Economics 119 Midterm, Spring 2007 - Suggested Solutions

Please see David Owens for questions on grading and the solutions for this midterm.

Question 1. A decisionmaker has reference-dependent preferences over mugs and money. Specifically, if her consumption in mugs and money is c_1 and c_2, respectively, and here reference point in mugs and money is r_1 and r_2, respectively, her utility is $v(4c_1 - 4r_1) + v(c_2 - r_2)$, where the value function v satisfies $v(x) = x$ for $x \geq 0$ and $v(x) = 2x$ for $x \leq 0$. Normalize the decisionmaker's current wealth to zero, and suppose she starts off with zero mugs.

Part a: [8 Points]. Suppose the decisionmaker receives no mugs or money, and this is her reference point. Calculate her buying price (the maximum amount she is willing to pay for a mug).

$$
\begin{aligned}
u(0,0|0,0) =& u(1,-p_b|0,0) \\
v(4\times 0 - 4\times 0) + v(0-0) =& v(4 - 4\times 0) + v(0 - p_b) \\
v(0) + v(0) =& v(4) + v(-p_b) \\
0 + 0 =& 4 + 2\times(-p_b) \\
p_b =& 2
\end{aligned}
$$

The decisionmaker's buying price is \$2.

Part b: [8 Points]. Suppose the decisionmaker receives a mug and no money, and this becomes her reference point. Calculate her selling price (the minimum amount for which she is willing to sell the mug).

$$
\begin{aligned}
u(1,0|1,0) =& u(0,p_s|1,0) \\
v(4\times 1 - 4\times 1) + v(0-0) =& v(4\times 0 - 4\times 1) + v(p_s - 0) \\
v(0) + v(0) =& v(-4) + v(p_s) \\
0 + 0 =& 2\times(-4) + p_s \\
p_s =& 8
\end{aligned}
$$

The decisionmaker's selling price is \$8.

Part c: [8 Points]. What is the amount the decisionmaker from Part (b) would be willing to pay to buy another mug?

$$
\begin{aligned}
u(1,0|1,0) =& u(2,-p_b^2|1,0) \\
v(4\times 1 - 4\times 1) + v(0-0) =& v(4\times 2 - 4\times 1) + v(0 - p_b^2) \\
v(0) + v(0) =& v(4) + v(-p_b^2) \\
0 + 0 = 4 + 2\times(-p_b^2)& \\
p_b^2 =& 2
\end{aligned}
$$

The decisionmaker would be willing to pay $2 for a second mug.

PART D [8 POINTS]. Now suppose that the decisionmaker from Part (b) makes *two* decisions that will be carried out at the exact same time. One decision is whether to sell the mug for $6. The other decision is whether to buy another mug for $3. She knows in advance that she will be making both decisions. But suppose that when she makes each of these decisions, she does not take into account that she is also making the other one, acting as if there was no other decision.

(i: [2 Points]) What concept you have learned in the class describes this type of decisionmaking? *narrow bracketing*

(ii: [6 Points]) What decisions will the person make? Is there something weird about them? *As $p_b^2 < 3$ from part c, and $p_s > 6$ from part b, the decision-maker would reject both choices if she brackets narrowly. This is weird, as if she brackets broadly, she would wind up with the same amount of mugs (1) and* 3 *additional dollars, which would clearly be to her benefit.*

PART E: [18 POINTS]. Now suppose that in addition to mugs and money, the decisionmaker cares about candy. If c_3 is her consumption of candy and r_3 is her reference point in candy, her total utility is $v(4c_1 - 4r_1) + v(c_2 - r_2) + v(c_3 - r_3)$. Suppose the decisionmaker receives two mugs and 10 pieces of candy, and this becomes her reference point.

(i: [6 Points]) Would she be willing to give up one of the mugs plus 5 pieces of candy for $15? *The decisionmaker would give up a mug plus 5 pieces of candy for $15 if and only if:*

$$\begin{aligned}
u(1, 15, 5|2, 0, 10) \geq& u(2, 0, 10|2, 0, 10)\\
v(-4) + v(15) + v(-5) \geq& v(0) + v(0) + v(0)\\
-8 + 15 - 10 \geq& 0\\
-3 \geq& 0
\end{aligned}$$

Obviously, this is not true, so the decisionmaker would refuse this trade.

(ii: [6 Points]) Would she be willing to give up one of the mugs plus $5 for 15 pieces of candy? *The decisionmaker would give up a mug plus $5 for 15 pieces of candy if and only if:*

$$\begin{aligned}
u(1, -5, 25|2, 0, 10) \geq& u(2, 0, 10|2, 0, 10)\\
v(-4) + v(-5) + v(15) \geq& v(0) + v(0) + v(0)\\
-8 + -10 + 15 \geq& 0\\
-3 \geq& 0
\end{aligned}$$

The decisionmaker would refuse this trade as well. (iii: [6 Points]) If she can undertake *both* of the above transactions at the same time, and takes this into account while making each of the decisions, what would she do? Explain in words how your answer relates to your answers to parts (i) and (ii). *In order for her to accept both trades:*

$$u(0, 10, 20|2, 0, 10) \geq u(2, 0, 10|2, 0, 10) \quad (1)$$
$$v(-8) + v(10) + v(10) \geq v(0) + v(0) + v(0) \quad (2)$$
$$-16 + 10 + 10 \geq 0 \quad (3)$$
$$4 \geq 0 \quad (4)$$

	Mugs	Money	Candy
Original	2	0	10
First Transaction	-1	+15	-5
Second Transaction	-1	-5	+15
Final	0	10	20

This inequality is satisfied, meaning that she will accept both trades when she brackets broadly, as opposed to rejecting both, as she would if she bracketed narrowly. Notice that the combined utility of the two transactions is 10 units higher (4 vs -6) when bracketed narrowly than when bracketed broadly. This is due to the fact that, when combined, $5 of the $15 from the first transaction and 5 of the 15 pieces of candy from the second transaction reduce losses from the other transaction, rather than increasing gains (as when they are bracketed narrowly). As seen in the value function, decreased losses are twice as valuable as same-sized gains. This accounts for the extra 10 units of utility, and the decisionmaker's decision to accept.

QUESTION 2: [50 POINTS]. Explain the following findings/phenomena *in detail* using a framework or concept you have learned in the course. In order to receive full credit, you need to identify how to apply each relevant element of the framework to the finding, and you need to explain each part of the finding. Please still be concise—we will penalize irrelevant or tangential discussions.

PART A: [10 POINTS]. If a person acquires a sum of money easily or unexpectedly, she tends to be more spendthrift with it than with her money more generally.

Loss Aversion:*Spending money involves a tradeoff between the money spent and the goods and services received. When people acquire money unexpectedly, it is typically not incorporated into their reference point. Therefore, spending this money is seen as a reduced gain rather than an incurred loss. According to the prospect theory's value function, losses are felt more strongly than same-size reduction in gains. Therefore, the utility gained from purchasing goods and services need not be as great when unexpectedly acquired money is being spent, and this money will thus be spent more liberally than when paying for the goods and services by incurring a loss relative to the reference point.*

PART B: [10 POINTS]. Researchers elicited MBA students' valuations for a bottle of an average wine and a bottle of rarer wine. Students were first shown the wines as well as expert descriptions of the wines. They then wrote down the last two digits of their social security numbers, and answered whether hypothetically they would be willing to buy each of the two bottles for that many dollars. Students' true valuations were then elicited in an incentive-compatible manner. The following table sorts subjects into groups with low, medium and high social security numbers, and displays the average willingness to pay of each group.

SSN range	low	medium	high
average wine	$8.64	$12.55	$27.91
rarer wine	$11.73	$18.09	$37.55

Coherent Arbitrariness: *The students' valuations of both types of wines are strongly correlated with the last two digits of their social security numbers, which are clearly unrelated to the wines. This suggests that the students do not have intrinsic valuations for the wines, and are influenced by arbitrary cues. They do, however, consistently value the rare wine more than the average wine, which shows that they form coherent preferences within the category of wines. Therefore, the observation suggests that people construct sensible preferences around arbitrarily influenced starting points.*

PART C: [10 POINTS]. When I was returning from a conference last month, my taxi driver happily reported to me that he just found a $100 bill stuck under the seat in his cab—which a previous passenger must have dropped long before—so he decided he will finish work earlier that day. ***Loss Aversion:*** *Camerer et. al. suggest that many taxi drivers have strict daily income targets, and are loss averse with respect to daily wage, using their target as a reference point. Taxi drivers' marginal utility of income therefore sharply decreases upwards of their reference point. As they* *choose their own hours, each driver constantly faces a tradeoff between earning additional wages and taking leisure time. The decrease of marginal utility of income above the reference point makes it very likely that leisure will become more attractive than work at this point. This particular driver's decision to quit early suggests that he, too, is reference dependent with respect to his daily wage. The* \$100 *put him closer to his target, and he will choose to quit earlier. If he were reference dependent with respect to his weekly or monthly wage, his decision of when to quit today would not be influenced by the* \$100 *he found, as he would choose to quit early only on the lowest-wage days rather than on the day he found the money.*

PART D: [10 POINTS]. Small investors tend to hold on to losing stocks and sell winning stocks, even though their return would be much higher if they did the reverse.

Diminishing Sensitivity and Narrow Bracketing: *In order to treat winning and losing stocks differently, stockholders must bracket very narrowly, specifically at the individual stock level. If they were reference-dependent with respect to their entire portfolio, they would always make the profit-maximizing choice with the money that they invest. The purchase price of an individual stock is a natural reference point for the evaluation of its current "value". Diminishing sensitivity implies risk-accepting behavior for stocks in losses, as additional losses hurt less than reduced losses help. Conversely, diminishing sensitivity implies risk-averse behavior for stocks in gains, as additional gains are less beneficial than reduced gains are harmful. Therefore, stockholders will tend to sell stocks in gains, and hold onto those in losses.*

PART E: [10 POINTS]. People were asked to make a choice in the following two hypothetical problems. In one problem, subjects chose between (a) a 50% chance of winning a three-week tour of England, France, and Italy; and (b) a one-week tour of England with certainty. 78% of the respondents chose (b). In the other problem, subjects chose between (c) a 5% chance of winning a three-week tour of England, France, and Italy; and (d) a 10% chance of winning a one-week tour of England. 67% chose option (c). ***Probability Weighting Function:****The probability weighting*

function is generally very steep close to 0 and 1, and relatively flat in the middle. In this case, we can see that if $\omega(p)$ *is the probability weighting function for probability p,* $\frac{\omega(1)}{\omega(.5)} > \frac{\omega(.1)}{\omega(.05)}$. *In other words, the ratio of the decision weights of probabilities of 100% to 50% is greater than that of 10% to 5%. This seems reasonable, as the probability weighting function is typically concave for small values (and therefore does not increase rapidly between 5% and 10%), and convex for large values (and therefore increases sharply between 50% and 100%). This would cause the decision-maker to value option b relative to option a much more than option d relative to option c, as shown in the data.*