Professor Robert A. Miller
Carnegie Mellon University
Auctions and Markets 75-440
Second Semester 2007-2008

THIRD PROJECT

COMPETITIVE EQUILIBRIUM

This is the third of three projects. You may do the project by yourself, pairs or in groups of three (in which case all students will be awarded the same grade), but no more than three in a group is permitted.

This final project is organized around designing, running, and reporting on, two experiments of competitive equilibrium. Parts A and D together essentially consist of a short paper. Part A should motivate the experiments with a model, explain the most important features of the model and, if possible, its solution. Part D should describe how the experiments were conducted, and compare the experimental outcomes with your theoretical predictions.

You will be graded on the nature of the issues (such as whether the questions you pose are interesting to business people, and why your experiments might shed light on them), as well as the analysis itself. Part A of this project is due Tuesday, April 22 and worth one third of the points. Parts B and C will be conducted in class on Tuesday and Thursday (the 23rd) , and together are also worth one third. Part D is Thursday, May 11. Parts A and D are reports of your analysis. The points in Part B are allocated to how well your group runs your own experiment. (Typically students score full marks on this, so I will only subtract marks from part C if things are done really badly.) Part C is based on how well you perform as an individual subject in experiments designed by the others.

IF YOU WOULD LIKE YOUR SUBJECTS TO HAVE THE OPPORTUNITY TO STUDY YOUR GAME BEFORE YOU RUN IT, PLEASE SEND YOUR GAME TO ARI KANG WITH AN APPROPRIATE REQUEST BY MONDAY. SHE WILL THEN DISTRIBUTE IT TO THE REST OF THE CLASS SO THEY CAN STUDY IT IF THEY WISH.

Part A

Design two experiments based on a competitive equilibrium. In the description of each clearly specify the distribution of valuations, or more generally preferences and production costs for the traded goods, the information that different types of players have, and the rules governing production and trade. They should not all have the same information sets as well as the same bidding rules. There should be some common features between the experiments so that you can attempt to show what happens as you change the parameters that describe your environment. For example how are the

results likely to be affected by the number of traders, the distribution of their valuations, whether they are differentially informed or not, how much access to the market they have (can they submit limit orders or only market orders), the prices paid by the traders? You are not expected to analyze all the possibilities, but I would like you to focus on some questions that are of interest to you. You should also explain why they are interesting questions to address, and also derive the competitive equilibrium price and final goods allocations.

Part B

Run your two experiments and send the teaching assistant and myself the output files from your experiments. Students who do a poor job of running their own experiments will also be penalized up to 50 percent of this portion of the project because it may compromise their results. This session will probably be very busy, so everyone should know exactly how to run their own experiments on both modules, and save their results before the sessions begin. I urge you to conduct some trials with your study partners and thoroughly familiarize yourself with the process of running experiments and saving the results. Please make a brief oral presentation (maximum 2 minutes) to the class that motivates your four auctions using a power point presentation. You should treat the class as future business colleagues who have not taken this course.

Part C

Participate as a player in the other experiments. During the session you may use a proxy name rather than your real one to hide your true identity. If you did not use your real name, please send me email at the end of the session divulging your proxy name. Your grade in this portion of the project will be a strictly monotone increasing function of how well you play the games designed and run by the other students (where you are one of their subjects).

Part D

Write a report on your findings. Please send me a consolidated copy of your report (including Part A as well), and also an attached file of the output from your experiments. The second part of the report should include two sections.

1. After accounting for the advantages that some experimental subjects had relative to others because of the role and valuation they were assigned in the experiment, how did the individual subjects perform in your experiment? That is how did each subject fare relative to the other traders in a similar position to him or her?

2. The second part of the report should also explain the main features of the trading game experiments that you conducted. The kinds of features you should focus upon depend on the game. For example:

- How close were the predicted competitive equilibrium allocations to the experimental results? Did the traders end up with the goods allocations predicted by the theory?
- Were any arbitrageurs profitable in buying and then selling, or vice versa?
- How close were the predicted competitive equilibrium prices to the experimental results? Did price follow a random walk?
- If your subjects were assigned concave utility functions, did they display risk-averse behavior as predicted by the theory?
- How much of the potential surplus did the experimental subjects extract from the trading game, more or less than competitive equilibrium theory would predict? How much surplus do consumers extract? Which consumers extract the most surplus? What proportion of the potential gains from trade is realized? Were better-informed traders able to benefit from their knowledge?

Apply your knowledge of statistics and econometrics to help summarize the data from your experiment. Explain the main features in your data that summarize the behavior of the class as whole. For example:

- Graph the prices paid by buyers as a function of their valuations, and contrast the valuations of buyers with those who neither buy nor sell, and those who sell. Plot the regression of purchase price against valuation in the diagram.
- Do prices rise, fall or follow a random walk in a sequential auction where multiple units are sold. Graph the empirical distribution of price changes that are observed in the experimental data, as a function of the number of items sold. You can test the null hypothesis of a random walk by regressing the first difference of successive prices on the number of items remaining to be sold.
- In a limit order market where there are multiple securities traded, display on a graph of time where gains from arbitrage were left unexploited, and which subset of traders “left money on the table”.