219B – Final Exam – Spring 2012

Question #1 (Disposition Effect)

a) Odean (1998) provides evidence on the disposition effect, that is, the tendency of investors to sell losers rather than winners. The main finding is that the propensity to realize gains (PGR, 0.148) is significantly higher than the propensity to realize losses (PLR, 0.098). Using the numbers in the notes to the Tables, describe how the PGR and PLR are computed, you should be able to obtain the numbers $PGR = 0.148$ and $PLR = 0.098$.

Table I

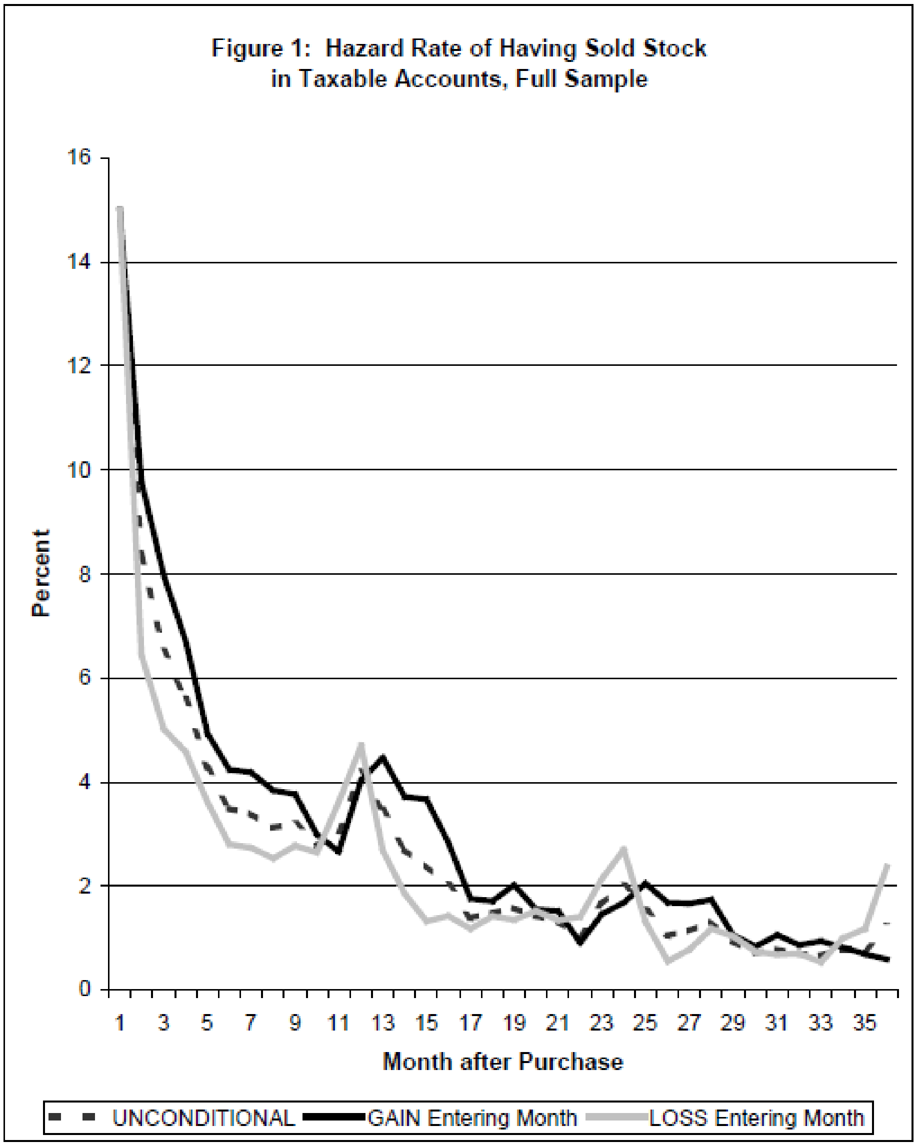
PGR and PLR for the Entire Data Set

This table compares the aggregate Proportion of Gains Realized (PGR) to the aggregate Proportion of Losses Realized (PLR), where PGR is the number of realized gains divided by the number of realized gains plus the number of paper (unrealized) gains, and PLR is the number of realized losses divided by the number of realized losses plus the number of paper (unrealized) losses. Realized gains, paper gains, losses, and paper losses are aggregated over time (1987–1993) and across all accounts in the data set. PGR and PLR are reported for the entire year, for December only, and for January through November. For the entire year there are 13,883 realized gains, 79,658 paper gains, 11,930 realized losses, and 110,348 paper losses. For December there are 866 realized gains, 7,131 paper gains, 1,555 realized losses, and 10,604 paper losses. The t-statistics test the null hypotheses that the differences in proportions are equal to zero assuming that all realized gains, paper gains, realized losses, and paper losses result from independent decisions.

	Entire Year	December	Jan.–Nov.
PLR	0.098	0.128	0.094
PGR	0.148	0.108	0.152
Difference in proportions	−0.050	0.020	−0.058
t-statistic	−35	4.3	−38

b)Why is this pattern reversed in December? Explain the tax reasons to sell losers, and why this makes the disposition effect a puzzle.

c) Explain the different empirical methodology used by Ivkovich, Weisbenner, and Poterba (2006) to measure the disposition effect referring to the Figure 1 below in as much detail as you can. (Read the notes carefully) What is the advantage of this methodology compared to Odean's? What do they find? Where do you find the December effect (see point b) in the picture?



Notes: Sample is January purchases of stock 1991-96 in taxable accounts. The hazard rate for stock purchases unconditional on the stock's price performance, as well as conditional on whether the stock has an accrued capital gain or loss entering the month, is displayed.

d) Discuss why prospect theory can in principle explain the disposition effect. Which feature (or features) of prospect theory helps to explain the disposition effect: (i) loss aversion; (ii) diminishing sensitivity (that is, concavity over gains and convexity over losses) ; (iii) non-linear probability weighting. Assume here and in what follows that the reference price is the initial purchase price. Provide intuition.

e) Now we consider Barberis and Xiong (JF 2009). Using Table II below, explain their set-up and their main finding. Use the notes to guide you.

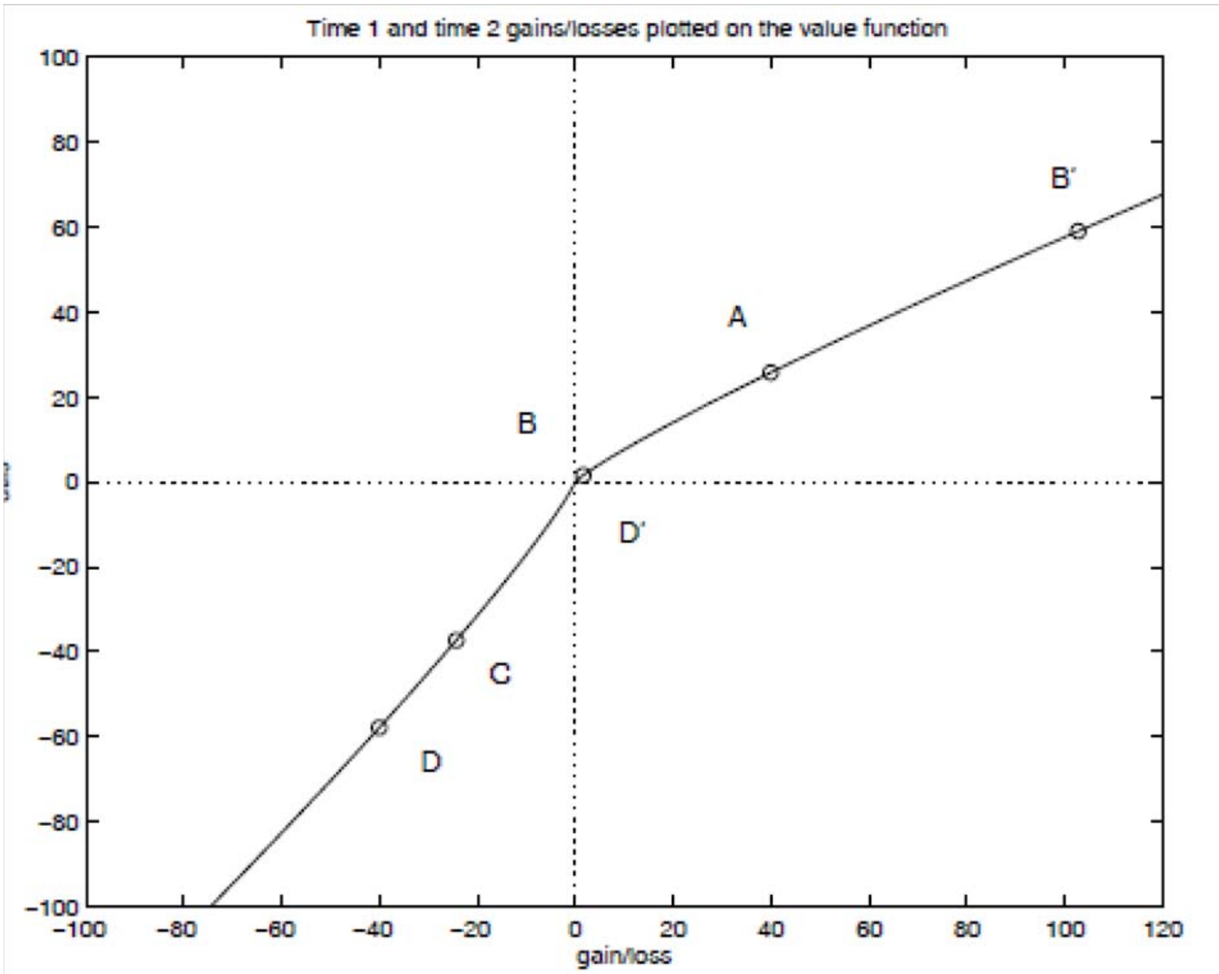
Table II

Simulation Analysis of the Disposition Effect

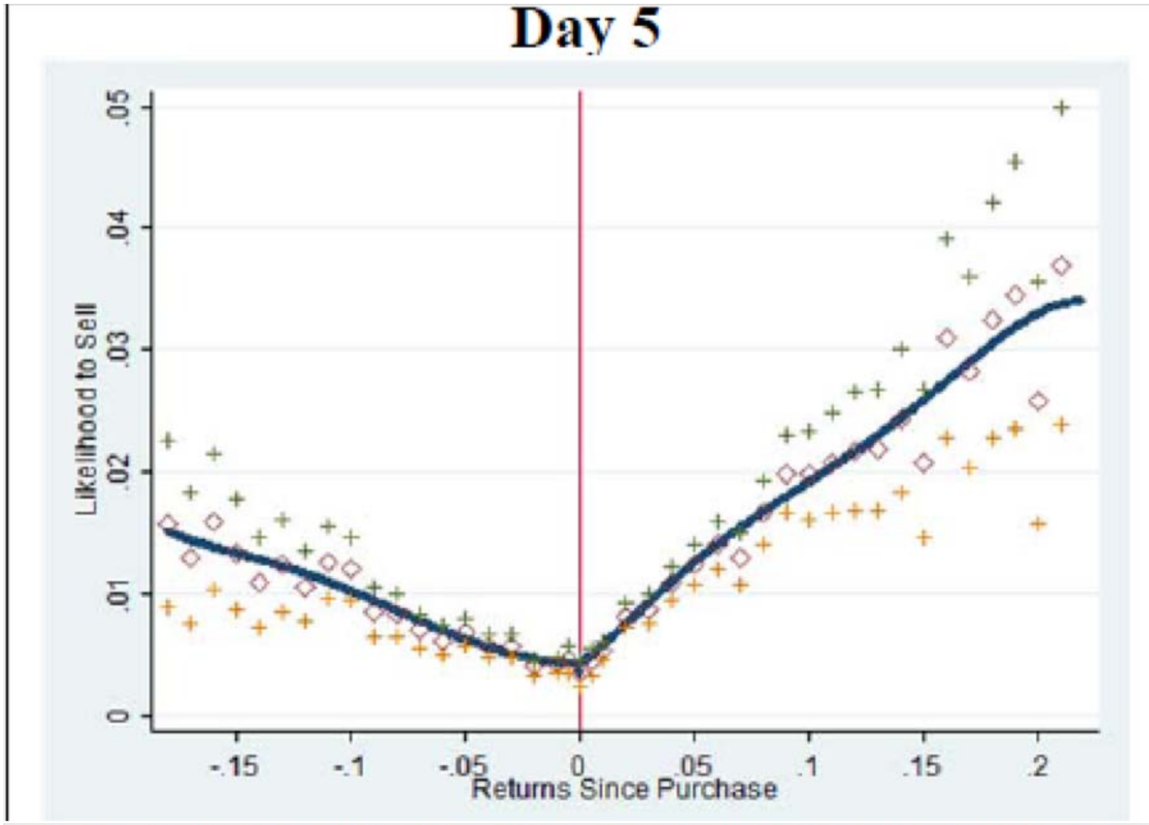
For a given (μ, T) pair, we construct an artificial data set of how 10,000 investors trade stocks when they have prospect theory preferences defined over end-of-year stock-level trading profits; each investor trades four stocks, each stock has an annual gross expected return μ, and the year is divided into T trading periods. For each (μ, T) pair, we use the artificial data set to compute PGR and PLR, where PGR is the proportion of gains realized by all investors over the course of the year and PLR is the proportion of losses realized. The table reports "PGR/PLR" for each (μ, T) pair. An asterisk identifies a case in which there is no disposition effect (PGR $<$ PLR). A hyphen indicates that the expected return μ is so low that the investor does not buy any stock at all.

Expected return	Number of trading periods within the year			
μ	$T=2$	$T=4$	$T=6$	$T=12$
1.03	-	-	-	0.55/0.51
1.04	-	-	0.52/0.55*	0.54/0.52
1.05	-	-	0.54/0.53	0.59/0.45
1.06	-	0.70/0.25	0.54/0.53	0.58/0.47
1.07	-	0.70/0.25	0.54/0.53	0.57/0.49
1.08	-	0.70/0.25	0.49/0.59*	0.47/0.60*
1.09	-	0.43/0.70*	0.49/0.59*	0.46/0.61*
1.10	0.0/1.0*	0.43/0.70*	0.49/0.59*	0.36/0.69*
1.11	0.0/1.0*	0.43/0.70*	0.49/0.59*	0.37/0.68*
1.12	0.0/1.0*	0.28/0.77*	0.24/0.81*	0.40/0.66*
1.13	0.0/1.0*	0.28/0.77*	0.24/0.83*	0.25/0.78*

f) Explain *why* prospect theory does *not* necessarily explain the disposition effect, which is Barberis and Xiong's main point. Use the Figure below to the extent that it is useful.



g) Inspired by this paper, David Hirshleifer and Itzhak Ben David do a more detailed test of the disposition effect. They consider stocks held for, say, 5 days and compute the probability that a stock will be sold on day 5 as a function of the return to the stock since the purchase. So a return of 0 means that the stock is back to the initial purchase price, a return of -.01 means that the stock lost 1 percent relative to P_0, etcetera. The Figure below plots the probability of selling such a stock as a function of the return which occurred between day 0 and day 5. Describe the pattern in the Figure below, and whether it is consistent with the disposition effect as found by Odean.



The charts present the likelihood of selling stock or buying additional shares as a function of the returns since the initial purchase. The sample used in each chart is restricted to stocks that were purchased exactly before the stated number of days (as stated above each chart) and in which logged gross returns are within 3 standard deviations from the mean. The diamond markers present the local average likelihood of selling stock or buying additional shares, at return intervals of 1% or 5% (for Day 20 onwards). The fitted curve is based on a 3rd degree polynomial fitted with separate parameters for the positive and negative regions. + markers indicate ±2 standard errors from the local means.

h) Explain whether the finding is consistent with the predictions of prospect theory for the case in which the reference point is given by the purchase price. Would you expect to find this pattern? Can you graph which pattern you would expect to find? The Barberis-Xiong discussion should help here.

Question #2 (Present Bias in Consumption Savings)

a) Laibson, Repetto, and Tobacman (2009) estimate a consumption-savings model which allows for present-bias, that is, for (β, δ) time preferences. The facts motivating the paper are presented in Table 1 attached. Summarize the evidence in the Table.

TABLE 1

SECOND-STAGE MOMENTS

Description and Name	$\overline{m}_{J_m}$	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).

b) In the main Table, the authors use the Simulated Method of Moments to estimate the time preferences parameters β and δ using the moments in the above Table 1. Explain as clearly as you can what the method of moments does in this case. (This is essentially the same discussion as for the minimum distance estimation used in the paper by DellaVigna, List, and Malmendier)

c) The main results of the estimation are in Table 3, which presents estimates with the Simulated Method of Moments of the time preferences parameters β and δ [Notice that $\hat{\beta}$ is not the naiveté parameter, but rather the empirical estimate of the β parameter]. Consider Column (1) of Table 3: what do the estimates of the time preference parameters β and δ suggest about present bias in this setting? How do the predictions of the model in Column (1) regarding the % Visa and the wealth/income ratio match the observed magnitudes (Column (5))? Now make the same comparison of the moments between the model that imposes $\beta = 1$ (Column (2)) and the data (Column (5). What explains the difference?

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

d) In light of your answer to d), discuss the following statement: "In consumption-savings models any (β, δ) model is equivalent to a model with no present bias $(\delta = 1)$ and with lower discount factor δ. Hence, there is an observational equivalence between β and δ and one cannot separately identify the present bias parameter β from the long-run discounting parameter δ" (This is a brutalized version of the equivalence result in Barro (1999)).

Question #3 (Present Bias and Naivete for Weight Gain and Loss)

a) We consider a model in which the agent can put forth weight loss effort. For simplicity, we assume that there is only one period of effort, which is period 1. The set-up is as follows. In period 0 we measure the agent's initial weight, W_0, and her prediction of her weight at the end of period 1, $\hat{W}_1$. She then supplies weight loss effort, e_1, in period 1 and incurs immediately (that is, at $t = 1$) the cost of this effort $C(e_1)$; this effort in weight loss determines the weight W_1 in period 1 (see below). In period 2 the benefit to the new weight W_1 is realized in the form of $b(W_1)$. The benefit of attaining a particular weight is

$$b(W_1) = -\frac{1}{2}(W_1 - W^*)^2,$$

where we assume $W^* < W_0$. (That is, the individual at time 0 is above the ideal weight) The cost of effort is assumed to be

$$C(e_1) = \frac{\phi}{2}e_1^2$$

Effort e_1 is implicitly defined through weight gained over a period. Weight gain between periods 0 and 1 is

$$W_1 - W_0 = \bar{W} - e$$

and $\bar{W}$ is interpreted as the amount of weight one would gain if she put forth zero effort toward controlling her weight (feel free to assume $\bar{W} > 0$). Assume the standard present-biased $\left(\beta, \hat{\beta}, \delta\right)$ preferences, with $\beta \leq \hat{\beta} \leq 1$ and set $\delta = 1$.

a) Interpret W^* and also the assumptions we are implicitly making about the cost of effort and the benefits of attaining weight W_1. To what extent you find these assumptions reasonable, or not? (Please do criticize as needed)

b) *Show* that a time 1 the agent maximizes

$$\max_{W_1} -C\left(\bar{W} - W_1 + W_0\right) + \beta b(W_1) \qquad (1)$$

c) Solve for the solution for $W_1 - W_0$ using the expressions for $b(W)$ and $C(e)$ above. Interpret economically the result.

d) Now consider at time 0 the *expected* weight loss $\hat{W}_1 - W_0$ that the agents *thinks* she will achieve. These are the expectations as of time 0. Set up the maximization problem similarly to (1) but keeping in mind that now it is about the expected weight loss. Compare $\hat{W}_1 - W_0$ to $W_1 - W_0$ as a function of the parameters, and provide intuition on the differences, if any, between the two.

e) Now consider at time 0 the *desired* weight loss $W_1^D - W_0$ that the agents would like to achieve as of time 0. Set up the maximization problem similarly to (1) but keeping in mind that now it is about the desired weight loss. Compare $W_1^D - W_0$ to $W_1 - W_0$ and to $\hat{W}_1 - W_0$ as a function of the parameters and provide intuition on the differences, if any, between the three.

f) (Trickier part, more credit for this question) Now three economists, Matthew, Stefano, and Ulrike, are trying to estimate the parameters of this model – the time preferences β and $\hat{\beta}$ and the cost of effort parameter ϕ. They have access to a group of overweight individuals who are going through a 3-month weight loss trial. In order to do this, guided by this simple model, they elicit W^* asking for the desired goal for weight, they measure W_0 by just measuring baseline weight, and they measure W_1 by measuring the weight three months later. (so here one period is three months). Finally, they elicit $\bar{W}$ by asking what is the average amount of weight that an individual would expect to gain (or lose) if he/she put no effort. Hence, the three economists observe $W_1 - W_0$, $\hat{W}_1 - W_0$, $W^* - W_0$, and $\bar{W}$. Can the economists identify the three parameters β, $\hat{\beta}$, and ϕ? (you can try to solve for them) Can they identify some combination of the parameters? Provide intuition on why you think some parameters are identified, or not.

g) Can you think of any way to identify all the parameters with additional information or additional treatments?