Problem set 2:

Imperfect Information and Search Models

Question 1.

Consider a market for a homogenous product with M identical stores, where M is determined by free entry. Each store has a cost function $C(q) = 4+q$, for q less or equal to 4 and $c(q) = \infty$ for $q > 4$ (in other words, each store can sell up to 4 units and its cost of selling the first q units is $4+q$). There are L consumers in the market, each of whom wishes to buy up to 1 unit and is willing to pay for it up to $r = 5$. Suppose that a fraction α of all the consumers is fully informed about the prices that the different stores charge. The remaining $(1-\alpha)L$ consumers are uninformed and have to pay a cost s in order to learn the prices that different stores charge. If an uninformed consumer does not pay s, he/she knows only the distribution of prices but not the actual prices charged by each store. Such a consumer then picks a store at random. However, once an uninformed consumer pays s, he/she becomes completely informed and knows all prices charged by all stores.

(a) Compute the marginal and average costs of stores.

(b) Suppose that $s = 0$. Solve for the long-run competitive equilibrium in the market: What are the total number of firms, price and individual quantities in equilibrium?

(c) Now suppose that $s > 0$. Prove that there can be at most 2 prices in a Nash equilibrium.

(d) Assume that there are two prices being charged in equilibrium. What is the low price, pl? Given your answer, compute the high price, ph (hint: assume that a fraction λ of all stores charge pl and a fraction 1-λ charge ph and use the condition that ensures that uninformed consumers do not find it worthwhile to search).

(e) Compute the demand faced by low and high price stores (note that uninformed consumers pick stores at random so each stores gets an equal share of the $(1-\alpha)L$ uninformed consumers; informed customers are indifferent among all stores that charge low prices, so each one of these stores gets an equal share of the αL informed consumers).

(f) Use your answers in (d) and (e) to express the zero profit conditions for high and low price stores (recall that there is a free entry so in equilibrium, each store must earn a zero profit).

(g) Solve the conditions you wrote in (f) for λ and M.

(h) How do the equilibrium values of λ and M vary with s? Explain the intuition for your result.

Repeated Games and Collusion

Question 2.

Two firms compete in a market for a homogenous product. In this market, there are $N > 0$ consumers; each buys one unit if the price of the product does not exceed k, and nothing otherwise. Consumers buy from the firm selling at the lowest price. In case both firms charge the same price, assume N/2 consumers buy from each firm. Assume zero production cost for both firms.

a. Find the Bertrand equilibrium prices for a single-shot game, assuming firms choose their prices simultaneously.

b. Now suppose the game is repeated infinitely. Let $\delta \in (0,1)$ denote the discount factor. Propose trigger price strategies for both firms yielding the collusive prices of (k, k) where $k>0$ each period. Calculate the minimal δ that would enforce the trigger price strategies that you proposed.

c. Now suppose that the unit production cost of firm 2 is $c2$, $k > c2 > 0$, but the unit cost of firm 1 remains zero. Find the Bertrand equilibrium prices for the single-shot game.

d. Assuming the new cost structure, propose trigger price strategies for both firms yielding the collusive prices *(k, k)* each period, and calculate the minimal value of δ that would enforce these strategies.

e. Conclude whether it is easier for firms to enforce the collusive prices when there is symmetric industry cost structure, or when the firms have different cost structures. Explain briefly.