ECONOMETRICS I
ECONOMICS 705
FALL 2006

Instructor: Áureo de Paula
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Office Hours: Monday, 9:00-10:30.

Class Webpage: Blackboard Courseware (http://courseweb.library.upenn.edu)

Teaching Assistants: (e-mail; office; office hours)
Geena Kim, (gkim2@sas.upenn.edu; 555 McNeil Building; Friday, Noon-1:00pm and by apt)
Seth Richards, (serichar@sas.upenn.edu; 477 McNeil Building; Tuesday, 2:00-3:00pm and by apt)

Review Sessions: TBA

Textbooks: Hayashi, F., *Econometrics* (required).

Even though we will follow Fumio Hayashi's text mostly, other references will be used sporadically in our lectures. These are: *Econometric Analysis*, by William H. Greene; *A First Course in Econometrics*, by Arthur Goldberger; *Econometric Analysis of Cross Section and Panel Data*, by Jeffrey Wooldridge; and *Statistical Inference*, by George Casella and Roger L. Berger. These books will be on reserve at Lippincott Library.

Grades:

- FINAL GRADE = 30% $\times$ PROBLEM SETS ($\approx$ 6) + 30% $\times$ MIDTERM + 40% $\times$ FINAL.
- No late problem sets. Points forfeited.

Software: Stata or R (recommended, but you can use any other software).

Calendar:
October 24: Fall Break.
October 26: Midterm Exam (tentatively).
November 14: No class.
November 23: Thanksgiving.
December 20: Final Exam.

Course Plan (check course website for updates):[1]

Review of Statistics (Casella and Berger) (4 lectures)

> *Basic Probability Concepts, Selected Probability Distributions, Moment Generating and Characteristic Functions, Point Estimation, Set Estimation, Hypothesis Testing, Sufficiency*

Finite Sample Properties of OLS (Chapter 1, Hayashi; Goldberger) (4 lectures)

> *OLS and Best Linear Predictor; Algebra of OLS; Matrix Notation, Projection Matrix; Classical Linear Regression Model; Mean and Variance of OLS; Gauss-Markov Theorem; Lehmann-Scheffé Theorem; Unbiased Estimation of Residual Variance; t-statistics; F-test; Frisch-Waugh-Lovell Theorem; Generalized Least Squares; Maximum Likelihood Estimation; Information Matrix Equality; Cramér-Rao Lower Bound*

Large Sample Theory (Chapter 2, Hayashi) (3 lectures)

> *Convergence concepts (almost sure, in probability, in distribution), Continuous Mapping Theorem, Slutzky's Lemma, Delta Method, Central Limit Theorem, Stationarity and Ergodicity, Large Sample Properties of OLS, Hypothesis Testing, Conditional Heteroskedasticity (also Chapter 11 of Greene).*

GMM (Chapter 3 and 4, Hayashi) (5 lectures)

> *Simultaneous Equation Models, Measurement Errors (also Section 5.6 of Greene), Generalized Method of Moments, Large Sample Properties of GMM, Hypothesis Testing, 2SLS (also Chapter 15 of Greene), 3SLS (also Chapter 15 of Greene), SUR (also Goldberger)*

[1] Greene chapters refer to 5th edition.

Extremum Estimators (Chapter 7, Hayashi) (3 lectures)

M-estimators, Large Sample Properties, Hypothesis Testing, Nonlinear Least Squares (also Chapter 9 of Greene), Two-stage Estimation Methods.

Examples of Maximum Likelihood (Chapter 8, Hayashi) (3 lectures)

Qualitative Response Models, Truncated Regression Models, Censored Regression Models, Duration Models (also Wooldridge).

Panel Data (Chapter 5, Hayashi; Chapters 10 and 11, Wooldridge) (2 lectures)

Fixed Effects, Random Effects, Hausman-Wu Specification Test.