Econ 331: Environmental Economics

PRACTICE Exam 2

- Define any variables you need to answer the problems.
- All materials except for your cheat sheet should be put away before beginning the exam. Use of cell phones during the exam for any purpose is forbidden. **Use of a 4-function or scientific calculator is allowed**.
- Please write your answers in the space provided.
- Keep your answers short but clear. Your goal is to convince a skeptical grader that you understand the relevant concepts well enough to answer the question you are given.
- The questions on the exam sum to 42 points. Your cheat sheet is worth up to 4 points, for a total possible points of 46 on this exam.
- Remember to turn in your cheat sheet with your exam.
- Good luck on your Econ test!

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1. (2 points) What is your name?

1 True/False Questions

Indicate "T"rue or "F"alse for each of the following statements or claims. For each false statement, if you explain why it is false I will give you a bonus point.

2. (2 points) Suppose instead of using r as the discount rate, we used the discount factor $\left(\frac{1}{1+r}\right)$ to think about an economic agent's time value of money, or patience between today and future periods. **Claim**: If Person A has a higher discount **factor** compared to Person B, Person A also has a higher discount **rate** compared to Person B.

3. (2 points) Bill has created a survey to estimate the value of having the Susquenhanna and Chenango rivers be clean enough to swim in in order to argue the benefits of cleaning up these rivers would outweigh the costs. Bill plans to conduct his survey by attending the Binghamton 2-degrees event (an event about how climate change is impacting Binghamton). **Claim**: Assuming there are no biases in Bill's survey questions, you would expect Bill to get a representative valuation of the average Binghamton resident from responses to his survey.

4. (2 points) **Claim**: You can figure out if people have different willingness to pay for two environmental goods simply by looking at the difference in the average willingness to pay for the two goods.

2 Multiple Choice Questions

Circle the best answer to each question. There is only one answer for each question. No explanation necessary.

5. (2 points) Bill's discount rate is 5%. Bill has just won the lottery. The lottery gives Bill the following four options. **Question**: Choose the option which has the highest present value for Bill.

    A. $10,000 received right now.

    B. $5,000 received today and 5,200$ next year.

    C. $1,870 received today and each year for the next 5 years.

    D. $1,143 received today and each year for the next 10 years.

6. (2 points) Suppose you were given two options. Option 1: You receive $100 today. Option 2: You receive $50 today and $55 tomorrow. Each time you receive money, you must pay a 10% tax on the amount of money you receive. Also suppose the discount rate is 10%. Compared to a world in which you did not have to pay any taxes, how does the tax change which option gives the highest present value (PV)?

    A. With no tax, Option 1 has the highest PV. With tax, Option 2 has the highest PV.

    B. With no tax, Option 2 has the highest PV. With tax, Option 1 has the highest PV.

    C. With no tax, both options have the same PV. With tax, Option 2 has the highest PV.

    D. With no tax, both options have the same PV. With tax, Option 1 has the highest PV.

7. (2 points) Bill is talking to an ecologist about her valuation of the Watkins Glen state park, a popular hiking spot near Ithaca. The ecologist gives a large number, and justifies by talking about how important it is that spots like these are available for future generations including being able to see the plants and animals that live there. **Question**: Based on what we have learned in class, the ecologist most likely assigns most of her value to which of the following?

    A. The existence value of Watkins Glen.

    B. The use value of Watkins Glen.

    C. The non-use value of Watkins Glen.

    D. None of the above.

3 Short Answer Questions

These questions all require an explanation. Remember you are trying to convince me you understand the why and the how of what you are doing, not simply getting the answer correct. Cite specific concepts from class in your answers for full credit.

8. **Bringing it all together**. Suppose you are working to update the National Ambient Air Quality Standards (NAAQS) to include carbon dioxide (CO_2) emissions. You and your team need to do the following:

    1. Estimate the public's willingness to pay for reducing CO_2 emissions by 1 ton (in order to estimate a MDF curve).
    2. Estimate firm's average cost of reducing CO_2 emissions by 1 ton (in order to estimate the MAC curve).
    3. Figure out the costs of implementation and benefits that accrue in each year.
    4. Determine the most stringent NAAQS that passes a present value cost-benefit analysis.

    (a) (6 points) **Step 1 Question**. Your team decides to ask the following question: "How much would you be willing to pay for 1 fewer day in which you get an air quality alert on your phone?" Assume You are perfectly able to translate 1 fewer air-quality-alert day into exactly how many fewer tons of CO_2 is emitted each year. **Question**: Based on what we have learned in class, define one survey bias that might be present in this question and explain how that survey bias could affect responses.

    (b) (12 points) **Step 2 Question**. Let's suppose there are 3 different industries. Within each industry there are many firms. You survey a random sample of firms within each of the three industries. You obtain the following information about MACs. Assume these values are constant for each unit of CO_2 abated:

        1. **Transportation Firms: 49**
            - Average MAC: \$100,000
            - Variance: \$64,000
        2. **Manufacturing Firms: 64**
            - Average MAC: \$250,00
            - Variance: \$100,000
        3. **Other Firms: 16**
            - Average MAC: \$100,000
            - Variance: \$16,000

        Question: Are the average MAC costs statistically different across sectors? If so, which sectors are statistically different using the critical value of 2 (or 1.96) that we used in class? Show all your work.

(c) (10 points) **Step 3 Question**: Suppose the benefits of a reduction of 1 ton of CO_2 is \$1,000,000 for the first unit and then the marginal benefits decrease by \$10,000 for each subsequent reduction in the emissions of CO_2.

Suppose we use a simple average of the three sectors as our MAC. What is the optimal amount of tons of CO_2 that we should reduce?

(d) (6 points) **Step 4 Question**: How does your answer to part c change if the abatement costs are paid today and the benefits of the emissions do not happen until the next year? Why?