Problem Set 2 -Measuring Market Power-

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Remarks

1. Use A4 report papers, staple them in the upper left corner.
2. Type your answer.
3. You can form a study group up to 3, and submit a solution as a group. If you do this, please put names and student IDs of all members.
4. Attach the print of your programming code for empirical exercise as an appendix.

Question 1

Assume that you have the following time series data for a particular product sold by several competing firms: average sales price P_t, aggregate quantity sold Q_t, and an exogenous "demand shift" variable Z_t. However, no cost or factor price data are available. Suppose that the demand curve is given by

$$Q_t = \alpha_0 + \alpha_1 P_t + \alpha_2 Z_t + u_t, \tag{0.1}$$

where u_t is unobserved demand shock.

(a) Can you estimate parameters in demand function (0.1) in this setting? Explain.

(b) Suppose that marginal cost function is written by the form $MC_t = c_0 + c_1 Q_t + e_t$, where e_t is unobserved supply shock. Write down the supply relationship using the conduct parameter θ.

(c) Under what assumptions could you determine whether the industry is perfectly competitive or imperfectly competitive (price greater than marginal cost)? Also explain how you would conduct this analysis.

Question 2

A researcher is interested in estimating whether the corn syrup industry is collusive or not. The researcher has time series data on monthly corn syrup prices, P_t, collected for several years. The researcher believes that the inverse demand function takes the following form in any month t:

$$P_t = a_0 + a_1 Q_t + a_2 S_t + e_t, \tag{0.2}$$

where Q_t is the quantity of corn syrup sold, S_t is the price of sugar (a substitute for corn syrup), and e_t is unobserved (by the researcher) demand shock. All sugar is imported at a regulated price set by the government.

Suppose that the researcher believes that the marginal cost of producing corn syrup is $MC_t = c_0 + c_z Z_t + u_t$, where Z_t is a supply shock such as factor prices and u_t is unobserved shock (error term). The researcher has data on Z_t, but has no information about c_0 and c_z.

(a) How would the researcher specify the supply relationship as a function of the degree of collusion (i.e., conduct parameter) θ?

(b) Using equation (0.2) and your answer in (a), how would the researcher estimate the conduct parameter θ?

(c) Now suppose that the researcher believes that marginal cost is determined by $MC_t = c_0 + c_z Z_t + c_1 Q_t + u_t$. Can the researcher estimate the conduct parameter θ? Explain.

(d) Suppose that the extent to which the industry is collusive takes on two values, so that the extent of collusion differs in the winter and summer (where both comprise six months). However, c_0, c_z and c_1 are the same in both summer and winter. Further, the researcher believes that the industry is perfectly collusive in the winter. Can the researcher identify the extent to which the industry is collusive in the summer? If so, explain how to do this.

Question 3

This question is based on Porter (1983, Bell journal of Economics). You can download the dataset from the class website.

(a) Replicate Table 2 in Porter (1983).

(b) Replicate 2SLS results of Table 3 in Porter (1983). [Hint] The monthly dummies are used in estimation. Please use "quasi_month" variable in the dataset.

(c) (Optional) Replicate full results (MLE with endogenous switching) of Table 3 in Porter (1983). Point estimates would be good enough.

Note: You may not be able to obtain the exactly same numbers as in Porter (1983), though your results should be sufficiently close to the ones in the paper.