Econ 331: Environmental Economics

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 50 points. Your cheat sheet is worth up to 5 points, for a total possible points of 55 on this exam.
- Remember to turn in your cheat sheet with your exam.
- Good luck on your Econ test!

---

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 a policy has an up-front cost (paid one time in period 0) and benefits that occur in each future period 1 through T. **Claim**: If the up-front costs and benefits in each future period are doubled, the net-present value of the policy will also double.

3. (2 points) **Claim**: For any finite discount rate $r > 0$, the net present value of any positive annual benefit B received each period from 1 to N is equal to the net present value of $\frac{1}{10}^{th}$ the benefit ($0.1B$) received for 10x as long (from period 1 to $10N$).

4. (2 points) **Claim**: Dividing an up-front cost equally (without accounting for time discounting) into equal payments in periods 1 through T will give you a lower annualized cost in each year compared to using the LAC and accounting for time discounting. *Example*: Dividing a \$100 cost into 10 even payments of \$10 in periods 1 through 10 compared to using the LCF to calculate the exact annual payment.

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) Suppose Bill has created a survey to estimate the value of installing scrubbers on the Binghamton University Power Plant in order to reduce the power plant's CO_2 emissions. Such a policy would almost exclusively impact individuals living in Conklin, NY, as climate models show Conklin residents are the main recipients of pollution blown downwind from the power plant. Conklin is also a part of Broome County. **Question**: Which of the below populations, if surveyed randomly, would have the least bias due to sample selection if there is no selection in who responds to the survey.

    A. Binghamton University students.

    B. Binghamton, NY residents.

    C. Conklin, NY residents.

    D. Broome County residents.

6. (2 points) Suppose a researcher is using an analysis of the prices fisherman have paid for licenses to fish in the Alaskan Sound in order to estimate the value of the Alaskan Sound. Which of the following are aspects of the Alaskan Sound this method is **least** likely to account for?

    A. The value of being able to fish in the Alaskan Sound.

    B. The value of being able to drive a boat on the Alaskan Sound.

    C. The value of the existence of current fish stock in the Alaskan Sound.

    D. The value of the Alaskan Sound in moderating winter temperatures in the Pacific Northwest.

7. (2 points) Bill is indifferent between receiving \$100 today and \$132 in 7 years from now. If you assume 7 years from now is 7 periods from now, which of the following is approximately Bill's discount rate based on this information?

    A. 3%

    B. 4%

    C. 7%

    D. 10%

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. **Great, you won the lottery!** How do you decide to accept your winnings? The New York lottery has a $50 million jackpot, and you have just found out you won! When you go to collect your winnings, you are presented with the following two options:

   1. (Lump-sum payment): $28 million paid right now.
   2. (Annuity payments): 30 annual payments starting next year.
      - The payments are not paid in equal amounts, but rather increase each year by 5%.
      - Year 1 payment: $1.25 million.
      - Year 2 payment: $1.3125 million.
      - etc., all the way to Year 30.

   Suppose there are no taxes. Also suppose your discount rate is 5%.

   (a) (4 points) What is the present value of the lump-sum payment? Why?

   (b) (4 points) Write an equation which represents the amount of the annuity payment in any year t as a function of both the year in which the payment is received and the amount of the first payment. Assume that $t = 0$ when you win the lottery, and the first payment occurs in $t = 1$. To check your equation, show that your formula correctly calculates the payment in year 2.

(c) (6 points) Using your equation from part (b), write an equation which represents **the present value** of the annuity payment in any year t as a function of both the year in which the payment is received and the amount of the first payment.

(d) (4 points) Based on your answer to part (c), what is the present value of the sum of all 30 annuity payments?

(e) (4 points) Should you take the lump-sum payment or the annuity payment if you want to maximize the present value of your lottery winnings? Why?

(f) (4 points) Tell me **one** aspect of reality that is not a part of this problem, and how including this one aspect could affect whether or not the present value of the sum of the annuity payments is higher than the present value of the lump-sum payment.

9. (10 points) Suppose you are evaluating possible survey questions designed to elicit people's valuation of clean air in the Adirondacks State Park in New York. Consider the following different but similar questions the team is proposing to ask individuals.

   Potential Question 1: How much would you have to accept in order for all trails within the park to be closed on undetermined days for undetermined amounts of time due to hazardous air quality that may affect people's ability to breathe while in the park?

   Potential Question 2: How much would you be willing to pay to keep the portions of the Adirondacks State Park you have visited in the past year from closing during the times you are most likely to travel to and visit the park?

   Question: Using what we have learned in class, discuss at least one difference in the above questions and how they relate to survey biases or conducting surveys. Finally, which question do you think would result in a more accurate valuation of the park? Why?