ECON 251: Problem Set 7

Due Sunday November 6 by 11:00 PM

Instructions. Each part of a problem is worth one point. Don't forget to answer the last two questions, as they are each worth one point. Unless otherwise stated, you can always assume that goods are continuously divisible: there is no need to consume an integer number of units of any good. Once you have finished, please submit your completed problem set on gradescope. To do this, you will either need to upload a pdf of your entire problem set or an image (for example, a picture that you take with your phone) of your work for each problem. If you upload a pdf, you will need to tag each problem on the appropriate page of the document. Please show your work and draw a box around your final answer. You are free to work together with your classmates, but the work that you upload must be your own.

1. Bardolph is an expected utility maximizer whose Bernoulli utility function over money payoffs is
$$u(x) = \frac{-1}{x}$$
What is Bardolph's certainty equivalent for the lottery $L = \left\{\frac{1}{2}, \frac{1}{2}; 25, 100\right\}$?

2. Dogberry is an expected utility maximizer whose Bernoulli utility function over money payoffs is
$$u(x) = \ln x$$
Characterize Dogberry's certainty equivalent for the lottery $L = \{\pi_1, \pi_2, \pi_3, \pi_4; x_1, x_2, x_3, x_4\}$?

3. Grumio is an expected utility maximizer whose Bernoulli utility function over money payoffs is
$$u(x) = \ln x$$
He has income $m > 0$ and faces a probability π of incurring a loss L where $0 < L < m$. Grumio can purchase insurance against his loss. For every dollar of insurance coverage that Grumio buys, he must pay $p < 1$ dollars (irrespective of whether the loss occurs). Thus, if he chooses Z dollars of insurance coverage, he must pay pZ. However, in the event of a loss, Grumio will receive Z dollars so that his consumption is $m - L - pZ + z$.

   (a) What is Grumio's expected utility if he chooses Z dollars of insurance coverage?

   (b) Find Grumio's demand for insurance.

4. Farmer Ben is deciding what to plant on his land. He faces probability π of encountering a drought. If he chooses to plant corn, he earns 900 euros, regardless of whether or not their is a drought. If he plants tomatoes, his income is 2500 euros if there is no drought, but only 100 euros in the event of a drought. Farmer Ben is an expected utility maximizer whose Bernoulli utility function over money payoffs is
$$u(x) = \sqrt{x}$$

   (a) What probability of a drought, π, would make Farmer Ben indifferent between growing corn and tomatoes?

(b) Suppose Ben can plant tomatoes on some of his land and plant corn on the rest. Let q indicate the share of his farm planted with tomatoes. This means that he will earn income $900(1-q)$ from his corn whether or not there is a drought. If there is no drought, his income from tomatoes will be $2500q$, but in the event of a drought it will only be $100q$. How much of Farmer Ben's land will he devote to planting tomatoes if the probability of a drought is $\pi = 1/3$?

5. Consider the St. Petersburg Paradox lottery: you flip a fair coin over and over again until it lands on heads; if it lands on heads (for the first time) on the n^{th} flip, you receive 2^n dollars. Calculate the certainty equivalent for this lottery for an expected utility maximizer with the Bernoulli utility function $u(x) = \ln x$. To receive full credit, you must show how you arrive at your answer.

   This question is challenging, and it is only worth one point. You may prefer to skip it.

6. Which of your classmates did you work with on this problem set?

7. Did you attend Jamie's TA office hours, or get help from her over email or outside of her regular office hours?