Psychology and Economics Field Exam
August 2016

There are 3 questions on the exam. Please answer the 3 questions to the best of your ability. Do not spend too much time on any one part of any problem (especially if it is not crucial to answering the rest of that problem), and don't stress too much if you do not get all parts of all problems.

Problem 1

Suppose that Mike's preferences are defined over mugs (good 1) and money (good 2), where consumption utility is $m(c) = \alpha c_1 + c_2$. Mike's reference-dependent utility for a deterministic consumption outcome $c = (c_1, c_2)$, given a deterministic referent $r = (r_1, r_2)$ is given $u(c|r) = m(c) + \mu(c_1|r_1) + \mu(c_2|r_2)$, where

$$\mu(x|r) = \begin{cases} \eta x & \text{if } x \geq 0 \\ \lambda \eta x & \text{if } x < 0 \end{cases}$$

and $\lambda > 1$. For a stochastic reference point with distribution $G(r)$, Mike's utility after a particular consumption outcome c is realized is $u(c|G) = m(c) + \int u(c|r)dG(r)$. Suppose that Mike has to wait until period 2 for the consumption outcome to be realized.

Part a. Suppose that in period 1 Mike is endowed with a mug, and he does not expect that he will be able to sell it. This sets his reference point to $(1, 0)$. What is the smallest price for which he would be willing to sell the mug in period 2? Express your answer in terms of the model parameters α, η, λ.

Part b. Suppose that in period 1 Mike is endowed with no mug, and he does not expect the opportunity to buy it in period 2. This sets his reference point to $(0, 0)$. What is the largest price for which Mike would be willing to buy the mug in period 2? What is the intuition for why Mike's willingness to pay for the mug in part (b) is lower than his willingness to accept in part a?

Part c. Show that the commonly quoted result that "losses way twice as heavily as gains" from traditional prospect theory (a model in which there is no consumption utility, meaning that $\eta = \infty$ in the notation of this model) translates to $\frac{\eta\lambda+1}{\eta+1} = 2$. What is the intuition for why Mike's choices in parts a and b can identify $\frac{\eta\lambda+1}{\eta+1}$, but cannot separately identify η and λ?

Part d. Suppose that in period 1 when Mike is given the mug, he is told that he will have the opportunity to sell it at a randomly drawn price $p \sim U[0, b]$ drawn from a uniform distribution with support $[0, b]$, with $b \geq \alpha\lambda$. The price draw is realized in period 2. Mike's strategy in period 2 is a threshold strategy: he sells if and only if the price p is above some $p^\dagger$. This induces the following expectations: keep the mug and receive \$0 with probability $p^\dagger/b$, lose the mug but gain \$$p$ with probability $1 - p^\dagger/b$. This expectation constitutes his (stochastic) reference point in period 2. In period 2, Mike must play a *personal equilibrium*, meaning that selling the mug at price p is optimal for him (given the expectation-based reference point induced by $p^\dagger$) if and only if $p \geq p^\dagger$.

Prove that in any personal equilibrium, $p^\dagger < \alpha\lambda$. What is the general intuition for why $p^\dagger$ must be bounded?

Part e. [warning: this is probably the most math intensive question on the test!] Prove that there is a unique personal equilibrium for a sufficiently large b. And show that for the unique equilibrium, $p^\dagger \to \alpha\frac{1+\eta}{1+\eta\lambda}$ as $b \to \infty$. *(Hint: It may be helpful to use the result from part (d). In fact, the result implies that the probability of not selling the mug can be made arbitrarily small for a sufficiently large b.)*

Part f. In part (a), you showed that mike's lowest acceptable selling price was higher than α. What is the intuition for why Mike's lowest acceptable selling price is *lower* than α as $b \to \infty$?

Part g. Does the personal equilibrium always have to be unique? Provide some intuition (concrete mathematical examples not necessary unless this makes your life easier) for why or why not. If your answer is that the personal equilibrium does not generally have to be unique, what is it specifically about this example that helps ensure uniqueness?

Problem 2

Suppose that in period 1, people have the opportunity to take a binary action $a \in \{0, 1\}$ (e.g., not go or go to they gym) that generates immediate costs c (e.g., inconvenience of taking the action) and delayed benefits h (e.g., health benefits). Suppose that (sometime in the future) they also receive monetary incentives $x \geq 0$ for taking the action. Assume that utility is linear in money, so that people are not risk averse with respect to monetary gambles. In period 0, a person only know that $c \sim F$, where F is an atomless distribution with a smooth density function, and whose support includes $[0, h]$. For simplicity, assume that F is the same for all people. Suppose that people are present biased: In period 1, they take the action if $\beta h + \beta x \geq c$, for $\beta \in [0, 1]$. In period 0 they are partially naive, thinking that they have present bias $\hat{\beta} \geq \beta$.

To fix notation, let $Q(x)$ denote a person's period 0 perceived probability of taking the action in period 1. Let $W(x)$ denote a person's period 0 willingness to pay for the contingent incentive x; that is $W(x)$ is the smallest a amount that a person would prefer to receive for sure instead of the incentive x that is contingent on taking the action. The decision is made in period 0, but the money is taken from the person's account in period 1 or later.

Part a. Show that when $\hat{\beta} = 1$, $W'(x) = Q(x)$. Using this, show that $W(x) \leq Q(x)$ for all x and $W(x) \approx Q(x)$ for small x. What is the intuition?

Part b. More generally, show that $W'(x) = Q(x) + (1 - \hat{\beta})(h + x)Q'(x)$. Using this, show that if x is sufficiently small and $\hat{\beta} < 1$, then $W(x) > Q(x)$. What is the intuition?

Part c. The only way to really elicit $Q(x)$ in this setting is to ask people for their forecasts in a non-incentivized way. But suppose that when people are asked for their forecast in a non-incentivized way, their answers are noisy. That is, when person i is asked for his forecast about his behavior given incentive level x, all we get is $\hat{Q}_i(x) = Q_i(x) + \epsilon_i$, where $Q_i(x)$ is the "true forecast for person i," and ϵ_i is a mean-zero noise term. Assume that the ϵ_i are distributed independently. Similarly, suppose that elicitations of willingness to pay (done in an incentivized way using multiple price lists or the Becker-DeGroot-Marschak mechanism) are noisy: all we can observe is $\hat{W}_i(x) = W_i(x) + \delta_i$ for independent, mean-zero δ_i.

Now imagine an analyst who tries to prove the existence of $\hat{\beta} < 1$ people—i.e., people with a demand for commitment—with the following logic: "Any person who says that he will take the action with probability p given a \$1 incentive, but values that \$1 contingent incentive by more than $p \cdot \$1$, must have $\hat{\beta} > 1$)." Why is this analyst wrong?

Part d. Show that under our assumptions about ϵ_i and δ_i, a robust test of the existence of $\hat{\beta} < 1$ people is to show that for some small x, $E[\hat{W}_i(x)] \geq E[\hat{Q}_i(x)]x_i$. But if $E[\hat{W}_i(x)] = E[\hat{Q}_i(x)]x$ for some very small x then the average $\hat{\beta}$ in the population must be approximately 1. (Assume that $\hat{\beta} \leq 1$ for all people)

Part e. Suppose that $\hat{\beta}$ and h are homogeneous in the population. Explain how you can identify $(1 - \hat{\beta})h$ using the strategy in part (d). Why can you not separately identify $\hat{\beta}$ and h using this strategy?

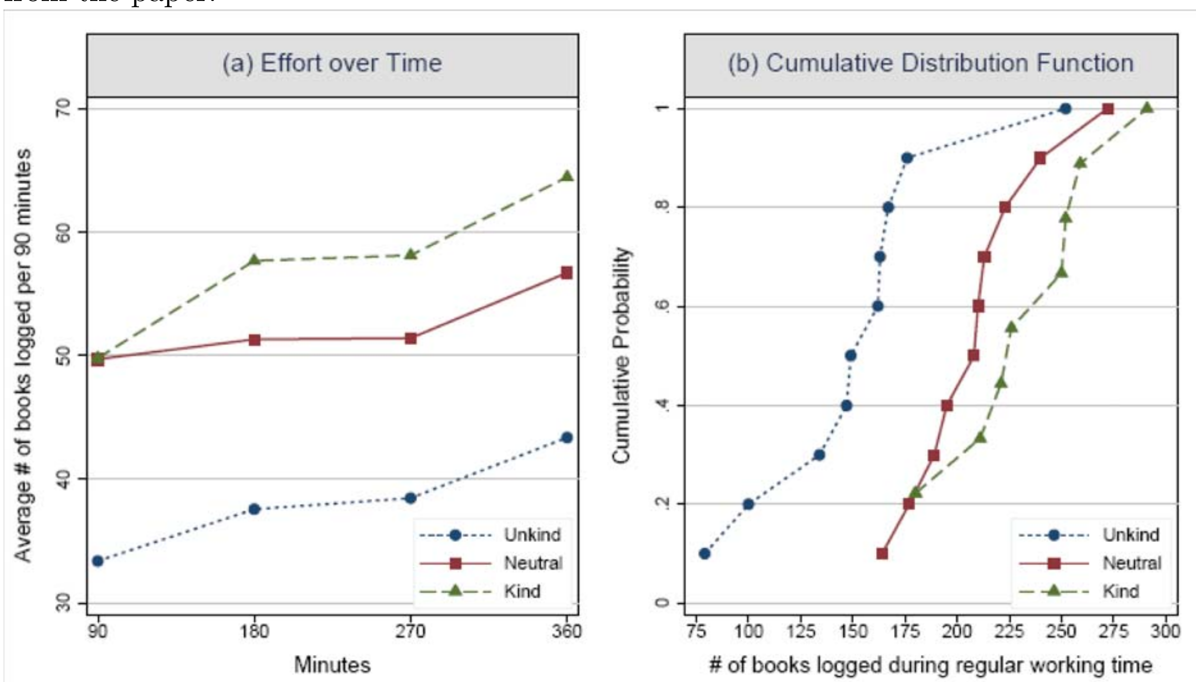
Part f. In part (c) the analyst may end up concluding that lots of people have a demand for commitment, even when $\hat{\beta} = 1$ for everyone. Discuss whether you think there may be similar problems with overestimating the demand for commitment in existing literature on commitment contracts. Bringing in some concrete examples from the literature into your discussion will help. There are no right or wrong answers—just explain your reasoning with lots of intelligent-sounding intuition.

Part g. Building on your discussion in part e, discuss what kinds of empirical strategies / experimental designs might help us get a better grip on whether observed demand for commitment is really coming from $\hat{\beta} < 1$, rather than just "noisy behavior." You don't need to propose a fully fleshed out research design. Just discuss what kinds of strategies can help us make progress on this question.

Problem 3.

Consider the gift exchange experiment of Kube, Marechal and Puppe (JEEA). Remember that the authors hire students at a rate of 'presumably' 15 Euros per hour. Then ex post after subjects have shown up, they indeed pay 15 Euros per hour to the control group. But in the *Kind* treatment group they surprise subjects by paying 20 Euros per hour, while in the *Unkind* treatment group they surprise the subjects by paying 10 Euros per hour. Remember that this is a one-time 6-hour job.

a. Describe in words the findings embedded in the Figure 1a. (first panel) below from the paper.



b. An earlier version of the paper included only Panel a. A referee writes 'I suspect that the difference between the *unkind* and *neutral* treatment is due just to 1 or 2 outliers.' Discuss in light of Panel B.

c. Assuming that effort is costly, describe the predictions of the standard model with no social preferences. How does that contrast with the data?

d. The authors of the paper write '*The paper provides evidence supporting the laboratory findings that negative reciprocity is stronger than positive reciprocity*'. Discuss making clear as precisely as possible the implicit assumptions made in this statement.

e. Consider the following model of the experiment above. Denote by w the worker earnings over 6 hours, and assume a cost of effort ce^{γ}/γ with $\gamma > 1$ and $c > 0$, where e is the number of units produced in 6 hours. For each unit of output produced e, the firm earns a return v. The worker maximizes

$$\max_{e} w - c\frac{e^{\gamma}}{\gamma} + \alpha\left[ve - w\right]. \tag{1}$$

What assumptions have we made to get to expression (1)? Discuss in particular the assumptions about the last part of the utility function.

f. Derive the first-order conditions of problem (1) and solve for e^*. Is the solution unique? Discuss, providing intuition, how the solution depends on v, c, and w. Link to your answer to point (c).

g. Going back to the field experiment, consider now that the treatments vary the wage w, which equals $w_k > w_n > w_u$. Assuming first that the change in wage w between the treatments affect no other parameter, what does the model of social preferences (1) predict about the effort in the different conditions?

h. Generalize model (1) assuming that a change in the wage w_j can lead to a change in the altruism α of the worker towards the firm, which is now a_j with $j = k, n, u$. Rewrite the solution for e_j^* taking this into account. Define positive reciprocity as the difference $\alpha_k - \alpha_n \geq 0$ and negative reciprocity as the difference $\alpha_n - \alpha_u \geq 0$. Why can we think of this as a (simple) reciprocity model and how does it differ from the pure altruism case above?

i. Now we are ready to discuss quantitatively the statement in point (d). The finding of the Kube et al. paper is $e_k^* - e_n^* < e_n^* - e_u^*$. Using the solution for e_j^*, when is it correct to infer that '*The paper provides evidence supporting the laboratory findings that negative reciprocity is stronger than positive reciprocity*'. Relate to parameter values for c, γ, and v.

j. Can you think of additional experimental sessions for Kube et al. to identify the cost of effort parameters c and γ?

k. Assume that Kube et al. ran these additional sessions so they identified c and γ. Can they structurally estimate α_k, α_n, and α_u? If something is missing for the estimation, how could they get around the problem?

l. Building on your work, briefly discuss the promise and potential pit-falls of a more structural approach to behavioral models, aimed at identifying the underlying behavioral parameters, in this case the altruism coefficients. Can you think of other reduced-form field experiments (discussed in the lectures or otherwise) where one could supplement the study and identify the parameters?