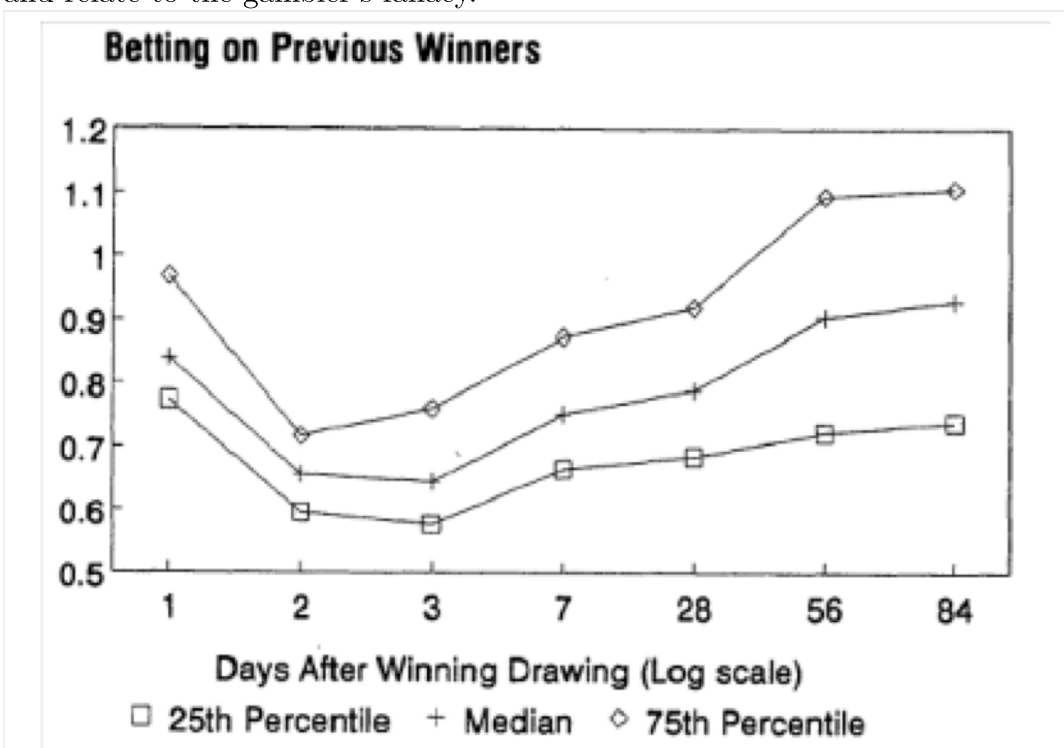
219B – Final Exam – Spring 2013

Question #1 (Shorter Questions)

a) **Individual Investor Decisions.** Over the course of 219B we have considered several ways in which individual investors deviate from holding an optimal portfolio (a well-diversified one, with low fees). Provide at least two examples of such deviations.

b) **Gambler's Fallacy.** Describe briefly what we mean by gambler's fallacy. Consider the following figure from Clotfelter and Cook (1993) considering the number of people betting on a particular number x days after that number was just drawn. Comment on the findings and relate to the gambler's fallacy.



c) **Market Timing.** The following figure from Loughran and Ritter (1995) documents the average stock returns to companies issuing equity (SEOs are Seconday Equity Offerings) compared to a matching sample of companies who do not. Describe the findings are related to the theory of market timing in behavioral corporate finance.

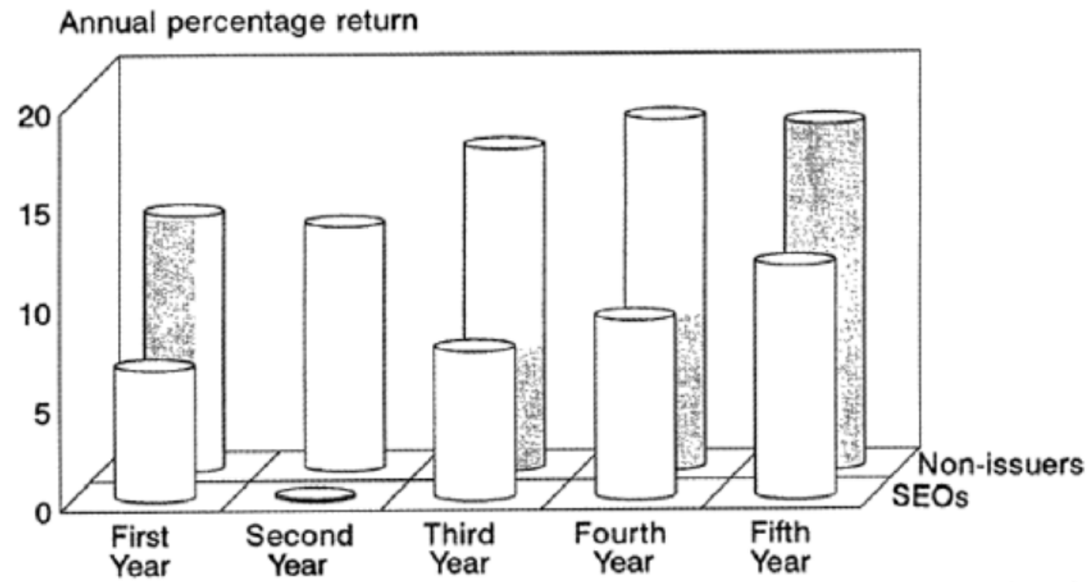


Figure 2. The average annual raw returns for 4,753 initial public offerings (IPOs), and their matching nonissuing firms (top), and the average annual raw returns for 3,702 seasoned equity offerings (SEOs), and their matching nonissuing firms (bottom), during the five years after the issue. The equity issues are from 1970 to 1990. Using the first closing postissue market price, the equally weighted average buy-and-hold return for the year after the issue is calculated for the issuing firms and for their matching firms (firms with the same market capitalization that have not issued equity during the prior five years). On each anniversary of the issue date, the equally weighted average buy-and-hold return during the next year for all of the surviving issuers and their matching firms is calculated. For matching firms that get delisted (or issue equity) while the issuer is still trading, the proceeds from the sale on the delisting date are reinvested in a new matching firm for the remainder of that year (or until the issuer is delisted). The numbers graphed above are reported in Table III.

d) **SMRT.** What does the Save More Tomorrow (SMRT) plan by Benartzi and Thaler consist of? Explain how this savings plan addresses self-control problems, naivete', and aversion to nominal losses to increase retirement savings.

Question #2 (Self-control and Procrastination)

The starting point for this question is the paper by Hanming Fang and Dan Silverman on the decision of single mothers to apply for welfare - or not. Single mothers have three possible choices – they can work (*Work* –in which case they will obviously not get welfare), they can stay at home and get welfare (*Welfare*), or stay at home but not get welfare (*Home*). The next Table from the paper reports the transition probability from each of the three states in year $t-1$ to year t. So 84.3% for example is the probability that a mother who in year $t-1$ is on welfare will also be on welfare in year t.

	Choice at t		
Choice at $t-1$	Welfare	Work	Home
Welfare			
Row %	84.3	3.5	12.3
Column %	76.7	6.3	17.9
Work			
Row %	5.3	79.3	15.3
Column %	2.6	76.4	12.1
Home			
Row %	28.3	12.0	59.7
Column %	20.7	17.3	70.0

a) Describe the main features of the data in the above Table. In particular, what is the puzzle the authors seek to explain?

b) The authors estimate a model in which a single mother at home can apply for welfare. Applying for welfare benefits is associated with a one-time (immediate) stigma cost $-\phi$ and yields future benefits from the monetary receipt of benefits. A mother who is already on welfare pays no further stigma cost from staying on welfare. The author estimate ϕ, as well as time preference parameters β and δ. Each period is assumed to be one *year*, so an immediate payoff is one that refers to the current year, the next period is next year, etc. Similarly, δ is the yearly discount factor. To reiterate this aspect, a single mother decides each year whether to work, be on welfare, or stay at home not on welfare, and then decides again the next year. The next Table reports the estimates of the main parameters in the paper.

Parameters		(1) Time Consistent		(2) Present-Biased (sophisticated)		(3) Present-Biased (Naive)	
		Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Preference Parameters							
Discount Factors	β	1	n.a.	0.33802	0.06943	0.355	0.0983
	δ	0.41488	0.07693	0.87507	0.01603	0.868	0.02471
Net Stigma	$\phi^{(1)}$	7537.04	774.81	8126.19	834.011	8277.46	950.77
(by type)	$\phi^{(2)}$	10100.9	1064.83	10242.01	955.878	10350.20	1185.27
	$\phi^{(3)}$	13333.2	1640.18	12697.25	1426.40	12533.69	1685.92

Discuss the main features of the estimates in Column (1), in which β is set to 1. The amount for stigma ϕ is in \$ (the superscript refers to three types, as the model allows for heterogeneity – do not worry about the heterogeneity). Comment on the magnitude of the estimated parameters (δ and ϕ) relative to what are plausible values (explain here). Provide intuition for why such values of the parameters are needed to estimate the patterns in the transition matrix above.

c) Discuss now how the estimates change for a sophisticated present-biased single mother (Column 2). Again, are the magnitudes of the parameters (β, δ, and ϕ) plausible?

d) Discuss now how the estimates change for a (fully) naive present-biased single mother (Column 3). Again, are the magnitudes of the parameters (β, δ, and ϕ) plausible?

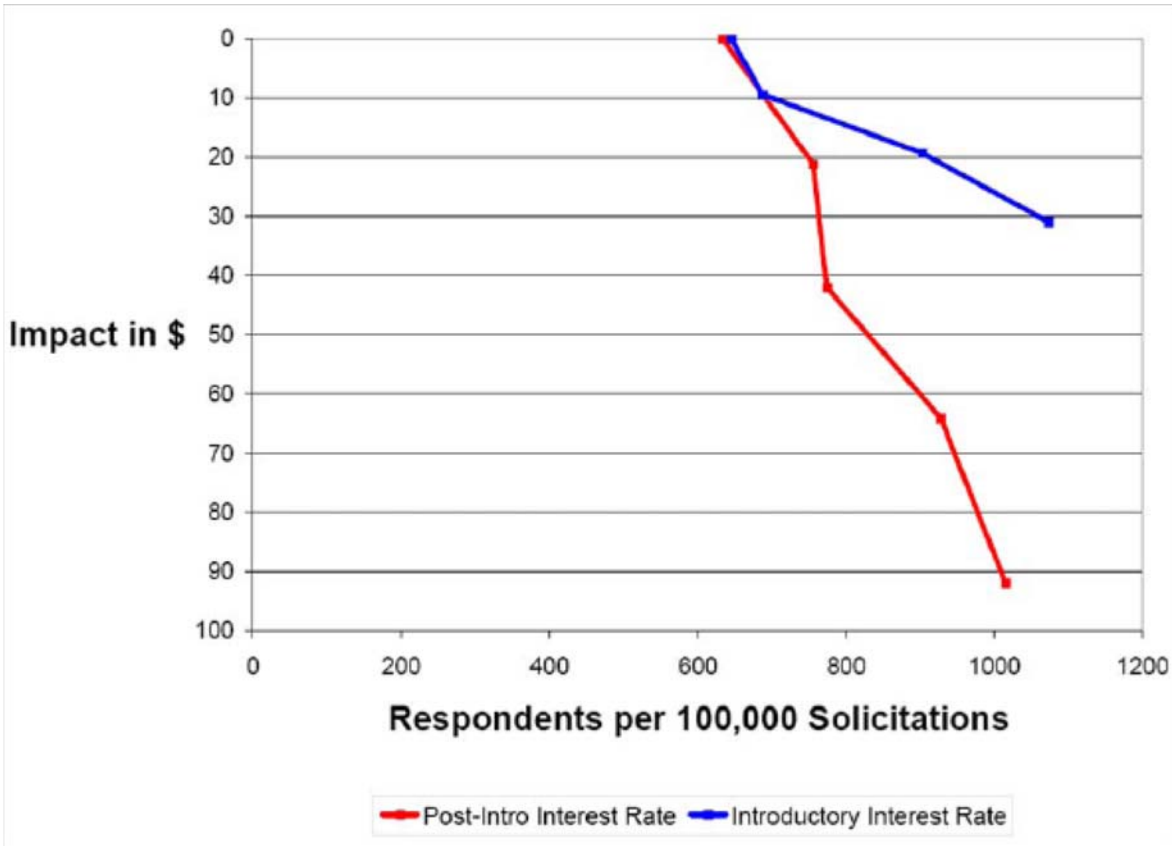
e) In short, in their estimation results the sophisticated and naive present-biased agents look nearly identical. Discuss one or more critical assumptions the authors make which imply the near-equivalence of naives and sophisticates. Guess what removing this assumption would imply for the estimation results.

f) Next, we turn to the results in Ausubel (1999), the field experiment by a credit card company which randomized the pre- and post-teaser interest rate. Describe briefly the experiment and the main results from Table 1 below; in particular, focus on the response rate.

TABLE 1: SUMMARY OF MARKET EXPERIMENTS

MARKET EXPERIMENT	MARKET CELL	NUMBER OF SOLICITATIONS MAILED	EFFECTIVE RESPONSE RATE	PERCENT GOLD CARDS	AVERAGE CREDIT LIMIT
MKT EXP I	A: 4.9% Intro Rate 6 months	100,000	1.073%	83.97%	$6,446
MKT EXP I	B: 5.9% Intro Rate 6 months	100,000	0.903%	80.18%	$6,207
MKT EXP I	C: 6.9% Intro Rate 6 months	100,000	0.687%	80.06%	$5,973
MKT EXP I	D: 7.9% Intro Rate 6 months	100,000	0.645%	76.74%	$5,827
MKT EXP III	A: Post-Intro Rate Standard - 4%	100,000	1.015%	82.96%	$5,666
MKT EXP III	B: Post-Intro Rate Standard - 2%	100,000	0.928%	77.69%	$5,346
MKT EXP III	C: Post-Intro Rate Standard + 0%	100,000	0.774%	76.87%	$5,167
MKT EXP III	D: Post-Intro Rate Standard + 2%	100,000	0.756%	76.98%	$5,265
MKT EXP III	E: Post-Intro Rate Standard + 4%	100,000	0.633%	73.62%	$5,095

g) Explain as clearly as you can how the numbers in this Table translate into the numbers in the key figure of the paper, reproduced below. It may help to remember that the average pre-teaser rate balance is $2,000 and the average post-teaser rate balance is $1,000. Also, borrowers are observed for 21 months, so that is how the impact of picking one card or another is calculated.



h) What do we learn from the fact that the two lines – the two demand curves – have very different slopes?

Ausubel and Shui (2009) write a model to explain the facts in Ausubel (1999). They assume that consumers have an existing credit card, and receive each quarter credit card offers which may be better than the existing one. Not unlike in the Fang and Silverman paper above, they assume an immediate cost of switching $-k$ and a delayed benefit of saving on borrowing costs (assuming they pick a better credit card). They assume that each period lasts a quarter and that consumers receive offers and at the beginning of each quarter decide whether to switch or not to a new credit card. The Table below reports the key estimated parameters.

Table 4: Estimated Parameters [a]

	Sophisticated Hyperbolic	Naive Hyperbolic	Exponential
β	0.7863 (0.00192)	0.8172 (0.003)	
δ	0.9999 (0.00201)	0.9999 (0.0017)	0.9999 (0.00272)
k	0.02927 \$293 (0.00127)	0.0326 \$326 (0.00139)	0.1722 \$1,722 (0.0155)

i) Comment on the findings in the last column for the 'standard' model (that is, $\beta = 1$). Are the magnitudes of the switching costs (captured by the \$ amount in the k row) plausible?

j) How do the estimated parameters change as we allow $\beta < 1$, both in the sophisticated and naive case?

k) Comment on the similarity between the naive and the sophisticated results – Can you single out an assumption which is critical to the results? Draw a parallel to the Fang and Silverman paper above if opportune.

l) Consider the set-up we discussed in class for signing-up for a 401(k) plan. There is an immediate one-time cost $-k$ followed by a delayed benefit b received on each day after the first period. While the time period is the day, the employer is allowed to take decisions only every T days. That is, if $T = 360$, only once a year, if $T = 1$ every day, etc. You showed in a problem set that a naive agent procrastinates if

$$\frac{\beta\delta T}{1-\beta} \lessapprox k \leq \frac{\delta b}{1-\delta}$$

Provide as much intuition as you can on what the expression above indicates (including what 'procrastination' means in this context). How does the range in which there is procrastination change as T increases? Relate if opportune to the previous parts of the question.

m) For a sophisticated agent, we discussed how the different selves can engage in a war of attrition between selves, but that in any case one can derive a bound of the longest delay L that a self will tolerate before investing right away. After solving, the delay L is:

$$L \approx k\frac{1-\beta}{\beta b}.$$

Why does T not play a role in this formula? Compare with the naive case, and relate to the above parts of the question.

Question #3 (Reference Dependence and Job Search)

Two researchers, Johannes and Stefano, make the following conjecture: '*Consider two unemployment benefit systems. State A has a constant unemployment benefits equal to a 60% replacement rate [That is, benefits equal 60% of the previous wage] for the whole duration of the benefits [6 months]. State B has a step system, with unemployment benefits set at 70% for two months, and then 60% for the remaining duration of four months. Hence, State B has a more generous system the first two months, and equally generous in the next four months. According to the standard model, State B will experience a slower exit from unemployment because it is more generous. If, however, unemployed workers use past earnings as a reference point and if loss aversion is high enough, then the reverse can be true: The step system in State B induces a* **faster** *exit, despite being more generous.*'

Motivated by this scenario, this question considers the impact on job search of loss aversion in a reference-dependent model where the reference point is past consumption. (Hence, in this model the reference point is the status quo, not expectations) We consider the following simplified model of job search with two periods of unemployment, $t = 1$ and $t = 2$. At time $t = 1$ the person becomes unemployed and at time $t = 1, 2$ the person decides how much search effort s_t to put into finding a job. If the person finds a job at time $t = 1$, which occurs with probability s_1, she receives wage w in periods $t = 1$ and $t = 2$. If she does not find a job, she gets benefits b_1 at $t = 1$ and then decides again in period 2 how much search effort s_2 to exert. If she finds a job in period 2, which occurs with probability s_2, the job pays w at $t = 2$; otherwise, she receives benefits $b_2 \leq b_1$ at $t = 2$. The benefit level can be constant or decreasing over time, but in any case unemployment benefits are lower than the wage obtained by finding a job, that is $w \geq b_2 \geq b_1$.

The utility function is as follows. The utility of consumption equals

$$u(c_t|c_{t-1}) = \begin{array}{ll} c_t + \eta [c_t - c_{t-1}] & \text{if} \quad c_t \geq c_{t-1} \\ c_t + \eta\lambda [c_t - c_{t-1}] & \text{if} \quad c_t < c_{t-1} \end{array}$$

The agent has consumption utility c_t (we are assuming linear utility) and gain-loss utility relative to consumption in the previous period c_{t-1}, which acts as the reference point.

a) Interpret the parameters η and λ, and discuss briefly the psychological interpretation.

We are going to assume that the agent consumes all that she earns. In addition to the utility of consumption, there is a cost of effort from searching for a job. The cost of effort is $c(s) = \gamma/2 * s^2$. (Assume that $s \in [0, 1]$ not worrying about possible corner solutions). Finally, the discount function is $\delta = 1$, so do not worry about discounting.

b) Let's start from the last period, $t = 2$. Explain why the maximization problem of the unemployed agent, conditional on still being unemployed at $t = 2$ (otherwise she just receives wage w) is

$$\max_{s_2} = s_2 u(w|c_1) + (1 - s_2) u(b_2|c_1) - c(s_2) \quad (1)$$

[We assume no probability weighting]

c) Take first-order conditions and solve for the optimal s_2^*. To do so, substitute the expressions for $u(|c_1)$ and $c(s)$. Keep in mind that c_1, which is the reference point, equals b_1 given that this agent consumes all that she earns. You should find

$$s_2^* = [w - b_2 + \eta (w + (\lambda - 1) b_1 - \lambda b_2)] / \gamma. \quad (2)$$

[Use this expression in the next questions if you are stuck in the derivation]

d) Consider first the special case with no gain-loss utility, hence $\eta = 0$. Rewrite the expression for s_2^*. Discuss the comparative statics of optimal search s_2^* with respect to (i) the wage w, (ii) the benefit level in period 2 b_2; (iii) the benefit level in period 1 b_1; (iv) the cost of effort γ. Here and below, provide intuition on the results.

e) Now consider the general case for gain-loss utility ($\eta > 0$) as well as loss-aversion ($\lambda > 1$). Discuss the same comparative statics as above, highlighting the differences. What is the main implication of reference dependence in this model?

f) Denote by V_2 the continuation payoff in period 2 for an unemployed worker, which is expression (1) evaluated at s_2^*. Consider now the maximization problem in period 1. Briefly explain why the maximization problem is

$$\max_{s_1} = s_1 \left[u\left(w|c_0\right) + u\left(w|w\right)\right] + \left(1 - s_1\right)\left[u\left(b_1|c_0\right) + V_2\right] - c\left(s_1\right). \tag{3}$$

Assume that $c_0 = w$, that is, before losing the job, the agent had earnings w equal to the re-employment earnings if she finds a job. (Remember that if the agent finds a job in period 1, the earnings are w in both periods).

g) Similarly to what you did in point (b), obtain the first order conditions and solve for s_1^*.

h) For the no-reference dependence case ($\eta = 0$), derive how search effort in the first period s_1^* responds to an increase in benefits b_1, holding constant the benefits b_2 in period 2. (Note: V_2 in this case will not depend on b_1. Why?) Discuss the intuition for this effect of more generous benefits in period 1.

i) Consider now the case with loss aversion ($\eta > 0$ and $\lambda > 1$) and discuss now how search effort in the first period s_1^* responds to an increase in benefits b_1, again holding constant benefits in period 2 b_2. Note: Solving formally for this is extra credit, as it requires using the envelope theorem to solve for $\partial V / \partial b_1$. Try instead to discuss *intuitively* the various channels through which more generous benefits in period 1 affect search effort. In particular, is there a channel by which a higher benefit b_1 can *increase* the search effort in period 1 s_1^*?

j) In light of this, how would you evaluate the assertion of the two economists below?