

SUID:

Peter J. Wilcoxon
Economics for Public Decisions

Department of Public Administration
The Maxwell School, Syracuse University

Exam 3
Fall 2013

You may not discuss ANYTHING about this exam with ANYONE before 4 pm on Friday, December 13th. The term "anyone" includes other people taking the exam now (to avoid anyone else overhearing, which has happened in the past). Talking about the exam with anyone will be regarded as a violation of SU's academic integrity policy.

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

Instructions

1. Write your SUID in the upper right corner of this exam. Do NOT write your name.
2. SHOW ALL YOUR WORK. Answers without supporting work will receive little or no credit.
3. There are 120 points on the exam and you'll have 180 minutes to complete it. Be sure to budget your time accordingly.
4. Some questions provide a blank table you can use to organize your calculations. Be sure to label the columns clearly. Where applicable, show the equation for the column in the bottom row of the table. The tables may have more rows or columns than you need.
5. Do all your work on the 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.*
6. Some helpful PV formulas:

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

$$PV = \frac{B}{r}$$

Question 1 (15 points)

An electric utility needs to build a new power line and is considering two alternatives: Plan T, a standard line using towers and suspended wires, and Plan U, a more expensive line that would be submerged under lakes and rivers or buried underground. Both plans would provide \$200 million in benefits every year for 40 years starting the year after construction is complete. Plan T would cost \$1 billion in year 0 and would begin providing benefits in year 1 (benefits in years 1-40). Plan U would cost \$2 billion in year 0 and would take 5 years to complete (benefits in years 6-45). Finally, the towers in Plan T are regarded as unsightly and would create externality costs of \$80 million per year for each year of the line's 40 year life.

Please calculate the net present value of each plan and indicate which one is best. The utility uses an interest of 5% in present value calculations.

Question 2 (15 points)

A government would like to raise more revenue and is considering imposing a new sales tax on a particular good. Right now, without the tax, the price of the good is \$100 and 100,000 units are sold. The government would like to raise at least \$1.5 million and is considering imposing a \$20 tax. It knows the supply of the good is perfectly elastic at a WTA of \$100. However, it is uncertain about the elasticity of demand. It believes there is a 50% chance the elasticity is -0.2 and a 50% chance it is -2.0.

Please determine the expected revenue raised by the tax and indicate whether it will meet the government's target. Then calculate the expected DWL the tax will cause.

Question 3 (15 points)

The government of a large metropolitan area is considering a major upgrade to the communication system used by its emergency responders. The upgrade would cost \$20 million per year for 10 years (periods 1-10) and the city would begin receiving benefits in year 11. For simplicity you may assume the benefits go on forever. The \$20 million would be raised via a tax known to cause 0.20 dollars of deadweight loss per dollar of revenue. However, the government is unsure about the benefits it will receive from the upgrade. There is an 80% chance the benefits will be \$5 million per year but a 20% chance they will be much larger: \$20 million per year.

Please determine the expected net present value of the upgrade. Should the city go ahead with the project? You may assume the government uses a 5% interest rate in present value calculations.

Question 4 (15 points)

Continuing the analysis from Question 3, now suppose the government could hire a consulting firm to determine whether the benefits from the upgrade would be high or low before it commits to the project. It would pay the consultant in year 0 and receive the results of the study three years later. It could then decide whether or not to go ahead with the upgrade described in Question 3. To be specific about the timing, the government would receive the report and decide on the project in year 3 and construction would begin in year 4.

What is the maximum amount the government would be willing to pay for the study? You may assume the consultant is infallible (ha!).

Question 5 (15 points)

A non-profit organization provides mental health counseling. It has total costs given by $TC = 200 + 10*Q + 5*Q^2$ where Q is the number of clients it serves and Q^2 indicates Q squared. The demand for its services is given by the equation $P = 200 - Q$, and there are no other organizations nearby providing a similar service. The organization wishes to serve as many people as possible without running a deficit.

What price should the organization charge and how many people will it be able to serve? How much profit will it earn? As a hint, the value of Q is between 25 and 35, inclusive.

Variable							
Equation							

Question 6 (15 points)

Suppose a firm believes it may be able to develop a new technology for storing electricity that would be lighter and more compact than a conventional battery with equivalent capacity (this is an important real area of active research). If the technology works, it could be used in devices ranging from cell phones to electric vehicles. The firm believes that demand for the product would be given by the equation $P = 320 - 5*Q$ and it would be able to produce units for a total cost given by $TC = 100*Q$. Assuming the firm is able to develop the product, what price would it charge and what quantity would it produce in each year during the time it is a monopolist? What profits will it earn each year? As a hint, the quantity will be between 15 and 25.

Variable							
Equation							

Question 7 (15 points)

Now suppose that a research project to develop the product in Question 6 would cost \$8,000, which would be paid in year 0. However, there is only a 20% chance the project would succeed. You may assume the research project could be carried out in year 0 and, if it succeeds, the profits found in Question 6 would begin to arrive in year 1. The firm would be a monopolist for 20 years (years 1-20) after which other firms would enter, the price would fall to \$100, and the firm's profits would drop to 0.

Please calculate the expected net present value of the project assuming that the firm uses an interest rate of 15% in present value calculations. Should the firm undertake it?

Question 8 (15 points)

Now let's consider the research project from the government's point of view. If the firm undertook the research and succeeded in developing the product, what is the present value of the consumer surplus the product will create, both during and after the monopoly period? You may assume the government uses a 5% interest rate in its PV calculations (note the interest rate is different from Question 7). Now step back one step further and calculate the expected NPV of the consumer surplus given that the research project might not succeed.

Question 8, continued.

Finally, suppose the government is considering offering the firm a \$6000 grant to undertake the research project. If it accepts the grant, the firm would have to undertake the project but would not be required to repay the money. Would that be efficient? Would that change the firm's decision? Please provide appropriate quantitative results to explain your answers.

Have a great break!