WRITTEN PRELIMINARY Ph.D. EXAMINATION

Department of Applied Economics

June 27, 2017

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.

• There are SIX questions in this exam.

• You are to answer a total of FOUR questions.

• You MUST answer Question 1.

• You MUST answer EITHER Question 2 OR Question 3, but NOT BOTH.

• You must CHOOSE 2 of the 3 questions from Questions 4, 5 and 6.

• You have four hours to complete the examination.

• Be sure to define all notation you use in your answers.

• Answer all questions you chose to answer completely and succinctly.
REQUIRE

Question 1: Consumer Demand Models

a. Explain the four properties of demand functions.

b. Discuss the significance of the properties of demand functions.

c. What are the economic factors that need to be included in order for a single, quantity-dependent regression model to be a demand equation?

d. Compare the assumptions behind a single-equation demand model and a demand system.

e. Generalize situations where single-equation demand model and a system of equations could respectively be justified in terms of research questions on hand or data availability.
Question 2: Behavioral Economics

Tversky and Kahneman conducted one experiment: in the experiment, participants were shown a short description of the personality of several individuals. These individuals were random selected from a group of 100 professionals—engineers and lawyers. For each description, the participants were asked to assess the probability that the individual is an engineer rather than a lawyer. In one scenario, participants were told that the group from which the descriptions had been drawn consisted of 70 engineers and 30 lawyers. In another scenario, participants were told that the group consisted of 30 engineers and 70 lawyers. The participants in the two scenarios produced essentially the same probability judgments.

a. What statistical rule did the participants violate?

b. Which information has been ignored by the participants?

c. Describe the heuristic that the subjects potentially used.

Question 3: Behavioral Theories

Consider the following lotteries:

A. $3000 for sure.

B. 80% chance to win $4000 and 20% chance to win nothing

C. 25% chance to win $3000 and 75% chance to win nothing

D. 20% chance to win $4000 and 80% chance to win nothing

a. Prove that the preference of A over B and at the same time D over C violate Expected Utility Theory.

b. Can you use Prospect Theory to predict such preferences?
**Question 4: Applied Demand Analysis**

Suppose you have been asked to further the understanding of consumer demand for soda in the United States.

a. Discuss the differences between approaching consumer choices in the goods space and the characteristics space, in the context of how the consumer’s optimization problem would be set up in the two approaches.

b. How might specific research questions differ depending on which approach is taken? Your answer should include some examples.

c. Discuss the empirical modeling method that correspond to each approach. Your answer should demonstrate data needs in the two approaches.

**Question 5: Quantitative Analysis of Demand**

Consider a representative consumer’s utility function is given as $U(q; z)$ where $q = q(q_1, ..., q_4)$ is a sub-vector of food goods and $z$ is the consumer’s health awareness index. Note that $z$ is a parameter of the model, and in the context of this problem $\frac{\partial U}{\partial z}$ has little meaning. Let $M$ denote consumer’s expenditure on $q$ and $p_i$ denote good $i$’s price.

a. Set up the consumer’s constrained utility maximization problem. Derive and interpret the first order conditions. Write out the optimal solutions of the model variables in implicit form.

b. Let $u^*(.)$ denote the indirect utility function. In words, what does $\frac{\partial^2 u^*}{\partial q_1 \partial z} < 0$ mean? Intuitively, why must it be true that if $\frac{\partial^2 u^*}{\partial q_1 \partial z} < 0$ then $\frac{\partial q_1^*}{\partial z} < 0$?

c. Suppose that the first product, $q_1$, has genetically modified food content. The company, which produces $q_1$, hires you to analyze whether it is true that $\frac{\partial q_1^*}{\partial z} < 0$? A colleague has come to your office and recommends that you estimate a demand system to account for the horizontal linkages in demand. How will you proceed to develop a model of demand system to test the above-mentioned hypothesis? Your analysis should clearly explain:
   - Your choice of econometric model
   - The data required to estimate the model
   - Your estimation procedure (including parameter restrictions, if any)
   - Hypothesis testing.
Question 6: Welfare

The government is considering extending the value-added tax to food by 15%. They ask you to evaluate the welfare consequences of this change. The cost of a price increase can be measured by compensating variation (CV) as:

\[-CV(p^0, p^1, y) = c(p^1, u^0) - c(p^0, u^0),\]

where \(y\) is income, and superscripts 0 and 1 denote the base value and the current value, respectively.

a. Explain in detail how you would obtain the “true” measure of CV. Your discussion should include (but need not be limited to): (i) what data you would use, (ii) what objects you would estimate, and subsequent calculations, if any (iii) if you plan to undertake estimation, how you would do so.

b. Now suppose due to time or data constraints you are not able to estimate the “true” measure of CV. One of your colleagues suggested that you can calculate first- and second-order approximations to CV, by using a Taylor series approximation\(^1\) of \(c(p^1, u^0)\) around \(p^1 = p^0\). Derive these approximations as suggested by your colleague and briefly discuss their advantages/limitations compared to the “true” measure.

c. Explain why first-order approximation always overestimates the impact of a price increase on welfare compared to the second-order approximation.

---

\(^1\) An \(n\)-order Taylor series approximation of \(f(x)\) around \(x=a\) is given as:

\[f(x) \approx f(a) + f'(a)(x - a) + \frac{f''(a)}{2}(x - a)^2 + \cdots + \frac{f^{n}(a)}{n!}(x - a)^n\]