Information Economics, Fall 2016
Pre-lecture Problems 7

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Note 1. The deadline of submitting the pre-lecture problem is **9:20am, October 31, 2016**. Please submit a hard copy of your work to the instructor in class. Late submissions will not be accepted. Each student must submit her/his individual work. Submit ONLY the problem that counts for grades.

Note 2. Please make your answer as clear (i.e., easy to read) as possible. We reserve the right to take away points when the correctness cannot be easily determined (e.g., when the writing is messy and cannot be easily understood).

1. (0 points) Consider the manufacturer's contract design problem by assuming that the retailer does not have an option of doing forecasting. In this case, suppose that the manufacturer offers neither rebates nor returns. The manufacturer's problem will be

$$\max_{q \geq 0, t} \quad t - cq$$
$$\text{s.t.} \quad p\mathbb{E}\min\{q, D\} - t \geq 0.$$

The objective function is to maximize the manufacturer's profit. The constraint is to ensure that the retailer will make nonnegative profit in expectation.

  (a) Show that the manufacturer can design a contract to achieve channel coordination and extract all the surplus. What is the optimal contract?

  (b) Convince yourself that the manufacturer can still do that by offering a rebate or return. Does a rebate or return contract makes the manufacturer strictly better off?

2. (0 points) Consider the manufacturer's contract design problem to induce forecasting, which is formulated on page 24 of the slides. Consider the last three constraints, which are two IC constraints and one IR constraint.

  (a) Explain to yourself why the LHS of the three constraints is the expected profit of the retailer if he forecasts. In particular, why the two arguments for $R^r(\cdot, \cdot)$ are the same?

  (b) Explain to yourself why the RHS of the IR constraint should be 0.

  (c) Explain to yourself why we have two IC constraints. In particular, why the RHS of the two IC constraints are different? What do they mean?

3. (10 points; 5 points each) Consider the manufacturer's contract design problem of inducing no forecasting with a return contract (the one described on pages 33 and 34 in the slides or Section 6.1 in the paper).

  (a) Formulate the manufacturer's contract design problem.

  (b) Prove that (q_N^I, p, pq_N^I) is an optimal contract.