Economics 207, Experimental Economics **Winter 2002**

Vincent P. Crawford **Economics 319, 858-534-3452, vcrawfor@weber.ucsd.edu**

Economics 207 introduces the subject matter, methods, and results of experimental economics. The course will stress the interaction of theory and experiment, seeking to relate questions in the theory of markets, games, and decisions to issues in experimental design and the analysis and interpretation of results. After an initial overview, these themes will be developed by discussing series of related experiments. The overlap of *topics* with last year's offering of Economics 201A, Behavioral Game Theory, will be approximately 50%, but the focus will be different, and the topics will include nonstrategic as well as strategic environments.

The course meets Tuesdays and Thursdays from 10:00-11:20 a.m. in Sequoyah 244, January 8 through March 14. Classes include lectures, demonstration experiments, discussions, and perhaps presentations by students taking the course for a grade. (There will be demonstration experiments in the first lecture, so please go beforehand to http://eexcl.ucsd.edu/sample.htm and read and consent to the general terms of the sample human subjects consent form posted there. EEXCL's new website, http://eexcl.ucsd.edu/, has some other things of interest. You should also practice the demonstration experiment at http://eeps3.caltech.edu/market-demo/ before the demonstration in the second week.) My office hours are Wednesdays from 2:00-3:00, or by appointment.

Students have two enrollment options. Those who just want to attend the lectures should enroll S/U; there will then be no formal requirements. Those who want a grade should enroll for one; they must either do a class presentation on a topic in the experimental literature not covered in the lectures, or complete and present a draft experimental design of their own choosing. The topic should be agreed on with me by the end of the third week, and the latter option can be a collaborative effort. If you are a student who plans to attend the lectures, please enroll either S/U or for a grade (this will help convince the administration graduate electives are worth offering).

The most important readings are marked *. Readings on reserve on the course web page, http://weber.ucsd.edu/~vcrawfor/econ207.htm are marked +; those available as hard copies on graduate reserve are marked ++; readings available from the ucsd.edu domain as pdf files on JSTOR, http://www.jstor.org/jstor/ (IDEAL, http://www.idealibrary.com/) are marked J (I); if you have trouble downloading anything, copies of some files not on the course web page are available on request by e-mail. I have ordered copies of three useful books for the bookstore:

++*Experimental Economics*, Douglas Davis and Charles Holt, Princeton, 1993 (graduate text)
++*The Handbook of Experimental Economics*, John Kagel and Alvin Roth (eds.), Princeton, 1995 (comprehensive surveys of experimental work in various fields of economics)

Additional useful readings can be found in:

+Colin Camerer, *Behavioral Game Theory: Experiments on Strategic Interaction*, Princeton, in press; pdf files also at http://www.hss.caltech.edu/CourseSites/Psy101/psy101.html
++Vincent P. Crawford, "Theory and Experiment in the Analysis of Strategic Interaction," Chapter 7 in David Kreps and Ken Wallis, editors, *Advances in Economics and Econometrics: Theory and Applications, 7th World Congress*, Vol. I, Cambridge 1997

1. Introduction and Overview

*+Camerer, Chapter 1, especially Section 8 (Appendix 2)

*++Crawford, Section 3, pp. 215-216

*++Davis and Holt, Chapter 1 (Appendix optional)

*++Kagel and Roth, Chapter 1, pp. 1-23 (rest optional)

(J) Charles Plott, "Industrial Organization Theory and Experimental Economics," *Journal of Economic Literature* 20 (1982), 1485-1527

(J) Vernon Smith, "Microeconomic Systems as an Experimental Science," *American Economic Review* 72 (1982), 923-955

(J) Alvin Roth, "Game Theory as a Part of Empirical Economics," *Economic Journal* 101 (1991, 107-114; http://www.economics.harvard.edu/%7Earoth/alroth.html

Alvin Roth, "Let's Keep the Con Out of Experimental Econ.: A Methodological Note," *Empirical Economics* 19 (1994), 279-289; http://www.economics.harvard.edu/%7Earoth/alroth.html

(J) Colin Camerer, "Progress in Behavioral Game Theory," *Journal of Economic Perspectives* 11 (1997), 167-188

Colin Camerer, "Behavioral Game Theory," paper presented at the Nobel symposium on Behavioral and Experimental Economics, December 4-6, 2001 http://www.iies.su.se/nobel/papers.htm

+Jacob Goeree and Charles Holt, "Ten Little Treasures of Game Theory and Ten Intuitive Contradictions," *American Economic Review* 91 (2001), 1402-1422

Demonstration experiment: Normal-form "order statistic" tacit coordination games with multiple, Pareto-ranked equilibria

Questions: What determines subjects' initial responses in tacit coordination games? Do they learn to play equilibria? What determines equilibrium selection in the long run?

Design: Normal-form complete-information coordination games in which effects of context are minimized, with common set of Pareto-ranked equilibria, varying off-equilibrium payoffs to stress-test traditional theories of equilibrium selection (risk- and payoff-dominance), and large (but finite) strategy spaces to give learning dynamics room to vary widely across treatments

Results: Little difference in initial responses, but modal responses give weak support for notions like risk-dominance; large differences in subsequent play, with adaptive dynamics driven by strategic uncertainty determining equilibrium selection in the long run

Follow-up reading:

+Vincent Crawford, "Learning Dynamics, Lock-in, and Equilibrium Selection in Experimental Coordination Games," in Ugo Pagano and Antonio Nicita (eds.), *The Evolution of Economic Diversity*, Routledge, 2001; UCSD Discussion Paper 97-19; http://www.econ.ucsd.edu/papers/dp97.html

++Kagel and Roth, Chapter 3, pp. 209-218

(J) John Van Huyck, Raymond Battalio, and Richard Beil, "Tacit Coordination Games, Strategic Uncertainty, and Coordination Failure," *American Economic Review* 80, (1990), 234-248.
(J) John Van Huyck, Raymond Battalio, and Richard Beil, "Strategic Uncertainty, Equilibrium Selection, and Coordination Failure in Average Opinion Games," *Quarterly Journal of Economics*, 106, (1991), 885-910

2. Competitive Markets
*++Davis and Holt, Chapter 3, pp. 125-155
*++Kagel and Roth, Chapter 1, pp. 49-60
++Kagel and Roth, Chapters 5 and 6

Demonstration experiment: Multiple-unit double-auction market http://eeps3.caltech.edu/market-demo/

Questions: What does "perfect competition" require (in 1960 most theorists would have said large numbers of well-informed traders on both sides of the market)? How well do competitive markets aggregate participants' private information? How do institutions affect performance?

Design: Inducing supply and demand, providing incentives, controlling information

Results: Robustly competitive outcomes for double oral auction with small numbers of traders on both sides, better results when traders are *not* informed about others' values, powerful but not unlimited aggregation of private information for some market institutions

Follow-up reading:

*Charles Plott, "Equilibrium and Equilibration in Multiple Market Systems," paper presented at the Nobel symposium on Behavioral and Experimental Economics, December 4-6, 2001 (http://www.iies.su.se/nobel/papers.htm)
(J) Chamberlain, Edward, "An Experimental Imperfect Market," *Journal of Political Economy* 56 (1948), 95-108
(J) Vernon Smith, "An Experimental Study of Competitive Market Behavior," *Journal of Political Economy* 70 (1962), 111-137
(J) Dhananjay Gode and Shyam Sunder, "Allocative Efficiency of Markets with Zero-Intelligence Traders: Market as a Partial Substitute for Individual Rationality," *Journal of Political Economy* 101 (1993), 119-137
(J) Charles Plott and Shyam Sunder, "Rational Expectations and the Aggregation of Diverse Information in Laboratory Environments," *Econometrica* 56 (1988), 1085-1118
(J) Vernon Smith, Gerry Suchanek, and Arlington Williams, "Bubbles, Crashes, and Endogenous Expectations in Experimental Spot Asset Markets," *Econometrica* 56 (1988), 1119-1152

3. Extensive-Form Games
*+Camerer, Chapter 4, pp. 12-28; Chapter 5, pp. 4-14
*++Davis and Holt, Chapter 5, pp. 263-275
*++Kagel and Roth, Chapter 4, pp. 253-331

Richard McKelvey and Thomas Palfrey, "Quantal Response Equilibria for Extensive-Form Games," *Experimental Economics* 1 (1998), 9-41: http://www.wkap.nl/jrnltoc.htm/1386-4157

(J) Alvin Roth, Vesna Prasnikar, Masahiro Okuno-Fujiwara, and Shmuel Zamir, "Bargaining and Market Behavior in Jerusalem, Ljubljana, Pittsburgh, and Tokyo: An Experimental Study," *American Economic Review* 81 (1991), 1068-1095

(I) Miguel Costa-Gomes and Klaus G. Zauner, "Ultimatum Bargaining Behavior in Israel, Japan, Slovenia, and the United States: A Social Utility Analysis," *Games and Economic Behavior* 34 (2001), 238-269

(I?) +Eric Johnson, Colin Camerer, Sankar Sen, and Talia Rymon, "Detecting Failures of Backward Induction: Monitoring Information Search in Sequential Bargaining," Columbia School of Business, *Journal of Economic Theory* (2002), in press

Demonstration experiment: Normal- versus extensive-form framing in 2x2 games

Questions: Does extensive-form framing yield systematically different results than normal-form framing (e.g. by making backward induction more salient or by creating asymmetries subjects can use to solve coordination problems)? How?

Design: Presentation of games in extensive form, designs to elicit "one-shot" responses versus designs that allow learning in repeated play

Results: Some failure to follow backward induction logic, some bias in extensive form toward allowing second mover to influence outcome

Follow-up reading:

++T. Randolph Beard and Richard Beil, "Do People Rely on the Self-interested Maximization of Others? An Experimental Test," *Management Science* 40 (1994), 252-262

(I) Andrew Schotter, Keith Weigelt, and Charles Wilson, "A Laboratory Investigation of Multiperson Rationality and Presentation Effects," *Games and Economic Behavior* 6 (1994), 445-468

David Cooper and John Van Huyck, "Evidence on the Equivalence of the Strategic and Extensive Form Representation of Games," manuscript, Texas A&M University, September 2001 (http://econlab10.tamu.edu/JVH_gtee/Sim1.pdf)

(J) Gerard Cachon and Colin Camerer, "Loss Avoidance and Forward Induction in Experimental Coordination Games," *Quarterly Journal of Economics* 111 (1996), 165-194

(I?) Ken Binmore, John McCarthy, Giovanni Ponti, Larry Samuelson, and Avner Shaked, "A Backward Induction Experiment," *Journal of Economic Theory* (2002), in press; http://www.ssc.wisc.edu/~larrysam/papers.htm

Russell Cooper, Douglas DeJong, Robert Forsythe, and Thomas Ross, "Alternative Institutions for Resolving Coordination Problems: Experimental Evidence on Forward Induction and Preplay Communication," pp. 129-146 in James Friedman (ed.), *Problems of Coordination in Economic Activity*, Boston : Kluwer, 1994

*++Crawford, Section 4, pp. 216-220
(I) Richard McKelvey and Thomas Palfrey, "Quantal Response Equilibria for Normal-Form Games," *Games and Economic Behavior* 10 (1995), 6-38

Demonstration experiment: MouseLab matrix games with dominance, iterated dominance, and unique pure-strategy equilibria (Costa-Gomes, Crawford, and Broseta (2001)); MouseLab asymmetric two-person guessing games (Costa-Gomes and Crawford (2002), time permitting)

Questions: To what extent do dominance and iterated dominance determine behavior in normal-form games, with or without opportunities for learning from experience? How do subjects deviate from equilibrium in such games? What decision rules best describe their behavior?

Design: Presentation of games in normal form, designs to elicit "one-shot" responses versus designs that allow learning in repeated play, using MouseLab to track subjects' searches for hidden payoff information along with their decisions

Results: Subjects typically follow 1-3 rounds of iterated dominance, but no more; they tend to play equilibrium in simple games, but deviate systematically in more complex games; much of their behavior (information search as well as decisions) is well described by simple boundedly rational strategic decision rules like *Naïve* and *L2*

Follow-up reading:
*+Camerer, Chapter 5, pp. 54-80
(I) Dale Stahl and Paul Wilson, "On Players' Models of Other Players: Theory and Experimental Evidence," *Games and Economic Behavior* 10 (1995), 218-254
+Miguel Costa-Gomes, Vincent Crawford, and Bruno Broseta, "Cognition and Behavior in Normal-Form Games: an Experimental Study," *Econometrica* 69 (2001), 1193-1235, plus Instructions in Appendices at http://www.econ.ucsd.edu/papers/2000.html/
+Miguel Costa-Gomes and Vincent Crawford, Instructions, script, and other materials for asymmetric two-person guessing game experiments, 2001
(J) Rosemarie Nagel, "Unraveling in Guessing Games: An Experimental Study," *American Economic Review* 85 (1995), 1313-1326
(J)+Teck-Hua Ho, Colin Camerer, and Keith Weigelt, "Iterated Dominance and Iterated Best Response in Experimental '*p*-Beauty Contests'," *American Economic Review* 88 (1998), 947-969

5. Unstructured bargaining
*++Crawford, pp. 223-227
++Kagel and Roth, Chapter 1, pp. 40-49
*++Alvin Roth, "Bargaining Phenomena and Bargaining Theory," 14-41 in Alvin Roth (ed.), *Laboratory Experimentation in Economics: Six Points of View*, Cambridge, 1987
(J) Alvin Roth and J Keith Murnighan, "The Role of Information in Bargaining: An Experimental Study, " *Econometrica* 50 (1982), 1123-1142

(J) Alvin Roth and Francoise Schoumaker, "Expectations and Reputations in Bargaining: An Experimental Study," *American Economic Review* 73 (1983), 362-372

(I) Diego Moreno and John Wooders, "An Experimental Study of Communication and Coordination in Noncooperative Games, *Games and Economic Behavior* 24 (1998), 47-76

No demonstration experiment

Questions: What determines outcomes of unstructured bargaining in settings like those studied in cooperative game theory? How well do standard bargaining theories (structured/noncooperative or unstructured/cooperative) describe observed bargaining outcomes?
Design: control of bargaining institutions and information, use of binary lottery procedure and private information to create invariances that can be used to test the theory, use of monitored communication via computer to mimic "no rules" bargaining with a deadline, modern implementation via NetMeeting software as in Moreno and Wooders (1998))

Possible topic for a student presentation, but may be covered in lectures if time permits:

6. Individual Decisions under Uncertainty (issues: preference reversals, Allais paradox and other deviations from expected-utility maximization, Ellsberg paradox and other deviations from probabilistic sophistication, time consistency and hyperbolic discounting, framing, risk aversion in gains and losses, mental accounting)

*++Kagel and Roth, Chapter 1, pp. 67-86, Chapter 8, pp. 587-676

*++Davis and Holt, Chapter 8, pp. 435-504

(J) Mahmoud El-Gamal and David Grether, "Are People Bayesian? Uncovering Behavioral Strategies," *Journal of the American Statistical Association* 90 (1995), 1137-1145

(J) David Harless and Colin Camerer, "The Predictive Utility of Generalized Expected Utility Theories," *Econometrica* 62 (1994), 1251-1289

Further possible topics for student presentations:

7. Fairness and "social utility" (issues: form of social preferences and how they interact with strategic decision-making, reciprocity, "indirect" evolutionary models of preferences)

*(J) Colin Camerer and Richard Thaler, "Ultimatums, Dictators, and Manners," *Journal of Economic Perspectives* 9 (1995), 209-219

*+Camerer, Chapter 3

Maya Bar-Hillel and Menahem Yaari, "Judgments of Distributive Justice," in Barbara Mellers and Jonathan Baron (eds.), *Psychological Perspectives on Justice: Theory and Applications*, New York: Cambridge University Press, 1993

Gary Bolton and Axel Ockenfels, "ERC: A Theory of Equity, Reciprocity, and Competition," *American Economic Review* 90 (2000), 166-193

Ernst Fehr and Klaus Schmidt, "A Theory of Fairness, Competition and Cooperation," *Quarterly Journal of Economics* 114 (1999), 817-868

(I) Larry Samuelson, "Introduction to the Evolution of Preferences," *Journal of Economic Theory* 97 (2001), 225-230

8. Coordination

*++Camerer, Chapter 7

(J) Russell Cooper, Douglas DeJong, Robert Forsythe, and Thomas Ross, "Selection Criteria in Coordination Games: Some Experimental Results," *American Economic Review* 80 (1990), 218-233

(J) Judith Mehta, Chris Starmer, and Robert Sugden, "The Nature of Salience: An Experimental Investigation of Pure Coordination Games," *American Economic Review* 84 (1994), 658-674

Teck Hua Ho and Keith Weigelt, "Task Complexity, Equilibrium Selection, and Learning: An Experimental Study," *Management Science* 42 (1996), 659-679

Van Huyck, John, Joseph Cook, and Raymond Battalio, "Adaptive Behavior and Coordination Failure," *Journal of Economic Behavior and Organization* 32 (1997), 483-503; http://www.elsevier.nl:80/homepage/sae/econbase/jebo/menu.sht

9. Preplay Communication (issues: how does it work? which institutions promote it?)

(I) Vincent Crawford, "A Survey of Experiments on Communication via Cheap Talk," *Journal of Economic Theory* 78 (1998), 286-298

Russell Cooper, Douglas DeJong, Robert Forsythe, and Thomas Ross, "Alternative Institutions for Resolving Coordination Problems: Experimental Evidence on Forward Induction and Preplay Communication," 129-146 in James Friedman (ed.), *Problems of Coordination in Economic Activity*, Boston : Kluwer, 1994

10. Learning (issues: reinforcement versus beliefs-based versus hybrid models, mixed strategies, analogies, "strategic teaching")

*+Camerer, Chapters 2 and 6

++Crawford, pp. 227-235

Colin Camerer and Teck-Hua Ho, "Experience-weighted Attraction Learning in Normal Form Games," *Econometrica* 67 (1999), 827-874

(I) Colin Camerer and Teck-Hua Ho, "Experience-weighted Attraction Learning in Coordination Games" Probability Rules, Heterogeneity, and Time Variation," *Journal of Mathematical Psychology* 42 (1998), 305-326

(J)+ Ido Erev and Alvin Roth, "Predicting how people play games: Reinforcement Learning in Experimental Games with Unique, Mixed Strategy Equilibria," *American Economic Review* 88 (1998), 848-881; http://www.economics.harvard.edu/~aroth/papers/AER884.pdf

(I) Yin-Wong Cheung and Daniel Friedman, "Individual Learning in Normal-Form Games: Some Experimental Results," *Games and Economic Behavior* 19 (1997), 46-76

(I) Raymond Battalio, Frederick Rankin, and John Van Huyck, "Strategic Similarity and Emergent Conventions: Evidence from Payoff Perturbed Stag Hunt Games," *Games and Economic Behavior* 32 (2000), 315-337

11. Auctions (issues: private versus common value auctions, open outcry versus sealed bid, first- and second-price, winners' curse and other phenomena)

*++Davis and Holt, Chapter 5, pp. 275-316

*++Kagel and Roth, Chapter 7, pp. 501-573

12. Public Goods (issues: public goods provision among two or many players, subject pool effects, dominated strategies versus equilibrium predictions)

*++Davis and Holt, Chapter 6, pp. 317-342
*++Kagel and Roth, Chapter 1, pp. 26-35, and Chapter 2, pp. 111-174

13. Equilibrium refinements (issues: what determines selection among non-strict equilibrium in the short and the long run)

*++Davis and Holt, Chapter 7, pp. 381-433
*++Crawford, pp. 220-221
(I) Jeffrey Banks, Colin Camerer, and David Porter, "An Experimental Analysis of Nash Refinements in Signaling Games," *Games and Economic Behavior* 6 (1994), 1-31
(J) Jordi Brandts, and Charles Holt, "An Experimental Test of Equilibrium Dominance in Signaling Games," *American Economic Review* 82 (1992), 1350-1365
David Harless and Colin Camerer, "An Error Rate Analysis of Experimental Data Testing Nash Refinements," *European Economic Review* 39 (1995), 649-660
+David Cooper and John Kagel, "Learning and Transfer in Signaling Games," manuscript, 2001