Department of Agricultural Economics
PhD Qualifier Examination
January 2005

Instructions:

The exam consists of six questions. You must answer all questions. If you need an assumption to complete a question, state the assumption clearly and proceed. Be as clear in your answer as possible. You have four hours to complete the exam. Be sure to put your assigned letter and no other identifying information on each page of your answer sheets. Also, put the question number and answer page number at the top of each page. Finally, please write on only one side of your paper and the leave the appropriate margins.

Good Luck!

(20 points)

1. Consider an economic agent with preferences represented by the utility function, $u(x) = (x_1^{1/2} + x_2^{1/2})^2$ in answering the following:

   a. Are these preferences homothetic? strictly convex? strictly monotonic? Explain carefully.

   b. What is meant by "representability"?

   c. Find the Marshallian demands and the indirect utility function.

   d. Do NOT compute, simply explain how one would obtain the Slutsky derivatives, $S_{ii}(p, m)$.

   e. Are these goods gross substitutes or complements?

   f. Obtain the Hicksian compensated demands and the expenditure function.

   g. Now reconsider parts (a) and (c) when an agent has preferences represented by the utility function, $u(x) = (x_1^2 + x_2^2)^{1/2}$; are preferences homothetic? strictly convex? strictly monotonic? Find the Marshallian demands and the indirect utility function. Then, in particular, determine for this agent the best chosen bundle when $m = 100$, $p_1 = 4$ and $p_2 = 5$, and explain.

(15 points)

2. Duality theory states a concave production function yields a cost function homogeneous of degree one in input prices given specified conditions. Consider the following production function for the following questions, $q = x_1^{\alpha} x_2^{\beta}$

   a. What is the domain of the inputs, such that the marginal product and output levels are positive?

   b. Under what conditions for α and β is the production function strictly concave for the above domain? Hint: for mathematical ease, replace $x_1^{\alpha} x_2^{\beta}$ with q whenever possible.

   c. Define expansion path, isoquant, and isocost lines. Graphically, show the expansion path.

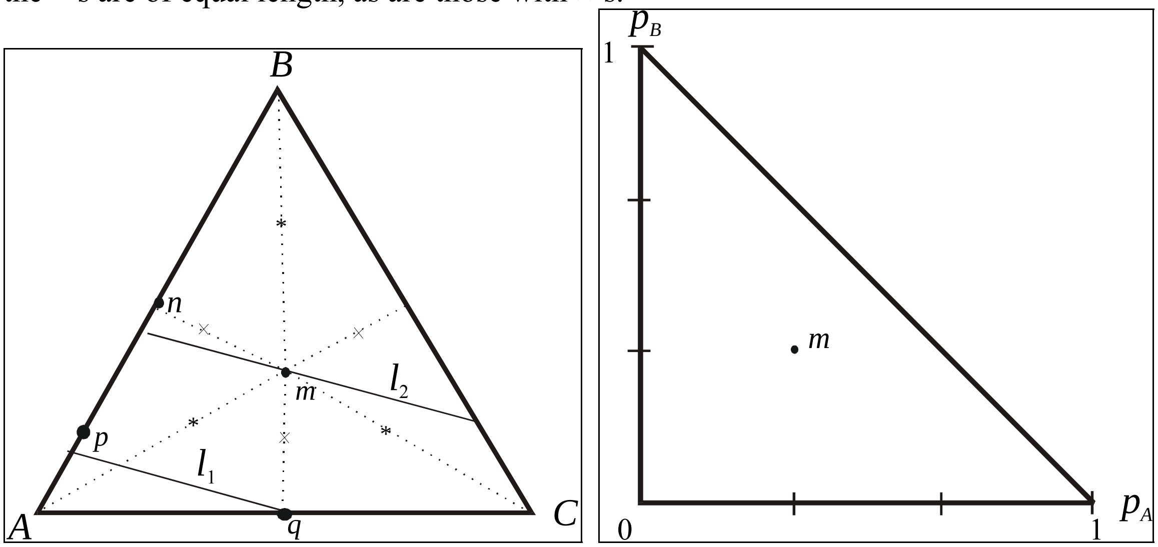
   d. What is the mathematical function for the expansion path for the above production function given the input costs are r_1 and r_2 and $c = r_1 x_1 + r_2 x_2$. (Hint: the expansion path can be derived from production maximization subject to a cost constraint or cost minimization subject to a production constraint.)

   e. Provide a definition for a cost function. Derive the cost function for the above production function, using the above expansion path and cost equation.

   f. Show the cost function is homogenous of degree one in input prices.

(20 points)

3. The figures below present the probabilities of three outcomes, *A*, *B*, and *C*. The axes in the figure on the right refer to probabilities. The lines l_1 and l_2 are parallel. The dotted lines with the *'s are of equal length, as are those with ×'s.



   a. Point *m* in the figure on the right corresponds to the point *m* in the figure on the left. Draw a figure similar to the one on the right and represent the other points, *n*, *p*, and *q* in that figure. In general, what does one of these points represent?

   b. Suppose all we know is that the agent is indifferent between all points on l_1, and that *p* is preferred to *q*. Using only this information, can we tell which of the three outcomes (*A*, *B*, or *C*) is the best? Prove your point.

   c. Suppose that *B*>*C*>*A*. Which, if any, of the identified points (*n*, *p*, and/or *q*) could be a mean-preserving of *m*? In your answer, be sure to define the term "mean preserving spread" and show that all necessary characteristics can be satisfied. (Hint: stochastic dominance)

   d. Assuming that the points identified in part c are in fact mean preserving spreads and that l_2 and l_1 are indifference curves with l_2 preferred to l_1, can we say whether the agent is risk loving, risk neutral, or risk averse.

(20 points)

4. In some competitions, a player wins if he stays while the other one quits, but if both players stay then they are both big losers (let’s say they die, D). The payoffs might take the following form:

		Player 2	
		Stay	Quit
Player 1	Stay	D_1, D_2	W,0
	Quit	0, W	C, C

where W is the payoff when you win, C is the payoff when you compromise, and D_1 and D_2 are the payoffs when the players die. For all parts assume that $D_1=D_2=D$. The payoffs are ordered as follow: $W>C>0>D$.

a. Find all pure strategy equilibria in this game.

b. Find all mixed strategy equilibria.

c. What is the probability that both firms will stay and, therefore, be defeated.

d. Suppose that $D_1=D_2=D$ but that player 1 believes that player 2 is more afraid of dying, i.e. he believes that $D_2<D_1$. What will player 1’s strategy be then? How does this error affect the probability that both will stay and die? What happens if both players make the same mistake (i.e. if 2 believes that $D_1<D_2$)?

(15 points)

5. This past year, four hurricanes hit Florida between the second week of August and the last week of September. An Associated Press article on October 12 made the following statement.

   WASHINGTON Oct 12, 2004 — Hard hit by four hurricanes, Florida citrus growers will produce 27 percent fewer oranges in the 2004 to 2005 season the smallest crop in 11 years, the Agriculture Department said Tuesday.

   The losses to Florida's $800 million citrus crop which accounts for three-quarters of the nation's citrus products will reduce production by the nation's biggest orange grower to production of 176 million 90-pound boxes, the department said in its first forecast of the hurricane damage.

   The hurricane season is between June and October. Oranges are harvested in the winter months of December, January, and February.

   An undergraduate student decides to estimate the impact of hurricanes on the monthly price of oranges. The student collects monthly cash price data on oranges in real dollars per 90 lb. box, which is how oranges are sold at the farm level, for the last 40 years. The student also collects hurricane data for the last 40 years. If the month had a hurricane that went through Florida, the student creates a dummy variable that is equal to one. If the month does not have a hurricane that went through Florida the dummy variable is zero.

   The student uses ordinary least squares (OLS) to estimate the model. The results of the model are

   $$P_t = 5.40 - 1.2D_t \qquad R^2 = .22$$
   $$(001) \quad (.02)$$

   where P_t is the monthly price of oranges in dollars per 90 lb. box, D_t is the dummy variable for a hurricane through Florida, and t = 1964.1, 1964.2, 1964.3,…,2004.12. In parentheses are the p-values associated with the parameter estimates and also given is the coefficient of determination. Based on this regression answer the following questions.

   a. What assumptions are necessary for OLS to be the appropriate method?

   b. Give a statistical and economic interpretation of *all* the numbers given.

   c. Suppose that the p-value for the Durbin-Watson test is 0.023. State the null hypothesis for this test and explain what this result means for drawing statistical inference about the parameter estimates and their significance.

   d. Using economic and econometric theory give some possible explanations for the unexpected result that hurricanes seem to be associated with lower not higher monthly prices?

(10 points)

6. Suppose you have the bivariate cumulative distribution function $F(y,x)$. Based on this information answer the following questions:
   a. Show mathematically and explain in words how you would get the probability density function in general form. Let $f(y, x)$ denote this function.

   b. Show mathematically and explain in words how you would get the marginal probability density function in general form for y. Let $g(y)$ denote this function.

   c. Show mathematically and explain in words how you would get the conditional probability density function in general form for y given x. Let $h(y \mid x)$ denote this function.

   d. Show mathematically and explain in words how you would get the expected value in general form for y given x. Let $E(y \mid x)$ denote this function.

   e. Show mathematically and explain in words how you would get the variance in general form for y given x. Let $V(y \mid x)$ denote this function.