

**Economics 696: Topics in Econometrics**  
**Spring Semester 2008**  
**Course Syllabus**

Lectures: Wednesdays 12:30-3:00 pm, McClelland 401KK

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**Course Description:** This topics course will focus on decision-theoretic methods for analyzing data and making policy prescriptions. We will look both frequentist and subjectivist formulations of the basic statistical decision problem, and compare them. We will also study modern Bayesian inference methods, which often require numerical methods including Markov chain Monte Carlo, to simulate posterior distributions and related quantities, and also frequentist simulation-based estimation procedures, such as the simulated method of moments, and discuss both practical implementation and asymptotic theory for such methods. If time permits we will discuss Bayesian nonparametrics and semiparametrics.

**Prerequisites:** Economics 520, 522A, and 522B, or equivalent. You are expected to be familiar with basic probability and statistics, linear regression theory, instrumental variables and method of moments/M-estimator theory, and conditional maximum likelihood techniques for nonlinear regression models. You also need to have familiarity with programming in a standard language so that you can write code to implement estimators and other procedures for the course.

**Textbook:** Most of the course will be based on lecture notes and articles. There is no required textbook for the course, but some readings will be drawn from the following book:

- Geweke, J., 2005, *Contemporary Bayesian Econometrics and Statistics*, Wiley.

Other good references for decision theory and Bayesian analysis include:

- Berger, J., 1985, , *Statistical Decision Theory and Bayesian Analysis*, 2nd ed., Springer-Verlag.
- Carlin, B., and Louis, T., 2000, *Bayes and Empirical Bayes Methods for Data Analysis*, 2nd ed., Chapman and Hall/CRC Press.
- Ferguson, T., 1967, *Mathematical Statistics: A Decision Theoretic Approach*, Academic Press.
- Gelman, A., Carlin, J., Stern, H., and Rubin, D., 2003, *Bayesian Data Analysis*, 2nd ed., Chapman and Hall/CRC Press.
- Lancaster, T., 2004, *An Introduction to Modern Bayesian Econometrics*, Blackwell.

**Assessment:** There will be a small number of problem sets, involving a combination of analytic work and data analysis. There will also be a final project in which you choose an empirical paper to reexamine using methods developed in the course. You may use any standard statistical package/programming language you wish. I recommend either Matlab or R.

**Course Web Site:** [http://www.u.arizona.edu/~hirano/696\\_2008.html](http://www.u.arizona.edu/~hirano/696_2008.html)

I will post lecture notes, homework assignments, and other supplementary material for the course here.

**Outline:** (may be revised as semester progresses)

1. Introduction: Statistical Decision Theory and Bayes Procedures

Lecture Notes

Barberis, N., 2000, "Investing for the Long Run when Returns are Predictable," *Journal of Finance* 55, 225-264.

Dehejia, R., 2005, "Program Evaluation as a Decision Problem," *Journal of Econometrics* 125, 141-173.

Efron, B., 2005, "Bayesians, Frequentists, and Scientists," *Journal of the American Statistical Association* 100(469), pp. 1-5.

Geweke, Ch. 1.

2. Foundations of Statistical Decision Theory and Bayesian Inference

Lecture Notes

Ferguson, Ch. 1-2.

3. Normal-based models

Lecture Notes

Geweke, Ch. 2.

4. Bayesian computations

Lecture Notes

Albert, J. H., and S. Chib, (1993), "Bayesian Analysis of Binary and Polychotomous Response Data," *Journal of the American Statistical Association*, Vol 88, No. 422, pp. 669-679.\*

Chib, S., and E. Greenberg, (1996), "Markov Chain Monte Carlo Simulation Methods in Econometrics," *Econometric Theory*, 12(3), 409-431.

Geweke, Ch. 4.

Carlin and Louis, Ch. 5.

Gelman, Carlin, Stern, Rubin, Ch. 10,11.

5. Hierarchical and Panel Models

Lecture Notes

Gelman, Carlin, Stern, and Rubin, Ch.5.

Rossi, P., R. McCulloch, and G. Allenby, (1995), "Hierarchical Modelling of Consumer Heterogeneity: An Application to Target Marketing," in *Case Studies in Bayesian Statistics*, Vol. II, *Lecture Notes in Statistics* 105, ed. C. Gatsonis, J. Hodges, R. Kass, and N. Singpurwalla, New York: Springer-Verlag.\*

- Geweke, J., Gowrisankaran, G., and Town, R., 2003, "Bayesian inference for hospital quality in a selection model," *Econometrica* 71, 1215-1238.
6. Simulation-based method of moments: introduction
- McFadden, D., 1989, "A Method of Simulated Moments for Estimation of Discrete Response Models without Numerical Integration," *Econometrica* 57, 995-1026.
- Pakes, A., and Pollard, D., 1989, "Simulation and the Asymptotics of Optimization Estimators," *Econometrica* 57, 1027-1057.
- Hajivassiliou, V., and McFadden, D., 1998, "The Method of Simulated Scores for Estimation of LDV Models," *Econometrica* 66(4), 863-896.
7. Empirical Process Theory and Asymptotics for Simulation-based estimators
- Lecture Notes
- Pakes, A., and Pollard, D., 1989, "Simulation and the Asymptotics of Optimization Estimators," *Econometrica* 57, 1027-1057.
8. Treatment Assignment and Testing: frequentist and Bayesian approaches
- Dehejia, R., 2005, "Program Evaluation as a Decision Problem," *Journal of Econometrics* 125, 141-173.
- Hirano, K., and Porter, J. R., 2005, "Asymptotics for Statistical Treatment Rules," working paper, University of Arizona.
- Manski, C. F., 2002, "Treatment Choice Under Ambiguity Induced by Inferential Problems," *Journal of Statistical Planning and Inference* 105, 67-82.
- Manski, C. F., 2004, "Statistical Treatment Rules for Heterogeneous Populations," *Econometrica* 72, 1221-1246.
9. Nonparametrics and Semiparametrics: decision-theoretic approaches
- Ferguson, T. S., 1974, "Prior Distributions on Spaces of Probability Measures," *The Annals of Statistics* 2, 615-629.
- Escobar, M., and M. West, 1995, "Bayesian Density Estimation and Inference using Mixtures," *Journal of the American Statistical Association* 90, 577-588.