Once Burned, Twice Shy: Naïve Learning, Counterfactuals, and the Repurchase of Stocks Previously Sold

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Abstract

We establish two previously undocumented patterns in the purchase selections of individual investors and confirm a related pattern. These patterns hinge on investors' previous experience with a stock. We demonstrate that investors prefer to (1) repurchase stocks that they previously sold for a gain, (2) repurchase stocks that have lost value subsequent to a prior sale, and (3) purchase additional shares of stocks that have lost value subsequent to being purchased. We document these trading patterns by analyzing trading records for 66,465 households at a large discount broker between January 1991 and November 1996 and 665,533 investors at a large retail broker between January 1997 and June 1999. We argue that the first trading pattern results from a simple form of learning whereby investors repeat actions that previously resulted in pleasure while avoiding actions that previously led to pain (i.e., they repurchase their previous winners but not their previous losers). We argue that the second trading pattern is tied to counterfactuals. Investors who buy a stock at a higher price than they previously sold it for are painfully aware that they are worse off than if they had simply never sold that stock. Investors who buy a stock at a lower price than they previously sold it for experience the pleasure of knowing they are better off than if they had never sold that stock. We argue that the third pattern can also be understood in terms of counterfactuals. Investors who purchase additional shares of a stock at a higher price than they originally paid are aware that they would have been better off making a larger initial purchase, while those who purchase additional shares at a lower price are better off than if they had made a larger initial purchase. Furthermore, by purchasing additional shares at a lower price, investors increase the likelihood that they will be able to sell their shares for more than the average purchase price. From a Prospect Theory perspective, investors are lowering their reference point for this position. Buying stocks that have gone down in price since they were sold, or first purchased, is inconsistent with the general preference of investors for buying stocks with strong recent performance. Investor returns do not reliably benefit from any of the three patterns we document.

Perhaps the simplest form of learning is to repeat behavior associated with pleasure and to refrain from behavior associated with pain. The benefits of this learning strategy depend, in part, upon the degree to which the behavior and outcome are correlated. For example, pressing one's hand against a very hot stove consistently results in pain. However, betting on black at the roulette table does not consistently result in either pleasure or pain. While the pain caused by holding skin against hot metal is deterministic, outcomes in roulette are random. The stove is predictably hot; the table is not. The stock market lies somewhere in between. Proponents of the efficient market hypothesis claim that after adjusting for risk, one cannot predict the relative performance of common stocks. Even non-believers in market efficiency generally acknowledge that beating the market is neither easy nor certain. On the continuum from deterministic to random, the market is closer to random than many investors may realize. Yet when purchasing stocks that they have previously owned and then sold, many individual investors behave as if the market were deterministic.

In this paper, we establish two previously undocumented patterns in the purchase selections of individual investors and confirm a related pattern. All three patterns hinge on investors' previous experience with a stock. We offer psychological explanations for each of the investor behaviors we observe. Furthermore, we find no evidence that these behaviors are tax-driven or that they reliably improve investor returns.

Seeking Previous Sources of Pleasure and Avoiding Previous Sources of Pain

The first pattern that we document for stocks that are no longer owned is that investors tend to buy specific stocks again if they had a good (profitable) experience with those stocks in the past, acting as if they expect their previous experience to be repeated. Analogously, they avoid specific stocks if they had an unpleasant (unprofitable) prior experience with those stocks. Analyzing trading records for 66,465 individual investors with accounts at a large discount brokerage and 665,533 individual investors with accounts at a large retail brokerage, we find that investors are twice as likely to buy a stock that they sold in the previous year if that sale was profitable. This behavior does not appear to be driven by superior information about these stocks since the investors do not earn superior returns on the previous winners they repurchase. The behavior also

does not appear to be tax driven since it is found in both tax-deferred and taxable accounts.

Counterfactuals: What Might Have Been

The second pattern we find is that investors are much more likely to repurchase a stock sold in the previous year if the stock's price has dropped since they sold it than if it has risen since they sold it. This tendency is only true for stocks that were previously sold at a profit; investors shy away from stocks previously sold for a loss regardless of what has happened to the stock's price since the sale. Repurchasing stocks that have dropped since sold behavior may result from a form of learning that involves comparing actual outcomes to outcomes that might have been.

People frequently compare actual outcomes in life to mental simulations of what might have been, otherwise known as counterfactuals (Kahneman and Tversky 1982; Kahenman 1995). The salience of such counterfactuals increases with their "closeness" to reality, that is, with the ease with which elements of reality can be cognitively altered to construct the counterfactual (Kahneman and Miller 1986; Roese and Olson 1995a). Certain features of actual scenarios are more readily mutable and give rise to easily imagined counterfactuals. For example, a passenger who misses a flight by five minutes generally experiences more regret than one who misses a flight by 30 minutes (Kahneman and Tversky 1982).

When an investor sells a stock, one obvious counterfactual is that he could have held it (i.e., not sold). If the investor repurchases a stock that he previously sold, the "not sold" counterfactual moves closer to reality. Now, in both the real and the counterfactual scenarios, the investor owned the stock earlier and owns it now; the two scenarios differ in that the investor chose two actions in reality (i.e., selling and repurchasing) rather than one inaction (i.e., not selling). Thus reality readily mutates to a salient "never sold" counterfactual. The two scenarios, one real (sell then repurchase the stock) and one that might have been (hold the stock), also differ in the investor's wealth. If the stock is repurchased at a higher price than it was sold for, the investor is less wealthy than he might have been had he not sold it to begin with; if the stock is repurchased at a lower

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price, he is wealthier than he would have been had he not sold it at the higher price before repurchasing it at the lower price. We propose that many investors repurchase stocks that have decreased in value since they were sold because reality then dominates the salient "never sold" counterfactual; no matter what happens to the stock in the future, they can always tell themselves that they are better off than if they had never sold the stock at the higher price and then repurchased it at the lower price. They refrain from repurchasing stocks at a higher price than they sold them for because doing so will increase the salience of the "never sold" counterfactual in which they would have been wealthier. In short, repurchasing a stock at a higher price increases regret. Even if the repurchased stock increases in price after it is purchased, the investor will always know that he would have done better had he not sold it in the first place.

Just as an investor who buys a stock that she previously sold creates a salient counterfactual, so too, an investor who buys additional shares of a stock she still owns creates a salient counterfactual: she could have simply bought these additional shares at the original price. If the price has dropped since the original purchase, she is better off buying the additional shares at the new, lower, price. If the price has increased, she would have been better off buying more shares to begin with. Odean (1998) reports that investors at a discount brokerage are more likely to purchase additional shares of stocks they already own if the stock's price has dropped since they bought it. We confirm this finding using larger, more diverse, and more recent datasets.

The economic importance of the trading patterns we document depends, in part, upon the frequency with which investors repurchase stocks that they have previously sold. The average investor in our samples owned fewer than six stocks. At both brokerages, average annual turnover was about 75 percent. Therefore, the individual stocks sold by an investor during the previous year generally constitute a small fraction of all purchasable stocks. Averaging first across purchase dates and then across accounts, we find that in the year preceding a purchase the average investor had sold, on average, only 1.7 stocks at the large discount brokerage and 1.5 stocks at the large retail brokerage. Nevertheless, repurchases of stocks sold during the previous year account for

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15 percent of all purchases at the large discount brokerage and 8 percent of all purchases at the large retail brokerage.

The remainder of this paper is organized as follows. In the first section, we discuss related studies of investor behavior. In Sections II and III, we describe our data and our methodology. In Section IV, we present results. We then discuss our theoretical contribution to understanding investing behavior, alternative explanations for our findings, and a summary of our conclusions.

I. Investor Behavior

Recent research has examined how investors choose which stocks to buy and to sell. Perhaps the best established pattern is the disposition effect, that is, the tendency of investors to sell winners more readily than losers (Shefrin and Statman, 1985; Odean, 1998; Grinblatt and Keloharju, 2001; Barber, Lee, Liu, and Odean, 2003a; Dhar and Zhu, 2002; Jackson, 2003; Feng and Seasholes, 2002). While the disposition effect leads investors to sell stocks with strong recent performance, investors also tend to buy stocks with strong recent performance (Odean, 1999; Barber, Odean, and Zhu, 2003; Barber, Lee, Liu, and Odean, 2003a; and Jackson, 2003). However, Odean (1998) finds that the preference for buying shares of stocks with strong recent performance does not hold for stocks that investors currently own.

When selecting individual stocks to buy, investors face a huge search problem due to the thousands of options from which they can choose. Barber and Odean (2003) argue that because of the difficulty of considering all possible purchase options, many investors simply choose from the subset of stocks that catch their attention. They find, for example, that investors are more likely to buy stocks that are in the news, simply because they think about those stocks. Investors are also more likely to think about stocks that they've owned in the past year than about other stocks. Thus, it is not surprising that investors tend to repurchase stocks they previously owned and sold (as well as stocks that they still own, but have not sold) at much higher rates than they repurchase stocks that they have never owned. In this research, we demonstrate that the probability that a given investor will repurchase a given stock will be affected by whether

that stock was previously sold for a loss or for a gain, as well as by whether the price of that stock has risen or fallen in price since the investor last sold it. We also demonstrate that for stocks that an investor still owns, the current price relative to the average purchase price influences the probability that the investor purchases additional shares.

II. Data

We analyze two datasets of investor trades. The first dataset was provided by a large discount brokerage firm. It includes trading and position records for the investments of 78,000 households from January 1991 through December 1996.[1] The data include all accounts opened by each household at this discount brokerage firm. Sampled households were required to have an open account with the discount brokerage firm during 1991. Roughly half of the accounts in our analysis were opened prior to 1987, while half were opened between 1987 and 1991. We focus on investors' common stock trades. We exclude from the current analysis investments in mutual funds (both open- and closed-end), American depository receipts (ADRs), warrants, and options. Of the 78,000 households sampled from the large discount brokerage, 66,465 had positions in common stocks during at least one month; the remaining accounts held either cash or investments other than individual common stocks. Roughly 60 percent of the market value in these households' accounts was held in common stocks. There were over 3 million trades in all securities; common stocks accounted for slightly more than 60 percent of all trades. During our sample period, the average household held 4.3 stocks worth $47,334, though each of these figures is positively skewed. The median household held 2.61 stocks worth $16,210. In December 1996, these households held more than $4.5 billion in common stock. There were slightly more purchases (1,082,107) than sales (887,594) during our sample period, though the average value of stocks sold ($13,707) was slightly higher than the value of stocks purchased ($11,205). As a result, the aggregate values of purchases and sales were roughly equal ($12.1 and $12.2 billion, respectively). The average trade was transacted at a price of $31 per share. The value of trades and the transaction price of trades are positively skewed; the medians for both purchases and sales are substantially less than the mean values

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[1] Position records are through December 1996; trading records are through November 1996. See Barber and Odean (2000) for a more compete description of these data.

The second data set contains information from a large retail brokerage firm on the investments of households for the 30 months ending in June 1999. These data include daily trading records. Using client ownership codes supplied by the brokerage firm, we limit our analysis to the 665,533 investors with non-discretionary accounts (i.e., accounts classified as individual, joint tenants with rights of survival, or custodian for minor) with at least one common stock trade during our sample period. The average household held 5.5 stocks worth approximately $107,000. During this period these accounts executed over 10 million trades. We restrict our analysis to their common stock trades: 3,974,998 purchases with a mean value of $15,209 and 3,219,299 sales with a mean value of $21,169.

III. Hypotheses regarding Individual Investor Repurchase Decisions

III.A. Stocks sold for a gain vs. stocks sold for a loss

To test whether investors are more likely to repurchase stocks that they previously sold for a profit than stocks that they previously sold for a loss, it is not sufficient to compare the number of purchases of stocks previously sold for a gain to the number of purchases of stocks previously sold for a loss. In an upward-moving market, investors are likely to have sold more stocks for a gain than for a loss; even if the market is not trending up, investors are likely to sell more stocks for a gain than for a loss due to the disposition effect. Suppose that investors have previously sold more stocks for gains but are indifferent to repurchasing their prior winners and losers. These investors will tend to repurchase more stocks previously sold for a gain than stocks previously sold for a loss simply because they have more opportunities to do so. To test whether investors demonstrate a preference for repurchasing stocks that they previously sold for a gain rather than those they previously sold for a loss, we must look at the frequency with which they repurchase prior winners and losers relative to their opportunities to repurchase each.

We begin our analysis at the account level. Starting one year after the beginning of each dataset (i.e., January 1992 at the discount brokerage and January 1998 at the retail brokerage), we look at each day on which an investor made a purchase. We observe whether any of the stocks purchased on that day had been sold by the same investor during the previous 252 trading days (i.e., one year). If so, we determine, when the data allow us to do so, whether the last time the investor sold this stock, the sale was for a gain or a loss (based on the average share-weighted purchase price). We count the number of repurchases of stocks previously sold for a gain (winners repurchased) and the number of those previously sold for a loss (losers repurchased). We then count the number of stocks that were sold for a gain during the last year that the investor could have repurchased on this day (opportunities to repurchase winners); these include stocks sold for a gain during the last year that were repurchased on the day in question and stocks sold for a gain during the last year that could have been repurchased that day but were not. Similarly, we calculate the number of opportunities to repurchase losers on this day. On days when no purchase takes place, we do nothing; no actual winners repurchased, actual losers repurchased, opportunities to repurchase winners, or opportunities to repurchase losers are counted.

For each account, we tabulate and aggregate over time the number of stocks sold for a gain that were repurchased relative to the number of opportunities to repurchase stocks that were sold for a gain. We do the same for the number of stocks sold for a loss that were repurchased relative to the opportunities to repurchase stocks sold for a loss. We sum these tabulations for all investors at each brokerage firm. We then calculate two ratios:

$$\frac{\text{\# of Prior Winners Repurchased}}{\text{\# of Opportunities to Repurchase Prior Winners}} = \text{Proportion of Prior Winners Repurchased (PPWR)} \quad (1)$$

$$\frac{\text{\# of Prior Losers Repurchased}}{\text{\# of Opportunties to Repurchase Prior Losers}} = \text{Proportion of Prior Losers Repurchased (PPLR)} \quad (2)$$

Our first hypothesis is that investors are more likely to repurchase a stock that they previously sold for a gain than they are to repurchase a stock they previously sold at a loss. That is:

Hypothesis 1: *Proportion of Prior Winners Repurchased > Proportion of Prior Losers Repurchased.*

The formal null hypothesis here is that PPWR ≤ PPLR. If markets are efficient in the sense that past price patterns do not predict cross-sectional differences in future risk-adjusted returns, investors expectations will be unaffected by whether they have made or lost money on a stock in the past. Thus the null hypothesis under this version of the efficient market hypothesis would be PPWR = PPLR. If investors sometimes sell stocks for a tax-loss with the intention of subsequently repurchasing these same stocks, then we would expect that for taxable accounts PPWR < PPLR. Our null hypothesis of PPWR ≤ PPLR captures these two alternatives. One other possibility is that investors who have made money on a stock in the past take this as evidence that they have superior information about that stock and therefore buy it again. While we cannot dispute that some investors may hold this belief, we find no evidence that investors earn superior returns by repurchasing stocks that they have previously sold for a gain. We discuss this further in Section V.A.

III.B. Stocks up since sold vs. stocks down since sold

We calculate the proportion of stocks that have gone up in price since being sold that are repurchased (PSUSSR) and the proportion of stocks that have gone down in price since being sold that are repurchased (PSDSSR) in a manner analogous to the calculations of PPWR and PPLR. Starting one year after the beginning of each dataset, we look at each day on which an investor made any purchase. We observe whether any of the stocks purchased on that day were sold by the same investor during the previous year. If so, we determine whether the stock was repurchased at a higher, lower, or the same price compared to the price at which it was most recently sold by this investor. We count the number of times stocks were repurchased at a higher price (stocks that have increased in price since being sold that were repurchased) and the number of times stocks were repurchased at a lower price (stocks decreased in price since being sold that were repurchased). We ignore stocks repurchased at the same price as the most recent sales price. To calculate the number of opportunities to repurchase stocks that have gone up since being sold and the number of opportunities to repurchase stocks that have gone down since being sold, we examine every stock sold from the account during the

previous year and determine whether its price has gone up or down since the most recent sale. If the high price of the day (or the actual repurchase price for stocks that are repurchased) is lower than the most recent sales price, we count that as an opportunity to repurchase a stock that has gone down in price since being sold; if the low price of the day (or the actual repurchase price for stocks that are repurchased) is above the most recent sales price, we count that as an opportunity to repurchase a stock that has gone up since being sold. We ignore cases where the stock could have been repurchased on that day at either a higher or lower price than the previous sales price.

For each account, we tabulate and aggregate over time the number of stocks that went up since being sold that were repurchased relative to the number of opportunities to repurchase stocks that went up since being sold. We do the same thing for the number of stocks that went down since being sold that were repurchased relative to the opportunities to repurchase stocks that went down since being sold. We sum these tabulations for all investors at each brokerage firm. We then calculate two ratios:

$$\frac{\text{\# of Stocks Up Since being Sold Repurchased}}{\text{\# of Opportunities to Repurchase Stocks Up Since being Sold}} = \begin{array}{c}\text{Proportion of Stocks Up Since being}\\ \text{Sold Repurchased (PSUSSR)}\end{array} \quad (3)$$

$$\frac{\text{\# of Stocks Down Since being Sold Repurchased}}{\text{\# of Opportunities to Repurchase Stocks Down being Since Sold}} = \begin{array}{c}\text{Proportion of Stocks Down Since}\\ \text{being Sold Repurchased (PSDSSR)}\end{array} \quad (4)$$

Our second hypothesis is that investors are more likely to repurchase a stock that has gone down in price since they last sold it than they are to repurchase a stock that has gone up in price since they sold it.

That is:

Hypothesis 2: *Proportion of Stocks Down Since being Sold that were Repurchased > Proportion of Stocks Up Since being Sold that were Repurchased.*

The formal null hypothesis here is that PSDSSR ≤ PSUSSR. If markets are efficient in the sense that past price patterns do not predict cross-sectional differences in future risk-adjusted returns, investors should be indifferent between repurchasing stocks that have gone up or down since they were last sold. Thus, the null hypothesis under this version of the efficient market hypothesis would be PSDSSR = PSUSSR. Investors who sold a stock before a decline may take this as evidence that they have superior information about that stock and, for this reason, buy it again. Again, we do not dispute that some

investors may hold such beliefs. However, we find no evidence that investors earn superior returns by repurchasing stocks that have lost value since they were sold.

III.C. *Currently owned winners vs. currently owned losers*

We calculate the proportion of currently owned winners that are repurchased (PCOWR) and the proportion of currently owned losers that are repurchased (PCOLR) in a manner analogous to our previous calculations. Our analysis begins at the account level. Starting at the beginning of each dataset, we look at each day on which an investor made a purchase. We observe whether he repurchased a stock already in his portfolio. If so, we determine, if we are able to do so, whether the stock was repurchased at a higher or lower price than the average purchase price previously paid. Stocks repurchased at a higher price are counted as currently owned winners repurchased; stocks repurchased at a lower price are counted as currently owned losers repurchased. To calculate the number of opportunities to repurchase currently owned winners and losers, we examine every stock in the portfolio and determine whether it is currently held for a gain or for a loss (relative to the average purchase price). If the high price of the stock that day (or the actual repurchase price for stocks that are repurchased) is below the average price previously paid for the stock, we count that as an opportunity to repurchase at a lower price. If the low price of the stock that day (or the actual repurchase price for stocks that are repurchased) is above the average price previously paid for the stock, we count that as an opportunity to repurchase at a higher price.

For each account, we tabulate and aggregate over time the number of currently owned stocks trading at a price above the average purchase price (i.e., current winners) that are purchased again, relative to the number of opportunities to purchase additional shares of currently owned stocks trading at a price above the average purchase price. We do the same thing for the number of currently owned stocks trading at a price above the average purchase price (i.e., current losers) that are purchased again, relative to the number of opportunities to purchase additional shares of currently owned stocks trading at a price below the average purchase price. We sum these tabulations for all investors at each brokerage firm. We then calculate two ratios:

$$\frac{\text{\# of Currently Owned Winners Repurchased}}{\text{\# of Opportunities to Repurchase Currently Owned Winners}} = \begin{array}{c}\text{Proportion of Currently Owned}\\ \text{Winners, Repurchased (PCOWR)}\end{array} \quad (5)$$

$$\frac{\text{\# of Currently Owned Losers Repurchased}}{\text{\# of Opportunities to Repurchase Currently Owned Losers}} = \begin{array}{c}\text{Proportion Currently Owned}\\ \text{Losers Repurchased (PCOLR)}\end{array} \quad (6)$$

Investors are more likely to purchase additional shares of a currently owned stock that has gone down in price since originally being purchased than they are to purchase additional shares of a currently owned stock that has gone up in price since originally being purchased. That is:

Hypothesis 3: *Proportion of Currently Owned Losers Repurchased > Proportion of Currently owned Winners Repurchased.*

The formal null hypothesis here is that PCOLR ≤ PCOGR. If markets are efficient in the sense that past price patterns do not predict cross-sectional differences in future risk-adjusted returns, investors should be indifferent between repurchasing stocks that have gone up since they were purchased and stocks that have gone down since they were purchased. Thus, the null hypothesis under this version of the efficient market hypothesis would be PCOLR = PCOGR. It is unlikely that an investor who bought a stock that then declined in value would take this as an indication that he has superior information about this stock. Nevertheless, we test whether investor returns benefit from purchasing additional shares of stocks that have lost value since being purchased. We find no evidence of this. Our results are reported in Table 5 Panel C and are discussed in Section V.A..

IV. Results

IV.A. Stocks sold for gain vs. stocks sold for loss

In Table 1, we present our calculations of the proportion of stocks that were sold for a gain that were repurchased and the proportion of stocks that were sold for a loss that are repurchased for both the discount broker and the retail broker. Investors might be unwilling to repurchase within 30 days of a sale stocks that were sold for a loss because doing so would prevent them from claiming the loss for tax purposes. To determine whether our results are influenced by this or any other tax consideration, we calculate the

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proportions separately for taxable and tax-deferred accounts.[2] At both the large discount broker and the large retail broker, and for both taxable and tax-deferred accounts, investors repurchase stocks previously sold for a gain at significantly higher rates than stocks previously sold for a loss. On average, the proportion of previous winners repurchased is approximately double the proportion of previous losers repurchased. The differences in these proportions are highly statistically significant (t > 59).

The tests of the null hypotheses treat each repurchase of a stock previously sold for a gain, repurchase of a stock previously sold for a loss, and decision not to repurchase on a particular day as separate independent observations.[3] These observations are aggregated across investors. This independence assumption will not hold perfectly. For example, suppose an investor chooses not to repurchase the same stock on repeated occasions. It is likely that the decision not to repurchase on one date is not independent from the decision not to repurchase on another date. This lack of independence will inflate the test statistics, but will not bias the observed proportions. All three of our null hypotheses are rejected with such a high degree of statistical significance that some lack of independence is not problematic.

As a robustness check, we calculate PPWR and PPLR at the account level on each account for which we have sufficient information. We then employ a binomial test of whether the proportion of investors who prefer to repurchase prior winners is greater than 50%. Instead of assuming independence at the transactions level, this test assumes independence only across investors. At the large discount brokerage, PPWR is greater than PPLR for 71.6% of the 12,913 accounts for which there was at least one opportunity to repurchase a stock sold for a gain during the previous year and at least one opportunity to repurchase a stock sold for a loss. We can reject the null hypothesis that one half or more of these investors prefer to repurchase previous losers or are indifferent between

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[2] In unreported analyses, we also calculate these proportions excluding any repurchases within 30 days of the most recent sale of a stock. Doing so does not qualitatively change our results.

[3] To calculate the t-statistics in Table 1, the standard error for the difference in the proportions PPWR and

PPLR is: $\sqrt{\dfrac{PPWR(1-PPWR)}{\text{\# of opporunties to repurchase prior winners}} + \dfrac{PPLR(1-PPLR)}{\text{\# of opportunities to repurchase prior losers}}}$.

Standard errors are calculated similarly for the differences in PDSSR and PUSSR and PCWR and PCLR.

repurchasing previous losers and winners (t = 49.1). At the large retail brokerage, PPWR is greater than PPLR for 74.7% of 31,785 accounts. Again the null hypothesis is rejected (t = 88.1).

Investors exhibit a clear preference for repurchasing stocks that they previously sold at a gain as opposed to repurchasing stocks that they previously sold at a loss.

IV.B.   Stocks up since sold vs. stocks down since sold

In Table 2, we present our calculations of the proportion of stocks that have decreased in value since being sold that were repurchased (PSDSSR) and the proportion of stocks that have increased in value since being sold that were repurchased (PSUSSR). To determine whether our results are influenced by tax considerations, we again calculate the proportions separately for taxable and tax-deferred accounts. At both the large discount broker and the large retail broker, and for both taxable and tax-deferred accounts, investors repurchase stocks that have decreased in value since being sold at significantly higher rates than stocks that have increased in value since being sold. The differences in these proportions are significant (t > 50). When we calculate PSDSSR and PSLSSR at an account level, we find that at the large discount brokerage (LDB) PSDSSR > PSUSSR for 66.5% of the 15,076 accounts for which there was at least one opportunity to repurchase a stock that had decreased in value since it was sold during the previous year and at least one opportunity to repurchase a stock sold that had increased in value since it was sold during the previous year. At the large retail brokerage (LRB) PSDSSR > PSUSSR for 55.5% of the 37,311 accounts. We can reject the null hypothesis that the proportion of investors who prefer to repurchase stocks that have lost value since being sold is less than or equal to 50% (t = 40.5 at the LDB and t = 21.2 at the LRB).

IV.C. Interaction Effects

We find that the tendency of investors to repurchase stocks that have lost value since last being sold applies almost exclusively to stocks that were sold for a gain. Investors who have lost money when they sold their position are reluctant to buy that stock again regardless of whether it has gone up or down since they sold it. Looking only at stocks previously sold for a loss in both taxable and tax-deferred accounts at the large discount brokerage, the proportion of stocks down since being sold that are repurchased

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is 0.041, and the proportion of stocks up since being sold that are repurchased is 0.037 (Table 3). Though statistically significant (t = 10.5) the difference in these proportions is not economically large. At the large retail brokerage, looking only at stocks previously sold for a loss, the proportion of stocks down since being sold that are repurchased is 0.026, and the proportion of stocks up since being sold that are repurchased is 0.027 When we calculate PSDSSR and PSLSSR at an account level for stocks that were previously sold for a loss, we find that at the large discount brokerage PSDSSR > PSUSSR for 53.3% of the 2,348 accounts for which there was at least one opportunity to repurchase a stock that had decreased in value since it was sold for a loss during the previous year and at least one opportunity to repurchase a stock sold that had increased in value since it was sold for a loss during the previous year (t = 3.2). At the large retail brokerage PSUSSR > PSDSSR for 53.6% of the 4,445 accounts (t = 4.6). Thus, at the large discount brokerage there is a slight tendency to more readily repurchase stocks previously sold for a loss if those stocks have decreased in value since being sold, while at the large retail brokerage there is a slight tendency to more readily repurchase stocks previously sold for a loss if those stocks have increased in value since being sold.

When we look at stocks that were previously sold for a gain, the story is quite different. At the large discount brokerage, looking only at stocks previously sold for a gain, the proportion of stocks down since being sold that are repurchased is 0.105, and the proportion of stocks up since being sold that are repurchased is 0.055. We can reject the null that these proportions are equal (t = 104). At the large retail brokerage, looking only at stocks previously sold for a gain, the proportion of stocks down since being sold that are repurchased is 0.068 and the proportion of stocks up since being sold that are repurchased is 0.043. We can reject the null that these proportions are equal (t = 111). When we calculate PSDSSR and PSLSSR at an account level for stocks that were previously sold for a gain, we find that at the large discount brokerage PSDSSR > PSUSSR for 68.7% of the 6,437 accounts for which there was at least one opportunity to repurchase a stock that had decreased in value since it was sold for a gain during the previous year and at least one opportunity to repurchase a stock sold that had increased in value since it was sold for a gain during the previous year (t = 30.0). At the large retail brokerage PSDSSR > PSUSSR for 55.0% of the 13,402 accounts (t = 11.6). At both

brokerages, investors are far more likely to repurchase stocks previously sold for a gain if those stocks have decreased in value since being sold.

IV.D. Winners currently owned vs. losers currently owned

Analyzing a dataset of 10,000 individual investor accounts at large discount brokerage for the period 1987-1993, Odean (1998) finds that investors are more likely to repurchase a stock they currently own if the price of the stock has decreased in value, rather increased in value, since they purchased it. We confirm this result with larger, more recent datasets. For these analyses, we pool taxable and tax-deferred accounts. Results are reported in Table 4. At the large discount brokerage, the proportion of currently owned winners repurchased is 0.094, whereas the proportion of currently owned losers repurchased is 0.146; the difference in the proportions is statistically significant (t = 113.2). At the large retail brokerage, the proportion of currently owned winners repurchased is 0.094 while the proportion of currently owned losers repurchased is 0.128; again, the difference in the proportions is statistically significant (t = 136.7).[4]

Investors exhibit a clear preference for repurchasing stocks they currently own when the stocks are trading at a lower price than the (average) purchase price rather than when they are trading at a higher price. This is consistent with their preference for repurchasing stocks that are trading at a lower price than the price at which they were sold during the last year. However, the tendency to purchase additional shares of a stock on which an investor has lost money could appear to be at odds with the tendency to avoid repurchasing stocks that were sold for a loss. We suspect that the salient difference between purchasing additional shares of a stock that has decreased in value since being purchased and repurchasing a stock that one previously sold for a loss, is that in the first case one still owns the stock and in the second one does not. Once the stock is sold, it as if the book is closed and one does not want to open it again. An investor who still owns a stock that he purchased for a higher price does not have the luxury of forgetting about

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[4] Daniel, Hirshleifer, and Subramanyam (1998) theorize that if investors buy a stock on the basis of private information and that information is then confirmed by public information, these investors will become overconfident about their private information and drive prices higher than would have otherwise been the case. Our evidence appears to contradict this theory. We observe that investors who have already bought a stock (perhaps reflecting their bullish private information), are less, rather than more, likely to buy additional shares if the stock price increases (thus publicly confirming their bullish private beliefs).

that stock, so it is as if the book is still open. As Kahneman and Tversky (1979) write: "A person who has not made peace with his losses is likely to accept gambles that would be unacceptable to him otherwise." By purchasing additional shares of a stock that has lost value, an investor does accept an additional gamble. While he lowers his average break even point—and likely reference point—he also increases his potential losses.

V. Performance Analysis and Alternative Hypotheses

V.A. Performance

Investors prefer to repurchase stocks that they previously sold when that sale was profitable. We believe that investors are engaging in a simple, though perhaps misplaced, form of learning: They are repeating actions that were previously rewarded and avoiding actions previously punished. The appropriateness of this learning depends upon how deterministic the process is that led to their gains and losses. If previous gains indicate that an investor has superior information about a particular stock, repurchasing previous winners may be normative. However, in general, individual investors do not exhibit stock picking ability (Odean 1999; Barber and Odean 2000, 2001; Barber, Lee, Liu, and Odean 2003b). For investors without stock picking ability, repurchasing previous winners is unlikely to improve performance.

We test whether investors are benefiting from the repurchase of stocks previously sold for a gain by calculating returns earned on such stocks subsequent to being repurchased. We assume a holding period of one year; results are qualitatively similar at other horizons. We form transaction-value-weighted portfolios of stocks repurchased by investors after being sold for a profit by the same investor within 252 trading days (i.e., one year). Securities are held in the portfolio for 12 months subsequent to portfolio formation. To see whether any observed abnormal returns can be explained by investment style, that is, by stock characteristics known to affect returns, we employ a three-factor model that includes market, size, and value factors (Fama and French 1993).[5]

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[5] The construction of the *SMB* and *VMG* portfolios is discussed in detail in Fama and French (1993). We thank Kenneth French for providing us with the remaining data.

To evaluate the return performance of a portfolio (R_{pt}), we estimate the following monthly time-series regression:

$$\left(R_{pt} - R_{ft} \right) = \alpha_j + \beta_j \left(R_{mt} - R_{ft} \right) + s_j SMB_t + h_j VMG_t + \varepsilon_{jt} \ , \qquad (7)$$

where R_{ft} is the monthly return on T-Bills, R_{mt} is the monthly return on a value-weighted market index, SMB_t is the return on a value-weighted portfolio of small stocks minus the return on a value-weighted portfolio of big stocks, and VMG_t is the return on a value-weighted portfolio of high book-to-market (value) stocks minus the return on a value-weighted portfolio of low book-to-market (growth) stocks.

Our results are reported in Table 5, Panel A, where we see that investors at both the discount and retail brokerages tilt their repurchases of prior winners towards high beta, growth stocks. Investors at the discount firm also prefer small stocks, though the retail investors display no such preference. On their portfolios of stocks previously sold for a gain that are repurchased, neither the discount nor the retail investors earn style adjusted returns that are reliably different from zero.

To test whether investors are benefiting from the repurchase of stocks previously sold that have dropped in value since they were sold, we calculate style-adjusted portfolio returns subsequent to stock purchases at prices lower than previous sales prices. Results are reported in Table 5, Panel B. For both the discount and retail investors, the regression intercept (i.e., alpha) is negative, though not reliably so. Thus, we find no evidence that these investors' performance is systematically benefiting from repurchasing stocks that have dropped in price since they were last sold.

To test whether investors are benefiting from purchasing additional shares of stocks currently owned that have dropped in value since they were first purchased, we calculate style-adjusted portfolio returns subsequent to stock purchases of currently owned stocks at prices lower than the original purchase price. Results are reported in Table 5, Panel C. For both the discount and retail investors, the regression intercept (i.e., alpha) is negative, though reliably so only at the large discount brokerage. Thus, we find no evidence that these investors' performance is systematically benefiting from

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purchasing additional shares of stocks currently owned that have dropped in value since they were first purchased.

V.B. Alternative hypotheses

We observe that investors are more likely to repurchase a stock that they previously sold if that stock is now trading for less than the price at which they sold it. We argue that by repurchasing a stock that she previously sold, an investor highlights the counterfactual in which she would own the stock today because she never sold it. If she repurchases the stock at a lower price than she sold it, repurchasing makes her better off than she would have been under the counterfactual; the comparison makes her feel good. If she repurchases the stock at a higher price than she sold it, repurchasing makes her worse off than under the counterfactual; the comparison makes her feel bad. Thus, investors increase the emotional pleasure associated with trading stocks when they repurchase stocks at prices lower than they sold them for. In contrast, repurchasing at a higher price than one has sold a stock for increases regret at having sold the stock in the first place.

One alternative to our explanation is that investors rightly or wrongly believe that stock returns are mean reverting and so they prefer to buy stocks with poor recent performance. We test this alternative by observing that if investors simply believe that stock returns are mean reverting this belief should apply both to stocks the investor has owned before and to other stocks. We form a partition of investors who exhibit a preference for buying stocks at a lower price than they sold them (i.e., the partition of investors for whom PDSSR > PUSSR). We then look to see whether this group of investors tends to select stocks with poor recent performance when they are buying stocks that they have not owned during the past year. We do so by calculating the mean market-adjusted return on purchases in event time, where day *0* is the day of purchase for stocks purchased by these investors, but not owned by them during the previous year. These means are cumulated beginning one year (252 trading days) prior to the purchase.

In Figure 1, we see that at both the discount and retail brokerage houses cumulative market-adjusted returns prior to purchase are, on average, strongly positive for stocks not

owned during the last year. In general, these investors chase performance, rather than bet on mean reversion. Only when they have previously owned a stock do they buy after poor performance. Thus, different experiences can cause two investors to treat the same stock differently.

As discussed in Section IV.D, investors are more likely to purchase additional shares of a stock that they currently own if the stock's price has fallen since they bought it. Suppose investors routinely sell part, but not all, of their holdings in stocks, that have gone up in price and they purchase additional shares of stocks they own that have fallen in price. Then our observation that investors repurchase stocks that have lost value since being sold, could be driven by investors' tendency to repurchase currently owned stocks that have dropped in price since they were purchased. To test that the tendency to repurchase stocks that have dropped in value since being sold is independent from the tendency to repurchase stocks that have dropped since being bought, we rerun our calculations of the proportion of stocks down since being sold that are repurchased (PDSSR) and the proportion of stocks up since being sold that are repurchased (PUSSR) with the added condition that we only count repurchases of stocks that the investor does not currently own. Our results are qualitatively similar to those reported in Table 2. For example, for all accounts at the large discount brokerage, the difference in PDSSR and PUSSR is 0.0260 (t = 57.9).

VI. Counterfactuals

Counterfactuals may serve both preparative and affective functions (Roese and Olson 1995b). For example, a driver who skids into a stopped car while driving in the rain may consider a counterfactual in which he was able to avoid the accident because he was driving less quickly. This can lead to the resolve to drive less quickly next time it rains. Thus, comparing reality to a better, or upward, counterfactual prepares him for the future. The same driver may also consider a counterfactual in which he skidded into an oncoming truck, rather than a stopped car, and was killed. This comparison to a worse, or downward, counterfactual helps him to feel less regret (or negative affect) about his accident, because he knows that it could easily have been worse.

The role that we propose counterfactuals to be playing in investor repurchase decisions improves affect, but it is more active than simply thinking of ways in which events that have already occurred could have "easily" turned out worse. The investors we study choose current actions (i.e., repurchasing or not repurchasing) that appear to reduce the regret—or increase the happiness—associated with past actions (e.g., having previously sold the stock).

VII. Conclusion

Analyzing trading records for hundreds of thousands of individual investors at a large discount brokerage and large retail brokerage, we establish two previously undocumented patterns in the purchase selections of individual investors. Both patterns hinge on investors' previous experience with a stock. Investors prefer to repurchase:

(1) stocks previously sold for a gain, and

(2) stocks that have lost value since they were last sold.

The first pattern dominates the second, that is, investors are reticent to repurchase stocks they previously sold for a loss, regardless of the post sale return. However, investors are much more likely to repurchase a stock previously sold for a gain if it has lost value since it was sold. None of these trading patterns reliably improve investors' returns.

We propose that a simple form of learning leads to the first repurchase pattern. By repurchasing stocks previously bought and then sold for a gain and avoiding those associated with prior losses, investors are simply repeating previously rewarded behavior and avoiding previously punished behavior. This pattern is wide spread even though, in the domain of stock repurchases, it does not improve investor welfare. We propose that counterfactual thinking leads to the second repurchase pattern.   When an investor repurchases a stock that he previously sold, he creates a powerful counterfactual. Had he never sold the stock he would have the same portfolio today but be either wealthier (if the stock price has declined) or poorer (if the stock price has increase). Investors experience regret when having sold and repurchased makes them worse off than they would have been had they not sold to begin with (i.e., when they repurchase at a higher price than they sold). Even if they end up with a profit, the counterfactual of not selling in the first place reminds them that they could have easily done better. Thus, by repurchasing with

greater frequency stocks that have decreased, rather than increased, in value since being sold, investors increase the emotional welfare of investing regardless of the final outcome of their investment.

In addition to establishing these two previously undocumented purchase patterns, we confirm that in the case of stocks they still own, individual investors are more likely to purchase additional shares of stocks that have decreased in value since being purchased than they are to purchase additional shares of stocks that have risen in value since being purchased. Like the repurchase of stocks that have fallen since last being sold, this behavior makes sense in terms of counterfactual reasoning. An investor who purchases additional shares of a stock he already owns could have, in most cases, achieved his current portfolio by simply purchasing more shares to begin with. If the stock has decreased in value since the original purchase, the investor who buys again is better off than he might have been. If it has increased in value, he is worse off.

Our large and detailed data sets enable us to document trading patterns of real investors with great certainty. The explanations we offer are both consistent with previous psychological research and intuitive. It makes emotional sense that investors repurchase stocks that have decreased in value since being sold. Investors who do so feel the pleasure of making choices resulting in better outcomes than what might have been, while investors who repurchase at higher prices feel regret from knowing that they could have easily done better. And avoiding what has been a source of pain in the past is one of the most basic primal instincts that humans possess. Thus it also makes emotional sense that investors are attracted to stocks that have treated them well in the past, but shy away from stocks by which they were once burned.

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Table 1: Preferences for Repurchasing Stocks Previously Sold for a Gain vs. Stocks Previously Sold for a Loss

This table compares the aggregate Proportion of Prior Winners Repurchased (PPWR) to the aggregate Proportion of Prior Losers Repurchased (PPLR). PPWR is the number of stocks sold for a gain in the previous year that were repurchased divided by the number of opportunities to repurchase stocks sold for gain in the previous year. PPLR is calculated similarly. All counters are incremented only on days when purchases are made. Results are separately aggregated across accounts for taxable accounts and tax-deferred accounts at the large discount brokerage (LDB) (January 1991 through November 1996) and the large retail brokerage (LRB) (January 1997 through June 1999). The t-statistics test the null hypotheses that the differences in proportions are equal to zero assuming that all purchases and non-purchases result from independent decisions.

	Large Discount Broker		Large Retail Broker	
	Taxable	Tax-Deferred	Taxable	Tax-Deferred
Winners Repurchased	82,917	22,297	157,288	64,787
Opportunities to Repurchase Winners	1,076,557	265,594	3,136,697	920,968
Proportion of Prior Winners Repurchased (PPWR)	0.0770	0.0838	0.0501	0.0703
Losers Repurchased	26,859	5,541	51,844	15,533
Opportunities to Repurchase Losers	665,405	140,683	1,972,282	513,223
Proportion of Prior Losers Repurchased (PPLR)	0.0404	0.0394	0.0263	0.0303
Difference (PPWR – PPLR)	0.0367	0.0445	0.0239	0.0401
t-statistic	104.0	59.5	142.2	111.9

**Table 2: Preferences for Repurchasing Stocks Up Since being Sold vs.
Stocks Down Since being Sold**

This table compares the aggregate Proportion of Stocks Up Since being Sold that were Repurchased (PSUSSR) to the aggregate Proportion of Stocks Down Since being Sold that were Repurchased (PSDSSR). PSUSSR is the number of stocks sold in the previous year that were repurchased for a higher price than the price at which they were sold divided by the number of opportunities to repurchase stocks sold in the previous year for a higher price than the price at which they were sold. PSDSSR is calculated similarly. All counters are incremented only on days when purchases are made. Results are separately aggregated across accounts for taxable accounts and tax-deferred accounts at the large discount brokerage (LDB) (January 1991 through November 1996) and the large retail brokerage (LRB) (January 1997 through June 1999). The t-statistics test the null hypotheses that the differences in proportions are equal to zero assuming that all purchases and non-purchases result from independent decisions.

	Large Discount Broker		Large Retail Broker	
	Taxable	Tax-Deferred	Taxable	Tax-Deferred
Stocks Down Since being Sold that were Repurchased	62,174	16,617	111,351	43,837
Opportunities to Repurchase Stocks Down Since being Sold	806,492	177,011	2,359,196	654,195
Proportion Stocks Down Since being Sold that were Repurchased (PSDSSR)	0.0771	0.0939	0.0472	0.0670
Stocks Up Since being Sold that were Repurchased	47,602	11,221	97,781	36,483
Opportunities. to Repurchase Stocks Up Since being Sold	935,470	229,626	2,749,783	779,996
Proportion of Stocks Up Since being Sold that were Repurchased (PSUSSR)	0.0509	0.0489	0.0356	0.0468
Difference (PSDSSR – PSUSSR)	0.0262	0.0450	0.0116	0.0202
t-statistic	70.1	54.5	65.5	50.8

Table 3: Interaction Effects

This table separately compares the aggregate Proportion of Stocks Up Since being Sold that were Repurchased (PSUSSR) to the aggregate Proportion of Stocks Down Since being Sold that were Repurchased (PSDSSR) for stocks that were previously sold for a gain and for stocks that were previously sold for a loss . PSUSSR is the number of stocks sold in the previous year that were repurchased for a higher price than the price at which they were sold divided by the number of opportunities to repurchase stocks sold in the previous year for a higher price than the price at which they were sold. PSDSSR is calculated similarly. All counters are incremented only on days when purchases are made. Results are separately aggregated across accounts at the large discount brokerage (LDB) (January 1991 through November 1996) and the large retail brokerage (LRB) (January 1997 through June 1999). The t-statistics test the null hypotheses that the differences in proportions are equal to zero assuming that all purchases and non-purchases result from independent decisions.

Panel A: Stocks Previously Sold for a Gain

	Large Discount Broker	Large Retail Broker
Stocks Down Since being Sold that were Repurchased	62,372	122,064
Opportunities to Repurchase Stocks Down Since being Sold	596,217	1,794,987
Proportion Stocks Down Since being Sold that were Repurchased (PSDSSR)	0.1046	0.0680
Stocks Up Since being Sold that were Repurchased	44,856	102,478
Opportunities. to Repurchase Stocks Up Since being Sold	808,908	2,406,334
Proportion of Stocks Up Since being Sold that were Repurchased (PSUSSR)	0.0555	0.0426
Difference (PSDSSR – PSUSSR)	0.0492	0.0254
t-statistic	104.4	111.2

Panel B: Stocks Previously Sold for a Loss

	Large Discount Broker	Large Retail Broker
Stocks Down Since being Sold that were Repurchased	17,744	34,502
Opportunities to Repurchase Stocks Down Since being Sold	140,061	1,341,011
Proportion Stocks Down Since being Sold that were Repurchased (PSDSSR)	0.0413	0.0257
Stocks Up Since being Sold that were Repurchased	15,308	33,489
Opportunities. to Repurchase Stocks Up Since being Sold	415,765	1,233,625
Proportion of Stocks Up Since being Sold that were Repurchased (PSUSSR)	0.0368	0.02715
Difference (PSDSSR – PSUSSR)	0.0044	-0.0014
t-statistic	10.5	-7.1

Table 4: Preferences for Purchasing Currently Owned Winners vs. Currently Owned Losers

This table compares the aggregate proportion of currently owned stocks up since being purchased (winners) that are purchased again to the aggregate proportion of currently owned down since being purchased (losers) that are purchased again. The proportion of currently owned winners repurchased is the number of stocks purchased and still owned that were purchased again for a higher price than the average price at which they were previously purchased divided by the number of opportunities to purchase currently owned stocks for a higher price than the average price at which they were previously purchased. The proportion of currently owned losers repurchased is calculated similarly. All counters are incremented only on days when purchases are made. Results are aggregated across accounts for accounts at the large discount brokerage (LDB) (January 1991 through November 1996) and the large retail brokerage (LRB) (January 1997 through June 1999). The t-statistics test the null hypotheses that the differences in proportions are equal to zero assuming that all purchases and non-purchases result from independent decisions.

	Large Discount Broker	Large Retail Broker
Currently owned losers repurchased	136751	393,679
Opportunities to repurchase currently owned losers	938345	3,094,891
Proportion of currently owned losers repurchased (PCOLR)	0.1457	0.1272
Currently owned winners repurchased	109,932	350,514
Opportunities to repurchase currently owned winners	1,165,032	3,725,718
Proportion of currently owned winners repurchased (PCOWR)	0.0944	0.0941
Difference in Proportions	0.0514	0.0331
t-statistic	113.2	136.7

Table 5: Percentage Return Performance and Style Tilts of Portfolios Formed on the Basis of Repurchases of Stocks Previously Sold for a Gain and Repurchases of Stocks that have Decreased in Value Since Previously Sold

Transaction Value-Weighted portfolios are formed of stocks purchased by investors that were sold for a profit by the same investor within the 252 trading days (i.e., one year) and of stocks purchased that have decreased in value in value since being previously sold by the same investor during the last 252 trading days. Securities are held in the portfolio for 12 months subsequent to portfolio formation. To evaluate the return performance of a particular decile (R_{pt}) we estimate the following monthly time-series regression:

$$\left(R_{pt} - R_{ft}\right) = \alpha_j + \beta_j\left(R_{mt} - R_{ft}\right) + s_j SMB_t + h_j VMG_t + \varepsilon_{jt} \ ,$$

where R_{ft} is the monthly return on T-Bills, R_{mt} is the monthly return on a value-weighted market index, SMB_t is the return on a value-weighted portfolio of small stocks minus the return on a value-weighted portfolio of big stocks, and VMG_t is the return on a value-weighted portfolio of high book-to-market (value) stocks minus the return on a value-weighted portfolio of low book-to-market (growth) stocks. *t-statistics* are in parentheses.

Panel A: Repurchases of Stocks Previously Sold for Gain

	α	β	s	h
Discount	0.080	1.335	0.481	-0.527
Brokerage	(0.25)	(10.89)	(4.05)	(-4.15)
Retail	-0.147	1.070	-0.0504	-1.390
Brokerage	(-0.11)	(3.57)	(-1.17)	(-3.11)

Panel B: Repurchases of Stocks Down in Value since being Sold

	α	β	s	h
Discount	-0.100	1.366	0.474	-0.534
Brokerage	(-0.29)	(10.44)	(3.74)	(-3.94)
Retail	-0.245	1.097	-0.381	-1.325
Brokerage	(-0.19)	(3.74)	(-0.90)	(-3.03)

Panel C: Purchases of Currently Owned Stocks Down in Value since last Purchased

	α	β	s	h
Discount	-0.532	1.369	1.032	-0.059
Brokerage	(-1.80)	(13.80)	(9.13)	(-0.48)
Retail	-0.186	0.943	0.528	-0.780
Brokerage	(-0.38)	(7.99)	(3.76)	(-4.17)

Figure 1.

Equally-Weighted Cumulative Market-Adjusted Returns for Stocks Purchased that had NOT been sold in Previous 12 Months