University of Illinois | Department of Economics
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Advanced Econometrics I

Course Prospectus

The field sequence 476-477 in econometrics is designed to give students a working knowledge of a broad array of current topics in econometric theory and prepare them for empirical applications near the research frontier. In the first course, 476, we intend to focus the first half of the course on asymptotic methods and the study of the large-sample behavior of econometric procedures supplemented by an introduction to monte carlo methods. The second half of the course will be devoted to recent developments in semi-parametric methods in econometrics.

Suggested Text:
Gourieroux, C. and A. Monfort (1995) *Statistics and Econometric Models*, Cambridge U. Press.

Recommended Supplementary Tests:
Davidson, R. and MacKinnon J.G. (1993), *Estimation and Inference in Econometrics*, Oxford U. Press.
McCabe, B. and Tremayne, A. (1993), *Elements of Modern Asymptotic Theory with Statistical Applications*, Manchester U. Press.

Readings for the second half of the course will be distributed in class. Regular problem sets, a brief research paper and final exam will be required. The problem sets will attempt to intermingle theoretical, empirical and monte-carlo exercises.

Outline

1. **Introduction to Asymptotic Theory and Monte-Carlo Methods**

   Asymptotic theory may be the violin of econometric analysis and monte-carlo the timpani. But this is not to disparage either; both are indispensable instruments required to explore the behavior of the wide array of estimation and inference methods which are currently employed in econometrics. Equally indispensible are the remaining instruments of orchestra with which we may identify the richness of empirical applications in economics. Asymptotics and monte carlo are complementary. To the extent that asymptotic theory is a reliable guide to the evaluation of the finite sample performance of estimators and test statistics, This can only be confirmed by appropriately designed monte-carlo experiments. Thus, asymptotics provides guidance on the design of simulation experiments, while the experiments serve to evaluate the adequacy of the approximations suggested by the asymptotics.

   In the first part of the course we will attempt to interweave asymptotics and monte-carlo introducing the basic techniques of both approaches and illustrating their application on a wide variety of problems of estimation and inference including

(a) (generalized) maximum likelihood and related methods of inference
(b) location/scale estimation
(c) (generalized) linear models (exponential family models)
(d) (quasi) maximum likelihood and related methods of inference

Along the way we will revisit, or encounter for the first time in some cases: modes of convergence, laws of large numbers, central limit theorems, stochastic equicontinuity, and weak convergence. The basic tools of the monte-carlo trade will also be introduced including some attention to design of experiments, variance reduction techniques and a brief introduction to density estimation. Particular attention will be paid to monte carlo methods for evaluation of inference procedures.

2. **Semi-Parametric Methods in Econometrics**

The second half of the course will be devoted to recent developments in semi-parametric methods of estimation and inference. These methods seek to relax the stringent assumptions required to justify the strictly parametric models employed in classical econometrics. We will consider a selection of the following topics.

(a) Nonparametric density estimation
(b) Nonparametric regression
(c) Quantile regression
(d) Semiparametric discrete choice models
(e) The bootstrap and related resampling methods
(f) Measures of inequality and tail behavior
(g) Semiparametric survival analysis
(h) Transformation models and "average derivative" estimation