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PPA 723, Managerial Economics   The Maxwell School, Syracuse University

Exam 2a
Fall 2004

DO NOT OPEN THIS EXAM UNTIL YOU ARE TOLD TO DO SO.

Instructions

Write your SUID in the upper right corner of this exam. Do NOT write your name.

SHOW ALL YOUR WORK. Answers without supporting work will receive little or no credit.

Do all your work on this exam. If you need extra space, write on the backs of the pages. However, if you do write an answer on the back of a page, *be sure you've noted that near the question*.

You may *not* discuss *anything* about the exam with *anyone* until after 3pm today. If you hear someone else from class discussing the exam, you *must* let me know.

Some helpful PV formulas:

$$(1) \ \frac{B}{(1+i)^t} \qquad\qquad\qquad (2) \ \frac{B}{i}$$

Some helpful factors in case your calculator can't handle exponents:

t	1	5	10	15	20	25	30	35	40
$(1.05)^t$	1.0500	1.2763	1.6289	2.0789	2.6533	3.3864	4.3219	5.5160	7.0400

Part 1

A consumer buys two goods, X and Y. Her preferences can be represented by the Cobb-Douglas utility function shown below. Also shown are her demand equations and her expenditure function.

$$U = X^{0.2} * Y^{0.8}$$
$$X = 0.2*M/P_x$$
$$Y = 0.8*M/P_y$$
$$M = U * (P_x/0.2)^{0.2} * (P_y/0.8)^{0.8}$$

Initially the price of X is $2, the price of Y is $5, and she spends $2000 on the two goods in total.

Question 1a (20 points)

Solve for her initial consumption of X and Y. Draw her budget constraint and include the numerical values of its intercepts. Also sketch several of her indifference curves and show her initial equilibrium on the diagram. Be sure to show your work and label everything.

Question 1b (20 points)

Now suppose that the government imposes a $2 tax on X and its price rises to $4. Calculate the consumer's new equilibrium consumption of X and Y and draw an appropriate diagram. What is the compensating variation associated with the tax? How much revenue does the tax raise? Comment on the difference, if any, between the CV and the revenue raised.

Part 2

Cleaning up Onondaga Lake is expected to take 15 years and cost around $420 million dollars. After that, it will be clean enough for swimming and other recreational activities. Assuming that the cleanup begins in year 1 and costs $28 million per year; that the cleaned-up lake will generate B dollars of recreational benefits each year forever beginning in year 16 (but nothing before that); and that the interest rate is 5%, please answer the following questions:

Question 2a (20 points)

Draw a diagram showing the cash flows associated with this project. Ignoring B for the moment, what is the present value cost of cleaning up the lake?

Question 2b (20 points)

If B is $20 million per year, what is the net present value of cleaning up the lake? What is the minimum value of B that would justify the cleanup? Be sure to show your work.

Part 3

A local government is considering a major highway improvement. The project would remove an unsightly elevated highway and replace it with an underground road. To pay for the project, the city would sell consols: perpetual bonds that are never paid off and entitle bond owners to specified interest payments forever.

Construction would cost $1 billion, which would have to be paid immediately (in year 0), and would take 10 years. The new road would be available for use beginning in year 11 and would generate $100 million worth of benefits every year forever.

To finance the project, the city would sell $1 billion worth of consols, which would obligate the government to pay $50 million in interest per year forever beginning in year 1. To pay the interest, the city would increase the tax on gasoline. However, it is known that the compensating variation for a gasoline tax is $1.20 for each dollar of revenue raised (the tax has a DWL of $0.20 per dollar of revenue).

Is it a good idea to go ahead with the project? You may assume the interest rate is 5%. Be sure to show all your work and explain your reasoning.