

# **Market and Information Economics**

## **Preliminary Examination**

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**Texas A&M University**

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Instructions: This examination consists of six questions. You must answer the first question and you must answer four of the remaining five questions (i.e. answer four of the questions numbered 2-6). 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 or she 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!

### You Must Answer this Question

1. An industry consists of two firms which can either “collude” or “compete” in each period. Payoffs per period are as follows:

		Firm 2	
		Collude	Compete
Firm 1	Collude	\$50, \$50	-\$10, \$75
	Compete	\$75, -\$10	\$45, \$45

If the firms initially collude, either of them can earn \$25 extra by cheating on the agreement and competing instead. The other firm can retaliate, however, by refusing to collude in subsequent periods.

(i) For how many periods would such retaliation have to last to deter cheating if the interest rate is 0%, so that the firms do not discount future profits?

(ii) Would this minimum retaliation period be longer if the interest rate were positive? Why or why not?

(iii) What is the minimum retaliation period if the interest rate is 10%?

(iv) Is there an interest rate so high that no retaliation ever deters cheating? If so, what is it?

**Answer four of the following five questions**

2. Several demand system models have been widely used in the applied literature. These include the

- i. Almost Ideal Demand System (AIDS) model
  - ii. Quadratic AIDS model (QUAIDS)
  - iii. Rotterdam model.
- a. Briefly describe each of the three models listed above and theoretical restrictions that must be satisfied for the models to be consistent with the consumer theory. Discuss the advantages and disadvantages of using these models in demand estimation.
  - b. There are several ways to incorporate demographic variables into demand systems. If you were asked to include demographics in the demand system model then how would you do it and why? Choose one of the models listed above and describe your steps.
  - c. The recently proposed Exact Affine Stone Index (EASI) demand system is shown to overcome some of the limitations of the existing methods used in demand estimation, while maintaining the simplicity of the AIDS model. Describe at least three of the appealing properties of the EASI model and compare those to properties of the AIDS model.

3. A sample of  $N$  respondents have to choose among  $J$  available alternatives during  $T$  choice situations. The utility person  $n$  derives from choosing alternative  $j$  on choice situation  $t$  is given by  $U_{njt} = \beta'_n x_{njt} + \varepsilon_{njt}$ . The density for  $\beta$  is denoted as  $f(\beta|\theta)$  where  $\theta$  represents the distribution parameters. The unconditional choice probabilities of person  $n$  choosing  $i$  on occasion  $t$  are:

$$P_{ni} = \int \frac{e^{\beta' x_{ni}}}{\sum_{j=1}^J e^{\beta' x_{nj}}} f(\beta|\theta) d\beta$$

In order to get credit, please make sure you provide an explanation to support your answers.

- a) Propose a way to estimate  $P_{ni}$
- b) Is the proposed estimator of  $P_{ni}$  unbiased?
- c) In terms of the properties of  $P_{ni}$ , what is the range of values  $P_{ni}$  can take? How can the  $Var(P_{ni})$  be reduced?
- d) What would be the log-likelihood function to estimate the parameters associated with  $P_{ni}$ ?
- e) Is the log-likelihood estimator in (d) unbiased? Is it consistent?

4. You have been asked by the USDA, Economic Research Service to submit a proposal on the trade liberalization (reduction in tariffs and other barriers to trade) in dairy products associated with recent Trans-Pacific Partnership. The goal of this proposed agreement is to secure trade benefits to citizens of member countries. Design a theory to isolate such benefits and design an empirical study to estimate such effects. You do not have to specify all signatory countries, but do address the US as one country and the rest of the world as another. Be sure to discuss your empirical methods, the type of data you will need and the expected results from your study.

Do your methods require you to address whether your data are observational or experimental? If your data are observational what methods will you use? If your data are experimental, comment on the external validity of your results.

5. The mayor of College Station is considering replacing air conditioning (AC) units in government buildings with high efficiency AC units. The mayor has asked you to consult on this project. The mayor wants to know the causal effect of high efficiency AC units on electricity consumption. To answer this question, she plans to install high efficiency AC units in the oldest government buildings. She hopes to estimate the causal effect by comparing average energy consumption in buildings with the high efficiency units to consumption in buildings without these units.
  - a. Explain to the mayor how, if at all, her proposed experiment differs from the ideal field experiment to estimate the effect of high efficiency AC units on energy consumption. Compare, using the potential outcomes framework, the causal effect estimate from the mayor's experiment to the causal effect estimate in your ideal experiment.
  - b. The mayor relents and allows you to run your ideal field experiment. Once the experiment is over, you find out that some building managers didn't like the new AC units and replaced them with the old units during the experiment. Provide a detailed explanation to the mayor, again using the potential outcomes framework, what can still be learned from this experiment, even when the building managers took this action.
  - c. How does your answer to (b) change if you also found out that some building managers in the control group purchased and installed high efficiency AC units during the experiment?

6. In 2010, the mayor of College Station purchased new low-efficiency air conditioning (AC) units for all government buildings. The seller accidentally included a few high efficiency AC units in the shipment to College Station. Each government building was outfitted with either a high or low efficiency AC unit. You are given a panel data set daily energy consumption for all government buildings from 2005-2015, along with a dummy variable indicating whether the building had a high efficiency unit installed.

Choose two methods we discussed in class and describe how you would use each method to estimate the causal effect of high efficiency AC units on energy consumption. For each method, you should clearly explain (at a minimum):

- a. your motivation for choosing the method,
- b. the necessary assumptions and (how you would determine whether those assumptions are plausible)
- c. the estimation procedure
- d. any concerns you would have about the estimate