Economics 208 Exam **Fall 2006**
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1. (#2 from problem set) Suppose three identical, risk-neutral firms must decide simultaneously and irreversibly whether to enter a new market which can accommodate only two of them. If all three firms enter, all get payoff 0; otherwise, entrants get 9 and firms that stay out get 8.

(a) Identify the unique mixed-strategy equilibrium and describe the resulting probability distribution of the total ex post number of entrants. (You are not asked to show this, but the game also has three pure-strategy equilibria, in each of which exactly two firms enter; but these equilibria are arguably unattainable in a one-shot game in the absence of prior agreement or precedent. The mixed-strategy equilibrium is symmetric, hence attainable.)

Now suppose that each firm follows a behavioral rule that is an independent and identically distributed draw from a distribution that assigns equal probabilities to two types: either *L1* (best response assuming the other firms are each equally likely to enter or stay out, and probabilistically independent), or *L2* (best response to *L1*).

(b) Describe the decisions of types *L1* and *L2* and the resulting *actual* (as opposed to what *L1* or *L2* expect) probability distribution of the total ex post number of entrants when each firm's type is drawn as explained above. Show that the expected number of entrants is closer to the ex post optimal number (2) than in your equilibrium from part (a), and that that the probability of exactly 2 entrants is higher than in (a). (In experiments subjects' initial responses come systematically closer to ex post optimality than the symmetric mixed-strategy equilibrium predicts, a result Kahneman has described as "magic." This analysis shows that bounded strategic rationality works like fairy dust.)

Now suppose that each firm follows a rule that is an independent and identically distributed draw from a distribution that assigns probability ½ to type *L1*, ¼ to *L2*, and ¼ to a type called *Sophisticated*, which plays an equilibrium in the game in which the prior probabilities of L1, L2, and Sophisticated players are common knowledge.

(c) Plugging in the behaviors of *L1* and *L2* players (which do not depend on the prior type probabilities), characterize equilibrium in the game played by Sophisticated players.

(d) How does your answer to (c) change, if at all, if the prior probability of Sophisticated players is $\varepsilon \approx 0$, and the prior probability of L2 players is ½ - ε (with the prior probability of L1 players held constant at ½)?

2. (new) Consider a single, large population of people randomly and anonymously paired to play a two-person game with payoff matrix as shown, once only, and with no common history of previous play, communication, etc. The game is presented to them as a story, without a matrix: “Each player chooses either X or Y. If you both choose X then you each get $5. If you both choose Y then you each get $5. If you choose differently, then neither one of you receives any money.” But it is publicly known that all the subjects are told the same story, so the common labeling of the actions is public knowledge.

	X	**Y**
X	5 5	0 0
Y	0 0	5 5

76% of the Row and Column players (whose choices can be pooled because the people are indistinguishable and the game is symmetric) choose X. (The data here and below are from an experiment whose identity will be revealed on request after the exam.)

Now suppose the setting is exactly as before, except that payoffs are changed as follows.

	X	**Y**
X	5.1 5	0 0
Y	0 0	5 5.1

This game is asymmetric from Row and Column players’ viewpoints, so even though the people are indistinguishable, their choices cannot be pooled across player roles. Now, 78% of the Row players choose X, but only 28% of the Column players choose X.

The hypothesis that for most subjects X is “more salient” than Y seems to directly explain the results from the first treatment (with some noise), without considering the subtleties of strategic decision-making. In the second treatment the increased payoff of 5.1 for coordinating on X for Column players seems to make X even more attractive for them, but Column players choose X much less frequently than in the first treatment. The increased payoff of 5.1 for coordinating on Y for Row players seems to make Y more attractive for them, yet they play X slightly more than in the first treatment. Thus the simple explanation suggested above for the first treatment doesn’t work for the second.

(a) Outline a model that has the potential to explain the role-asymmetric patterns in both treatments, using behavioral assumptions that are the same for Row and Column players, and the same in both treatments. (Hint: In the second treatment, the more salient label X bears a different relation to Row players’ payoffs than to Column player’s payoffs.)

3. (announced essay question from syllabus)

Write a brief (one-page or less) essay on how research on the parts of behavioral game theory studied in this segment should change how we think about your choice of one of the following kinds of application. For some or perhaps all of them, more than one answer is defensible. Full credit will be given for any answer that includes a coherent and empirically plausible rationale. In some cases, there are readings on the syllabus beyond those discussed in class that may be helpful.

(a) the standard use of the revelation principle in designing auctions or incentive schemes

(b) the standard use of the Folk Theorem to characterize outcomes sustainable as implicit contracts in complete-information repeated games

(c) the use of subgame-perfect equilibrium to predict outcomes in infinite-horizon alternating-offers bargaining with complete information, as in Rubinstein (*Econometrica* 1982)

(d) the use of sequential or perfect Bayesian equilibrium in models with "crazy types" to characterize reputation building, as in Kreps and Wilson, Milgrom and Roberts, or all of the above (*Journal of Economic Theory* 1982)

(e) the use of refinements such as the "intuitive criterion," as in Cho and Kreps (*Quarterly Journal of Economics* 1987), to derive unique predictions despite multiple equilibria in signaling games

(f) the use of rational expectations and/or perfect foresight assumptions in dynamic macroeconomic models to predict the effects of policy changes, as in the Lucas critique, Kydland and Prescott, "Rules versus Discretion…" (*Journal of Political Economy* 1977), or Barro, "Are Government Bonds Net Wealth?" (*Journal of Political Economy* 1974)

(g) the use of refinements such as risk-dominance to derive unique predictions despite multiple equilibria in macroeconomic models based on coordination failure like those discussed in Cooper and John (*Quarterly Journal of Economics* 1988)

(h) the use of iterated dominance in incomplete-information games with small idiosyncratic payoff trembles ("global games") to select among multiple Pareto-ranked equilibria in coordination games, as in Carlsson and Van Damme, "Global Games and Equilibrium Selection" (*Econometrica* 1993) and recent applications to bank runs and other problems, as in Morris and Shin, "Global Games: Theory and Applications," in *Advances in Economics and Econometrics* (Proceedings of the Eighth World Congress of the Econometric Society), edited by M. Dewatripont, L. Hansen and S. Turnovsky. Cambridge: Cambridge University Press (2003), 56-114; linked in manuscript at (http://www.princeton.edu/%7Esmorris/pdfs/paper_36_Global_Games.pdf)

(i) the use of ergodic evolutionary dynamics to characterize equilibrium selection in the "long run" in games played repeatedly in populations, as in Kandori, Mailath, and Rob; or Young (*Econometrica* 1993)