WRITTEN PRELIMINARY Ph.D. EXAMINATION

Department of Applied Economics

January 29, 2008

Consumer Behavior and Household Economics

Instructions

• Identify yourself by your code letter, not your name, on each question
• Start each question’s answer at the top of a new page
• You are to answer a total of FOUR questions
• Answer Question #1 (you MUST answer this question)
• Answer THREE of the remaining FIVE questions (question 2 - 6)
• You have four hours to complete the examination
1. (Static utility maximization.) Consider the following Marshallian demand functions for n goods:

\[ p_i q_i = x[\alpha_i + \beta_i \ln(x) + \sum_{j=1}^{n} \gamma_{ij} \ln(p_j)] \quad i = 1, 2, \ldots n \]

where \( x \) is total expenditure, \( q_i \) is the quantity of good \( i \), \( p_i \) is the price of good \( i \) (and \( p_j \) is the price of good \( j \)), and the \( \alpha \)'s, \( \beta \)'s and \( \gamma \)'s are all constants.

a) Suppose that the adding up restriction holds. What restrictions does this imply for the parameters (the \( \alpha \)'s, \( \beta \)'s and \( \gamma \)'s) of this demand system?

b) Suppose that the homogeneity restriction holds. What restrictions does this imply for the parameters (the \( \alpha \)'s, \( \beta \)'s and \( \gamma \)'s) of this demand system?

c) For this demand system, calculate \( s_{ij} \), the element in the \( i \)th row and the \( j \)th column of the Slutsky matrix (also called the substitution matrix). [Notational hint: To keep the expression simple it is OK to have \( q_i \) in your final expression for \( s_{ij} \).]

d) Consider the Slutsky symmetry property. Using your answer to c), is it possible to impose Slutsky symmetry by assuming some parameter restrictions on the values of \( \alpha \)'s, \( \beta \)'s and \( \gamma \)'s? If yes, show those restrictions. If no, explain why it is not possible. You may want to refer to your answers for a) and b).
Question 2.

2. Rational addiction is explained in economic models of consumer behavior. A basic model of rational addiction is

\[ u(t) = u[y(t), c(t), S(t)] \]

How is this model used to explain rational addiction? Please do the following to answer this question:

a) Define the arguments in the equation.

b) Explain how speeding up the depreciation would rate impact the current consumption of the potentially addictive good.

c) Explain how an increased tolerance for the addictive good will impact current consumption.

d) Define and illustrate a steady state of consumption in this model.
Question 3.

3. A Donald Trump likes consumption (c) and dislikes work (h), which are the only two arguments in his utility function. His utility function is:

\[ U(c, h) = 4c - 0.5h^2 \]

Mr. Trump has no non-labor income and he can work as many hours as he wants at $10 per hour. The price of consumption goods is 1.

a) Find Mr. Trump’s optimal amounts of hours of work and consumption goods.

b) Now assume that the government imposes an income tax of 20% (on labor income) and uses that money for foreign assistance. What are Mr. Trump’s new optimal amounts of consumption and hours of work?

c) Explain the changes in Mr. Trump’s optimal consumption and hours of work (compare what you calculated in part a to part b) in terms of income and substitution effects.

d) If Mr. Trump gets married, discuss in general how you would model labor supply in a household setting (using a general utility function, not the specific one given above.) Describe two or three alternative approaches to modeling household labor supply and discuss predictions about how changes in each person’s wage will affect each one’s labor supply.
**Question 4.**

4. Please answer the following questions concerning demand theory:

   a) List the axioms necessary for the existence of a well-behaved utility function and briefly discuss the purpose of each.

   b) Describe an additive utility function and the implications of assuming additivity.

   c) Describe the concept of a branch utility function or two-stage maximization.

   d) Describe a conditional demand function.

   e) What does it mean that even if we do not believe individuals actually behave in accordance with utility maximization, as economists we have found it has made sense to assume that consumers do.

**Question 5.**

5. Consider a worker-firm relationship defined over two time periods, in which training occurs in the first period.

   a) Describe the firm’s profit-maximizing condition and describe the conditions under which the worker pays for the entire cost of training.

   b) Who pays for training if it is specific to the firm? How might the wage be determined when there is firm-specific training? What might be the role of deferred compensation (e.g., a pension) when there is specific training?

   c) What are the implications of specific training for the “durability” of the worker-firm relationship, that is, for the longevity of employment? Explain.
Question 6.

6. In making choices over time a generalized hyperbolic discount function helps to explain the observed behavior of consumers. It may be written as

$$\Phi(t) = (1 + \alpha t)^{-\beta / \alpha}$$

a) Explain how this equation satisfies the “Matching Law” that explains findings from experimental economics. Include how you it can be used to explain the asymmetry of value of gains and losses.

b) Explain what happens if $\alpha \to 0$.

c) In the case of $\alpha \to 0$, how does the consumer value gains and losses and why?

d) Discuss how hyperbolic discounting might be used to explain the “sub-prime” mortgage crisis currently causing financial institutions around the world to lose so much money OR how hyperbolic discounting can be used to explain why the federal government is promoting the use of corn to produce ethanol as a partial substitute for gasoline even when it helps to raise the price of food.