Information Economics, Spring 2013
Homework 4b

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Note 1. This homework is due ***8:30 am, October 28, 2013***. Please submit a hard copy into the instructor's mail box. As each team only needs to submit one copy, please indicate the names and student IDs of all team members on the first page.

Note 2. Each team must have ***exactly three*** students unless a special approval is obtained.

1. (20 points) In Taylor and Xiao (2009), the retailer makes the forecasting decision after the manufacturer makes the offer and before he chooses a contract. Suppose the retailer now makes the forecasting decision before the manufacturer makes the offer. Also suppose that whether the retailer does forecasting is observable. In this case, however, the demand signal observed by the retailer is private.

   (a) (5 points) Suppose the retailer does not forecast. Find the manufacturer's optimal offer, the retailer's optimal response, and their equilibrium payoffs. If there are multiple optimal offers or responses, describing one is enough as long as you show that it is indeed optimal.

   (b) (10 points) Suppose the retailer forecasts. Find the manufacturer's optimal offer, the retailer's optimal response, and their equilibrium payoffs. If there are multiple optimal offers or responses, describing one is enough as long as you show that it is indeed optimal.

   (c) (5 points) Combining your answers in Parts (a) and (b), should the retailer forecast or not? If it depends, find conditions for the retailer to prefer either option.

2. (10 points) In Pasternack (1985), a contract with full returns with full credits is inefficient. Why in Taylor and Xiao (2009) the full-returns contract is efficient? Find the differences between the two contracts and intuitively explain why one is efficient but the other one is not.

3. (20 points) Consider a supply chain with a manufacturer and a newsvendor retailer. The unit production cost is c, unit sales revenue is p, and random demand follows a uniform distribution between $\mu - r$ and $\mu + r$. Here we refer to r as the retailer's forecasting accuracy: The larger r is, the less accurate the retailer is. The manufacturer offers a wholesales price w to the retailer. The retailer then chooses an order quantity q. Both firms are expected profit maximizers.

   (a) Suppose the two firms integrate to find a production quantity that maximizes the expected system profit. Prove or disprove that as the retailer becomes more accurate (r decreases), the system is better off.

   (b) Suppose the two firms do not integrate. In this case, prove or disprove that the manufacturer is better off when the retailer becomes more accurate.

   Note 1. To disprove the statement, you need to find a counterexample by finding values of c, p, μ, r_1, and r_2, where $r_2 < r_1$ and the manufacturer's expected profit is strictly lower with r_2.

   Note 2. Note that in both problems, the players' equilibrium decisions (i.e., the optimal q and w) will change when r changes. You cannot fix their decisions!

References

Pasternack, B. 1985. Optimal pricing and return policies for perishable commodities. *Marketing Science* **4**(2) 166–176.

Taylor, T., W. Xiao. 2009. Incentives for retailer forecasting: rebates vs. returns. *Management Science* **55**(10) 1654–1669.