

UCSD
Economics 170B
Final

June 15, 2001
Professor J. Betts

DO NOT BEGIN OR TURN THE PAGE UNTIL TOLD TO

Please print: Name: _____
 Student # _____

1. You may use pencil instead of pen if you wish, but exams cannot be submitted for re-marking unless you used pen.
2. You must hand in all materials, including paper used for rough work.
3. Show all of your work.

There is a total of 94 points on this test. This includes 2 bonus points, so that theoretically you could obtain 94/92 or about 102% on this exam. You have three hours to finish the exam

Good luck!

For graders' use:

Question		Out of a Total of:
1		14
2		9
3		4
4		16
5		15
6		18
7		6
8		6
9		6
TOTAL		/94 (graded out of 92)

1. **(14 points)** Suppose that the oil industry is an n -firm oligopoly, $n > 0$. All n firms are identical with marginal cost of production = c . Assume that overall oil demand is $P = a - bQ$, where $a > 0$, $b > 0$.

a) Derive the profit-maximizing production levels q_1^* through q_n^* that obtain in the Cournot equilibrium, as well as total output Q^* and price P^* . **In this and later questions you must show your work and explain what you are doing to obtain full credit.**) (6 points)

b) Suppose that the n firms form a cartel, and operate like a single monopoly. Derive total output Q^* and price P^* in this situation. (2 points)

c) Prove

i) that as n goes up, Q^* goes up and P^* goes down,

ii) that as $n \rightarrow \infty$ Q^* and P^* approach the outcome that would occur with perfect competition, and

iii) that when $n = 1$ the outcome becomes the same as the result with the cartel. (6 points)

2. (9 points) a) Two firms are competing as a duopoly in a market for X, a certain type of clothing currently popular with teenagers. No other firms can enter the market, but both firms know that the market for good X will disappear after this season, because teenagers' tastes change constantly. Therefore the two firms play a one-time game, choosing production levels for X. Here is the payoff table:

		Firm 2	
		Hi	Lo
Firm 1	Hi	0,0	10,-3
	Lo	-3,10	8,8

So, for instance, both firms can get profits of 8 by setting supply to low, driving up prices. Derive the Nash equilibrium of the game. (4 points)

b) Is this an example of a Prisoner's Dilemma? (Yes or no, no explanation needed). (1 point)

c) Now consider the market for sport jackets with leather elbow patches. There are two firms that compete in this sub-industry, and the payoff table is identical to the table from part a. Because there is always going to be demand for this type of clothing (from professors who actually think it looks cool) the firms know that they will be competing every year forever against each other.

Firms maximize the sum of returns across periods, without discounting. Consider a tit-for-tat strategy in which firm i plays Lo initially and continues to do so until firm j plays Hi . If the other firm plays Hi , then firm i retaliates by playing Hi for one period, and then reverts to Low , until the other firm plays hi again. Show that this tit-for-tat strategy will lead to an equilibrium in which both firms always play Hi . (Hint: Show what happens if a firm tries to cheat once.) (4 points)

3. (4 points) a) What is the method of “direct elicitation” mentioned in the textbook chapter on benefit-cost analysis? In what circumstance would you need to use this method? (2 points)

b) List one advantage and one disadvantage of this method. (2 bonus points)

4. (16 points) Suppose that a person has a utility function that depends on income Y as follows:

$$U = Y^{1/2}$$

This person has a 50-50 chance of being healthy, in which case his income is 16, and being sick, in which his income drops to 9.

a) Is this person risk-averse, risk-loving, or risk-neutral? Explain why using math if necessary. (2 points)

b) What is the person's expected utility? (2 points)

c) What is the person's expected income and certainty equivalent? (4 points)

d) An insurance company is willing to insure the person against becoming ill, so that it pays him 7 if he becomes sick. What is the maximum that the person would be willing to pay for this insurance? What is the expected profit that would result for the insurance firm? (8 points)

5. (15 points) Your company can generate revenues of \$200 million by buying exclusive rights to a drug recently patented by Firm A.

Firm A has decided to sell rights to the patent, and will begin in period 1 by setting a price of \$160 million. If it finds no bidders after period 1 then in period 2 it will reduce the price to \$140 million. If it still can't find somebody willing to pay this price, then in period 3 it will reduce its price to \$100 million.

You must decide between the decisions to buy the patent or wait in periods 1 and 2.

Your corporate acquisitions department advises you that you can buy this product for \$160 million today with probability 1. But if you wait until period 2, when the price falls, there is only a probability 0.8 that the drug patent will **not** have been sold to another firm. If you wait until period three, the probability that the patent will **not** have been sold will fall to 0.5.

Draw a decision tree to determine whether you should wait or buy in periods 1 and 2. Also, show your calculations for each step. *(There is a blank page over leaf for the decision tree. You can use the space below for explanations/calculations.)*

6. (18 points) You run a southern California real estate development company, Pave-it-All, and must decide whether to build 100 new McMansions or 50 McMansions this quarter. Based on past experience, you believe that there is a 0.8 probability chance that the economy will “boom” (that is, do well) and a 20% chance that it will “tank” (that is, do poorly). Your profits are as follows:

		Economy	
		Boom (B)	Tank (T)
Number of houses to build:	100 McMansions	200	-150
	50 McMansions	80	20

a) Calculate the expected profit from building either 100 or 50 houses. Which number of houses should Pave-it-All build? (Your company is risk neutral.) (3 points)

b) Suppose that Pave-it-All is approached by Ace Forecasting, which gives you evidence that in its 100 last forecasts for the local economy it has received Positive (P) predictions (that is, optimistic predictions) 60% and negative (N) predictions 40% of the time as follows:

		Economy	
		Boom (B)	Tank (T)
Economic forecast by Acme::	Positive (P)	60	0
	Negative (N)	20	20

Calculate $\Pr(B|P)$ and $\Pr(T|N)$. (2 points)

c) Now draw a decision tree that shows the decisions you should make and the expected profit to Pave-it-All if Acme gives its forecast (P or N) to you for free. (Hint: the first (leftmost) branch in your tree should be the forecast results.) (10 points)

d) What is the economic value of information provided by Acme? Suppose that in reality Acme is willing to sell you the forecast for 5. Should your company buy the information and if so, what will be Pave-it-All's expected profit? (3 points)

7. (6 points) Suppose that 90% of all new cars sold work perfectly, and that 10% are “lemons”. Lemons run poorly but the car dealership will be unable to fix such cars and unwilling to take the cars back. New cars sell for \$20,000 and, once purchased, are worth this if they work perfectly, but are worth only \$10,000 if they are lemons.

Everybody who buys a lemon will try to sell it in the used market. In addition, 1 out of 100 new car owners will get a good car but will be forced to sell it in the used car market because s/he is moving out of the country.

Used car buyers cannot tell which used cars are lemons and which are good cars.
a) What is the expected worth of used cars? What do you predict to be the selling price of used cars? (Hint: Don't panic if your calculations do not come out to a nice round number like \$15000!!) (4 points)

b) Suppose that you are that 1 in a 100 person who buys a really good car but who is forced to sell it. What is the difference between the worth of your car and what you can get for it in the used car market? Does this situation represent one of moral hazard, adverse selection, or both? (You don't need to explain your answer to this last question.) (2 points)

8. (6 points) a) List three factors favoring decentralization of decision-making responsibilities in the firm. (3 points)

b) List three factors favoring in-house production of goods in the firm. (3 points)

9. (6 points) Your firm is considering the following investment project. After an investment in the present period (period 1) of 100, the project brings in revenues of 0 in period 2 and \$134.56 in period 3.

a) Calculate the internal rate of return to this investment project. (3 points)

b) What is the rule based on the internal rate of return for whether a firm should proceed with an investment project? Suppose that the current interest rate is 10%. Do you recommend the project? (3 points)