Assignment: Estimating Demand (Aggregate Data)

Industrial Organization

Ketchup

This problem is based on the data posted here for ketchup purchases made by a set of households in two US markets. More information about the data can be found here. We will focus on households in market 1.

We will upload our cleaned version of the data for this assignment. We recommend using these files for your analysis. If you prefer to do the data cleaning yourself, you may use any package you like (e.g., Stata) to clean the data, and you do not need to submit your data cleaning code. In your solutions, please describe the main decisions you made in preparing the data for analysis, should you decide to do it yourself.

Please do all analysis using MATLAB (or R or python if you prefer).

Suppose that for each household i in week t the utility from purchasing ketchup brand j is given by

$$u_{ijt} = \alpha_j - \beta_i p_{jt} + \xi_{jt} + \varepsilon_{ijt} \tag{1}$$

where p_{jt} is the per-unit price, ξ_{jt} is an aggregate preference shock, and ε_{ijt} is an individual preference shock distributed i.i.d. type-1 extreme value conditional on p_{jt} and ξ_{jt}. (There is no outside option.) Let $\tilde{p}_{jt}$ be the per-unit price of brand j in week t in market 2. Let p_t and $\tilde{p}_t$ be $J-$vectors of the corresponding prices.

Estimate the model under each of the following sets of assumptions. Report the parameter estimates and the matrix of own- and cross-price elasticities for each specification.

1. $E\left(\xi_{jt}|p_t\right) = 0 \ \forall j,\ \beta_i = \beta \forall i$

2. $E\left(\xi_{jt}|\tilde{p}_t\right) = 0 \ \forall j,\ \beta_i = \beta \forall i$

3. $E\left(\xi_{jt}|p_t\right) = 0 \ \forall j,\ \ln \beta_i \sim N\left(\mu, \sigma^2\right)$

For specification 3, briefly explain what you did to convince yourself that your code delivers a valid solution.

Cars

There is a unit mass of consumers each of whom must buy a car. There are two classes of cars, sports cars and family cars, each of which is produced at constant marginal cost. Within each

class there are two brands. Each brand is produced by a separate firm. Firms set prices in a static Bertrand-Nash equilibrium.

Market shares and prices are as follows:

Class	Brand	Market share	Price ($1000)
Sports	1	0.1	50
Sports	2	0.1	50
Family	3	0.4	30
Family	4	0.4	30

A researcher believes that consumer i's utility for a car from brand j is given by

$$u_{ij} \quad = \quad \alpha - \beta p_j + \varepsilon_{ij} \tag{2}$$

$$\varepsilon_{ij}|p_j \quad \overset{iid}{\sim} \quad T1EV.$$

1. What is the researcher's estimate of β?

2. Evaluate the fit of the researcher's model to the data.

3. What is the researcher's estimate of the marginal cost of each class and brand?

4. The researcher is asked to predict the effect on prices of two possible mergers. The first is a merger between the owners of brands 1 and 2. The second is a merger between the owners of brands 1 and 3. Write out the system of equations that the researcher needs to solve in order to predict equilibirum prices in each case.

   Now suppose that in reality there are two kinds of consumers. Share 0.2 of consumers are sporty types who will only consider purchasing a sports car. Share 0.8 of consumers are family types who will only consider purchasing a family car. For each type of consumer, utility among the brands considered follows (2).

5. What are the correct predictions for the effects of the two possible mergers on prices?