Behavioral Economics. Problem Set 1.

Due Week 4, Friday, in class, 4.40pm. Each hour delayed means a penalty of 2% of the Problem Set grade. Questions 1–4 are worth 20 points each. Questions 5–6 are for practice only, but 5 has to be handed in any case. Questions 7–10 are worth 5 points each. Question 11 is worth 10 points. Total: 110 points.

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1. Assume Naz is an expected utility maximizer (as all agents are according to rational choice theory). Suppose Naz has the following utility function over money: $u(x) = \frac{x}{4}$. Naz has the chance of playing a lottery $\mathcal{L}$ that gives her \$0 with 50% chances, and \$1,000 with 50% chances.

   (a) What is the expected value of this lottery?

   (b) What is the expected utility of the lottery for Naz?

   (c) Would Naz prefer to have \$500 for sure, or play the lottery? Show the intuition graphically.

2. Assume Lauren is an expected utility maximizer, as all agents are according to rational choice theory. Suppose Lauren has the following utility function over money: $u(x) = \sqrt{x}$. Lauren has the chance of playing lottery $\mathcal{L}'$, which gives her \$0 with 40% chances, and \$1,000 with 60% chances.

   (a) What is the expected value of this lottery?

   (b) What is the expected utility of the lottery?

   (c) Would Lauren prefer to have \$500 for sure, or play the lottery? Show numerically, and also show the intuition graphically

   (d) What is her Certainty Equivalent?

   (e) Now suppose Vincent faces the same lottery and has the same utility function as Lauren. The only difference between Vicent and Lauren is that Vincent's initial wealth is \$10,000. What is the expected utility of the lottery for Vincent? What is his certainty equivalent?

3. Now suppose a variation of the lottery. We call it lottery $\mathcal{L}''$: it gives \$0 with 25% chances, \$1,000 with 25% chances, and \$500 with 50% chances. Compute the expected value for this lottery. Will Lauren prefer $\mathcal{L}''$ or $\mathcal{L}'$ ($\mathcal{L}'$ as defined in question 2)? Assume Lauren is an expected utility maximizer, as all agents are according to rational choice theory. Show numerically and graphically, *and explain the intuition.*

4. Suppose there is a disease D for which NUS medical school is developing a medical test. We know this three facts:

- If 100 people who have D are tested, 99 of the results will show up positive (i.e. probability of detection if the patient has D is 99%)
- If 100 people who *do not* have D are tested, 98 of the results will show up negative (i.e. probability of false detection is 2%)
- 1 in 100 in the population of interest have this disease D

In light of this, what is the probability that someone *taken at random* testing positive has the disease? In other words: we take someone at random, use the test and find it positive. What is the probability that this person actually suffers from D?

5. **(For practice, but has to be done)** Suppose an individual lives two periods. Her utility function is given by:

$$(1)\ max_{c_1,c_2}\Big(log(c_1)+\beta log(c_2)\Big) \quad \text{subject to } c_1=\omega_1-s_2 \text{ and } c_2=\omega_2+s_2(1+i),$$

where log means natural logarithm and s_2 means savings from time one to time 2 (or borrowing at time 1 if $s_2<0$).

- Find the optimal levels of consumption (i.e, the values of c_1^* and c_2^*) as a function of the parameters of the model.
- What happens to c_1^* if the interest rate i increases?
- What happens to c_1^* if the wage in time 2 ω_2 increases?

6. **(Optional, for practice)** (a) A risk averse agent, whose utility is given by $U(x)=log(x)$ (natural logarithm) and wealth is \$50,000 is faced with a potential loss of \$10,000 with a probability of $p(Loss)=0.1$. What is the maximum premium she would be willing to pay to protect herself against this loss?

The following four questions are taken from the midterm in 2017. 5 points each.

7. Suppose that Sheldon is an expected utility maximiser, who, as a proper graduate student, has \$0 to start with. His utility function is strictly increasing and strictly concave in all its domain. Suppose Sheldon faces two lotteries:

   (a) $\mathcal{L}$: Win \$$X$ with 50% chances, and \$0 with 50% chances. Denote the EV (expected value) of this lottery as EV($\mathcal{L}$). Denote the expected utility of the lottery as EU($\mathcal{L}$).

   (b) $\mathcal{L}'$: Win \$$10X$ with 50% chances, and \$$9X$ with 50% chances. Denote the EV (expected value) of this lottery as EV($\mathcal{L}'$). Denote the expected utility of the lottery as EU($\mathcal{L}'$).

   X is any number strictly bigger than 0. Let $U(.)$ denote utility. Circle the correct answer:

   $U\big(\text{EV}(\mathcal{L})\big)$ - EU($\mathcal{L}$) is larger than / equal to / smaller than $U\big(\text{EV}(\mathcal{L}')\big)$ - EU($\mathcal{L}'$). If we cannot tell, state so.

   Argue briefly using a *neat, comprehensible and well labeled graph.*

8. The reading "Boys Will Be Boys" used investments data from around 30,000 US families to show that men, on average, get lower returns than women. Why is that the case? (answer in 30 words or less).

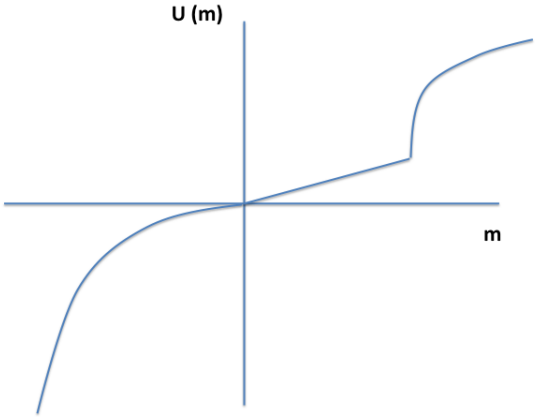
9. What is the best set of options that you should offer online in order to maximise the sales of the option "menu + dessert": SET A or SET B? No need to argue.

   (a) SET A
      i. Menu: \$15
      ii. Dessert only: \$5
      iii. Menu + dessert: \$15

   (b) SET B
      i. Dessert: \$5
      ii. Menu + dessert: \$15

10. Look at the following graph (Figure 1) representing preferences for money. What can you say about attitudes towards risk? Describe them in your own words (again, 40-45 words should suffice).

Figure 1: Utility function of money



11. **(10 points, one point each)** Listen to the Freakonomics podcast called "Does Doing Good Give You License to Be Bad?", link here. If the PLAY button does not work, you can try this YouTube link, too.

    Answer the following:

    (a) What is the methodology used by John List in the first study described?

    (b) What is the goal of his research (study 1)? Be precise

    (c) What is the main finding (study 1)?

    (d) What is the main takeaway from his research (study 1)?

    (e) What do we refer to as "sorting mechanism"? Use your own words. You should be able to infer it given the context.

    (f) In the second study (Amazon Turk) why is it essential that participants are getting paid the same whether or not they translate all images?

    (g) What is the main finding (study 2)?

    (h) For both studies: are you surprised by the results?

    (i) Describe moral licensing using your own words. Come up with one realistic example.

    (j) Suppose you're a primary school teacher and two of your students, Prerna and Lisa, have behaved tremendously well for the whole week. You congratulate Prerna for that, whereas you forget to send any compliments to Lisa. Who is more likely, according to John List, to behave in a slightly selfish or antisocial manner next week?