MIT 14.13 – Problem Set 3

Please make sure to explain your answers carefully and concisely, i.e. do not simply write a numeric answer without an explanation of how you arrived at this answer. Answers without adequate explanation will not receive full credit.

Part 1: Shoe Shopping (25 points)

Gordon has reference-dependent preferences over pairs of shoes (c_s) and money (c_m). His utility takes the form:

$$u(c_s - r_s) + v(c_m - r_m),$$

where r_s is Gordon's reference point for pairs of shoes and r_m is his reference point for money. The function u is defined by

$$u(x) = \begin{cases} 10\sqrt{x} & \text{if } x \geq 0 \\ -20\sqrt{|x|} & \text{if } x < 0 \end{cases}$$

and the function v is defined by

$$v(x) = \begin{cases} \sqrt{x} & \text{if } x \geq 0 \\ -2\sqrt{|x|} & \text{if } x < 0 \end{cases}$$

Gordon currently has 7 pairs of shoes (1 pair for each day of the week) and \$100 in cash.

1. (3 points) Provide a brief interpretation of Gordon's preferences. In the gain domain (i.e., for $c_s \geq r_s$ and $c_m \geq r_m$), is he risk-averse, risk-neutral, or risk-loving? In the loss domain (i.e., for $c_s < r_s$ and $c_m < r_m$), is he risk-averse, risk-neutral, or risk-loving? Does he exhibit increasing or diminishing sensitivity?

   Solution: Gordon exhibits reference-dependence, loss aversion (marginal utility is larger to the left of zero than to the right), risk-aversion in the gain domain, and risk-lovingness in the loss domain. His preferences satisfy these properties for shoes and money separately. Since he is risk-averse in the gain domain and risk-loving in the loss domain, we say that he exhibits diminishing sensitivity.

2. (4 points) Suppose first that Gordon's reference points reflect the status quo, so that $r_s = 7$ and $r_m = \$100$. Gordon is walking down the street when he sees an ad for a pair of Nike shoes priced at $p = \$20$. Is Gordon willing to buy the pair of shoes at this price?

   Solution: Gordon is willing to buy the pair of shoes at $p = \$20$. If Gordon does not buy the pair of shoes, then shoe consumption c_s and money consumption c_m remain at their reference points and his utility

equals zero. So for Gordon to be willing to buy the pair of shoes, we need

$$10\sqrt{r_s+1-r_s}-2\sqrt{|r_m-p-r_m|}\geq 0$$
$$10\sqrt{7+1-7}-2\sqrt{|100-20-100|}\geq 0$$
$$10\sqrt{1}-2\sqrt{20}\geq 0$$
$$10\geq 2\sqrt{20}$$
$$10\geq 8.94,$$

which is true.

3. (4 points) Gordon continues walking down the street and runs into his friend Kemba. They begin discussing shoes, and Gordon learns that Kemba only owns 6 pairs of shoes (1 pair for each weekday and 1 pair for the weekend). Now self-conscious about how many shoes he owns, Gordon updates his shoe reference point to $r_s = 6$. Is Gordon still willing to buy the advertised Nike shoes at $p = \$20$?

Solution: Gordon is no longer willing to buy the the pair of shoes at $p = \$20$. For Gordon to be willing to buy the pair of shoes, we need:

$$10\sqrt{r_s+2-r_s}-2\sqrt{|r_m-p-r_m|}\geq 10\sqrt{r_s+1-r_s}+\sqrt{r_m-r_m}$$
$$10\sqrt{6+2-6}-2\sqrt{|100-20-r_m|}\geq 10\sqrt{6+1-6}+\sqrt{0}$$
$$10\sqrt{2}-2\sqrt{20}\geq 10\sqrt{1}$$
$$10(\sqrt{2}-1)\geq 2\sqrt{20}$$
$$4.14\geq 8.94,$$

which is not true.

4. (2 points) Compare your answers to questions 2 and 3. If your answers to questions 2 and 3 differ, explain why Gordon's decision about shoe buying changed.

Solution: We found that with $p = \$20$, Gordon was willing to buy the pair of shoes before meeting Kemba but was not willing to buy them afterward. Gordon's reference dependence and diminishing sensitivity explain this result. When $r_s = 7$, Gordon's marginal utility from buying the pair of shoes is 10, which is greater than the marginal cost of $2\sqrt{20}$. When he revises his reference point to $r_s = 6$, the marginal utility of buying the pair of shoes becomes $10(\sqrt{2}-1)$, which, because of the concavity of u in the gain domain, is no longer greater than the marginal cost of $2\sqrt{20}$.

5. (4 points) Gordon walks some more and runs into his other friend Jaylen. They begin discussing shoes, and Gordon learns that Jaylen also owns 7 pairs. No longer self-conscious about his shoe consumption, Gordon updates his shoe reference point back to $r_s = 7$. Gordon and Jaylen decide to go to the Nike store to check out the advertised shoes. When Gordon walks into the store, what is his maximum willingness to pay for the pair of shoes?

Solution: Gordon's maximum willingness to pay for the pair of shoes is \$25. His maximum

willingness to pay is the price p_{max} at which he is indifferent about buying them:

$$10\sqrt{r_s + 1 - r_s} - 2\sqrt{100 - p_{max} - 100} = 0$$
$$10\sqrt{1} - 2\sqrt{p_{max}} = 0$$
$$2\sqrt{p_{max}} = 10$$
$$\sqrt{p_{max}} = 5$$
$$p_{max} = 25$$

6. (6 points) Gordon enters the Nike store and grabs the pair of shoes off the shelf. He's pleased about his impending shoe purchase and is excited to go home and try them out, so he updates his reference points to reflect the new status quo: $r_s = 8$ and $r_m = \$100 - p = \$80$. Once at the register, Gordon is informed by the cashier that an additional \$20 sur-"charging" fee applies to his purchase, so that the total price is now $p + \$20 = \$40$.
   (a) Is the new total price of \$40 less than, equal to, or greater than the maximum willingness to pay that you found when Gordon entered the store in question 5?
   (b) Is Gordon willing to pay the new total price of \$40, or does he prefer to leave the store without buying the shoes?

Solution: (a): The new total price of \$40 is greater than the maximum willingness to pay of \$25 that we found when Gordon entered the store in question 5. (b): Even though the new total price is higher than Gordon's maximum willingness to pay when he entered the store, he is still willing to buy the shoes. With $r_s = 8$ and $r_m = \$80$, Gordon's utility from leaving the store without buying the shoes is:

$$\begin{aligned} &-20\sqrt{|r_s - 1 - r_s|} + \sqrt{100 - r_m} \\ &= -20\sqrt{|7 - 1 - 7|} + \sqrt{100 - 80} \\ &= -20\sqrt{1} + \sqrt{20} \\ &= -15.53 \end{aligned}$$

Gordon's utility from paying the fee and buying the shoes is:

$$\begin{aligned} &\sqrt{r_s - r_s} - 2\sqrt{|r_m - 20 - r_m|} \\ &= \sqrt{8 - 8} - 2\sqrt{|80 - 20 - 80|} \\ &= \sqrt{0} - 2\sqrt{20} \\ &= -8.94 \end{aligned}$$

Since $-8.94 > -15.53$, Gordon gets higher utility from paying the fee and buying the shoes, so he is still willing to buy them.

7. (2 points) Firms often impose unanticipated fees at the end of a transaction – e.g., service fees and small-order fees from food-delivery companies, booking fees on travel websites, and processing fees on secondary ticket exchanges like Ticketmaster and StubHub (including for Celtics tickets!). Use your answer to question 6 to explain why firms often find it optimal to charge such fees.

Solution: Question 6 illustrates that surprise fees can increase firms' revenue when consumers exhibit reference-dependent preferences. Before consumers begin a transaction, they have some maximum willingness to pay (like the \$25 we found for Gordon when he entered the store). However, once they decide to make the purchase and put the item in their (real or virtual) shopping cart, they may begin to think as if they already own the item and update their reference points accordingly. They may have a higher willingness

to pay at the new reference points, and may tolerate add-on fees that they wouldn't have accepted at the beginning of the transaction.

Part 2: Social Preferences and Random Acts of Kindness (15 points)

1. We're lucky to be studying social preferences during MIT's Random Acts of Kindness Week. The idea of a random act of kindness is to perform a selfless act to either help or cheer up a random other person (possibly a stranger), for no reason other than making that person happier. To better understand how random acts of kindness might affect you and others, please do the following (in this order!):

   (a) Pick a random act of kindness (RAK) and a person to whom you might want to perform it. Such random acts might include a wide range of actions, including

   (i) sending an encouraging note;

   (ii) expressing your appreciation; or

   (iii) expressing your gratitude to a friend, colleague, former teacher, or family member.

   Try to put some thought into your RAK and try to come up with something that you think could make the other person's day. To address any concerns about the coronavirus, try to avoid random acts that require physical contact.

   (b) Predict, on a scale from -5 to 5, how good you would feel after performing a random act of kindness for someone. On this scale, let -5 correspond to feeling much worse than normal, 0 correspond to feeling no di
   erent than normal, and 5 correspond to feeling much better than normal.

   (c) Predict, on a scale from -5 to 5, how the other person will react. On this scale, let -5 correspond to feeling much worse than normal, 0 correspond to feeling no di
   erent than normal, and 5 correspond to feeling much better than normal.

   (d) Perform the random act of kindness to the person you picked.

   (e) Think about how good you actually felt after performing the random act of kindness, and place this feeling on the same scale as in part (b).

   (f) What is your best guess of the other person's reaction after you performed the random act of kindness? Place this reaction on the same scale as in part (c).

   (g) As your written answer to this question, report

   (i) the random act of kindness that you performed,

   (ii) whether your answer to part (e) was greater than, equal to, or less than your answer to part (b),

   (iii) whether your answer to part (f) was greater than, equal to, or less than your answer to part (c).

   (h)

14.13 Psychology and Economics

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