Market and Information Economics
Preliminary Examination
Department of Agricultural Economics
Texas A&M University

Winter 2010

Instructions: This examination consists of seven questions. You must answer the first question and you must answer four of the remaining six questions (i.e. you must answer four of the questions numbered 2-7). Each question answered (five in total) has a weight of 20% in the final examination score. Please read through the entire examination before making a decision on the particular set of five questions you actually answer. The examination proctor will review the content of the exam at the beginning of the time period (9:00 am). He will answer general questions for the entire set of students writing this prelim. You have until 1:15 pm to complete the exam. Good Luck!
1. A common theme throughout the past two decades is consolidation of agricultural processing industries: industries that purchase raw agricultural products for processing into consumer goods. One example is sugar refining. Three companies, Domino, United Sugar, and Imperial Sugar, refine nearly all sugar produced in the United States. In the United States refined sugar is produced from sugar cane, produced primarily in the southeast, and from sugar beets, produced primarily in the northwest. Typically the companies do not own any cane or beet production and instead rely on numerous farmers to supply those inputs. Companies maintain refining plants in both regions. Suppose you are interested in determining competitiveness in the United States sugar refining industry.

   a. Describe the steps you would undertake to determine the competitiveness of the sugar refining industry located in the United States. In answering this question, provide a list of the analyses you would perform and then give specific details on how you would perform each step in your analysis. Provide specific econometric models you would use in your analysis. Discuss specific assumptions you would make in conducting this analysis and specific hypotheses that you would test. Describe specific data you would need to conduct your analysis.

   b. In 2005 hurricane Katrina destroyed Domino’s southeastern plant. Before hurricane Katrina, Imperial Sugar (the smallest of the three refining companies) was losing money. However, according to John Sheptor, CEO of Imperial Sugar, “Katrina solved the no-money-in-the-bank issue for us.” Imperial’s profits soared to $48 million after Katrina. Based on your answer to part a, describe how you would determine the extent, if any, that competitiveness in the sugar refining industry changed after Katrina.

   c. In 2005, Louisiana’s 700 cane farmers formed a joint venture with Cargill to build a new refinery in the southeast. Why might farmers be interested in investing in such a joint venture? Discuss how you might estimate the effects on farm sugar cane prices and retail sugar prices from completion of such a project.
ANSWER FOUR OF THE FOLLOWING SIX QUESTIONS.

2. Consider the following the graph that generates variables on scientific knowledge (SK), farmer inputs to crop production (INPUTS), crop yields (YIELDS), actual research expenditures from the private sector (RPRIV), actual research expenditures from the public sector (RPUB), and Legislative Funding of Land Grant Experiment Station Research (LEG). Each variable is measured at a particular time period (T), as indicated by the index given in parentheses on each variable. The graph indicates that scientific knowledge (SK) and private sector research (RPRIV) are not measured (are latent or unobserved). Inputs levels (INPUTS), crop yields (YIELDS), public sector research expenditures (RPUB) and legislative funding (LEG) are measured.

![Graph of variables](image)

a. Assume all measurements are observational (non-experimental). Discuss three different ways one can obtain unbiased estimates of $\frac{\partial \text{YIELDS}(T+K+1)}{\partial \text{RPUB}(T)}$. Take the graph given here as the “true” theoretical structure and offer three alternative approaches (equations or system of equations) to obtain unbiased and consistent measures of the requisite derivative.

b. Discuss how an experimentalist would modify the graph given above to obtain (internally valid [unbiased and consistent]) estimates of the same derivative ($\frac{\partial \text{YIELDS}(T+K+1)}{\partial \text{RPUB}(T)}$). Do not worry about the feasibility of such an experiment, but merely describe its structure in an “ideal” environment.
3. Global warming continues to be an issue for scientific discussion. In particular some are interested in the role of US real GDP on global warming. Below are plots of Global Temperature, Global CO2 levels, and US real GDP over the years 1880 through 2007.

![Temperature Plot]

![CO2 Plot]

![US Real GDP Plot]

a. Please outline a study using these three variables and tools studied here at TAMU to offer non-spurious forecasts of temperature ten and twenty years into the future. Be explicit on methods and tests used to construct these forecasts.

b. What evidence might you offer to support the appropriateness of these forecasts? Discuss other measures (data and or analyses) you might use to offer evidence on the “goodness” of your forecasts.
4. A firm has a project requiring an investment of 20 at period $t=0$ for a sure return of 30 at $t=1$. There is no discounting. The investment cost has to be raised from the financial market. Assume that a new equity issue is proposed. Potential new investors are uncertain about the value of the firm’s assets in place. Suppose that assets $A \in \{50, 100\}$ with $\Pr[A=100]=0.1$.

Hints: Equity is defined as ownership interest in a firm. To begin, ask yourself whether current shareholders would benefit from having new investors contribute fresh equity, in return for which these investors would earn a share of the profits. Note that shareholders, but not prospective investors, know whether the firm is of a good type ($A=100$) or bad type ($A=50$).

a. Suppose that investors believe that both types of firms invest. What fraction of the firm’s equity has to be issued to new investors? What are the payoffs to existing shareholders if they undertake the project? Are these beliefs reasonable? Explain.

b. Suppose that investors believe that only bad firms issue new equity. What fraction of the firm’s equity has to be issued to new investors? What are the payoffs to existing shareholders if they undertake the project? Are these beliefs reasonable? Explain.

c. Suppose now that shareholders commit at $t=0$ to a wasteful advertising campaign at $t=1$ after the project return is realized. The advertising expenditure is an irreversible action on the part of the firm that results in a drop in profits of $K$. The size of the expenditure is a choice variable. Show that a good firm can signal its type through such expenditures. Discuss.
5. An entrepreneur has two projects available, each requiring an investment outlay of 6 at t=0. The first project generates cash flow $C_1 \in \{5, 45\}$ at t=1. The second project generates cash flow $C_2 \in \{0, 48\}$. The probability of getting a high cash flow is in each case equal to $\alpha$ where $\alpha$ also denotes the level of effort of the entrepreneur. The entrepreneur has a cost of effort of $40\alpha^2$ and can choose from among three effort levels: $\alpha \in \{0, 1/3, 1/2\}$. The firm has no assets in place. Everyone is risk neutral and there is no discounting. The two projects are mutually exclusive.

Hint: If you have difficulty solving for $\alpha^*$ given $\alpha \in \{0, 1/3, 1/2\}$, first try to solve for $\alpha^*$ assuming $\alpha \in \{0, 1/2\}$.

a. If the entrepreneur can self-finance, what level of effort will she choose under each project? Which project is worth investing in?

b. Suppose now that the entrepreneur is cash-constrained and that the project is entirely financed with debt. What face value $D$ of debt should the entrepreneur choose under each project? Which project does she end up choosing if she can get an unconditional loan, that is, a loan that does not depend on which of the two projects she decides to invest in? Discuss the implications.

c. Can the entrepreneur do better by issuing a fraction $\lambda$ of equity instead of financing the project with debt?
6. Under the assumptions of Independent Private Value Paradigm (IPVP) and risk neutral bidders, one can show that for a bidder with valuation \( v \); the optimal bidding strategy in a first-price seal-bid auction without a reserve price is

\[
\sigma(v) = v - \frac{\int_{v}^{\bar{v}} F_V(u)^{(N-1)} du}{F_V(u)^{(N-1)}}
\]

where \( F_V \) is the common distribution of bidders’ valuation defined on \([v, \bar{v}]\), and \( N \) is the number of bidders.

a. Discuss the difference between the optimal bidding strategy in a first-price seal-bid auction and that of a Vickrey auction.

b. Show that \( \sigma(v) \) increases in \( v \).

c. Show that \( \sigma(v) \) increases in \( N \).

d. Suppose now that bidders are risk averse with a CRRA utility function \( U(Y) = \eta Y^{1/\eta} \), \( Y \geq 0, \eta \geq 1 \). Derive the optimal strategy in a first-price seal-bid auction. How does the optimal strategy for risk averse bidders compare to that of risk neutral bidders?
7. Consider the Vickrey auctions under IPVP and no reserve price.

   a. Describe in detail a strategy to estimate the underlying bidder value distribution if we observe all bids in 100 auctions of identical items.

   b. Describe in detail a strategy to estimate the underlying bidder value distribution if we only observe the winning bids in 100 auctions of identical items.