

Microeconomic Analysis
PROBLEM SET 5

Due at your discussion section meeting the week of October 2nd

1. Fred has just arrived at college and is trying to figure out how to supplement the meager checks that he gets from home. "how to everyone live on \$50 a week for spending money?" he asks. But he asks to no avail. "if you want more money, get a job," say his parents. So, Fred glumly investigates the possibilities. The amount of leisure time that has left after allowing for necessary activities like sleeping, and studying economics class is 50 hours a week. He can work as many hours per week at a nearby Taco Bell for \$5 an hour. Fred's utility function for leisure and money to spend on consumption is $U(C,L)=CL$.
 - a. Write down Fred's budget constraint for leisure and consumption. Draw the corresponding budget line on a diagram with leisure on the X-axis.
 - b. Sketch Fred's indifference curves.
 - c. Find the optimal bundle. That is: find the bundle of leisure and consumption that maximizes Fred's utility.
 - d. Find the optimal labor supply. That is the number of hour Fred chooses to work in Taco Bell.

2. Decide whether each of the following statement is true or false. Then explain why your answer is correct, based on the Slutsky decomposition into income and substitution effects.
 - a. "if both current and future consumption are normal goods, and increase in the interest rate will necessarily make a saver save more."
 - b. "if both current and future consumption are normal goods, an increase in the interest rate will necessarily make a saver choose more consumption in the second period."

3. Mr. Adam will only live for two periods. In the first period, he will earn \$50,000. In the second period, he will retire and live on the savings. His utility function is $U(C1, C2)=C1C2$, where $C1$ is consumption in period 1 and $C2$ is consumption in period 2. He can borrow and lend in the interest rate $r = 0.1$.
 - a. if the interest rate rises, will his period 1 consumption increase, decrease, or stay the same?
 - b. Would an increase in the interest rate make him consume more or less in the second period?
 - c. If Mr. Adam's income is 0 in period 1, and \$55,000 in period 2, would an increase in the interest rate make him consume more, less, or stay the same amount in period 1?

4. Peter owns a large, poorly insulated home. His annual fuel bill for home heating averages \$300 per year. An insulation contractor suggests to him the following options.
Plan A: insulate just the attic. If he does this, he will permanently reduce his consumption by 15%. Total cost of insulating the attic is \$300.
Plan B: insulate the attic and the walls. If he does this, he will permanently reduce his consumption by 20%. Total cost of insulating the attic and the wall is \$500.

Plan C: insulate the attic and the walls, and install a solar heating unit. If he does this, he will permanently reduce his fuel cost to \$0. total cost of this is \$7,000 for the solar heater and \$500 for the insulating.

- a. Assume for simplicity of calculation that the house and the insulation will last forever. Calculate the present value of \$ saved on fuel from each of the above option if the interest rate is 10%
 - b. Each plan requires an expenditure of money to undertake. The difference between the present value and the present cost of each plan is: Plan A? Plan B? Plan C?
 - c. If the price of fuel is expected to remain constant, which option should you choose if he can borrow and lend at an annual interest rate of 10%? How about if the interest rate is 5%?
 - d. Suppose the government offers to pay half of the cost of any insulation or any solar heating device. Which option will he now choose at interest rate 10%? 5%?
 - e. Suppose there is no government subsidy but that fuel prices are expected to rise by 5% per year. What is the present value of fuel savings from each of the fuel proposals if interest rates are 10%?
5. Dan is a risk averter who tries to maximize the expected value of $C^{1/2}$, where C is his wealth. Dan has \$50,000 in safe assets and he also owns a house that is located in an area where there are a lot of forest fires. If his house burns down, the remains of his house and the lot it is built on would be worth only \$40,000, given him a total wealth of \$90,000. If his home does not burn, it will be worth \$200,000 and the total wealth will be \$250,000. The probability that his home will burn down is 0.01.
- a. Calculate his expected utility if he does not buy fire insurance.
 - b. Calculate the certainty equivalent of the lottery he faces if he does not buy fire insurance.
 - c. Suppose that he can insurance at a price of \$1 per \$100 of insurance. For example, if he buys \$100,000 worth of insurance, he will pay \$1,000 to the company no matter what happens, but if his house burns, he will also receive \$100,000 from the company. If Dan buys \$160,000 worth of insurance, what will be his wealth?
 - d. If he buy full insurance, what is his certainty equivalent of his wealth? What is his expected utility?