WRITTEN PRELIMINARY Ph.D. EXAMINATION

Department of Applied Economics

University of Minnesota

June 25, 2010

MANAGERIAL, MARKETING AND PRODUCTION ECONOMICS

Instructions:
You have the option of writing your answers by hand on the paper provided, or typing your answers on the laptop you are provided.

- **If you use the laptop**, save your answers in a file with YOUR CODE LETTER, not name. Example of the filename: “Prod_Managerial_Prelim_Student_A.docx” Be sure to save your answers frequently.

  You may use the paper provided to write additional answers – i.e., equations or graphs. Write your code letter, not name, on all sheets of paper and be sure to turn in these sheets at the end of the exam.

- **If you write your answers by hand**, use the paper provided to write your answers. Again, IDENTIFY YOURSELF BY CODE LETTER, not name, on all pages.

- **In either case**, start each question at the top of a new page.

This Exam has three sections, and you are expected to answer 4 questions

- Answer **AT LEAST ONE** question from each section
  - When finished you should have answered **FOUR** questions, with at least one question from each section and two questions from at most one section.
  - You have four hours to complete this examination.

- This is a closed book exam. No notes, articles, books or other sources may be used. You may not access the Internet for any reason while taking this exam. Accessing the Internet during the exam will result in a failing grade on the exam.
Section A – Financial Economics

This section contains two questions: Question I and Question II.

Answer at least one question from this section, but no more than two.
Financial Economics

Question 1

Popular financial advice for investors concerning portfolio asset allocation decisions encourages risk-averse investors to hold a higher ratio of bonds to stocks. Similarly, investors at different ages are advised to hold different proportions of cash, bonds and stocks (e.g., as the investor ages, the proportion of bonds should increase). These kinds of advice appear to systematically contradict the mutual fund separation theorem as a basic tenet of the Capital Asset Pricing Model (CAPM) and it has been identified as an “asset allocation puzzle” (Canner, Mankiw and Weil, 1997).

a) Carefully state and explain the mutual fund separation theorem, identifying the key underlying assumptions and what the theorem suggests that investors should do.

b) Based on the assumptions underlying the mutual fund separation theorem (and the CAPM), what alternative economic reasons might be cited for the asset allocation puzzle? Are any of these reasons plausible explanations for the puzzle?

c) One argument is that investors do not optimize perfectly (i.e., they are “near rational” in their behavior). What might that mean in the context of portfolio theory? How would you empirically determine if near rationality might provide an explanation for the observed discrepancy between the prediction of the mutual fund separation theorem and popular advice concerning asset allocation?
Question II

In the simplest financial models we assume that decision makers can specify, agree on, and verify states of the world in which they operate and that they know each other’s preferences. With regard to the use of standard debt contracts this becomes problematic when the characteristics of loan applicants are unobservable. For example the possibility of default together with adverse selection for loan applicants with differing riskiness (of investment projects with uncertain returns) may cause a lender to ration credit among seemingly identical customers.

a) Identify and discuss the conflict of interest between borrowers and lenders with regard to choice of contract that is the basis for credit rationing. How might lenders design contracts to address this potential conflict?

b) Now consider a situation where there are multiple firms and a lender cannot distinguish between the two types of firms (i.e., the lender is equally likely to face a firm with project 1 or one with project 2). There are 10 firms with project 1 and 10 firms with project 2 and each project requires $100 of funds to invest. The projects are distinguished by the following return distributions:

<table>
<thead>
<tr>
<th>Probabilities</th>
<th>0.5</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project 1</td>
<td>$100</td>
<td>$180</td>
</tr>
<tr>
<td>Project 2</td>
<td>$60</td>
<td>$220</td>
</tr>
</tbody>
</table>

The lender offers funds at a return of R if firms provide collateral of $40. Draw a diagram showing the expected return of the lender from each of the two projects as a function of R. Show in another diagram the expected profit of each type of firm from its project as a function of R. Determine the aggregate demand function for loans if a firm demands a loan for only positive expected profits.

Suppose that the lender can raise $400 at an interest rate of 20% and another $800 at an interest rate of 50%. Draw a diagram for the supply function of the lender. Now, suppose the lender behaves as a price-taker and offers loan funds at marginal cost. Determine the loan market equilibrium and if credit rationing occurs in this case.

c) Empirical research on credit rationing can take alternative methodological approaches. One approach has been to employ the static farm-household model. The implication of this model is that credit market imperfections (such as credit rationing) lead to: 1) a shadow interest rate that exceeds the market rate, and 2) important interactions between production and consumption activities of the household. One econometric version of this model is a reduced form output supply equation (Petrick, 2004; Feder et al., 1990).

Identify the underlying economic model then discuss the econometric approach to estimation and what the econometric model is expected to show. What criticisms can you cite concerning this econometric model approach?
Section B – Managerial Economics

This section contains two questions: Question III and Question IV.

Answer at least one question from this section, but no more than two.
Managerial Economics

Question III

Banks began adopting automated teller machines (ATMs) in the 1970s as a way to automate banking services. Consider the effect of network effects on the banks' adoption decisions.

a) Briefly describe, in words, why there are network externalities in this industry and how banks' overall size affects their propensity to be early adopters.

b) A bank's decision to adopt ATM technology depends on the flow of benefits and costs from doing so. The per period benefit to a bank customer is represented by \( a + b(N) \), where \( a \) represents network-independent benefits and \( b(N) \) represents the network effect. The network effect term, \( b(N) \), is increasing in \( N \), network size, with \( b(0) = 0 \). If the bank has \( n \) customers, the aggregate per-period adoption value is given by \( n[a + b(N)] \). Assume that the cost to adopt ATMs is given by \( C(N, T) \), which consists of variable costs dependent on network size and fixed costs dependent on \( T \), the time of adoption. Including a growth factor, \( g \), for the benefits provided by ATM technology and a proportionality factor, \( \lambda \), for the share of these benefits captured by the bank, and discount factor, \( \delta \), the net present value of a bank's profits from adopting ATMs at time \( T \) is given by the equation,

\[
\pi = \sum_{t=0}^{\infty} \lambda n[a + b(N)]\delta^t g^{T-t} - C(N, T)
\]

i) Derive the inequality describing when a bank will choose to adopt ATMs at time \( T \) rather than wait until time \( T+1 \). Explain how this inequality shows a network effect and its effects on adoption.

ii) Explain how Saloner and Shepard (1995) use this model to identify an empirical relationship between network effects and banks' propensity to adopt early.

c) How would you adapt this model to examining banks' adoption of internet banking technology?
Question IV

In recent times, patent records have provided a rich source of data for examining the economics of research and development. Describe how economists have used patents and patent citation data to address the following problems, making sure to reference specific published research and provide details on the models and estimation techniques.

a) Estimating the value of patents.

b) Estimating the spillover effects of research and development activities.
Section C – Marketing Economics

This section contains two questions: Question V and Question VI.

Answer at least one question from this section, but no more than two.
Marketing Economics

Question V

The market power versus efficiency debate in industrial organization is long standing. Traditionally, it is argued that concentration in product (or factor) markets may lead to a restriction of output (or input) relative to the competitive level and thereby misallocate resources and result in welfare loss. This may be referred to as the welfare triangle effect of concentration. On the other hand, it has been argue that concentration in product (or factor) markets may lead to a cost-efficiency gain that is more than enough to offset the undesirable welfare loss due to resource misallocations. This may be referred to as the cost-efficiency effect of concentration. Yet, a third argument is that the traditional welfare triangle measure provides only the lower bound of the true costs of market power because, in addition to resource misallocations, there are other “ills” associated with high industry concentration. For example, Hicks suggests that the reduction in competitive pressure in concentrated markets may result in lessened effort by managers to maximize operating efficiency. This may be referred to as the quiet life effect of concentration.

Consider a food-processing industry consisting of $N$ oligopsonistic firms converting a single material input into a final output utilizing a fixed proportions technology. The processing technology also requires a number of non-material inputs, used in variable proportions. To simplify, the firms are assumed to be price takers in their purchase of non-material input markets as well as in their sale of the final output.

a) Within the framework of New Empirical Industrial Organization, present a conceptual model and discuss how you would use the model to empirically estimate the degree of market power exercised by the oligopsonistic firms and how you would measure the welfare triangle effect of concentration.

b) Elaborate in more detail the concept underlying the cost-efficiency effect of concentration. Then, present a procedure for testing the hypothesis within the context of the oligopsonistic food processing firms mentioned in the question statement.

c) Elaborate in more detail the concept underlying the quiet life effect of concentration. Then, present a procedure for testing the hypothesis within the context of the oligopsonistic food processing firms mentioned in the question statement.
Question VI

You are the new dairy marketing economist in the U.S. Department of Agriculture. Your current project is to assess the effects of generic fluid milk advertising programs on milk consumption and on producer welfare. Instead of adopting the traditional advertising sales response models, you would like to entertain the possibility that there exist threshold effects in the sale response of advertising.

a. Elaborate in detail the concept underlying the threshold effect of advertising and discuss how you would mathematically formalize the concept.

b. Discuss in detail how you would estimate the threshold advertising sales response model, while accounting for the carryover and decay effects of the advertising campaign.

c. Discuss in detail how you would simulate the effects of advertising programs on consumption and on producer welfare.