219A – Final Exam – Spring 2011

Question #1 (Insurance)

In this Question we consider the deductible choice in the home insurance industry, as in Sydnor (2006)'s paper. A home insurance contract is characterized by a premium P and a deductible level D. The home insurance contract offers two possibilities (to simplify): a high-deductible contract (P_{Hi}, D_{Hi}) and a low-deductible contract (P_{Lo}, D_{Lo}), with $D_{Hi} > D_{Lo}$ and $P_{Hi} < P_{Lo}$. The agent has wealth W and a utility function $U(C)$, where C is the amount of wealth left over after paying the premium and the (eventual) losses after the deductible. Finally, the probability of an accident is π and the loss in case of an accident is $L > D_{Hi}$.

a) Assuming expected utility, derive the condition under which the agent prefers the low-deductible to the high-deductible contract (assume that the probability of accident and the loss are independent of the deductible chosen).

b) Linearize now the utility function around W using the first-order Taylor approximation $U(C) = U(W) + U'(W)(C - W) + o(C - W)$. Neglect the term $o(C - W)$. Show that this implies that the agent chooses the low-deductible contract if (ad only if)

$$\pi (D_{Hi} - D_{Lo}) \geq P_{Lo} - P_{Hi}. \tag{1}$$

c) Consider Table 2a from Sydnor (2006). Consider the consumers that choose a \$500 deductible (D_{Lo}) over the \$1,000 deductible (D_{Hi}) (first row) [Neglect for now the existence of the \$250 deductible] For them, (1) must hold. Fill in the average observed values for $\pi, D_{Hi} - D_{Lo}$ and $P_{Lo} - P_{Hi}$ in equation (1). Is equation (1) satisfied? Argue that you reject the null hypothesis of approximate risk-neutrality.

Chosen Deductible	Number of claims per policy	Increase in out-of-pocket payments *per claim* with a $1000 deductible	Increase in out-of-pocket payments *per policy* with a $1000 deductible	Reduction in yearly premium per policy with $1000 deductible	Savings per policy with $1000 deductible
$500	0.043	469.86	19.93	99.85	79.93
N=23,782 (47.6%)	(.0014)	(2.91)	(0.67)	(0.26)	(0.71)
$250	0.049	651.61	31.98	158.93	126.95
N=17,536 (35.1%)	(.0018)	(6.59)	(1.20)	(0.45)	(1.28)

Average forgone expected savings for all low-deductible customers: $99.88

* Means with standard errors in parentheses

d) To what extent risk aversion in the expected utility sense can rationalize this finding?

e) We now consider a reference-dependent utility model of the above decision (Read on to the next point to have a full picture). Assume that the value of an insurance contract

$V(P, D, \pi)$ is given by $v(-P) + w(\pi) v(-D)$ where $w(\pi)$ is the probability weighting function, and $v(x)$ is the value function according to prospect theory. Assume a piece-wise linear value function:

$$v(x) = \begin{cases} x & \text{if} \quad x \geq 0 \\ \lambda x & \text{if} \quad x < 0 \end{cases}$$

(the reference point here is zero) Write the condition under which the agent prefers the low-deductible to the high-deductible contract and simplify it. Given calibrated values of λ and $w(\pi)$, does this formulation of reference-dependent preferences explain partially or totally the finding in Table 2a?

f) Assume now that there should be no loss-aversion for paying a premium, since one can get used to paying a premium; you suffer loss aversion only from unexpected losses if an accident occurs. Discuss the reasonableness of this assumption in light of what you know of models of reference points as rational expectations (Koszegi and Rabin, 2006) Follow this suggestion, and repeat the steps in point (e). Does this version explain partially or totally the finding in the Table above?

g) Now, let's take this to a broader setting. Is your guess that reference dependent preferences, as outlined here, predict over-insurance more generally? Discuss two cases, such as car insurance and health insurance.

Question #2 (Gift Exchange)

Consider the gift exchange game in Fehr-Kirchsteiger-Riedl (QJE, 1993) in simplified format. At $t = 0$, a firm makes a take-it-or-leave-it offer to a worker by promising a pay $w \geq 0$, which the worker accepts or rejects. The worker's reservation wage is 0. The pay is unconditional on effort, that is, the contract is a flat wage. At $t = 1$, after observing w, the worker exerts effort $e \geq 0$. The firm payoff is $x_f = ve - w$, with $v > 0$, and the worker payoff is $x_w = w - ce^2/2$, with $c > 0$. The game is one-shot (given that workers and firms are re-matched every period).

a) Stepping back briefly, consider two persons s and o (s for *self* and o for *other*) and associated monetary payoffs by π_s and π_o. Charness and Rabin (*QJE*, 2002) consider the following simple formulation of the preferences of *self*:

$$(1 - \rho r - \sigma s)\pi_s + (\rho r + \sigma s)\pi_o,$$

where $r = 1$ (resp. $s = 1$) if $\pi_s > \pi_o$ (resp. $\pi_s < \pi_o$) and zero otherwise. Explain how the parameters ρ and σ allow for a range of different theories of social preferences; provide at least two examples.

b) Consider now the gift exchange game in the selfish version with $\rho = 0$ and $\sigma = 0$; that is, the utility function of the firm is $U_f = x_f$ and the utility function of the worker is $U_w = x_w$. Solve for the sub-game perfect equilibrium in this game.

b) Solve for the 'efficient' w and e, that is, the ones that solve the utilitarian sum of utilities, that is, $x_f + x_w$. Compare this to the result of (a).

d) Consider the following Figure which plots the observed effort and wage in Fehr-Kirchsteiger-Riedl (FKR). Keep in mind that in FKR, the minimum effort is 0.1 and the reservation wage a little higher so the minimum acceptable wage is 30. Describe the observed patterns in the Figure and relate them to your answer to (a). Do the results support the predictions of the standard model?
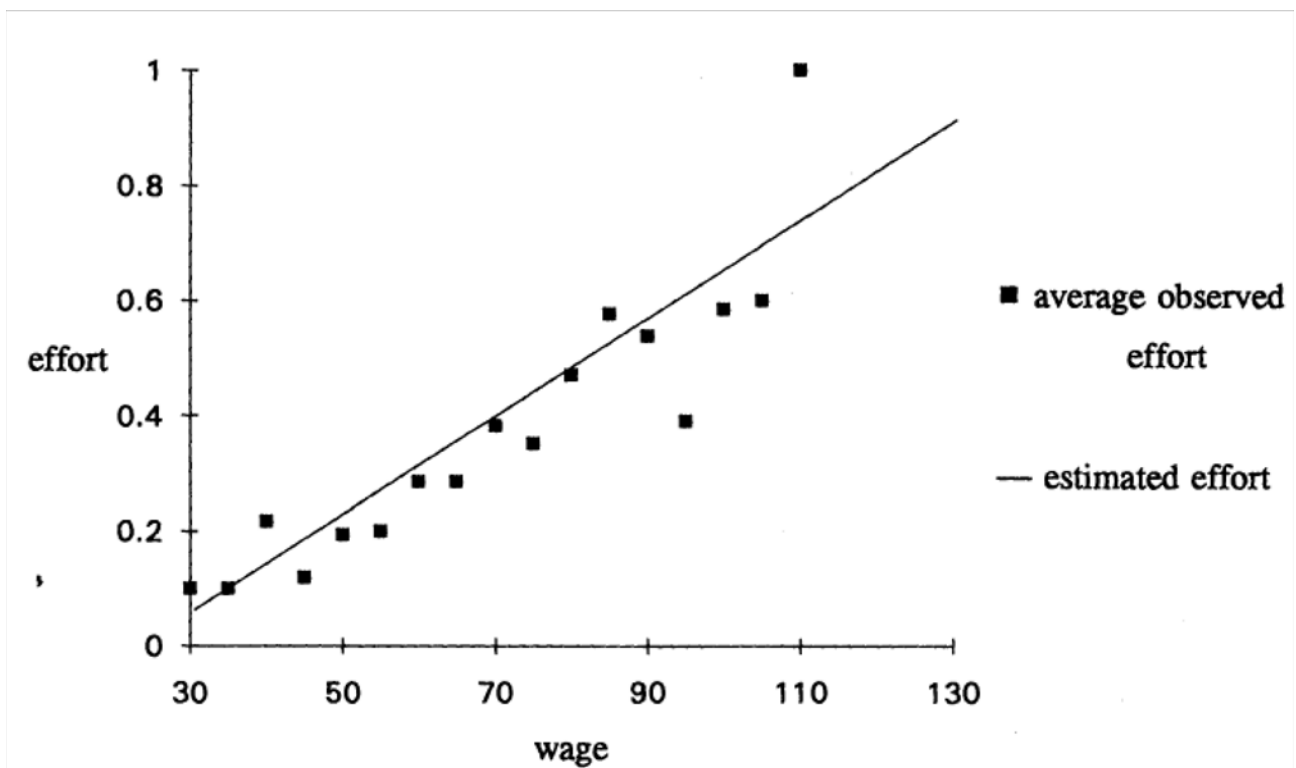
e) Now consider a Charness-Rabin / Fehr-Schmidt model with ρ and σ different from zero. To simplify, assume that the firm is still selfish, but the worker is characterized by the preferences in Question 1 with $\rho > 0$ and differential altruism if ahead ($\rho > \sigma$). To start with, also assume $\rho > 0 > \sigma$. What does this mean?

f) Solve, *in as much detail as you can,* for the optimal wage w and effort e in this game. To the extent that you cannot solve it fully analytically, describe the qualitative solution. [Hint: Discuss the came when the worker is ahead and when the worker is behind] This part is harder than the previous parts, so plan on spending more time here. How does the solution vary with ρ, σ, v, and c?

g) Qualitatively (do not attempt to solve fully), discuss whether and how results would change if the firm also has inequity-averse preferences with the same parameters.

h) Now, assume that the firm, in addition to the payoffs of the gift-exchange game, has substantial income M from other projects. That is, the payoff of the firm is $x_f = M + ve - w$, where M is a very large, that is $M >> w - ce^2/2$ for any plausible e and w (I am not being precise here, but it's to simplify the solution). The payoffs of the worker do not change. Does this make a difference for the analysis of point (b) (where both firm and worker are selfish)? Does this make a difference for the analysis of points (e-g) (where the worker is inequity-averse)? Use your intuition here.

i) Let's now go to the field. Consider the Gneezy-List (Econometrica) paper where an employer randomly varies the pay and pays (after hiring) some workers \$12 an hour and others \$20 an hour. Describe briefly the finding, summarized by this Figure.

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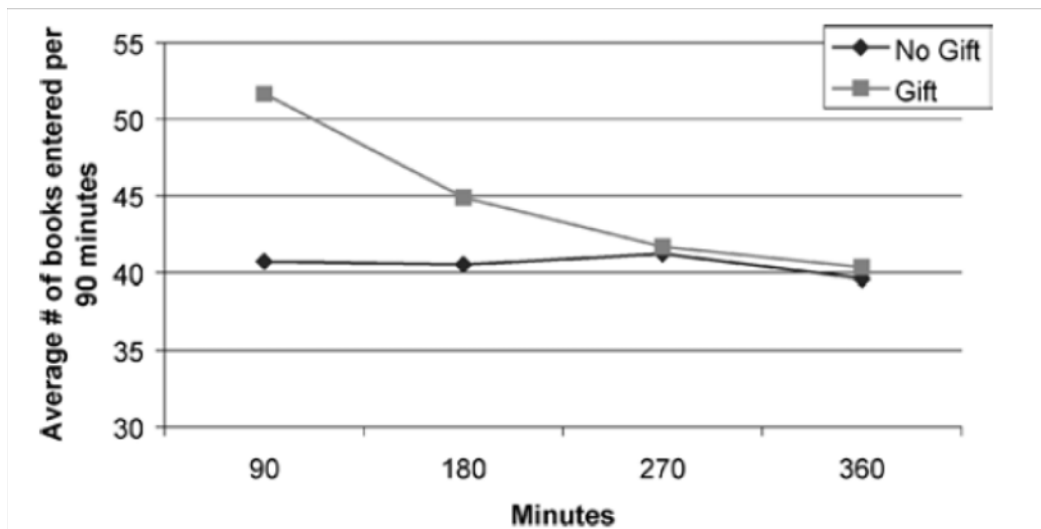
j) Setting aside the later decrease in effort, describe whether the following models can explain the initial effort increase in response to higher pay: (i) the standard model with no social preferences (point (b)); (ii) a model with inequity-averse workers (point (f)); (iii) a model with inequity-averse workers and rich firms (point (h)).

k) In light of this, is it likely that the observed gift exchange *in the field* describes inequity aversion? Could inequity aversion explain the Falk (Econometrica) findings on the post-cards and amount fund-raised?

l) Can you think of another social preferences model that would explain these phenomena?

Question #3 (1/N heuristic)

This question concerns the empirical evidence for the 1/N heuristic, and in particular the evidence in Benartzi and Thaler, "Naive Diversification Strategies in Defined Contribution Savings Plans", AER, 2001 and in Huberman and Jiang, "Offering vs. Choice in 401(k) Plans: Equity Exposure and Number of Funds", Journal of Finance, 2006.

a) How would you define the 1/N heuristic?

b) Benartzi and Thaler (2001) collect data on investment in 401(k) plans across 162 companies. They investigate how the share of money invested in equity on average in a 401(k) plan (%*Invested In Equity*) varies as a function of the number of equity funds in the plan (%*Equity Options*). They find the following linear relationship:

$$\%Invested\ In\ Equity \ = \ \alpha + .63 * \%Equity\ Options. (\text{N=162})$$
$$(.09)$$

Discuss the context briefly, interpret the economic content and the magnitudes of this finding.

c) Relate the finding to the 1/N heuristic.

d) What are possible confounding factors and alternative interpretations of the result above?

e) In their 2006 paper, Huberman and Jiang use an alternative, richer data set to provide a new test of the Benartzi and Thaler findings. Do you remember the main differences between the Benartzi and Thaler data and the Huberman and Jiang data of 401(k) plans?

f) Huberman and Jiang (2006) find

$$\%Invested\ In\ Equity \ = \ \alpha + .29 * \%Equity\ Options.$$
$$(.06)$$

for funds with less than 10 options and

$$\%Invested\ In\ Equity \ = \ \alpha + .06 * \%Equity\ Options.$$
$$(.07)$$

for funds with more than 10 options. You can find these results in Panel A of Table IV (attached) Are these two findings supportive of the 1/N heuristics? Discuss [In Benartzi and Thaler, the median 401(k) plan has 6.8 investment options]

Table IV
Sensitivity of Equity Allocation to Equity Exposure: Estimates of
$$\%EQ_{i,j} = \gamma \%EQOffered_j + \beta Control_{i,j} + \varepsilon_{i,j}$$

The dependent variable, *%EQ*, is the percentage of current-year contributions that go to equity funds. The key independent variable, *%EQOffered*, is the percentage of equity funds out of all funds offered. Company stock is excluded from both variables. In regressions with controls, the control variables are: (1) individual attributes: savings rate, log compensation, log wealth, gender, age, tenure, and registration for web access; and (2) plan policies: match rate, availability of company stock, presence of restricted match in company stock, presence of a DB plan, and the number of funds offered; (3) plan average of individual attributes. Estimates (COEF) are obtained through censored median regression (Powell (1984)) to account for the constraint that *%EQ* falls within [0, 100%]. The standard errors (SE) are adjusted for both heteroskedasticity and arbitrary correlation of error disturbances clustered by plan. *indicates that the coefficient is different from 0 at the 5% significance level.

	(1)		(2)		(3)		(4)	
	All NFunds				NFunds ≤ 10		NFunds > 10	
	COEF	SE	COEF	SE	COEF	SE	COEF	SE
Panel A: Full Sample—Uniform Sensitivity								
%EQOffered	0.175	0.274	0.177*	0.088	0.292*	0.107	0.058	0.09
R^2	0.000		0.061		0.063		0.068	

g) Why do Huberman and Jiang (2006) cluster the standard errors at the level of the plan (i.e., company)? (see the Notes to Table IV). Give an assumption of a (plausible) correlation in the error term that this correlation allows.

h) Huberman and Jiang also characterize the relationship between the total number of funds chosen by an individual and the total number of funds offered by the fund (see Figure attached). [Here, we are not distinguishing any more between equity and non-equity investments] How do you characterize this result? To what extent does this result contradict the definition of 1/N heuristic that you gave in point a)?
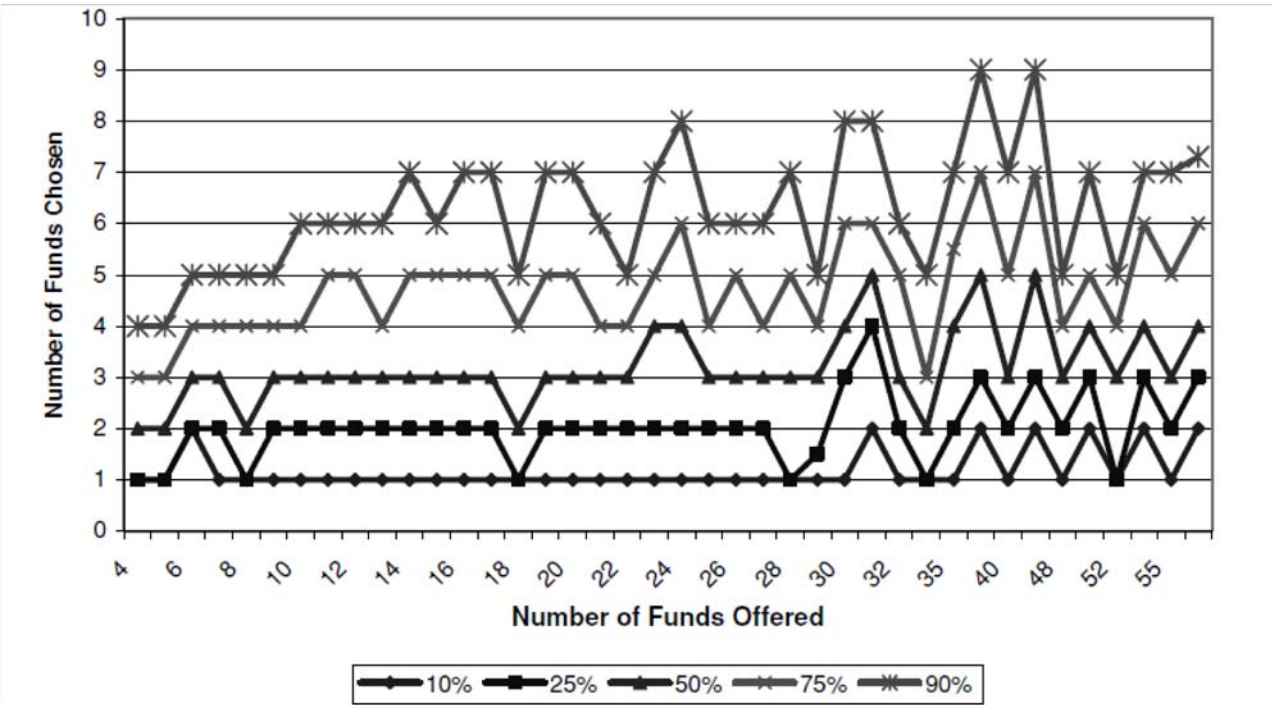
i) Can you sketch a version of that 1/N heuristic that stands up to the evidence in both Benartzi and Thaler (2001) and Huberman and Jiang (2006)?