Psychology and Economics Field Exam
August 2014

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.

Question 1:

This is a question in which we consider Cindy deciding whether to smoke her cigars, but really it is about whether she finds out if she has cigars. It mostly involves prospect-theory-based news utility, and a bit of present bias. Please label in a clear way crucial steps in your work on this problem if you would like partial credit despite mistaken arithmetic, but don't spend too much time explaining your analysis; if not specifically asked for an explanation, you will get full credit if you give the right answer.

Cindy knows that she is going to live for T periods. She may or may not have cigars to smoke. On any given day, she would get consumption utility 1 from smoking 1 or more cigars (relative to smoking 0), with no additional utility for a 2nd cigar, and no current or future costs of smoking. In all parts of this problem, Cindy will either have 0 cigars to smoke or enough cigars to smoke one each day remaining in her life. So if Cindy knows she has cigars, she will and should smoke each day. There is no trade-off to consider in that case.

But Cindy does not start out knowing if she has cigars or not. There is a 50% chance she has a lifetime supply in storage, and 50% she has none. Cindy can find out for free on any morning if she has the lifetime supply of cigars. Once she finds out, she can and will smoke every day *beginning that day*. But Cindy has news-utility preferences, with loss aversion but no diminishing sensitivity, as in the simplified form of Koszegi and Rabin (2009). She has values $\gamma = \eta = 1$ (please assume these values as given everywhere, to make your life easier) and $\lambda > 1$, known to Cindy but which we treat as a parameter. So if Cindy goes from not knowing whether she will smoke to knowing she will smoke, she'll get immediate contemporaneous and prospective news utility (equally strong, so she cares just as much about news of future consumption as she does about news of current consumption) based on the fact that she'll get consumption utility of 1 each day remaining in her life. If she thought there was a positive probability of current or future consumption and then learns this period that she has none, she will get negative news utility. Per the usual model, Cindy's news utility if she changes from one probabilistic belief about consumption to another probabilistic or certain beliefs involves a "stochastic reference point". Assume that Cindy is fully rational in the sense we use in this context: her behavior is dynamically consistent given rational expectations about her own behavior.

Given this set-up (and recall the 50% chance of having cigars), let us start by considering $T = 1$: Cindy has only 1 day on which she can smoke. On Day 0, Cindy can form future plans, but not smoke or learn of her supply nor experience news utility; hence

a) If Cindy started Day 1 planning not to smoke a cigar, for what values of λ will she instead decide to learn of her supply (and of course smoke iff she has cigars)?

b) If Cindy started Day 1 planning to search for cigars and smoke if she finds a supply, for what values of λ will she follow through on that plan?

c) For what values of λ is the unique optimal consistent plan (preferred personal equilibrium, or fully rational choice when she can choose her favorite consistent plan) for Cindy to search for cigars?

d) If Cindy could commit on Day 0 (when, recall, she gets no news utility) to *not* search for cigars (or, equivalently, to burn all the cigars she might or might not have), for what values of λ would Cindy strictly prefer to commit?

e) Suppose again that Cindy cannot commit, but now she lives for $N > 1$ days. For what values of N and λ is the unique optimal consistent plan for Cindy to search for cigars *immediately*. Explain briefly how you reached your conclusion.

f) Suppose again that Cindy *can* commit in period 0 to any date to learn (or to never learn). For each possible N, λ combination, state whether Cindy will i) commit to never learn, ii) not commit (because commitment doesn't help, assume again she does not commit if indifferent), or iii) commit to learn in a particular day (and state the day, or if you cannot calculate it give an intuition).

Part (g) may be complicated (or may not be). Do not spend too much time on it if you are not confident you will have appropriate time on other parts of the exam.

g) Now suppose again the situation of (e), Cindy lives for N days, but cannot commit. Now however suppose that has present bias $\beta < 1$, but (as before) otherwise has no time preference. Assume Cindy is fully naive (about β—still assume full sophistication about what she would do in the future *if*, as she naively believes, she did not discount in the future). Assuming (as implicitly we always sound like we are assuming) that consumption utility happens the period of consumption and both contemporaneous and prospective news utility is experienced the period where the news happens, when (if ever) will Cindy learn about her cigar supply as a function of N, λ, and β? Get as far as you can in stating the intuition or results; but do state your intuitions succinctly (and incorrect intuitions listed along with correct ones will count against you). Briefly discuss anything interesting about the answer.

Question 2.

We consider a setting as in the Kaur, Kremer, and Mullainathan paper on self-control at work. This question extends into Question 3. The worker has time preferences $\left(\beta, \hat{\beta}, \delta\right)$ model. The worker decides how much effort e_t to put at work at time $t = 1, 2$. Effort has immediate costs $-c(e)$, with $c(0) = 0, c'(0) = 0, c' > 0$ and $c'' > 0$. The product of work is stochastic: it is high output y_H with probability e, in which case the worker earns w_H and it is low output y_L with probability $1 - e$, in which case the worker earns $w_L < w_H$. The worker decides effort at work in periods $t = 1$ and $t = 2$ and pays the effort cost immediately, but pay is at $t = 2$ in both cases. The worker is risk-neutral.

a) Discuss briefly why the maximization problem of the worker at $t = 1$ when deciding e_1 is

$$\max_{e_1} \beta\delta \left[e_1 w_H + (1 - e_1) w_L\right] - c(e_1). \tag{1}$$

b) Derive the first order conditions and derive the comparative statics of e_1^* with respect to β, δ, and $w_H - w_L$. Provide intuition.

c) Now write down the maximization problem of the worker at $t = 2$ when deciding e_2^*.

d) Derive the first order conditions and derive the comparative statics of e_2^* with respect to β, δ, and $w_H - w_L$. Provide intuition.

e) In light of the parts above, describe this first prediction tested in Kaur et al.: **Prediction 1.** *Worker exhibit a payday cycle (that is, $e_1^* < e_2^*$)* When is this true? Give conditions on β, $\hat{\beta}$, and δ.

f) Now consider the maximization problem (1) regarding e_1^* but evaluated from the perspective of the $t = 0$ self. Write down the value function V_0 of the problem (1) from the perspective of the self $t = 0$.

g) Consider first a time-consistent agent $(\beta = \hat{\beta} = 1)$ and use the envelope theorem to derive dV_0/dw_L. (To be clear, we vary w_L holding w_H constant) What is the sign of dV_0/dw_L? Discuss the intuition.

h) Consider now a sophisticated time-inconsistent agent $(\beta = \hat{\beta} < 1)$ and similarly derive an expression for dV_0/dw_L. Can you use the envelope theorem? What is the sign of dV_0/dw_L? Discuss the sign of the parts of the expression and provide intuition.

i) Consider now a (fully) naive time-inconsistent agent $(\beta < \hat{\beta} = 1)$ and similarly derive dV_0/dw_L. (For the naive, V_0 is how the naive sees the future value, it is not the true future value function) Can you use the envelope theorem? What is the sign of dV_0/dw_L? Discuss the intuition.

j) In light of these parts, discuss a second prediction. **Prediction 2.** *Some workers may demand a commitment device (that is they prefer a low w_L).* Which workers? Under what conditions?

k) In light of your response to the above point, why is the demand for commitment device a more unique distinguishing feature than a payday cycle?

l) Suppose now that there can be three types of workers. A fraction p_{TC} is time-consistent, a fraction p_S is sophisticate, and the remaining $1 - p_{TC} - p_S$ is naive. Importantly, the three types are identical other than in their β and $\hat{\beta}$. Under what conditions the following prediction is true: **Prediction 3:** *Types who exhibit a payday cycle (that is, $e_1^* < e_2^*$) also are more likely to exhibit demand for commitment (that is, prefer a low w_L as of $t = 0$)*

m) Consider now the case $\beta = \hat{\beta} = 1$ and assume that there are two types which differ in δ. Type Low has $\delta_L < \delta_H$, the discount factor of the high type. Can you get Prediction 3?

n) Going back to points (f)-(j), assume now that workers at time 0 can similarly have a commitment device to affect future effort, but this time they may decide to affect effort e_2^*, .as opposed to effort e_1^* as we considered till now. Without going through all the steps, explain as clearly as you can if this would change the derivation of the demand for commitment for the different types.

Question 3

In this question we relate field evidence to the simple model above.

a) Summarize the setting and design of Kaur, Kremer and Mullainathan.

b) Discuss Figure 2 below and relate to Prediction 1 of a payday cycle. To what extent does the model support a present-bias model? To what extent it does not?

Figure 2
Production over the Pay Cycle
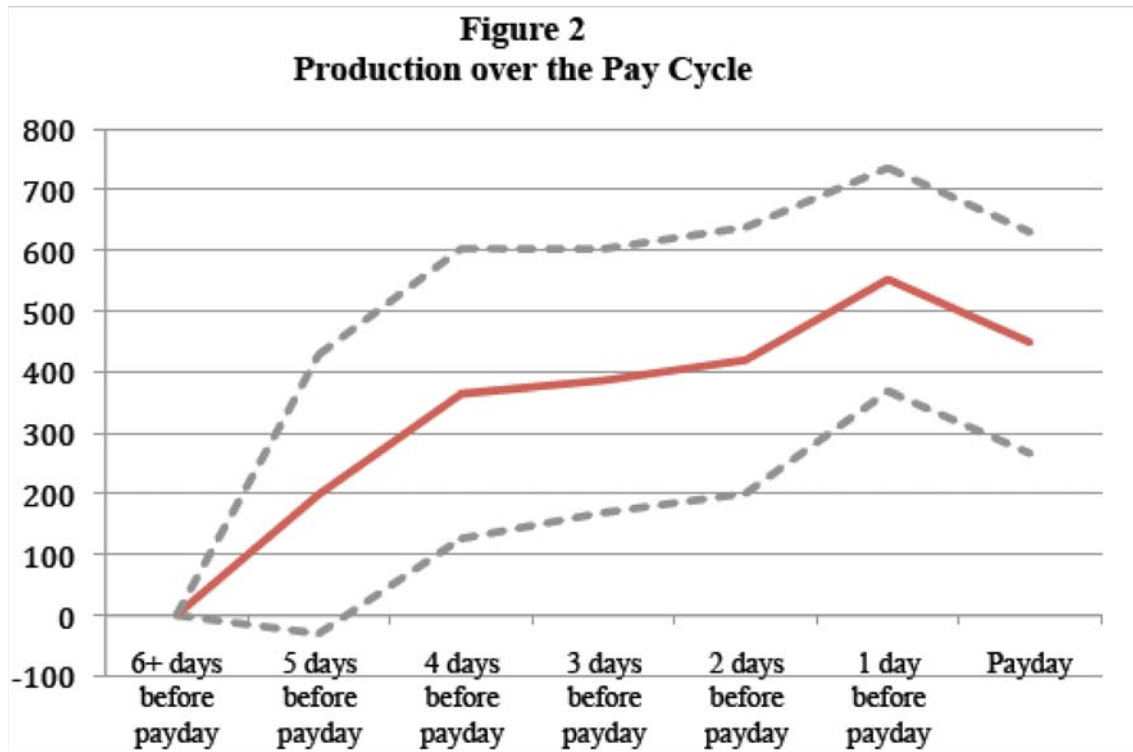
c) A finding in the paper is that approximately two thirds of workers choose a version of the dominated contract in the Figure below. Explain how this was implemented, and relate to Prediction 2.

Figure 1
Incentive Contracts
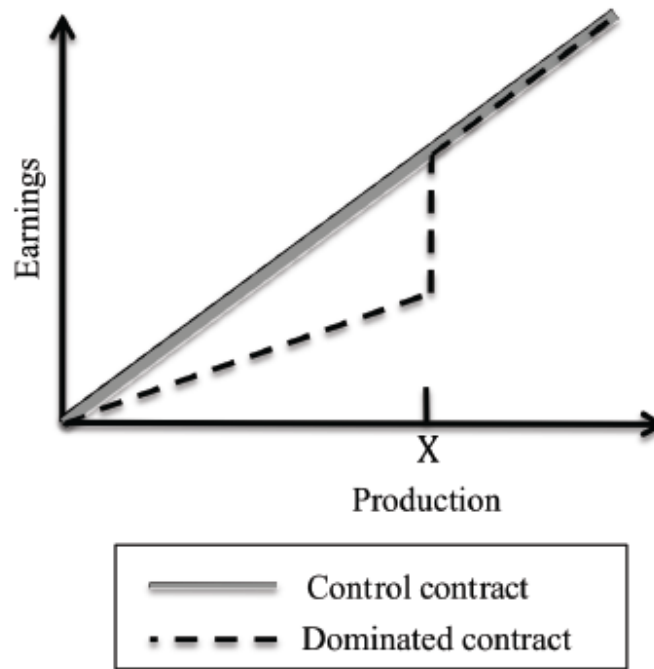
d) The authors also find a positive correlation between the payday effect and the demand for commitment. Relate Prediction 3 to the findings below.

Table 5
Heterogeneity in Take-up of Dominated Contracts:
Correlation with Payday Impact

Dependent variable	Target level chosen	Positive target indicator
	(1)	(2)
High payday production impact	353	0.138
	(129)***	(0.044)***
Seat fixed effects	Yes	Yes
Date fixed effects	Yes	Yes
Lag production controls	Yes	Yes
Observations	4098	4098
R2	0.22	0.20
Dependent variable mean	759	0.28

e) Summarize briefly at least two more papers which examine the demand for commitment, in addition to the Kaur et al.

f) Is the demand for commitment generally as robust as in the Kaur et al. paper?

g) Discuss why the test of the demand for commitment is a one-sided test (That is, what can we conclude about present bias if we do *not* observe demand for commitment). What are reasons we may not observe demand for commitment even if individuals are present-biased (that is, $\beta < 1$).