURSE PROJECT

To gain an appreciation for the practical problems associated with applying asymptotic estimation and inference theory to finite data sets, all students will be required to complete a Monte Carlo project assessing the small sample performance of an estimator (or group of estimators) or hypothesis testing procedure (or group of hypothesis testing procedures). These projects are due the last day of the final exam period, March 24, 2006. These projects should be no more than 15 to 20 double-spaced typewritten pages of text. Students will be required to submit a one-page proposal/summary of their topic by March 2, 2006.

HOMEWORK

There will be 5 theoretical problems sets due throughout the quarter.

GRADING

Homeworks 25 percent
Final Project 25 percent
Final Exam 50 percent

IMPORTANT DATES

Course Project Outline Due 03/01/06
Final Exam 03/22/06 (7:00-10:00 pm)

COURSE OUTLINE

1. Asymptotics for Linear Least Squares Estimation (2 Lectures)
   (a) Classical Assumptions
   (b) Violation of Classical Assumptions: Autocorrelation, Heteroscedasticity
   (c) Feasible of Generalized Least Squares
   (d) Hypothesis and Specification Testing


2. Asymptotics for Nonlinear Least Squares Estimators (2 Lectures)
   (a) Classical Assumptions
   (b) Violation of Classical Assumptions: Autocorrelation, Heteroscedasticity
   (c) Feasible Generalized Least Squares
   (d) Hypothesis and Specification Testing


3. Asymptotics for Maximum Likelihood Estimation (2 Lectures)
   (a) Classical Assumptions
   (b) Misspecified Models
   (c) Hypothesis and Specification Testing


4. Asymptotics for M-Estimators with Differential Objective Functions (2 lectures)
   (a) Stochastic Equicontinuity
   (b) Empirical Process Methods


5. Asymptotics for M-Estimators with Non-Differentiable Objective Functions (1 Lecture)
   (a) Least Absolute Deviations
   (b) Quantile Regression Estimators


6. **Non-Standard Methods for Performing Hypothesis Tests (3 Lectures)**
(a) Bootstrapping
(b) Sub-sampling


7. **Asymptotic Theory for Generalized Method of Moments Estimators (2 Lectures)**
(a) Consistency and Asymptotic Normality for Arbitrary Weighting Matrix
(b) Nonlinear 2SLS and 3SLS
(b) Optimal Weighting Matrix
(c) Estimating Optimal Weighting Matrix


8. **Simulation Estimation and Related Asymptotic Theory (2 Lectures)**
(a) Method of Simulated Moments
(b) Method of Simulated Scores
(c) Simulated Maximum Likelihood
(d) Indirect Inference


9. **Introduction to Nonparametric Estimation (2 Lectures)**
   (a) Kernel Density Estimation
   (b) Spline Smoothing.


