



Microeconomics I

Undergraduate Programs in Business Administration and Economics

Academic year 2011-2012

Second test

1st Semester

January 11, 2012

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NOTES:

- 1. Duration: 2:30 hours.*
- 2. Different groups must be answered in separated sheets.*
- 3. The use of (non-graphical) calculators is allowed.*
- 4. This is a closed book and closed notes test.*
- 5. GOOD LUCK.*

I (4.5 points)

Firms X and Y form a duopoly of a homogeneous good. Both firms have marginal costs of 3 and no fixed costs. The market demand function is given by $D(p) = (9 - p)/2$.

a) (1.5 points) Determine the quantities of the Cournot equilibrium. What are the equilibrium price and the profits of each firm?

b) (1.5 points) Firm X has the possibility of investing in a new production technology, which would reduce its marginal cost to 2. However, if firm X decides to invest, firm Y will know it and will decide faster taking the lead in this quantity setting duopoly. Should firm X invest?

c) (1.5 points) The Competition Authority (CA) is sure that in the long-run both firms will adopt the new technology. Concerned with the firms' market power, the CA is considering imposing that both firms are divided in n firms, so that in the equilibrium the price does not exceed 1.5 of the cost. How much should n be?

II (4.5 points)

Consider the following description of the payoffs of a game:

- Each player must choose between the actions L and R ;
- If both players choose L , player A will get 3 and player B will get 2;
- If both players choose R , player A will get 2 and player B will get 1;
- If player A chooses L and player B chooses R , both players will get 0;
- If player A chooses R and player B chooses L , player A will get 4 and player B will get 0.

a) (1.5 points) Represent the payoff matrix of the game, and identify the Nash equilibria.

b) (1.5 points) Suppose now that the players play in sequence: first player A then player B. Determine all Nash equilibria. If you obtain more than one equilibrium, is there any reason to consider that one of them is more likely? Why?

c) (1.5 points) Imagine now that the payoff of player A, when both players choose L , is x . If the players play the simultaneous choice game infinitely, what is the interval for x that generates (L, L) as a subgame perfect equilibrium of the repeated game.

III (5.0 points)

Consider the problem of an investor that has an amount of X to invest. He may invest it in a safe asset that generates in one year $1.05X$ or invest it in a risky asset which might generate in one year $1.1X$, with known probability p , but may generate 0, with the remaining probability. This investor has an utility function $U(w) = \sqrt{w}$, and assume that the discount factor is 1.

a) (1.5 points) If the investor must invest in one of the assets only, which asset should he select?

b) (2.0 points) Suppose now that the investor can invest in both assets. Identify the optimal investment for this investor.

c) (1.5 points) Suppose now that the probability p depends on some actions taken by a second agent that can not be observed by the investor. What type of problem of asymmetric information is this and why? How can this affect the optimal investment policy?

IV (6.0 points)

a) (2.0 points) “In the equilibrium of a monopolistically competitive market there are more firms than there would be if all firms produce with the minimum average cost.” Comment.

b) (2.0 points) Describe the dominant firm model and the equilibrium it predicts in a market.

c) (2.0 points) Explain why in private value auctions when bidders are risk averse, the English auction yields a lower expected revenue to the seller than the first price auction.



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I (4.5 points)

Firms X and Y form a duopoly of a homogeneous good. Both firms have marginal costs of 3 and no fixed costs. The market demand function is given by $D(p) = (9 - p)/2$.

a) (1.5 points) Determine the quantities of the Cournot equilibrium. What are the equilibrium price and the profits of each firm?

Solution: Firm X will solve the problem:

$$\text{Max } (9 - 2(q_X + q_Y))q_X - 3q_X.$$

Firm Y will solve a similar problem. These lead to the equilibrium conditions $q_X = q_Y = 1$, and so $p = 5$ and $\pi_X = \pi_Y = 2$

b) (1.5 points) Firm X has the possibility of investing in a new production technology, which would reduce its marginal cost to 2. However, if firm X decides to invest, firm Y will know it and will decide faster taking the lead in this quantity setting duopoly. Should firm X invest?

Solution: If it invests, firm X will be a follower in a Stackelberg duopoly. Its problem will be:

$$\text{Max } (9 - 2(q_X + q_Y))q_X - 2q_X.$$

leading to $q_X = (7 - 2q_Y)/4$. Then firm Y will solve the problem:

$$\text{Max} \left(9 - 2 \left(\frac{7 - 2q_Y}{4} + q_Y \right) \right) q_Y - 3q_Y$$

with the solution $q_Y = 5/4$. So, $q_X = 9/8$, $p = 17/4$, and $\pi_X = 81/32$. So, the cost of the investment does not exceed $17/32$, the investment should be made.

c) (1.5 points) The Competition Authority (CA) is sure that in the long-run both firms will adopt the new technology. Concerned with the firms' market power, the CA is considering imposing that both firms are divided in n firms, so that in the equilibrium the price does not exceed 1.5 of the cost. How much should n be?

Solution: To get the target price cost margin the equilibrium price needs to be $p = 3$, and so the total quantity will also be 3, and the elasticity 0.5. Using the equilibrium condition $(p - c)/p = -1/(2n\varepsilon)$ one concludes that $n = 3$.

II (4.5 points)

Consider the following description of the payoffs of a game:

- Each player must choose between the actions L and R ;
- If both players choose L , player A will get 3 and player B will get 2;
- If both players choose R , player A will get 2 and player B will get 1;
- If player A chooses L and player B chooses R , both players will get 0;
- If player A chooses R and player B chooses L , player A will get 4 and player B will get 0.

a) (1.5 points) Represent the payoff matrix of the game, and identify the Nash equilibria.

Solution: The payoff matrix is the following:

		Player B	
		L	R
Player A	L	3,2	0,0
	R	4,0	2,1

This game has a unique Nash equilibrium: (R, R) .

b) (1.5 points) Suppose now that the players play in sequence: first player A then player B. Determine all Nash equilibria. If you obtain more than one equilibrium, is there any reason to consider that one of them is more likely? Why?

Solution: The payoff matrix in this case will be:

		Player B			
		(L,L)	(L,R)	(R,L)	(R,R)
Player A	L	3,2	3,2	0,0	0,0
	R	4,0	2,1	4,0	2,1

This game has two Nash equilibria: $(L,(L,R))$ and $(R,(R,R))$. The equilibrium $(L,(L,R))$ is more reasonable as it is the subgame perfect equilibrium.

c) (1.5 points) Imagine now that the payoff of player A, when both players choose L , is x . If the players play the simultaneous choice game infinitely, what is the interval for x that generates (L,L) as a subgame perfect equilibrium of the repeated game.

Solution: Then $x \geq 2(2 - \delta)$.

III (5.0 points)

Consider the problem of an investor that has an amount of X to invest. He may invest it in a safe asset that generates in one year $1.05X$ or invest it in a risky asset which might generate in one year $1.1X$, with known probability p , but may generate 0, with the remaining probability. This investor has an utility function $U(w) = \sqrt{w}$, and assume that the discount factor is 1.

a) (1.5 points) If the investor must invest in one of the assets only, which asset should he select?

Solution: He should invest only in the riskless asset if:

$$\sqrt{1.05X} > p\sqrt{1.1X} \Leftrightarrow p < \sqrt{1.05/1.1}.$$

b) (2.0 points) Suppose now that the investor can invest in both assets. Identify the optimal investment for this investor.

Solution: The optimal investment will result from:

$$\text{Max } p\sqrt{1.1(1-\alpha)X} + \sqrt{1.05\alpha X}.$$

$$\text{leading to } \alpha = \frac{1.05}{1.05 + 1.1p^2}.$$

c) (1.5 points) Suppose now that the probability p depends on some actions taken by a second agent that can not be observed by the investor. What type of problem of asymmetric information is this and why? How can this affect the optimal investment policy?

Solution: This is a problem of moral hazard. It may affect the optimal investment as the probability will be chosen by the agent to his own interest. In particular, if higher values of the probability has more costly to the agent, this alternative asset may be of no interest.

IV (6.0 points)

a) (2.0 points) “In the equilibrium of a monopolistically competitive market there are more firms than there would be if all firms produce with the minimum average cost.” Comment.

Solution: If the firms produced with the minimum average cost each of the firms would produce more than in the monopolistically competitive equilibrium. However the price would be smaller, and so global demand would be larger. Therefore, it does not seem possible to say, in general, whether there would be more or less firms.

b) (2.0 points) Describe the dominant firm model and the equilibrium it predicts in a market.

Solution: The slides of the lectures provide a detailed description.

c) (2.0 points) Explain why in private value auctions when bidders are risk averse, the English auction yields a lower expected revenue to the seller than the first price auction.

Solution: If bidders are risk neutral the two auctions yield the same expected revenue. The equilibrium bid in the English auction does not depend on the bidder's position towards risk. To the contrary, in the first price auction risk averse bid higher than would risk neutral bidders, so reducing the uncertainty they face. Hence, the result.