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Problem Set #7

Due November 28, 2001

1. The first half of Chevalier's paper is an event study which estimates a regression of the form

$$R_{it} = \alpha_i + \beta_i Rm_t + \sum_j (\gamma_j x_{ij} + \delta_j(1 - x_{ij}))D_{jt} + \epsilon_{it},$$

where R_{it} is the return on a stock, Rm_t is the return on the stock market, D_{jt} is a dummy variable set equal to one for the thirty day period prior to a supermarket firm j announcing that it was undertaking an LBO, and x_{ij} is a measure of whether firms i and j are competitors.

(a) What assumptions about stock market valuations are necessary for this event study methodology to identify the effects of an LBO on a firm's rivals?

(b) What assumptions is Chevalier making about the equality of certain coefficients to avoid the problem of having only one data point on the return of each rival chain every time an LBO occurs? Why does she interact D_{jt} with x_{ij} and $1 - x_{ij}$? Can you suggest controls that would work better than her x_{ij} and $1 - x_{ij}$?

(c) In her event study Chevalier finds that two of the four $\hat{\gamma}_j$ are positive and significant and interprets this as evidence that LBO's soften competition. Why might one argue that one should be testing whether $\hat{\gamma}_j - \hat{\delta}_j$ is significant? Would such a test have provided significant results?

2. Tirole review exercise 35

3. Consider the following four stage game involving two firms. Initially firm 1 is a monopolist. In the first stage, it sets price p_1 and receives profits $\pi_1^1 = (p_1 - c)D(p_1)$. The demand function is initially unknown to the firms. They share a common prior, believing that demand is $\overline{\theta}d(p)$ with with probability q and $\underline{\theta}d(p)$ with probability $1 - q$. Assume $\overline{\theta} > \underline{\theta}$. Demand is the same in both periods of the game. Firm 1 learns the true value of θ after the first stage. Firm 2, however, does not observe firm 1's demand.

In the second stage firm 1 has the option of bulding a fire with \$100 bills so that he may reduce his profits to any level he likes. At the end of the second stage firm 1 is required by law to disclose its remaining profits (but not the amount of money it burned).

In the third stage firm 2 may enter the market at a cost of $E > 0$.

Finally in the fourth stage the firms compete earning profits $\pi_1^m(\theta)$ and 0 if firm 2 didn't enter and $\pi_1^D(\theta)$ and $\pi_2^D(\theta)$ if firm 2 did enter.

(a) If $q\pi_2^D(\overline{\theta}) + (1 - q)\pi_2^D(\underline{\theta}) > E$, show that there is no perfect Bayesian equilibrium where firm 1 burns $(\overline{\theta} - \underline{\theta})d(p_1)$ in the high demand state to pretend that it is low demand state.

(b) Find sufficient conditions for the existence of a separating PBE where firm 1 burns money only when demand is low. How does the welfare analysis of such an equilibrium differ from that of Fudenberg and Tirole's signal-jamming model.

4. Consider a two period model of limit pricing under incomplete information where an incumbent produces an observable level of output in period 1, and a potential entrant may enter in period

2 conditional on the observed period 1 output of the incumbent. The incumbent has a constant marginal cost of either c_1 or c_2 where $c_2 > c_1$. The potential entrant does not observe the incumbent's marginal cost, but knows that if he enters his marginal cost wil be identical to that of the incumbent. Entry involves a sunk fixed cost of E. Upon entering the entrant learns his marginal cost and the two firms engage in Cournot competition. The inverse demand curve in each period is $P(Q) = a - bQ$, where Q is the total output in that period. The discount factor of the incumbent is δ. Assume that

$$\frac{(a-c_1)^2}{9b} > E > \frac{(a-c_2)^2}{9b}$$

and that

$$(a - bq_2^m - c_1)q_2^m + \delta(a - bq_1^m - c_1)q_1^m > (a - bq_1^m - c_1)q_1^m + \delta\frac{(a-c_1)^2}{9b}$$

where $q_i^m = \frac{a-c_i}{2b}$.

What is the set of separating Perfect Bayesian Equilibria for this model? What is the effect of signaling on first-period welfare? How does this compare to Milgrom and Roberts' results.

5. Consider a two period version of the chain store game. At $t = 1$ an incumbent monopolist faces a potential entrant E1 in market 1. They play a two stage game where the entrant first chooses to enter or stay out, and then if the entrant enters the monopolist must choose to accomodate or fight. At $t = 2$ a second potential entrant E2 (who has observed the play at $t = 2$) plays the same game against the incumbent monopolist in a second market.

Assume that each entrant gets a payoff of 0 if he stays out, $b > 0$ if he enters and is not fought, and -1 if he enters and is fought. Assume that the incumbent has one of two possible types. With probability $1 - p$ the incumbent is "rational". The rational type's expected payoff is the sum of his payoff in the two periods. His payoff in each period is $a > 1$ if the entrant stays out, 0 if the entrant enters and he does not fight, and -1 if the entrant enters and he fights. With probability p the incumbent is crazy and has fighting as a strictly dominant strategy.

Find the PBE of this game when $p \in (0, \frac{b}{b+1})$. What is the probability that we observe a case of successful "predation", with the incumbent fighting at $t = 1$ and the potential entrant at $t = 2$ deciding not to enter?