ECON239 INTRODUCTION TO ECONOMETRICS

Econ 239D
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COURSE CONTENT

This course introduces fundamental knowledge and application of econometrics in a more formal manner than does an undergraduate econometrics class. Students will learn the derivation of the most common econometric estimators and conditions under which those estimators are valid. Topics include ordinary least squares (OLS) estimation, finite sample property, asymptotic theory and large sample analysis, hypothesis test and inference, binary choice models and maximum likelihood estimation, instrument variable and generalized method of moments estimation, as well as an introduction to time series analysis if time allows. Students will also learn how to conduct basic estimation in empirical problems using econometrics software (mostly STATA.)

Prerequisite: Undergraduate Calculus, Probability and Statistics. Working knowledge of Linear Algebra. A brief review of the linear algebra and statistical knowledge used mostly in this course will be given in the first week. Undergraduate econometrics is not required but useful. However, students who have taken ECON139 or ECON220 are strongly encouraged to take more advanced class, e.g. ECON342, if they are interested in econometrics.

TEXTBOOK

- Wooldridge, Jeffery: *Introductory Econometrics: A Modern Approach*, South-Western College Pub; 4th Edition

This book is designed for an introductory undergraduate class. We will study similar topics but on a more rigorous level. However, this book is excellent for providing intuition and analysis of basic empirical problems. There will be homework questions from this book, especially the empirical ones.

Not required but recommended:

- Stock, James and Mark Watson: *Introduction to Econometrics*. 2nd Edition

This is regarded as the most advanced undergraduate level textbook. Our discussion on time series in particular will be similar to the relevant chapters in this book.

- Casella, George and Roger Berger: *Statistical Inference*, 2nd Edition

This is a popular textbook to establish a solid background in probability theory and statistical method essential for advanced econometrics classes.

- Hayashi, Fumio: *Econometrics*,

This is the textbook widely used in a first-year PhD level econometrics class. Our discussion on OLS and its properties will be based on the first two chapters of this book but will be less mathematically intensive.

- Hamilton, James: *Time Series Analysis*

This is the classic textbook for time series econometrics. If time permits, we will explore topics including stationary ARMA process and forecasting following this book but only in an intuitive way.

Course Materials:

Class notes with outline and major conclusions will be posted on Blackboard before each lecture. The details of the derivation of some of those conclusions and specific examples that illustrate them will be given in class through lecture and will not be posted afterward unless otherwise notified.

GRADING

Assignments, midterm, and final. Assignments will contain both theoretical and empirical questions. The midterm will be in-class and 75 minutes, the final is as scheduled by the Graduate School. Practice questions as well as their solutions will be posted on Blackboard before the exams to give students information about the structure and difficulty of the actual exams.

The (tentative) weight for the final grade is

Homework: 20%

Midterm: 30%

Final: 50%

Topics

1. Mathematics Review

Linear algebra; probability and statistics; conditional expectation and mean independence

2. OLS estimator and finite sample properties

Classic assumptions for linear regressions; derivation of OLS estimator; interpreting coefficients; finite sample properties of OLS; heteroskedasticity and GLS

3.Large Sample Theory

Concepts of convergence; Law of Large Numbers and Central Limit Theorem; large sample properties of OLS estimator;

4. Hypothesis Test

Hypothesis and test statistics; test errors; size, power and significant level of tests; finite sample inference; large sample inference

5. Maximum Likelihood Estimator (MLE)

Principles of maximum likelihood; MLE for i.i.d. normal sample; conditional MLE for standard linear regression; properties of MLE

6. Qualitative Information and Non-linear Models

Dummy Variable; probit model; Tobit model

7. Instrumental Variables and Generalized Method of Moments (GMM)

Simultaneous equations; derivation of GMM; properties of GMM; GMM and OLS

8. Introduction to Time Series Analysis

Classic assumptions for time series data; stationary ARMA process; non-stationary process; vector autoregression (VAR); forecasting

* Depending on the actual progress of this class, Topic 7 and 8 may only bepartly covered.