ECONOMICS 205A: ECONOMETRIC METHODS I
FALL 2008

Instructor: Professor Tae-Hwy Lee
Lectures: MW 2:40 p.m. – 04:00 p.m., SPR2206
Office Hours: MW 10:30 a.m. – 11:20 a.m., open door when available, or by appointment, SPR 3103

TA: Yundong Tu
Discussion: F 1:10 p.m. – 02:00 p.m., SPR2206
Office Hours: F 10:00 a.m. – 12:00 noon or by appointment, SPR 3129

Course Description: The course will provide a thorough introduction to statistical methods required for 205B and 205C, and a technical background for reading articles in econometrics, economic theory, and other fields of economics published in core economics journals. The course is primarily theoretical, but covers some applications and examples. The lectures will emphasize theory. The homework assignments cover mainly analytical problems, but occasionally some computing problems may be included to learn operational aspects of the subject.

References:

- George Casella and Roger Berger (CB, 2002), *Statistical Inference*, 2ed., Duxbury, ISBN 0-534-24312-6. (Required textbook)
- Takeshi Amemiya (1994), *Introduction to Statistics and Econometrics*, Harvard University Press, ISBN 0-674-46225-4
- Herman Bierens (2005), *Introduction to the Mathematical and Statistical Foundations of Econometrics*, Cambridge University Press, ISBN: 0521542243
- Ronald Gallant (1997), *An Introduction to Econometric Theory*, Princeton University Press, ISBN 0-691-01645-3
- Halbert White (1994), *Estimation, Inference, and Specification Analysis*, Cambridge University Press, ISBN 0-521-25280-6.

Computing: You can use Matlab or Gauss (on your choice), both available at the Collabaratory.

- Eric Zivot's GAUSS Webpage: http://faculty.washington.edu/ezivot/gaussfaq.htm
- James P. LeSage's MATLAB Webpage: http://www.spatial-econometrics.com/
- UCR Collab has Gauss and Matlab information: Go to http://collaboratory.ucr.edu/ ; choose "Computing Resources"; and then click "Software Support".

Grading:

- Midterm 1 25% Monday, October 20, 2008
- Midterm 2 25% Monday, November 10, 2008
- Final Exam 50% Friday, December 12, 2008

The above time schedule may be subject to change with a short notice. There will be weekly homework assignment, which will not be counted towards the course grades because many of these problems are to be discussed in the TA sessions. Understanding homework materials will be very useful for exams. The final exam is cumulative and comprehensive. There will be no make-up exams. You are fully responsible for following up on all the announcements made during the lectures.

Request: Please arrive on time, and do not leave before the end of the class. Please turn off any electronic device (e.g., cellular phone, laptop computer, or MP3 player) before the class begins. Questions regarding computer programming should be directed to the TA.

Course Outline: The structure is based on CB. Many materials in CB will not be covered. Other materials (not covered in CB) will be added. The order of covering some topics may be changed, for example, some materials in Ch 10 will be discussed earlier, and may be combined with the materials in Section 5.5 of CB. The course outline may be revised during the session.

- Probability Theory (CB1)
- Transformations and Expectations (CB2)
- Common Families of Distributions (CB3)
- Multiple Random Variables (CB4)
- Properties of a Random Sample (CB5)
- Point Estimation (CB7)
- Hypothesis Testing (CB8)
- Interval Estimation (CB9)
- Asymptotic Evaluations (CB10)

Course Outline

The course outline may be revised during the session. The structure is based on CB. Many materials in CB will not be covered (e.g., CB6). Other materials (not covered in CB) will be added. The order of covering some topics may be changed, for example, some materials in CB10 will be discussed earlier, and may be combined with the materials in Section CB5.5.

1. **Probability Theory:** set theory, axiomatic foundations, random experiments, sample space, events, probability measure, measurability, probability space, conditional probability, independence, random variables, distribution functions, density and mass functions

2. **Transformations and Expectations:** empirical distributions and histograms, change of variables, functions of a random variable (univariate transformations), expected values, moments and moment generating function, characteristic function, differentiating under an integral sign

3. **Common Families of Distributions:** discrete distributions, continuous distributions, exponential families, location and scale families, some important inequalities

4. **Multiple Random Variables:** random vectors and multivariate probability distributions, joint distributions, marginal distributions, conditional distributions, conditional expectations, law of iterated expectations, bivariate transformations, moments, covariance and correlation, some important inequalities, functions of random vectors (multivariate transformations), bivariate normal distribution, marginal normal, conditional normal, regression, multivariate normal, quadratic forms of normal variates

5. **Properties of a Random Sample:** population and random sample, sampling theory and statistics, sums of random variables from a random sample, sampling from normal distribution, the sampling distribution of the sample mean, the sampling distribution of the sample variance, Student's t distribution, Snedecor's F distribution

6. **Principles of Data Reduction:** sufficient statistics

7. **Point Estimation:** maximum likelihood estimation, method of moments, generalized method of moments, mean square error criterion, best unbiased estimators, information matrix, Cramér-Rao bound, Gauss-Markov theorem

8. **Hypothesis Testing:** introduction to hypothesis testing, the Wald test, the Lagrange multiplier test, the likelihood ratio test, error probabilities, the power function, p-values

9. **Interval Estimation:** methods of finding interval estimators, inverting a test statistic, pivotal statistics, methods of evaluating interval estimators, coverage probability, testing for correct coverage probability

10. **Asymptotic Evaluations:** limits, orders of magnitude, motivation for convergence concepts, convergence in quadratic mean and L_p-convergence, convergence in probability, almost sure convergence, convergence in distribution, the delta method, consistency, efficiency, calculations and comparisons, law of large numbers, central limit theorems, bootstrap

11. **Simple Linear Regression:** least squares (a mathematical solution), best linear unbiased estimators (a statistical solution), models and distribution assumptions, estimation and testing with normal errors, large sampling testing (with non-normal errors), prediction