American University
Department of Economics

Econ 724
Amos Golan
TA: Marya Hillesland
Fall 2008

Advanced Econometric Methods
(Tuesday 2:10-4:50 p.m.)

In this class we will study, review and practice the major traditional econometric techniques as well as some recently developed methods in econometrics. The primary objective of this class is to provide the background for understanding the theory and to develop the necessary theoretical and empirical tools for practicing the theory in a wide range of economic/econometric estimation problems.

To accomplish this objective, we will *(i)* emphasize the theory and its basic set of assumptions, *(ii)* study economic applications and *(iii)* will perform computer experiments (including analyzing real and artificial data).

An empirical paper, developed by each student is also an essential part of this class.

Specifically, we will discuss and investigate some of the basic concepts of estimation and inference in econometrics. For each econometric problem we study, we will discuss the data generation process, the corresponding statistical models behind these processes, the information we have (such as observables and unobservables, known and unknowns), how to recover the unknowns from the data (the known), the estimator's properties and related inference (e;g., hypothesis tests, likelihood ratio, confidence intervals, basis for prediction, etc.) We will follow these questions and guidelines as we investigate and analyze each one of the following topics.

Basic Outline of the Class *(we may add/change topics throughout the semester):*

Computer Labs (throughout the semester)**:**

1. <u>First Lab:</u> September 16, 2008 (2-5 p.m. – SSRL/Hurst 202 Lab)

2. <u>Second Lab</u> (Tentative): October 21 (2-5 p.m. – SSRL/Hurst 202 Lab)

I. Introduction, Review and the basics of GLS - 2-3 weeks (*Greene, 2-4, 5, 6, 8; and additional – optional - MJM, Chaps. 5, 6, 14.4, 15.4*)**.**

The review will include a (brief) discussion of the General Linear Model (Known and Unknown Error Covariance Matrix; Heteroskedasticity and Autocorrelation).

II. Nonlinear Least Squares and Nonlinear Maximum Likelihood Estimation – 3 weeks *(Greene Chap. 11, 14.1, 14.2.1, 14.5, 16.1-16.9.2; Also highly recommended: MJM Part III;)***.**
1. Nonlinear LS
2. Nonlinear ML
3. Empirical Likelihood (*MJM Chap 12; Owen, 1991, Ann. Stat., 19 1725-47; Qin and Lawless, Ann. Stat., 22 300-325, Bera A and Y. Bilias, 2002, J. Econometrics*; and additional reading that will be provided.)
4. GMM (*Greene, 14.3, 14.5, 16.5; Hall, 2005; Imbens et. al. 1998*)

III. Background Material (Read only) - Stochastic Regressors and Asymptotics *(Greene, 4.5;*

MJM 10.1-10.5) **- (no discussion, only reading)**

IV. Sets of Linear Statistical Models - 1 week *(Greene, 10; MJM 15.2, 16.9.3; Judge, Chapters 11 and pp. 420-433)***.**

V. Instrumental Variables and Simultaneous Equation Statistical Models – 2-3 weeks *(Greene, 12-13, 16.9.4; MJM 17.1, 17.3, 17.4*)***.**

VI. Discrete Choice and Censored Models - 2 weeks *(Greene, 23-24; Maddala; MJM Chap 20)***.**

VII. Time-series and Distributed Lag Models (*Tentative*) **- 2 weeks** *(Greene, 19-21)***.**

Note, discussion will be very limited here and we will just give very basic background to the topics.

VII. Tentative (*if time permits*) **: Non Parametric and Ill-Posed Inverse Problems - 1-2 weeks** *(Greene, 14.4;MJM 21, 13, CD-ROM E3)***.**

IX. Possible Additional Topics.

X. Review.

Grades:

1. Approximately 6 Problem Sets will be given (about every two weeks) and will involve analytical problems and computer work. This will amount to 25% of final grade. Note: you may collaborate on the computer programming part of the problem sets, but ***not*** on the analysis, explanation, interpretation and write up of the problem set.

2. Research Paper (60%). **Paper is due on Friday, November 28, 2008.**

3. A Quiz (15%). Will be give without notice during the second part of the class in one of the last four lectures.

Office Hours: Tuesday 12:15-2:00 p.m. and by appointment.

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Note Special Dates:

- September 16: Computer Lab.
- October 21 (*Tentative*): Computer Lab.
- November 25: No Class (No Tuesday classes).
- November 28 (Friday): Papers are due by 5:00 pm.
- December 2: Paper presentations in class – **Attendance and Presentation are mandatory.**

Partial Reading List (additional readings will be provided during the semester)

BOOKS
Required
Greene, W. H., "Econometric Analysis" (6th Edition, New York, Prentice Hall, 2008).

Recommended
Mittelhammer, Judge, Miler, "Econometric Foundations" (Cambridge, 2000): *MJM*.

Additional Texts
Amemyia, T., Advanced Econometrics (Cambridge Univ. Press, 1985).
Cameron C. and P. Trivedi, "Microeconometrics: Methods and Applications" (Cambridge, 2005).
Hall, A., "Generalized Method of Moments" (Oxford University Press, 2005).
Hamilton, J. D., "Time Series Analysis" Princeton, 1994).
Judge, et. al, "Introduction to the Theory and Practice of Econometrics" (Wiley, 2nd ed.1988).
Judge et. al, "The Theory and Practice of Econometrics" (Wiley, 2nd ed., 1985).
Maddala, G. S., "Limited Dependent Variables and Qualitative Variables in Econometrics"
Owen, A. B., "Empirical Likelihood" (Chapman & Hall/CRC), 2001).
Wooldridge, J., "Introductory Econometrics: A Modern Approach," (South Western College Publishing, 2nd Edition, 2002).

Incomplete List of Papers

1. Amemyia, T., Tobit Models: A Survey, J. of Econometrics 24, 3-61.
2. Bera A and Y. Bilias, The MM, ME, ML, EL, EF, and GMM approaches to estimation: A synthesis, *J. Econometrics* 107 (2002) 51-86.
3. Heckman, James. 1978. "Dummy Endogenous Variables in Simultaneous Equation System." *Econometrica* 46:931-960.
4. Heckman, James. 1990. "Varieties of Selection Bias." *American Economic Review* 80:313-318.
5. Imbens G. et. al., Information Theoretic Approaches to Inference in Moment Condition Models, *Econometrica*, (1998) 333-358.
6. Kitamura, Y. and M. Stutzer, "An information-theoretic alternative to generalized method of moment estimation." *Econometrica* (1997) 66 4, 861-874.
7. Owen A. B., Empirical Likelihood for Linear Models, *Ann. Statistics*, (1991) 19, 1725-1747.
8. Powell, J. L., Least Absolute Deviations Estimation for the Censored Regression Model, *J. of Econometrics* (1983) 25, 303-325.
9. Qin J., and J. Lawless, Empirical Likelihood and General Estimating Equations, *The Ann. of Statistics*, (1994) 22, 300-325.
10. Tobin, J. Estimation of Relationship for Limited Dependent Variables, *Econometrica* (1958) 26, 24-36.