Department of Economics
Syracuse University

ECN 622
Spring 2016

Econometrics II

Lectures:	Tu/Th, 3:30pm − 4:50pm, EGGERS 111
Instructor:	Prof. Yoonseok Lee (426 Eggers Hall, `ylee41@maxwell.syr.edu`)
Office Hours:	by appointment

Course Description

This is a graduate level course in econometrics, which is designed for first-year economics Ph.D. students. The pre-requisites are *both* ECN 620 and ECN 621 (or their equivalents). Knowledge of linear algebra, graduate level of probability/statistics and linear regression theory is essential. The main goal is to provide a broad overview of basic modern econometrics tools focusing on extremum estimators and time series models. Selected current research topics are also covered depending on time and interest.

The class web page is available at `http://blackboard.syr.edu`. Announcements and additional course materials are to be posted there, so make sure to visit the site frequently. Hard copies of these materials will *not* be distributed.

Course Requirements

The main requirement of this course is two midterm exams (50% each). The exams are scheduled as follows (in the regular classroom):

Midterm I: 3:30pm − 4:50pm, Thursday, March 10 (in class)
Midterm II: 3:30pm − 4:50pm, Thursday, April 28 (in class)

All exams are closed-book. No make-up exams nor early exams are given for any reason, so please plan your travels smartly. Students are required to take all the exams to pass this course.

To prepare for the exams, though not collected/graded, it is strongly recommended that students form study groups and collaborate with other students to keep working on the end-of-chapter exercise questions from the main textbook (*Econometrics* by F. Hayashi, 2000). Answers to selected questions, data sets for empirical exercises and other accompanying materials are available on the web from http://fhayashi.fc2web.com/hayashi_econometrics.htm. Students are also encouraged to learn graduate-level programming software such as MATLAB, GAUSS, R, SAS or Stata.

References

The recommended textbook for this course is:

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

The following books are useful references for graduate level econometrics:

[A] Amemiya, T. (1985). *Advanced Econometrics*, Harvard University Press.

[B] Baltagi, B. (2011). *Econometrics*, 5th ed., Springer.

[DM] Davidson, R. and J.G. McKinnon. (1993). *Estimation and Inference in Econometrics*, Oxford University Press.

[G] Green, W. (2012). *Econometric Analysis*, 7th ed., Prentice Hall.

[HJ] Hamilton, J.D. (1994). *Time Series Analysis*, Princeton University Press.

[HB] Hansen, B.E. (2015). *Econometrics*, available at http://www.ssc.wisc.edu/~bhansen/econometrics/Econometrics.pdf.

[WH] White, H. (2001). *Asymptotic Theory for Econometricians*, rev. ed., Academic Press.

[W] Wooldridge, J. (2010). *Econometric Analysis of Cross Section and Panel Data*, 2nd ed., MIT Press.

Each textbook has a different approach in econometrics but the coverages are very comparable. [HF] has nice treatment in GMM theories and time series; it tries to interpret all econometric models in the unified framework of GMM, so this textbook is the most suitable to this course. [A] and [DM] are classic and they cover most of the topics with enough theoretical depth; [A] is particularly recommended for the students interested in econometric theory. [B] and [G] are also quite broad including recent development in econometrics, but they are easier to read comparing with [A] and [DM]. [HJ] is a popular econometrics textbook in classical time series models, which includes many examples. [HB] is an open source textbook, which includes the essential topics for the Econ PhD. [WH] is a good reference for asymptotic theories covered in this course. [W] has more microeconometric point of view including panel data models. I also recommend the series of *Handbook of Econometrics*, Elsevier, for further reading.

Course Outline

I. Extremum estimators and Nonlinear Models

1. Extremum estimators
   (a) M-estimators: MLE, (N)LS
   (b) Generalized Method of Moments (GMM) estimators: IV, nonlinear GMM, M-estimators
   (c) Classical Minimum Distance (CMD) estimators

2. Asymptotic properties of extremum estimators

   (a) Review of basic large sample theory
   (b) Consistency and identification (MLE, NLS, GMM)
   (c) Asymptotic normality (MLE, QMLE, NLS, GMM)
   (d) Optimal weight matrices and continuously updated GMM, HAC estimator

3. Hypothesis testing

   (a) General nonlinear null hypothesis
   (b) J test (or over-identification test) in GMM
   (c) Model selection

4. Examples of nonlinear models (Limited dependent variables models)

   (a) Binary choice models: Logit, Probit, random utility models
   (b) Censored regressions: censoring vs. truncation, Tobit, sample selection models and Heckman's two-step estimation (Heckit), treatment effects

II. Time Series Models

1. Stationary process

   (a) Time series, stationarity, and serial dependence
   (b) Stationary process in the time domain
   (c) Stationary process in the frequency domain
   (d) ARMA process
   (e) Linear process and large sample theory

2. Vector autoregressive models

   (a) VAR models
   (b) Structural VAR models

3. Nonstationary process

   (a) Unit Root, Brownian Motion, and functional CLT
   (b) Spurious regression and cointegration
   (c) Error Correction Models (ECM)

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