Psychology and Economics Field Exam

August 2019

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.

1 Long question 1

In this question, we consider consumers who undervalue some product, x, like healthy food or energy-efficient upgrades, because of incorrect beliefs or inattention. Consumers start out with some income y, and they maximize the utility function

$$\hat{U} = \hat{\alpha} \ln(x) + (y - (p - s)x - T)$$

where p is the price set by producers, s is the subsidy set by the government, T is the lump-sum tax, and $y - (p - s)x - T$ is spending on the "numeraire" good. Consumers' true utility is instead given by

$$U = \alpha \ln(x) + (y - (p - s)x - T)$$

where $\alpha \geq \hat{\alpha}$.

The choice of x can be any non-negative real number. The lump-sum tax T must balance the budget: if consumers choose $x^*(s)$ given a subsidy s, then $T(s) = s \cdot x^*(s)$. Assume that y is large enough such that the choice of x is always interior (i.e., it is characterized by a first-order condition).

1.1 For parts 2.1- 2.5, assume that the producer price is fixed because the good is produced by a price-taking firm with constant marginal costs of production (graphically, this means that the supply curve is flat). Let $x^*(s)$ be choice as a function of the subsidy. Show that

$$\frac{d}{ds}\left[\alpha \ln(x) - (p - s)x^*(s)\right] = \frac{\alpha}{p - s}.$$

1.2 Let $x^*(s)$ be choice as a function of the subsidy. Show that

$$\frac{d}{ds}\left[sx^*(s)\right] = \frac{\hat{\alpha}p}{(p-s)^2}.$$

1.3 Using the derivations above, show that the optimal subsidy must satisfy

$$\frac{p-s}{p} = \frac{\hat{\alpha}}{\alpha}.$$

What is the intuition behind this equation? Explain why this subsidy obtains the "first best"—i.e., welfare that would be achieved if no consumers misoptimized.

1.4 Suppose now that a fraction q of consumers have $\hat{\alpha} = \hat{\alpha}_L < \alpha$ and a fraction $1-q$ of consumers have a $\hat{\alpha} = \hat{\alpha}_H = \alpha$. Using 2.1 and 2.2 above, generalize 2.3 to show that the optimal subsidy must satisfy

$$\frac{p-s}{p} = q\frac{\hat{\alpha}_L}{\alpha} + (1-q).$$

Explain the intuition, and explain why this subsidy can no longer achieve first-best welfare. (The government must still maintain a balanced budget, meaning that the lump-sum tax T must equal the total amount of subsidy paid out to the two types of consumers. That is, $T = s\left[qx_L^* + (1-q)x_H^*\right]$,where x_L^* and x_H^* are the respective consumption choices of type L and H consumers.)

1.5 Suppose that "poor" consumers have $\hat{\alpha} = \hat{\alpha}_L$ while "rich" consumers have $\hat{\alpha} = \hat{\alpha}_H$. This means that rich people buy more x than poor people. A progressive politician named Bennie Xanders gives a speech about how the subsidy calculated in 2.4 above would be regressive, since it would end being distributed to the rich much more than to the poor. Using your calculations in 2.4, explain why Bennie's concept of regressivity is incorrect, and that in fact the subsidy benefits the rich and the poor consumers equally. Explain the intuition behind why standard concepts of regressivity have to be refined with behavioral consumers.

1.6 For the rest of this question (2.6-2.10), assume that the supply of good x is fixed. The firm supplying this good is still a price-taking firm. (Graphically, this means that the supply curve is a vertical line.) Explain why when $q = 1$ (all consumers are homogeneous), the first-best welfare obtains with no subsidy. Unless you prefer, you don't have to do any math here. Hint: You may find it helpful to recall our discussion about how tax salience does not affect deadweight loss of taxation with vertical supply, since it does not affect equilibrium quantity sold and purchased.

1.7 Explain why, when $0 < q < 1$, the first-best welfare no longer obtains. But also explain why subsidizing (or taxing) can't improve things. Hint: Think about the principles of misallocation due to heterogeneous consumer bias that we discussed in the context of sales tax salience. Unless you prefer, you don't have to do any math here.

1.8 Go back to the case in which $q = 1$. Imagine a "nudge" that fully debiases consumers. Explain why this nudge would increase profits of the price-taking firm and decrease consumer surplus. (Consider doing this graphically by drawing the supply and demand curves.) Would the result of the nudge be different if instead the supply curve was flat?

1.9 Go back to the case in which $q = 1$. Imagine a "nudge" that debiases half of the consumers. Explain why this nudge would lower the sum of consumer and producer surplus (i.e., would lower social welfare). Hint: Use 2.6 and 2.7. Would the result of the nudge be different if instead the supply curve was flat?

1.10 Building on 2.8 and 2.9, explain why, generally speaking, nudges do, indeed, affect the choice-sets of both "behavioral" and "rational" consumers in markets with endogenous prices.

2 Long question 2

In this question, we consider two examples of minimum distance estimation.

2.1 Laibson, Repetto and Tobacman (2009) estimate a consumption-savings model which allows for (β, δ) preferences. The moments used in the paper are presented in Table 1 below. Describe the evidence in the table.

TABLE 1
SECOND-STAGE MOMENTS

Description and Name	$\overline{m}_{J_m}$	$\text{se}(\overline{m}_{J_m})$
% Borrowing on Visa: *"% Visa"*	0.678	0.015
Mean (Borrowing$_t$ / mean(Income$_t$)): *"mean Visa"*	0.117	0.009
Consumption-Income Comovement: *"CY"*	0.231	0.112
Average weighted $\frac{wealth}{income}$: *"wealth"*	2.60	0.13

Source: Authors' calculations based on data from the Survey of Consumer Finances, the Federal Reserve, and the Panel Study on Income Dynamics. Calculations pertain to households with heads who have high school diplomas but not college degrees. The variables are defined as follows: *% Visa* is the fraction of U.S. households borrowing and paying interest on credit cards (SCF 1995 and 1998); *mean Visa* is the average amount of credit card debt as a fraction of the mean income for the age group (SCF 1995 and 1998, weighted by Fed aggregates); *CY* is the marginal propensity to consume out of anticipated changes in income (PSID 1978-92); and *wealth* is the weighted average wealth-to-income ratio for households with heads aged 50-59 (SCF 1983-1998).

2.2 Explain what a minimum-distance estimator does. Call $m(\theta)$ the theoretical moments as function of the parameters θ and $\hat{m}$ the empirical moments. Write out what objective function the minimum distance minimizes.

2.3 What role does the weighting matrix (call it W) play in the estimation? What does minimum distance reduce to when W is the identity matrix? Do you remember what is the optimal weighting matrix? Why does it make sense to use such weighting in the case of the Laibson et al paper, given the four moments above?

2.4 The table below reproduces the key results from the paper estimates. Explain how well the hyperbolic model (Column 1) qualitatively fits the data (the empirical moments) versus how well the exponential model (Column 2) fits.

TABLE 3
BENCHMARK STRUCTURAL ESTIMATION RESULTS

	(1) Hyperbolic	(2) Exponential	(3) Hyperbolic Optimal Wts	(4) Exponential Optimal Wts	(5) Data
Parameter estimates $\hat{\theta}$					
$\hat{\beta}$	0.7031	1.0000	0.7150	1.0000	-
s.e. (i)	(0.1093)	-	(0.0948)	-	-
s.e. (ii)	(0.1090)	-	-	-	-
s.e. (iii)	(0.0170)	-	-	-	-
s.e. (iv)	(0.0150)	-	-	-	-
$\hat{\delta}$	0.9580	0.8459	0.9603	0.9419	-
s.e. (i)	(0.0068)	(0.0249)	(0.0081)	(0.0132)	-
s.e. (ii)	(0.0068)	(0.0247)	-	-	-
s.e. (iii)	(0.0010)	(0.0062)	-	-	-
s.e. (iv)	(0.0009)	(0.0056)	-	-	-
Second-stage moments					
% Visa	0.634	0.669	0.613	0.284	0.678
mean Visa	0.167	0.150	0.159	0.049	0.117
CY	0.314	0.293	0.269	0.074	0.231
wealth	2.69	-0.05	3.22	2.81	2.60
Goodness-of-fit					
$q(\hat{\theta}, \hat{\chi})$	67.2	436	2.48	34.4	-
$\xi(\hat{\theta}, \hat{\chi})$	3.01	217	8.91	258.7	-
p-value	0.222	<1e-10	0.0116	<2e-7	-

Source: Authors' calculations.
Note on standard errors: (i) includes both the first stage correction and the simulation correction, (ii) includes just the first stage correction, (iii) includes just the simulation correction, and (iv) includes neither correction.

2.5 What are the benefits of structural estimation in the context of this paper? Discuss

2.6 Consider now another paper with minimum-distance estimation, DellaVigna, List, and Malmendier on "altruism versus social pressure in charitable giving". Summarize briefly the design and results of the experiment, you can read off the key results in the empirical moments.

Appendix Table 1. Empirical Moments and Estimated Moments

Specification:	Minimum-Distance Estimates			
Charity	La Rabida Charity		ECU Charity	
Moments for Charity	Empirical Moments	Estimated Moments	Empirical Moments	Estimated Moments
Moments	(1)	(2)	(3)	(4)
P(Home) No Flyer	0.4130	0.4142	0.4171	0.4142
P(Home) Flyer	0.3733	0.3735	0.3806	0.3983
P(Home) Opt-Out	0.3070	0.2989	0.3281	0.2911
P(Opt Out) Opt-Out	0.1202	0.1142	0.0988	0.1179
P(Giving) No Flyer	0.0717	0.0666	0.0455	0.0422
P(Giving) Flyer	0.0699	0.0710	0.0461	0.0449
P(Giving) Opt-Out	0.0515	0.0633	0.0272	0.0390
Additional Moments (not shown)				
P(0<Giving<10), P(Giving=10), P(10<Giving<=20), P(20<Giving<=50), P(Giving>50) in Treatments NF, F, OO	X	X	X	X
N	N = 4962	N = 4962	N = 2707	N = 2707

2.7 Comparing the empirical moments with the estimated moments, how well does the model fit the data? What is/are the moment(s) with the worst fit?

2.8 In the context of this experiment, what are the benefits of structural estimation?

3 Short questions

Please answer the short questions below. You will be graded on the quality of your explanation. Make as convincing of a case as possible—whether that involves plain English or brief model sketches.

Question 3.1 If an individual is present-biased, is naivete about present bias (i.e., overestimating the short-run discount factor β in future decisions) always bad for this individual? Answer this question using the welfare criterion of the "long-run," "period 0" preferences.

Question 3.2 Will sophisticated present-biased individuals always demand commitment devices?

Question 3.3 Suppose that a person prefers \$30,000 with 90% chance over \$61,000 with 45% chance (thus, strictly prefers \$30,000 with 90% chance over \$60,000 with 45% chance), and also prefers \$59,000 with 1% chance over \$31,000 with 2% chance (thus, strictly prefers \$60,000 with 1% chance over \$30,000 with 2% chance). Is this set of preferences consistent with expected utility theory? If not, what can explain this person's behavior?

Question 3.4 Suppose that a person enters a lab and rejects a gamble that would give her \$3 with 50% chance but that would require her to pay \$2 with 50% chance. The outcomes of this

gamble would be realized the next day. The next day, this person would also realize the outcomes of numerous investments in the stock market. Can this person's lab behavior, which exhibits *first-order risk aversion,* be explained by loss aversion alone? Or does it need to be explained by a combination of loss aversion and narrow bracketing?

Question 3.5 Is the following statement True, False, or Uncertain: "The gambler's fallacy and the hot-hand fallacy are contradictory concepts and cannot be explained by a single sensible model."

Reminders: The *gambler's fallacy* is a false belief in negative autocorrelation, like the belief that after a fair coin lands heads up 5 times, then it is "due" for a tails. The *hot-hand fallacy* is a false belief in "streakiness," as in the belief that after a basketball player makes a few shots in a row, he must be "on fire" and continue playing very well.

Question 3.6 Is the following True, False, or Uncertain: "Even if firms can create contracts with shrouded attributes, market competition will drive down the size of these attributes, will make firms want to educate consumers about opaque features of contracts, and will make markets efficient."