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Economics 410

The Maxwell School
Syracuse University

Exam 2

Spring 2009

VERSION P

Instructions

1. Write your SU ID NUMBER and the exam version letter above on your blue book. Please do NOT write your name.

2. Do not open the exam until you are told to do so.

3. Please turn off the ringer on your phone right now – before the exam begins.

4. SHOW ALL YOUR WORK. Numerical answers without supporting work will receive little or no credit.

5. You have 120 minutes to work on the exam. There are 90 points possible; please budget your time accordingly. Also note that many of the questions have (a), (b), etc., inserted into the text to help you avoid overlooking part of the answer.

6. YOU MAY NOT USE YOUR PHONE. *Any use of phones or other wireless devices during the exam will be presumed to be collaboration and therefore cheating.*

7. Cheating of any kind will result in an F on the exam and referral of the case to the Dean's office for further sanctions.

8. Calculators *may not* be shared.

9. Some handy formulas:

$$PV = \frac{B}{(1+r)^t} \qquad PV = \frac{B}{r}$$

Question 1: Pollution Control Under Uncertainty (15 points)

An air pollutant causes two problems. First, each ton creates acid rain which a study has shown to cause $10 of damage per ton of pollution. Second, when emissions exceed 500 tons, each additional ton causes an additional $30 in health risks for people in the area.

Two sources of the pollutant were recently regulated. Just before regulation, each source was emitting 400 tons of the pollutant (800 tons total). At the time of regulation, the sources were believed to have identical abatement costs given by: MCAi = (1/5)*Qi. A tradable permit policy was established that would have been efficient if those costs had been correct. However, the projected MCA for source 1 turned out to be wrong. Its true cost curve is MCA1 = Q1.

Please calculate: (a) each firm's efficient amount of abatement had the original MCA1 had been correct; (b) the total number of permits that were originally issued (only the total, you don't need to make any assumptions about how they were distributed between the firms); (c) the amount of abatement that would be efficient for each firm given the true MCA1; (d) the equilibrium price of a permit given the number that were handed out (from part b) and the true MCA1; and (e) the actual amount of abatement done by each firm.

Question 2: Travel Cost (15 points)

A community organization would like to determine the value of a popular park. No admission fee is charged and 26,000 people visit the park each year. A researcher interviewed a sample of the visitors and found they come from five geographic zones. The cost of a round trip to the park from each zone is shown in the table below, along with each zone's population and the number of people who visit from the zone.

Travel Cost	Population	Visitors
$5	10,000	8,000
$10	20,000	12,000
$15	10,000	4,000
$20	10,000	2,000
$25	10,000	0

The public's willingness to pay for visits to the park (including people from all zones) is known to be given by an equation of the form: W2P = A - B*Q, where Q is the number of visitors and A and B are constants.

Please compute: (a) the number of people who would visit the park if a $5 admission fee were charged, (b) the values of A and B, (c) the amount of consumer surplus currently produced by the park each year, and (d) the present value of keeping the land as a park forever when the interest rate is 10%.

Question 3: Option Value (15 points)

A mining company would like to buy land for a new mine. Currently, the land is owned by the government and used for recreation. However, recreation and mining are incompatible: if the area is mined, its recreational value will be permanently destroyed.

The government is concerned about two periods: now (period 0) and a generation in the future (period 1). The interest rate between the two periods is 25% (please note the unusual value). Left in its current state, the land will produce $10 million of recreational benefits in period 0. The recreational benefits in period 1 are uncertain: there's a 75% chance they will be $15 million and a 25% chance they will be $60 million. The mining company is willing to buy the land for $32 million in period 0 or $25 million in period 1. Note that it only has to pay once: if it buys the land in period 0, it doesn't have to pay anything in period 1. If the mine is built, it eliminates the recreational benefits in the period it is constructed and for all future periods.

Please: (a) calculate the present value of leaving the area in its natural condition in period 0; (b) explain why your value is higher or lower than the $32 million the company is offering; and (c) indicate whether or not the government should sell the land in period 0.

Question 4: Rival and Non-Rival Use of Water (15 points)

A river is used for two purposes: irrigation and navigation (moving ships and barges). The demand for irrigation water by farmers as a group is given by W2Pf = 100 – (1/100)*Qf. Water used for irrigation is taken out of the river and does not return. Navigation does not take water out of the river, and occurs downstream from the point where the irrigation water is removed. There are 10 navigational users of the river and each of the users has a marginal benefit given by MBj = 28 – (1/100)*Qr, where Qr is the amount of water left in the river after the irrigation water is diverted. Navigational use is non-rival. The amount of water originally in the river is 4000 units.

Please calculate: (a) the efficient quantities of water to allocate to allocate to irrigation and to leave in the stream. Next, determine (b) the allocation of water that would occur under the doctrine of prior appropriation. Finally, calculate (c) the deadweight loss that occurs in the second case.

Question 5: Effect of a Backstop (15 points)

Consider the allocation of an exhaustible resource across three generations. The following information is available about demand and MEC in the three periods:

Period	Demand	MEC
1	$W2P_1 = 500 - 2Q_1$	50
2	$W2P_2 = 600 - 2Q_2$	50
3	$W2P_3 = 700 - 2Q_3$	50

Initially, there are 650 units of the resource available. The interest rate between generations is 100%.

Please calculate: (a) the equilibrium royalty, extraction cost, price and quantity that would occur in each period, and summarize your results in a table. Then suppose that a backstop is available at a marginal cost of $170. Please calculate: (b) the new equilibrium royalty, extraction cost, price and quantity in each period, summarizing your results in a second table. Finally, calculate (c) the total amount of the resource produced via the backstop.

Question 6: Exploration (15 points)

Suppose that a resource is to be allocated across two periods. The demand for the resource in period 1 is given by $W2P_1 = 2100 - (1/2)*Q_1$ and the demand for the resource in period 2 is given by $W2P_2 = 3300 - (1/2)*Q_2$. Initially, 6800 units of the resource are know to be available and can be extracted at MEC = $100 in either period. However, it is possible to find more of the resource via exploration. The cost of drilling an exploratory well is $375. In 80% of the wells, no new deposits will be found. However, in 15% of the wells, 2 new units will be found and in 5% of the wells 9 units will be found. The marginal cost of extracting any new units is the same as the existing deposits: $100. The interest rate is 100%.

Please calculate: (a) the minimum price that will induce exploration; (b) the market equilibrium price and quantity in each period without exploration (summarize in a table); (c) the equilibrium price and quantity in each period taking exploration into account (summarizing in a second table); (d) the amount of the resource that will be found via exploration; and (e) the expected number of wells that will be drilled.