

Homework 2

due Monday, February 13 in class

Problem 1 Suppose that most people will not speed if the expected fine is greater than \$100. Given current police practices, the probability of being caught speeding is $1/3$.

- a. How high must the actual fine for speeding (what you have to pay if you get a ticket) be to deter most people from speeding?
- b. Suppose the Lexington mayor caps the amount police can fine speeding motorists at \$200. The police vow to step up enforcement in order to continue to deter speeding. How high must the probability of being caught speeding be in order to deter most people from speeding?

Problem 2 Suppose an investor is considering a business opportunity that would cost \$100, but which would generate a return according to the probability distribution below:

Probability	Return
0.2	\$100
0.3	\$30
0.2	-\$10
0.3	-\$30

- a. What is the expected return of the uncertain investment? What is the variance? What is the standard deviation?
- b. Would a risk neutral investor take this business opportunity, if he has no alternative investment in mind? What about a risk averse investor?

Problem 3 Answer the following questions about expected utility and risk aversion:

- a. True/false/uncertain: Rex, who is risk averse, prefers a salaried job that will pay him \$100,000 with certainty to a commission-based job that will pay him \$20,000 with probability .5 and \$200,000 with probability .5. (Explain why you think it is true, false, or uncertain.)
- b. Kyle is an English PhD student; there is some chance he will get a prestigious university job that will pay him \$80,000/year (probability p). If he does not get this job, he will have to take a job at Starbucks, paying \$25,000/year (probability $(1 - p)$). Kyle's utility function over salary is given by \sqrt{w} , where w is the amount of his salary. Before Kyle has a chance to finish his PhD, he is offered a job at Dunder Mifflin paying \$60,000/year. How low does p have to be before Kyle is better off taking the Dunder Mifflin job? (hint: p is some number between 0 and 1. For example, $p = .25$ means there is a 25% chance of Kyle getting the university job and a 75% chance of his working at Starbucks.)

Problem 4 A driver faces a 5% probability that his car will be in an accident and will be worth nothing. Consider three drivers with cars that have value \$30,000. Abdulla's utility function over the value of his car W is $u(W) = \ln(1 + W)$. Bedriya's utility function is $u(W) = 100 + 0.5W$.

- a. What is Abdulla's risk premium?
- b. What is Bedriya's risk premium?
- d. Which of these two people is less likely to take on risk? Which is more likely? How do you know?

Problem 5 Betty's only wealth is a house worth \$500,000. There is a 1% chance that it will catch on fire at some point in the next year, causing \$100,000 in damages. Betty's utility function over wealth is $5 * \sqrt{w}$.

- a. Suppose Betty can pay \$ p to fireproof her house (i.e. installing fire extinguishers and smoke alarms), which will lower the probability the house burns to 0.1%. What is the maximum price p Betty would be willing to pay for fireproofing? (hint: if Betty pays a price of p for fireproofing, her utility is $5\sqrt{W - p}$).
- b. Now suppose that Betty has a fire insurance policy on her house, which costs \$2,000. If the house burns, she has to pay only a deductible of \$1,000, and the insurance company pays her \$99,000 to compensate her for the damages. Now how much is Betty willing to pay for fireproofing?
- c. Is Betty's willingness to pay for fireproofing higher with or without insurance? What economic phenomenon does your answer illustrate?

Problem 6 The production function for a firm's product is give by $q = f(K, L) = 5 * K * L$. The price of capital is \$10 and the price of labor is \$15.

- a. Suppose the firm wishes to produce output of 500. List 5 combinations of capital and labor that the firm can transform into 500 output.
- b. For each of your 5 combinations from part a, give the cost of using that combination of capital and labor. Which is the lowest?
- c. For your lowest cost combination from part b, calculate the marginal product of capital (MPK) and the marginal product of labor (MPL).
- d. For your answer in parts b-c, is your marginal product per dollar equal across the two inputs? If not, should the firm use more labor-intensive production or more capital-intensive production?

Problem 7 Chip is offered a lottery ticket giving him nothing 75% of the time but where he wins \$5 25% of the time. The ticket costs \$1. If Chip is risk averse,

- a. He will certainly buy the ticket
- b. He may or may not buy the ticket
- c. He will certainly not buy the ticket
- d. He is indifferent over whether or not to buy the ticket

Problem 8 Someone with decreasing marginal utility of wealth is:

- a. Risk-averse
- b. Risk-neutral
- c. Risk-loving
- d. Not enough information to tell