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# PSC 508

## Estimating Games & Testing Formal Models

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Spring 2009  
Wed, 12:30-3:15

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**PURPOSE:** Scholars of political science, economics, and business are increasingly interested in the empirical analysis of and/or “testing” of formal models. This course will survey a wide range of methodological issues at the intersection of formal models and empirical analysis, ranging from broad epistemological questions (e.g., What is the empirical content of a formal model? What does it mean to “test” a formal model?) to working through advanced statistical techniques. Topics vary each year and may include: experiments versus field data, case studies as evidence or illustration, comparative statics and partial tests of formal models, structural estimation, econometrics of auctions, strategic discrete choice models, ultimatum games, dynamic games, and multiple equilibria.

**PREREQUISITES:** Students must have taken PSC 505. PSC 506 is recommended, but not required.

### COURSE REQUIREMENTS:

- **Participation and Weekly Assignments (50%).** Students will be responsible for having done the required readings each week and for participating in our discussions. Applied or theoretical problems will be assigned each week based on the required readings. Students will be expected to have completed the assignment and should be prepared to present their results in class.
- **Final Paper (50%).** A final paper is due at the end of the reading period. The paper topic should be consistent with the course material – i.e., emphasizing the statistical analysis of formal models. The paper should either develop a new statistical technique or apply advanced methods. Except in very rare circumstances, the paper should employ real data and make a substantive contribution.

**BOOKS:** You may find it useful to purchase the following books. Alternatively, many are available in the star lab library.

- (RBM) Morton, Rebecca B. 1999. *Methods & Models*. Cambridge.
- Robert H. Bates, Avner Greif, Margaret Levi, Jean-Laurent Rosenthal, and Barry R. Weingast. 1998. *Analytic Narratives*. Princeton, NJ: Princeton University Press.

### COURSE SCHEDULE AND READINGS:

#### 0. Course Organization

## 1. Models, Empirical Analysis, and Epistemology

### 1.1 Formal Models: What Are They? Why Do We Use Them?

- Von Neumann, John and Oskar Morgenstern. 1972. *Theory of Games and Economic Behavior*. Chapter 1.
- Kreps, David M. 1990. *A Course in Microeconomic Theory*. Chapter 1.
- RBM. Chapters 1-3.
- Walt, Stephen M. 1999. "Rigor or Rigor Mortis? Rational Choice and Security Studies." *International Security* 23(4): 548. Read all responses and Walt's reply.
- Roger Myerson. 2001. "On the Value of Game Theory in Social Science." *Rationality and Society* 4(1): 62-73.

### 1.2 History, Illustration, and Analytic Narratives

- Robert H. Bates, Avner Greif, Margaret Levi, Jean-Laurent Rosenthal, and Barry R. Weingast. 1998. *Analytic Narratives*. Princeton, NJ: Princeton University Press.
  - Intro, Greif, Weingast
- Carpenter, Daniel. 2000. "Commentary: What Is the Marginal Value of Analytic Narratives?" *Social Science History* 24(4): 653-667.
- Skocpol, Theda. 2000. "Commentary: Theory Tackles History." *Social Science History* 24(4): 669-676.
- Parikh, Sunita. 2000. "Commentary: The Strategic Value of Analytic Narratives." *Social Science History* 24(4): 677-684.
- Robert H. Bates, Avner Greif, Margaret Levi, Jean-Laurent Rosenthal, and Barry R. Weingast. 2000. "Analytic Narratives Revisited." *Social Science History* 24(4): 685-696.

### 1.3 What Exactly Are We Doing? Empirically Evaluating? Analyzing? Testing? Models

- Fogel, Robert W. 1966. "A New Economic History," reprinted in Fritz Stern, ed. 1973. *The Varieties of History*. Vintage Books. pp.456-473.
- RBM. Chapters 4-9.
- 2004. "Symposium: Two Paths to a Science of Politics." *Perspectives on Politics* 2:295-324.
- Clarke, Kevin. 2007. "The Necessity of Being Comparative: Theory Confirmation in Quantitative Political Science." *Comparative Political Studies* 40:7
- Clarke, Kevin and David M. Primo. 2007. "Modernizing Political Science: A Model-Based Approach." *Perspectives on Politics* 5:4.

## 2. Ideal Point Estimation

(Q: Primer on R programming, Bayesian MCMC, & bootstrapping?)

- Poole, Keith, and Howard Rosenthal. 1985. "A Spatial Model For Legislative Roll Call Analysis." *American Journal of Political Science* 29(2): 357-384.
- Krehbiel, Keith, and Douglas Rivers. 1988. "The Analysis of Committee Power: An Application to Senate Voting on the Minimum Wage." *American Journal of Political Science* 32: 1151-74.
- Martin, Andrew, and Kevin M. Quinn. 2002. "Dynamic Ideal Point Estimation via Markov Chain Monte Carlo for the U.S. Supreme Court, 1953-1999." *Political Analysis* 10:134-153.

- Clinton, Joshua and Adam Meirowitz. 2003. "Integrating Voting Theory and Roll Call Analysis." *Political Analysis*. 11:381-396.
- Clinton, Joshua, Simon Jackman, and Douglas Rivers. 2004. "The Statistical Analysis of Roll Call Data." *American Political Science Review* 98:355-370.
- Hirsch, Alexander V. 2008. "Voting Error and Econometric Testing of Complete Information Theories of Lawmaking." Working paper.
- Peress, Michael. 2008. "Estimating Proposal and Status Quo Locations Using Voting and Cosponsorship Data." Working paper.

### **3. Bounded Rationality, Noisy Nash Eq, and the Quantal Response Equilibrium**

- R. McKelvey and T. Palfrey. 1995. "Quantal Response Equilibria for Normal Form Games." *Games and Economic Behavior*. 10: 638.
- McKelvey, Richard D. and Thomas R. Palfrey. 1998. "Quantal Response Equilibria for Extensive Form Games." *Experimental Economics*. 1(1):9-41.
- Fey, Mark, Richard D. McKelvey, and Thomas R. Palfrey. 1996. "An Experimental Study of the Constant-Sum Centipede Game." *International Journal of Game Theory*. 25(3):269-87.
- Chen, Hsiao Chi, James W. Friedman, and Jacques-Francois Thisse. 1997. "Boundedly Rational Nash Equilibrium: A Probabilistic Choice Approach." *Games and Economic Behavior*. 18: 32-54.
- Haile, Philip A., Ali Hortacsu, and Grigory Kosenok. 2008. "On the Empirical Content of Quantal Response Equilibrium." *American Economic Review*. 180-200
- Goeree, Jacob K., Charles A. Holt, and Thomas R. Palfrey. 2005. "Regular Quantal Response Equilibrium." *Experimental Economics*. 8:347-367.

### **4. Sequential Discrete Games**

- Signorino, Curtis S. 1999. "Strategic Interaction and the Statistical Analysis of International Conflict." *American Political Science Review* 93(2):279-297
- Signorino, Curtis S. 2003. "Structure and Uncertainty in Discrete Choice Models." *Political Analysis* 11(4):316-344.
- Signorino, Curtis S., and Kuzey Yilmaz. 2003. "Strategic Misspecification in Regression Models." *American Journal of Political Science* 47(3):551-566.
- Signorino, Curtis S., and Ahmer Tarar. 2006. "A Unified Theory and Test of Extended Immediate Deterrence." *American Journal of Political Science* 50(3):586-605.
- Bas, Muhammet, Curtis S. Signorino, and Robert Walker. 2008. "Statistical Backwards Induction: A Simple Method for Estimating Recursive Strategic Models." *Political Analysis*.

### **5. Perfect Bayesian Equilibrium and Signaling**

- Lewis, Jeffrey B., and Kenneth A. Schultz. 2003. "Revealing Preferences: Empirical Estimation of a Crisis Bargaining Game with Incomplete Information." *Political Analysis* 11(4):345-367
- Wand, Jonathan. 2005. "Comparing Models of Strategic Choice: The Role of Uncertainty and Signaling." *Political Analysis* 14(1):101-120.
- Schultz, Kenneth A., and Jeffrey B. Lewis. 2005. "Learning about Learning: A Response to Wand." *Political Analysis* 14(1):121-129.
- Bas, Muhammet, Curtis S. Signorino, and Taehee Whang. 2008. "Knowing One's Future Preferences: A Correlated Agent Model with Bayesian Updating." Working paper.

- Esarey, Justin, Bumba Mukherjee, and Will H. Moore. 2008. "A Fixed-Effects Bayesian Quantal Response Estimator for Incomplete Information Games." *Political Analysis* 16(3): 250-273.

## 6. Experimental Methods

- Ochs, Jack, and Alvin E. Roth. 1989. "An Experimental Study of Sequential Bargaining." *American Economic Review* 79(3): 355-384.
- Roth, Alvin E., Vesna Prasnikar, Masahiro Okuno-Fujiwara and Shmuel Zamir. 1991. "Bargaining and Market Behavior in Jerusalem, Ljubljana, Pittsburgh, and Tokyo: An Experimental Study." *American Economic Review* 81(5): 1068-1095.
- Forsythe, Robert, Joel L. Horowitz, N. E. Savin, and Martin Sefton. 1994. "Fairness in Simple Bargaining Experiments." *Games and Economic Behavior* 6(3): 347-369.
- Costa-Gomes, Miguel, and Klaus G. Zauner. 2001. "Ultimatum Bargaining Behavior in Israel, Japan, Slovenia, and the United States: A Social Utility Analysis." *Games and Economic Behavior* 34(2): 238-269.
- Ramsay, Kristopher W., Curtis S. Signorino. 2008. "Bargaining and Society: A Statistical Model of the Ultimatum Game." Working paper, University of Rochester.
- Kedziora, Jeremy, Kristopher Ramsay, and Curtis S. Signorino. 2008. "A Statistical Model of the Ultimatum Game with Partial Anonymity." Working paper.
- Review McKelvey and Palfrey experimental work.
- Frechette, Guillaume R., John H. Kagel, and Steven F. Lehrer. 2003. "Bargaining in Legislatures: An Experimental Investigation of Open versus Closed Amendment Rules." *American Political Science Review* 97:221-232.
- Morelli, Massimo. 2005. "Behavioral Identification in Coalitional Bargaining: An Experimental Analysis of Demand Bargaining and Alternating Offers." *Econometrica* 73(6): 1893-1937.
- Battaglini, Marco, Rebecca Morton, and Thomas R. Palfrey. 2007. "Efficiency, Equity and Timing in Voting Mechanisms." *American Political Science Review* 101(3): 409-424.
- Battaglini, Marco, Rebecca Morton, and Thomas R. Palfrey. 2008. "Information and Pivotal Voter Models in Large Laboratory Elections." *American Economic Review Papers and Proceedings*, forthcoming.

## 7. Simultaneous Move, Discrete Games

- Bjorn, Paul and Quang H. Vuong. 1984. "Simultaneous Equations Models for Dummy Endogenous Variables: A Game Theoretic Formulation with an Application to Labor Force Participation." Social Science Working Paper 537. California Institute of Technology.
- Bresnahan, Timothy F. and Peter C. Reiss. 1991. "Empirical Models of Discrete Games." *Journal of Econometrics*. 48:57.
- Berry, Stephen T. 1992. "Estimation of a Model of Entry in the Airline Industry," *Econometrica*, 60, 889-917.
- Bajari, Patrick, Han Hong, John Krainer, and Denis Nekipelov. 2006. "Estimating Static Models of Strategic Interactions." Working Paper.
- Bajari, Patrick, Han Hong, and Stephen Ryan. 2007. "Identification and Estimation of a Discrete Game of Complete Information." Working Paper.
- Aradillas-Lopez, Andres. 2007. "Pairwise Difference Estimation of Incomplete Information Games." Working paper.

- Aradillas-Lopez, Andres. 2008. “Semiparametric Estimation of a Simultaneous Game with Incomplete Information.” Working paper.

## 8. Auctions

- Laffont, J.-J., H. Ossard, and Q. Vuong. 1995. “Econometrics of First-Price Auctions,” *Econometrica*, 63, 953—980.
- Laffont, J.-J., and Q. Vuong. 1996. “Structural Analysis of Auction Data,” *American Economic Review, Papers and Proceedings*, 86, 414—420.
- Laffont, J.-J. 1997. “Game Theory and Empirical Economics: The Case of Auction Data,” *European Economic Review*, 41, 1—35.
- Porter, R. 1995. “The Role of Information in U.S. Offshore Oil and Gas Lease Auctions,” *Econometrica* 63(1): 1-27.
- Guerre, E., I. M. Perrigne, and Q. Vuong. 2000. “Optimal Nonparametric Estimation of First-Price Auctions,” *Econometrica*, 68, 525—574.
- Li, T., I Perrigne, and Quang Vuong. 2002. “Structural Estimation of the Affiliated Private Value Auction Model.” *RAND Journal of Economics*. 33:171-193.
- Athey, S. and J. Levin. 2001. “Information and Competition in U.S. Forest Service Timber Auctions.” *Journal of Political Economy* 109(2): 375-417.
- Hendricks, K., Pinkse, J. and Porter, R. 2003. “Empirical Implications of Equilibrium Bidding in First Price Common Value Auctions.” *Review of Economic Studies* 70-1, 242, pp. 115-146.
- Hong, H. and Shum, M. “Increasing Competition and the Winner’s Curse: Evidence from Procurement.” *Review of Economic Studies* 69(4), pp 871-898.
- Bajari, Patrick, and Ali Hortacsu. 2005. “Are Structural Estimates of Auction Models Reasonable? Evidence from Experimental Data.” *Journal of Political Economy* 113(4): 703-741.
- Athey, Susan and Philip A. Haile. 2007. “Nonparametric Approaches to Auctions.” in J. Heckman and E. Leamer, eds, *Handbook of Econometrics*, Vol 6A. Elsevier. Ch 60. Pp3847-3965.
- Hendricks, K. and R. H. Porter. Forthcoming. “An Empirical Perspective on Auctions.” in *Handbook of Industrial Organization*. M. Armstrong and R. Porter, eds. Vol 3. Elsevier.

## 9. Estimation of Dynamic Models

### 9.1 Dynamic Optimization

- Stokey, Nancy L. and Robert E. Lucas, Jr. 1989. *Recursive Methods in Economic Dynamics*. Cambridge, MA: Harvard University Press. Chapters 3-4.
- R. Sundaram. 1996. *A First Course in Optimization Theory*. New York, NY: Cambridge University Press. Chapters 11-12.

### 9.2 Single Agent

- John Rust. 1987. “Optimal Replacement of GMC Bus Engines - An Empirical Model of Harold Zurcher.” *Econometrica* 55: 999-1033.
- Wolpin, Kenneth I. 1987. “Estimating a Structural Search Model: The Transition from School to Work.” *Econometrica* 55: 801-17.
- V. J. Hotz and R. Miller. 1993. “Conditional Choice Probabilities and the Estimation of Dynamic Models.” *Review of Economic Studies* 60: 497-529.

### 9.3 Government Formation

- Merlo, Antonio. 1997. "Bargaining over Government in a Stochastic Environment." *Journal of Political Economy* 105:101-131.
- Daniel Diermeier, Hulya Eraslan, and Antonio Merlo. 2003. "A Structural Model of Government Formation." *Econometrica* 71(1): 27-70.

### 9.4 Multiple Agents

- R. Ericson and A. Pakes. 1995. "Markov-Perfect Industry Dynamics: A Framework for Empirical Work." *Review of Economic Studies* 62: 5382.
- Berry, S., S. Levinson, and A. Pakes. 1995. "Automobile Prices in Market Equilibrium." *Econometrica* 63:841-890.
- V. Aguirregabiria and P. Mira. 2002. "Swapping the Nested Fixed Point Algorithm: A Class of Estimators for Discrete Markov Decision Models." *Econometrica* 70: 1519-1543.
- Ryan, S. 2005. "The Costs of Environmental Regulation in a Concentrated Industry." Working paper.
- V. Aguirregabiria and P. Mira. 2007. "Sequential Estimation of Dynamic Discrete Games." *Econometrica* 75: 153.
- Bajari, P. Benkard, C.L. and Levin, J.D. 2007. "Estimating Dynamic Games of Imperfect Competition." *Econometrica* 75: 1331-1370.
- Jofre-Bonet, M. and Pesendorfer, M. "Estimation of a Dynamic Auction Game." *Econometrica*, forthcoming.

## 10. Multiple Equilibria

- Jovanovic, B. 1989. "Observable Implications of Models with Multiple Equilibria." *Econometrica*. 57(6):1431-1437.
- Tamer, E. T. 2003. "Incomplete Bivariate Discrete Response Model with Multiple Equilibria." *Review of Economic Studies* 70: 147-167.
- Cooper, Russell W. 2005. "Estimation and Identification of Structural Parameters in the Presence of Multiple Equilibria." *Eastern Economic Journal*. 31:105-130
- Gregoir, Stephane. 2002. "'Multiple Equilibria and Identification' by Russell Cooper: A Comment" *Annales D'Economie et de Statistique*. 66.
- Echenique, Federico and Ivana Komunjer. 2005. "Testing Models with Multiple Equilibria by Quantile Methods." Working paper.
- Tamer, Elie and Federico Ciliberto. 2007. "Market Structure and Multiple Equilibria in Airline Markets." Working paper.

## 11. Comparative Statics and Statistical Analysis

- TBD
- RBM. pp. 111-112; all of Ch 7.
- Carrubba, Clifford J., Amy Yuen, and Christopher Zorn. 2007. "In Defense of Comparative Statics: Specifying Empirical Tests of Models of Strategic Interaction." *Political Analysis*.
- Signorino, Curtis S. 2007. "On Formal Theory and Statistical Methods: A Response to Carrubba, Yuen, & Zorn." *Political Analysis*. (With reply by Carrubba, Yuen, & Zorn.)

## 12. American Politics

- Mebane, Walter R. Jr. 2000. "Coordination, Moderation and Institutional Balancing in American Presidential and House Elections." *American Political Science Review* 94.
- Groseclose, Tim, and Nolan McCarty. 2001. "The Politics of Blame: Bargaining Before an Audience." *American Journal of Political Science* 45:100-119.
- Canes-Wrone, Brandice, Michael C. Herron, and Kenneth W. Shotts. 2001. "Leadership and Pandering: A Theory of Executive Policymaking." *American Journal of Political Science* 45:532-550.
- Canes-Wrone, Brandice, and Kenneth W. Shotts. 2004. "The Conditional Nature of Presidential Responsiveness to Public Opinion." *American Journal of Political Science* 48:690-706.
- Daniel Diermeier, Michael Keane, and Antonio Merlo. 2005. "A Political Economy Model of Congressional Careers." *American Economic Review* 95(1): 347-373.
- Gordon, Sanford C., and Catherine Hafer. 2005. "Flexing Muscle: Corporate Political Expenditures as Signals to the Bureaucracy." *American Political Science Review* 99: 245-261.
- Krehbiel, Keith. 2007. "Supreme Court Appointments as a Move-the-Median Game." *American Journal of Political Science* 51:231-240.
- Clinton, Joshua. 2007. "Lawmaking and Roll Calls." *The Journal of Politics*. 69(2):457-469.
- Patty, JohnW. 2008. "Equilibrium Party Government." *American Journal of Political Science* 52:636-655.
- Primo, David M., Sarah A. Binder, and Forrest Maltzman. 2008. "Who Consents? Competing Pivots in Federal Judicial Selection." *American Journal of Political Science* 52:471-489.

## 13. International Relations

- TBD

*Work on Paper & Presentation: No Class, 4/22*

*Project Presentation: Last Class, 4/29*

*Paper Due: End of Reading Period, 5/3*