Individual investors' buying and selling behaviour [1]

Cristiana Cerqueira Leal

Lecturer in Finance
Management Department – University of Minho
Campus de Gualtar
4710-553 Braga – Portugal
ccerqueira@eeg.uminho.pt

Abstract

We study individual investors trading behavior on the basis of a unique database that consists of trading records of 6 177 investors' accounts for the period from 01-08-2003 to 31-07-2007. These investors are under-diversified and trade many times, being their trading concentrated in few stocks with which the investor persistently develops a long relation. We find preferences for (1) repurchasing stocks previously sold for a gain; (2) repurchasing stocks that have lost value subsequent to a prior sale; (3) additionally purchasing more stocks if they have lost value after the purchase. We also find that these preferences are stronger for less active and underdiversified investors. These patterns can be explained by behavioral factors related to mental accounting and counterfactuals thinking. Generally, individual investors take decisions to emphasize the positive experiences (gains), expected to be repeated; and avoid the sources of regret associated with negative experiences (losses realized).

Keywords: Investor Behavior; Individual Investors; Trading Behavior.

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Introduction

Individual investor behavior is a major topic in the behavioral finance literature. Over the last decades, the literature has shown that investors systematically deviate from rationality and individual investors are particularly susceptible to such deviations. Many examples of poor individual investor's decisions have been reported. For instance, investors trade too much (Odean, 1999), are under-diversified (Goetzmann and Kumar, 2008), hold on their losing stocks too long and sell their winning stocks too soon (Odean, 1998). The traditional finance does not offer a satisfactory explanation for these patterns that usually hurt the investors' portfolio performance. Behavioral finance is developing in order to understand why individual investors trade, how they choose their portfolios and how they perform (Subrahmanyam, 2008).

When selecting stocks to purchase, investors have a large set of investment opportunities. As it is difficult to consider all possible options, individuals concentrate their choice in particular subsets that catch their attention. Barber, Odean and Zhu (2008) demonstrate that investors are more likely to buy stocks that are in the news because they can easily recall them. In addition, investors are more likely to purchase stocks that they have owned in the past instead of stocks that they have never owned. This is explained by the fact that investors easily recall previously owned stocks and, additionally, they already have some knowledge about them. This research purposes to contribute to the behavioral finance literature, by studying the individual investor behavior in repurchasing stocks currently or previously owned.

Individuals seldom choose in absolute terms because estimating the fundamental value of their holdings is a hard task to do. Instead, they prefer to value their holdings in relative terms. When an investor buys an asset by the first time at some price, he becomes anchored to that price. The previous prices determine the following accepted prices, even if they are arbitrary because individuals seek to be coherent with previous decisions (Ariely, Loewenstein and Prelec, 2003). Regarding portfolio decisions, experienced past prices play as anchors and determine future decisions (Tversky and Kahneman, 1974). Individuals tend to frame their portfolios into separated mental accounts associated to each security to better monitor experienced prices and price evolution (Thaler, 1985). This mental accounting may be seen as a positive way of keeping track of their wealth. However, it may have nefarious consequences because segregating assets in non-fungible mental accounts may lead to incoherent decisions across accounts. Hence, mental accounting and past prices anchors play a key role in the repurchasing decision. The present study goes further in the concept of mental accounting. Mental accounting literature, usually, assumes that when the security is sold the account is closed. In the context of repurchasing behavior studies, the concept of mental accounting is extended: even when the security is sold, the account is kept opened and investors continue monitoring prices to implement future decisions.

Our study is based on a unique database of 6 177 individual investors' accounts, with detailed data on their registered trades. The data set under analysis goes from 1st August 2003 to 31st July 2007, comprising about 1 million trades. Using the accounts movements, we compose the account position of each investor, on each day of the sampling period. Our analysis is focused on the stock buying decision related to investor past prices. We find, in line with Barber, Odean and Strahilevitz (2010), that: (1) investors prefer repurchase stocks that are their past winners; (2) investors prefer repurchase stocks that have decreased in price since sold; and (3) investors prefer to additionally purchase stocks currently owned when the price of the stock has decreased in value. We also find that there are differences on these tendencies related to the investors' frequency of the trading and to investors' level of diversification. Testing the previous tendencies related to level of investor activity and diversification, we find every tendency for both groups but statistically stronger for infrequent/under diversified investors. Generally, individual investors take decisions to emphasize the positive experiences (gains), expected to be repeated, and to avoid the sources of regret associated with negative experiences (losses realized). Then, when buying past winners, they are repeating a good experience. If the stock price decreased since sold, buying the stock again emphasizes the good decision, once investor is in a better situation instead of having kept that stock. If, simultaneously, the stock is a past winner and the price decreased since sold, the positive connotation of that stock is highlighted and, consequently, the preference for an additional purchase of that stock is amplified. In addition, when the investor has a losing stock in portfolio, he may decide to buy more of those stocks, in order to reduce the average acquisition price and, consequently, achieve the break even easily. The patterns are based on the assumption that investors are able to maintain mental control over their accounts. Hence, individuals have cognitive and memory limitations and frequent and diversified traders have more difficulty in maintaining control over their accounts becoming less vulnerable to this type of bias. Moreover, learning is a function of experience and more active traders improve faster their knowledge and skills and therefore reduce their predisposition to these bias.

Literature Review

According to overconfidence theory individuals tend to be too much confident in various aspects of life. This overconfidence is triggered by biased self-attribution that assumes that the good results are motivated by individual good decisions and bad results are attributed to bad luck and other external causes. Then, the investors' overconfidence is increased by biased self-attribution that associates good market performance to investors' great investment ability. In this framework, overconfident investors will trade more frequently and accept riskier deals and, as consequence, the market volatility and trading volume will increase (Gervais and Odean, 2001). Moreover, the degree of overconfidence is correlated with market performance because investors believe that the good results are a consequence of the precision of their information and of their great selection abilities (Daniel, Hirshleifer and Subrahmanyam, 1998; Odean,

1998b). As a result, good (poor) market performance leads to high (low) subsequent volume (Odean, 1998b; Gervais and Odean, 2001). Good market performance makes investors even more overconfident about their abilities and the quality of their information. Hence, overconfident investors trade more frequently in the subsequent periods due to their mistaken believes. Statman and Thorley (2006) studied changes in trading volume over time related to returns and found a positive lead-lag effect at both the market level and at the individual securities level. They found that market turnover and securities turnover is related to lagged market returns, explained by overconfidence theory. It was also found that trading volume is more responsive to the market performance than individual securities performance. The authors also found that individual security turnover is related to lagged security returns, explained as consistent with disposition effect. Disposition effect is one of the most studied anomalies in financial markets. As identified by Shefrin and Statman (1985), individual investors prefer to sell winning investments too soon and hold the loosing ones too long. Investors sell a winning stock, not because they believe it was finished rising, but because they want to "lock in profits". Also, they hold on a losing stock because they "believe" it will come back and breakeven. The explanations for these patterns are mainly based in Prospect Theory value function (Kahneman and Tversky, 1979) and mental accounting (Thaler, 1985).

A. Preference for repurchasing past winners rather than past losers.

The decision making in the context of risk has two possible outcomes: gains or losses. The discussion on gains and losses implies the existence of some implicit benchmarks for what "expected" utility might be. The benchmark for expected wealth might be current wealth. This means that a zero change in wealth is the reference point from which departures are measured. In this context, when a purchase is made the natural reference point that comes out is the acquisition price (Shefrin and Statman, 1985).

Gains and losses conduct to opposite sentiments. Gains produce pleasure and pride while losses generate pain and regret. Thus, investors act in order to feel the pleasure of a good decision and emphasize it and, simultaneously, to avoid the regret of a bad decision. On this framework, in the context of repurchasing behavior, investors keep the mental account of stocks previously hold opened and its reference prices are used as anchors for future decisions. Then, investors prefer to repurchase past winners rather than past losers because they are looking for the sources of pleasure and avoiding the sources of regret. The repurchase of past winners emphasizes the positive experience that investors expect to repeat. Furthermore, even if eventually some losses occur in the repurchased stock, investors use mental accounting strategies, as integrating those losses in the total gains and keep saying that globally that the stock is a winning one. Simultaneously, inventors may do not consider repurchasing their past losers in order to avoid remembering unpleasant experiences.

A possible alternative explanation would be that investors concentrate in their past winners because they have some advantage: experience, knowledge, expertise, ect. Barber, Odean and Strahilevitz (2010) find that the previous winners repurchased do not earn superior adjusted returns in the subsequent 12 months, which indicates that this is not the proper explanation.

B. Preference for repurchasing stocks that decreased in price after being sold rather than the ones that increased in price.

When considering the repurchasing of one stock, investors also take into account the behavior of that stock subsequent to the sell. Investors engage in mental accounting simulations and think in terms of counterfactuals that can induce pleasure or regret. Counterfactual thinking is a mental construction of "what might have been" (Roese, 1996; Roese, 1997). Counterfactuals emerge mainly in response to a negative affect and generate feelings as pain and regret. If the stock price increased since it was sold, investor would be better off if he had kept the stock into portfolio. Hence, investor regrets the past sell and, consequently, he might not consider that stock to buy again just because it evidences his bad decision. No matter how well de stock performs after the repurchase, investor would in a better position if he had retained the stock in possession. Contrarily, if the stock had lost value subsequent to the sell, investor would have a good decision and, if he buys the stock again, he would be better off than if had done nothing. Then, repurchase stock that is losing value subsequent to the sell will emphasize the investor's ability and will make him proud of his investment decision. These mental simulations suppose the existence of mental accounting and the possibility of maintaining the accounts opened even when the stock is sold. If the investor closes the mental account when the shares are sold, no preference should be found related to past prices. The mental accounting and its prevalence trough time even after the sell of the stock emphasizes the importance of the past prices as anchors in the actual decision making process. Moreover, the relevant prices are the prices of the previous transactions, which mean that the references are distinct for each investor. (Weber and Welfens, 2007) using an experimental setting applied to 145 students, documented two of the patterns already identified by Barber, Odean and Strahilevitz (2010), namely that stocks purchased occur more frequently if the stock decrease in value subsequent to (1) a prior purchase (additional purchased concentrated on losers) and (2) a prior sale (repurchase concentrated in stock that decreased in price after de sale). This study as being experimental had the advantage of controlling for the counterfactual thinking as motivations of the preferences. If the individuals have no responsibility in the past decisions, counterfactual thinking should decrease. Therefore, the experiment varied the antecedent controllability, imposing to one group the previous decision to purchase or sell while the other group has the opportunity to decide. For the group that the decision was imposed, the identified patterns were considerably reduced, which means that in counterfactual thinking is the main explanation for this behavior.

C. Preference for additionally purchasing their actual losers rather than winners.

In the case of additional purchase, the mental accounting plays again an important role. The stock currently owned and additionally purchased at a lower price will reduce the average acquisition price while additional purchases at a higher price will increase it. In this situation counterfactual thinking appears naturally, by comparing the current situation with the situation that could have been, if a larger initial purchase has been made. What had happened if investor had bought all shares at the initial price? The comparison that makes investor better off is the first situation, so if investors engage in counterfactual thinking, they prefer to additionally purchase stocks that are decreasing in price since they were bought. Moreover, investors may buy at a lower price aiming to lower acquisition average price. In spite of the theory recall that this can be a bad strategy because investors are allocating more resources to a bad investment, it is very common that individual investors refer it as a strategy seeking to breakeven more easily. This behavior can be understood based on the s-value Prospect Theory function (Kahneman and Tversky, 1979). It considers the acquisition price as the natural reference point and decreasing sensitivity in face to new gains or losses. Then, when investor is in the losses zone, additional losses are not so painful but a possible recovery, and the possibility to breakeven, is much valuable. As the value function attributes a subjective value associated to each amount of gains or losses, in the losses zone, the first euro lost is more painful than the second one and so on. Additionally, a possible recovery of one euro has more subjective value than a loss of the same amount. Investors also exhibit loss aversion, which is represented in the value function by a steeper losses zone than the gains zone. In this context, investors may accept very risky bets aiming to lower the acquisition price and consequently make the breakeven easier to attain. In the gains zone, the investment is doing well and investors tend to be more risk averse. This change in risk attitude when moving from loss to gain is called reflection effect (Kahneman and Tversky, 1979; Kahneman and Tversky, 1982). Due to the decreasing sensitivity, the first euro of gains is more pleasant than the second one and so on. Hence, investors may decide to behave more conservatively and do not additionally invest in that stock because the perceived additional gain is less valuable but a possible reduction in price is very painful (they would move to the steeper zone of gains).

When considering buying a stock, investors have an enormous amount of possibilities available. However, constrains of time and effort result in a need to reduce the possibilities to a small number that they can effectively consider. Hence, investors tend to concentrate their focus in a few stocks, because they are more visible or familiar, and trade many times those stocks. Thus, frequently, investors decide to buy stocks they hold previously. However, they do not buy these stocks discretionarily looking only to the market and raising expectations. Their past experience with those stocks plays an important role in the determination of preferences.

D. Differences on these preferences related to activity and diversification

Moreover, we aim to investigate whether there are differences among investors concerning to these preferences. Particularly, we find that, on average, investors are under-diversified and trade frequently the same stock, i.e., engage in repurchase and additional purchase. Being aware of these features, we also purpose to study whether there are differences in preferences related to the activity and diversification.

Nevertheless, for frequent traders it is possible that these patterns are eventually attenuated because active investors have difficulty in control every mental account. The cognitive and memory limitations might conduct to a decrease of these patterns. Based on this explanation, the reduction of the pattern may be result not from a decrease of the preference, but from the lack of mental control capabilities of active investors. However, the experience is a way of learning and trading frequency is directly related to learning. As, Seru, Shumway et al. (2007) refer the learning is derived from experience and this is given by the number of years that the investor trades and cumulative number of transactions. Hence, the reduction of the pattern also can be explained by this reason. Then, there are two competitive explanations: the reduction of the preference or the lack of mental control.

Data

The primary data for the qualitative study consists of a unique database of 6 177 individual investors' accounts, with detailed data on their registered trades. The data set under analysis goes from 1st August 2003 to 31st July 2007, comprising about 1 million of trades. The data was supplied by a Portuguese brokerage house and the collected data concerns their discount brokerage clients. These investors make their own investing decisions without supervision or advice from the brokerage house. The largest majority of them trade online and the direct interaction with the brokerage house is almost inexistent.

The analysis considers 5,122 investor accounts that traded stocks, at least, once in the sampling time period. We have excluded all data but that related with stocks, namely those on bonds and on derivatives, and obtained a database that comprises 343,360 stock trades (179,481 buys and 163,879 sells) of 1,621 different stocks in 14 markets (countries) and 6 different currencies. Investors are concentrated in Euro Zone markets (94.9% of all trades) and also US market (4.6% of the trades). We observe a strong home bias (68,8% of all trades are in Portuguese stock market) despite the purported benefits of diversifying into foreign securities (e.g., Coval, 1999; Ivkovi, 2005; Karlsson, 2007).

Using the accounts movements, we construct the investors' accounts in a daily basis. We compose the account position of each investor, on each day of the sampling period. We net all trades, on the same day and security, for the same investor and ignore all sells for which it is

not possible to identify the purchase date and its price (purchases before the 1st of August 2003), because of lack of information on acquisition prices. Constructing the daily investor portfolio based in the supposition that, at the beginning of the data period, the initial balance is null implies that there are sells without a matching purchase (the matching purchase exists and is reflected in the initial balance but the acquisition price is unknown). These sells are dropped, otherwise they would appear as short selling[2]. The elimination can be total or partial. If the investor does not have the stock in account at all, the sell is eliminated. If the investor has a quantity of that stock, but less than the amount sold, the sell is considered but only by the quantity in account. This means that we keep the sell registration but alter the quantity sold. Consequently, the transaction costs also are rectified to the quantities sold in order to do not overcharge the remaining sell. We calculate the unit transaction cost and input it to the quantity that is considered as sold.

We also adjust the data for every corporate action that occur in the period (dividends, stock splits, mergers, etc)[3]. During the data period, we have registries of 1,167 stock corporate actions (840 of which concern to dividends). Some of these do not affect the investors' accounts because they do not hold those stocks while others affect many accounts. Already taking into account liquid daily corporate actions (in the case that more than one corporate action occurs in the same day, for the same stock), we come up with 13,549 registrations of adjustments due to corporate actions. Since we know the records of all account movements including the corporate actions (the registrations of value adjustments and/or quantities adjustments), we incorporate all the relevant movements in the daily portfolio construction. Besides, by doing the real adjustment, we also consider the real transaction costs charged (if any) associated to the event. The consideration of null initial balance also influences the corporate actions adjustment. Consistently, we correct the corporate actions registrations to the quantities of stocks in account (if they exist), ignoring the initial balance.

On average, and ignoring the day-trading, each investor has 23 trades in the period. However, there are great differences among investors. The standard deviation of trading is 120 and the maximum number of trades for one investor is 3,597. We also find that investors are under-diversified: on average, each investor holds a portfolio with 2.38 securities (standard deviation of 4.7 and maximum of 78 securities hold). Barber and Odean (2000) reported that a typical individual investor holds a portfolio with only four stocks. Moreover, they are concentrated in

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[2] Short-selling is only allowed for intraday trading. This means that before the end of the session the account has to have the short-selling positions closed and for the daily analysis point of view short-selling does not exist.

[3] We calculate every result presented along this study to the portfolio construction with and without corporate actions adjustment and obtain quite similar results. The reported results are always considering the adjustment.

trading just a few stocks. On average, each investor trades 4.54 stocks in the period (standard deviation of 11.6 and maximum of 286 stocks traded).

This means that investors trade many times but just a few stocks, because they buy and sell the same stock very often. Then, this is a good scenario to study repurchase and additional purchase.

Hypotheses and Methodology

A. The repurchase of stocks previously sold for a gain/loss

Firstly, we expect that, when considering the repurchase of one stock, investors prefer repurchasing their past winners rather than their past losers. Once they had a positive experience with that stock, they are expected to repeat the behavior, seeking the sources of pleasure. By opposite, we expect that they avoid losing stocks, attempting to avoid the sources of pain and regret.

To measure a preference it is not enough to account how many times one behaves that way Barber, Odean and Strahilevitz (2010). It has to be pondered by the opportunities to do so. Then, to test whether investors prefer the repurchase of stocks previously sold for a gain or for a loss, it is not sufficient to compare the number of repurchases of stocks previously sold for a gain (prior winners repurchased) and the number of repurchases of stocks previously sold for a loss (prior losers repurchased). The repurchases of prior gains and/or losses have to be compared to the opportunities to do so, that is the total number of prior gains realized and the total number of prior losses realized. In an up-ward market, the average investor has more opportunities to repurchase previous winners than previous losers even if he has no preference at all. Then, the number of purchases of stocks previously sold for a gain is compared to the total number of stocks sold for a gain that could have been repurchased that day and the number of purchases of stocks previously sold for a loss is compared to the total number of stocks sold for a loss that could have been repurchased that day, expressed by Proportion of Prior Winners Repurchased (PPWR) and Proportion of Prior Losers Repurchased (PPLR), respectively.

The first hypothesis is that investors are more likely to repurchase prior winners rather than prior losses.

Preference for repurchasing past winners rather than past losers:

H0: Proportion of Prior Winners Repurchased (PPWR) ≤ Proportion of Prior Losers Repurchased (PPLR)

H1: Proportion of Prior Winners Repurchased (PPWR) > Proportion of Prior Losers Repurchased (PPLR)

In our study, we consider as repurchase a buy of a stock that investors owned up to one quarter (one year) earlier, which implies that the analysis starts one quarter (one year) after the beginning of the data. We consider one year and one quarter windows because both have interest in terms of data analysis. Considering one year means that we are using a lager window to consider repurchasing and consequently is expected to find more purchases classified as repurchases. However, that also means that the purchases that can be considered as repurchases are starting one year after the beginning of the data period. When, considering only one quarter, we start classifying purchases as repurchases earlier. Therefore, there is a trade-off between the two strategies: considering one year back we will find more opportunities of repurchasing but a smaller period of possible repurchasing; considering a quarter implies o longer period of analysis of purchases that can be classified as repurchases but a smaller window back to verify if the investor previously owned the security. We used both trough this study. Theoretically, the discussion of the suitably of the two windows is done later, when discussing the results.

The analysis starts at investor's account level. Each day a security is bought, we observe if it was owned in the previous trimester/ year but not at the moment (this means, the investor has not that stock in the beginning of day in analysis, otherwise it would be an additional purchase). For 3 months (one year) window, we start looking for repurchases in 1-11-2003 (1-08-2004) and using a moving window of 91 (365) calendar days back. Whether, in the repurchasing period, the stock was sold and repurchased many times, we make the correspondence of the repurchase to the earlier previous sell. For every buy classified as repurchase, we check if the correspondent previous sell was for a gain or for a loss, by comparing the selling price to the reference price. In our study, the reference price is the volume weighted average acquisition price of the stock previously bought (A). Whether only one buying trade occurred, the average security price is the sole buying price registered in that account for that specific security.

We define and compute Prior Winners and Prior Losers. Prior Winners (PW) and Prior Losers (PL) in a security *i*, in a specific account *l*, are the difference between the selling price (S) and the average acquisition price for that security (A).

$$PW_{i,l} = S_{i,l} - A_{i,l} > 0$$
$$PL_{i,l} = S_{i,l} - A_{i,l} < 0$$

where $S_{i,l}$ represents the selling price for security *i* in account *l*, and $A_{i,l}$ represents the average acquisition price of security *i* in account *l*. Then, we calculate the Prior Winners Repurchased (PWR) and the Prior Losers Repurchased (PLR).

Next, again for every investor, every day he makes a repurchase, we calculate the Opportunities to Repurchase Prior Winners (ORPW) and the Opportunities to Repurchase Prior Losers (ORPL). These opportunities include the prior sells that were effectively repurchased and the ones that potentially could have been. To calculate the Prior Winners Potentially Repurchased (PWPR) and the Prior Losers Potentially Repurchased (PLPR), we compute every stock that investor sold previously, at a gain and at a loss, not repurchased up to the moment and that could have been repurchased that day.

Having this information, we count throughout time and investors the number of repurchases of prior winners and prior losers and the opportunities to do so and compute the ratios Proportion of Prior Winners Repurchased (PPWR) and Proportion of Prior Losers Repurchased (PPLR):

$$PPWR = \frac{\#\ prior\ winners\ repurchased}{\#\ opportunities\ to\ repurchase\ prior\ winners}$$

$$PPLR = \frac{\#\ prior\ losers\ repurchased}{\#\ opportunities\ to\ repurchase\ prior\ losers}$$

Prior Winners Repurchased, Prior Losers Repurchased, Opportunities to Repurchase Prior Winners and Opportunities to Repurchase Prior Losers are only calculated for the account when a repurchase occurs in that account.

B. The repurchase of stocks previously sold at a higher/lower price

When considering the repurchase of one stock, other important anchor is the price evolution since sold. We determine the Proportion of Stocks Up Since being Sold that were Repurchased (PSUSSR) and the Proportion of Stocks Down Since being Sold that were Repurchased (PSDSSR) similarly to the calculations of PPWR and PPLR.

The second hypothesis is that investors prefer to repurchase stocks that decreased in price since sold than the ones increased in price.

Preference for repurchasing stocks down since sold rather than up since sold:

H_0: Proportion of Stocks Down Since being Sold that were Repurchased (PSDSSR) ≤ Proportion of Stocks Up Since being Sold that were Repurchased (PSUSSR)

H_1: Proportion of Stocks Down Since being Sold that were Repurchased (PSDSSR) > Proportion of Stocks Up Since being Sold that were Repurchased (PSUSSR)

We start the analysis 3 months (one year) after the beginning of the data period. Each day an investors makes a purchase, we verify whether that stock(s) was (were) sold during the previous trimester (year). If so, we determine whether the stock was repurchased at a higher, lower or the same price, in relation to the last sell. So, we compute the number of repurchases at a higher price (RHP) and repurchases at lower price as the difference between selling price (S) and repurchasing price (R):

$RHP_{i,l} = S_{i,l} - R_{i,l} < 0$
$RHP_{i,l} = S_{i,l} - R_{i,l} > 0$

where $S_{i,l}$ represents the selling price for security *i* in account *l*, and $R_{i,l}$ represents the repurchasing price of security *i* in account *l*. We ignore the repurchases at the same price of the last sell.

Then, we calculate the opportunities to repurchase stocks up since being sold and the opportunities to repurchase stocks down since being sold by examining every stock that investor could repurchase that day and compute if it could be repurchased at higher or lower price by comparing the selling price of the last sell (S) in the trimester (year) window to the closing price of the repurchasing day.

We aggregate the figures for each account and over time and compute Proportion of stocks up since being sold that were repurchased (PSUSSR) and the Proportion of stocks down since being sold that were repurchased (PSDSSR) as follows:

$$PSUSSR = \frac{\#\ of\ stocks\ up\ since\ being\ sold\ repurchased}{\#\ of\ opportunities\ to\ repurcahse\ stocks\ up\ since\ sold}$$

$$PSDSSR = \frac{\#\ of\ stocks\ down\ since\ being\ sold\ repurchased}{\#\ of\ opportunities\ to\ repurchase\ stocks\ down\ since\ sold}$$

In efficient markets investors should be indifferent to purchase stock that went up or down in price since sold.

C. The additional purchase of stocks at a higher/lower price

We compare the additional purchase of a stock at higher and lower price to the opportunities to do so. Investors would rather to additionally purchase securities than went down in value since bought than the ones that went up. In order to test this hypothesis, we will test the following null hypothesis:

H_0: Proportion of Losers Additionally Purchased (PWAP) ≤ Proportion of Winners Additionally Purchased (PLAP)
H_1: Proportion of Losers Additionally Purchased (PWAP) > Proportion of Winners Additionally Purchased (PLAP)

For each account, each time there are an acquisition of stock, we check if investor has that stock into his account. If so, this purchase is classified as additional purchase and each day an additional purchase takes place, we check if it was at a higher or lower price than the reference price. The additional purchase at a higher price means that presently that stock is a winner and the additional purchase at a lower price means that presently that stock is a loser. The reference price is the volume weighted average acquisition price of the stock previously bought and currently owned (A), as earlier defined.

Then, if the market price is higher/lower than the average acquisition price, the security is a current winner/loser.

Each time there are an additional purchase in an account, we define and compute Current Winners Repurchased and Current Losers Repurchased. Current Winners Repurchased (CWR) and Current Losers Repurchased (CLR) in a security *i*, in a specific account *l*, are the difference between the current purchase price (P), and the average acquisition price previously paid for that security (A).

$$CWR_{i,l} = P_{i,l} - A_{i,l} > 0$$
$$CLR_{i,l} = P_{i,l} - A_{i,l} < 0$$

where $P_{i,l}$ represents the purchase price of the additional purchase for security *i* in account *l*, and $A_{i,l}$ represents the average acquisition price of security *i* previously bought and currently owned in account *l*. Current Winners and Current Losers are only computed when an additional purchase occurs for a security in an account.

Then, we calculate the opportunities to additional repurchase at higher and lower price (the opportunities include the securities bought and the potential buys). Each day there are an additional purchase in the account, we look at every stock that is in that account and for which there was no additional purchase and verify if they are current winners or losers, by comparing the average acquisition price previously paid for that security (A) to the day closing price. The opportunities to an additional purchase of current winners and the opportunities to an additional purchase of current losers are only calculated if an additional purchase occurs for that account in that day.

Then, we calculate the Proportion of Winners Additionally Purchased (PWAP) and the Proportion of Losers Additionally Purchased (PLAP) as follows:

$$PWAP = \frac{\#\ of\ winners\ additionally\ purchased}{\#\ of\ opportunities\ to\ additionally\ purchase\ winners}$$

$$PLAP = \frac{\#\ of\ losers\ additionally\ purchased}{\#\ of\ opportunities\ do\ additionally\ purcahse\ losers}$$

We used a t-test for testing the statistical significance of the differences in the proportions. The t-statistic tests the null hypothesis that the differences in theses proportions are equal to zero. A significant difference means that investors exhibit the preference. The standard error for the difference in the proportions PWPR and PLPR is given by[4]:

$$\vartheta(PLPR - PWPR) = \sqrt{\frac{PWPR(1-PWPR)}{\#\ opportunities\ to\ repurchase\ prior\ winners} + \frac{PLPR(1-PLPR)}{\#\ opportunities\ to\ repurchase\ prior\ losers}}$$

Every test considers the observations aggregated across investors and over time independent. The independence assumption does not hold perfectly. Although this assumption can inflate the test, it does not bias the proportions calculated. So, for high degree of statistical significance the assumption of independence is not problematic.

D. Differences among investors

We also aim to investigate if there are differences on these preferences among investors. Even if we find these patterns for the entire dataset, we wonder if there are differences among investors. From the explorative interviews, we found that a characteristic that appears to generically affect investor actuation is the intensity of trading. Hence, we aim to investigate there are significant differences related the previous preferences related to activity.

Then, we test the following hypothesis related to the individual investors' frequency of trading:

A. Preferences for repurchasing stocks previously sold for a gain/loss

H (A1): $[(PPLR\text{-}PPWR)_{infrequent} - (PPLR\text{-}PPWR)_{frequent}]>0$

B. Preferences for repurchasing stocks up/down since being sold

H (B1): $[(PSDSSR\text{-}PSUSSR)_{infrequent} - (PSDSSR\text{-}PSUSSR)_{frequent}]>0$

C. Preference for additionally purchasing stocks their current winners/losers

[4] PSDSSR-PSUSSR and PLAP-PWAP standard errors are calculated similarly.

H (C1): $[(\text{PLAP-PWAP})_{\text{infrequent}} - (\text{PLAP-PWAP})_{\text{frequent}}]>0$

The diversification is also an interesting variable to relate with these patterns. The literature finds that generically individual investors are under-diversified. Particularly, for the database under analysis, investors are under-diversified. However, some of the investors are not under-diversified and we aim to find out if for these investors' past prices play a lower role or no role at all in the repurchasing decision. It can be expect that these investor better understand the sources of risk and choose diversification. Then, we also expect that they are more sophisticated in some other decision and therefore play less or none attention to past prices.

Hence, we also test the same hypothesis related to the individual investors' diversification:

A. Preferences for repurchasing stocks previously sold for a gain/loss
H (A2): $[(\text{PPLR-PPWR})_{\text{underdiversified}} - (\text{PPLR-PPWR})_{\text{diversified}}]>0$

B. Preferences for repurchasing stocks up/down since being sold
H (B2): $[(\text{PSDSSR-PSUSSR})_{\text{underdiversified}} - (\text{PSDSSR-PSUSSR})_{\text{diversified}}]>0$

C. Preference for additionally purchasing stocks their current winners/losers
H (C2): $[(\text{PLAP-PWAP})_{\text{underdiversified}} - (\text{PLAP-PWAP})_{\text{diversified}}]>0$

To test the difference on the proportions, as there are not division points from which investors are active or diversified, we use as division points to test the differences the percentiles 50, 75 and 90.

Results

A. Preference for repurchasing past winners

People look for predictability and they do so interpreting what is happening around them. Previsions of the future are linked to the explanations of the past. Individuals look at the past expecting to find tendencies and gain control over what is possibly happening around them. In the context, individuals exert in wishful thinking, expecting that, if they repeat their past behavior that generated positive outcomes, good things will keep happening to them. Therefore, the wishful betting contaminates their vision of the market. Investor think that a stock is "good" if it was "good for them" in the past. Therefore, they still betting in that stock, expecting that the stock will keep being "good". This means that investors do not take investment decisions on basis of price expectations but based on the past prices they experienced. As the past prices used as anchors are different for each investor, even in a short period, the stock might have been "good" for one investor and "bad" for another depending of their timing in and out. Hence,

each investor has its own anchors: the prices at which they bought and sold stock and, consequently, its own perception of the stock.

Table 1 below presents the preferences regarding the repurchase of stocks previously sold for a gain and for a loss. A purchase is considered a repurchase if the investor had that stock in account in the previous quarter/year. On average, the proportion of prior winners repurchased is at least 1.5 times higher than the proportion of prior losers repurchased. Table 1 – Panel A presents the results without considering trading costs while Table 1 – Panel B reports the same figures considering the trading costs. When considering trading costs, obviously, the number of winners decreases and the number of losers increases but, also, the number of opportunities to repurchase prior winners decreases and the number of opportunities to repurchase prior losers increases and at a higher rate. Consequently, when considering the trading costs the differences in proportions become higher as well as its significance[5]. In both cases the difference in the proportions is statistically significant (t-statistic of -24.2 and -22.6 for one year and three months, respectively, without taking into consideration the trading costs; and -28.9 and -27.3 for one year and three months, respectively when considering the trading costs). So, we reject the null hypothesis related and conclude that investors prefer to repurchase stocks previously sold for a gain rather than for a loss. These results are not expected in the presence of efficient markets and rational investors. However, they can be explained because of behavioral and psychological factors that affect investors and particularly individual investors. When Individual investors experience a positive occurrence with one stock, they expect that by repeating the behavior achieve the same positive result. Moreover, following the same logic, they do not want to repeat negative experiences and, consequently, avoid their previous losers.
Table 1 accounts every trade without taking into consideration the amount of gains and losses previously realized. However, it may have a different impact in the preferences the magnitude of those prior gains and losses. A gain (or loss) of one Euro might have different impact on the investor preferences than a large gain (or loss). If the investors were repurchasing their small prior winners and their larger prior losers the conclusions in terms of preferences would be jeopardized.

Table 2 presents the amounts of the prior gains and losses that were repurchased, as well as the extent of the prior gains and losses for which there is opportunity for being repurchased. Comparing Table 2 with Table1, we observe that the differences in the proportions increase considerably (as well as its significance). The results are of great importance because it informs that, in the preferences construction besides being a prior winner or losers, it matters the magnitude of that gain of loss. Hence, the conclusion for the preference of prior winners becomes reinforced, since that when accounting units of Euros, instead of only trades, the results become stronger.

[5] It is demonstrated that the trading costs consideration does not affect the results, so, from now on, the results are presented without trading costs consideration, except where clearly identified the opposite. The inclusion of trading costs does would provide similar results.

Moreover, for a quarter (year) window, the average winner repurchased corresponds to a gain of 788€ (786€) and the average losers repurchased corresponds to loss of 805€ (679€). With respect to the potential repurchases, these figures decrease substantially: the average winner that could be potentially repurchased (but that was not) is 361€ (361€, also) and the average loser that could be potentially repurchased is 386€ (426€). We cannot see relation of these figures with preferences but maybe with the investors' characteristics. One possible explanation is that the investors that are repurchasing more intensively are the investors with larger accounts (in value) and consequently the amounts of gains and losses evolved are larger. In addition, these figures are quiet similar for gain and losses wish means that investors repurchase their larger winners and losers. Surprisingly for a quarter window, the losers are even larger than the winners. In the existence of a preference for repurchasing winners, it would be expectable that the prior winners repurchased would assume much smaller amounts. These subjects need deeper analysis.

These results are designed in the assumption of independence across investor and days. Anyway, we know that this assumption does not hold completely. This assumption does not bias the statistic test but it may inflate them. However, as the t-statistic is very high, it is not a problem to the present analysis. Concerning to Table 2, the statistical significance becomes even higher because the decision of repurchasing is being associated to each euro gained or lost in the prior ownership.

To overcome the problem of possible dependence across investors, we use an alternative test, relaxing that assumption. Hence, it is calculated the Proportion of Prior Winners Repurchased (PPWR) and the Proportion of Prior Losers Repurchased (PPLR) and its difference for each investor separately and, then, the average. The test applied is a statistical test to the means. Results are presented in Table 3. The difference of the proportions as well as the its significance increase with this version of the test because we are weighting all investors equally, giving larger expressions to infrequent traders than they have in dataset. It is a drawback of this alternative test. It ignores that accounts with more transactions provide more accurate estimates (it assumes that the PPLR and PPWR are homoscedastic when they are clearly heteroscedastic). However, as we do not know the degree of independence of each account, the test serves its purpose that is to demonstrate that in a different set of independence, the null hypotheses remains rejected at a high significance level.

Looking to the account registrations individually, we observe that a large proportion of the accounts only have past realized winners (we wonder if this fact can be due to disposition effect) and repurchase every past winner.

These findings bring good insights that investors may exhibit differences in their preferences or at least in its intensity. In concrete, wealthier and active investors eventually give less importance to past prices in the decision of a new purchase of a stock previously owned.

B. Preference for repurchasing stocks that decreased in price after being sold

Table **4**

Table 1: Preferences for repurchasing stocks previously sold for a gain/loss

This table shows the Proportion of Prior Winners Repurchased (PPWR) and the Proportion of Prior Losers Repurchased (PPLR) from 1-8-2003 to 31-07-2007. The observations are aggregated across accounts and days and are assumed as being independent. Panel A presents the figures without considering the trading costs. Panel B presents the same figures considering the trading costs of the buy and of the sell. When the buy occurs in more than one moment, it is considered the average unit trading cost of the buy.

Panel **A: without considering trading costs**	1 year	3 months
Prior Winners Repurchased	9,953	10,568
Prior Losers Repurchased	2,897	2,986
Opportunities to Repurchase Prior Winners	216,429	112,150
Opportunities to Repurchase Prior Losers	99,492	47,882
Proportion of prior losers repurchased (PPLR)	0.0291	0.0624
Proportion of prior winners repurchased (PPWR)	0.0460	0.0942
PPLR-PPWR	-0.0169	-0.0319
PPWR/PPLR	1.5793	1.5110
standard deviation	0.0007	0.0014
t-statistic	-24.1769	-22.6358

Panel B: considering trading costs	1 year	3 months
Prior Winners Repurchased	9,412	10,032
Prior Losers Repurchased	3,700	3,793
Opportunities to Repurchase Prior Winners	195,478	102,657
Opportunities to Repurchase Prior Losers	128,659	61,964
Proportion of prior losers repurchased (PPLR)	0.0288	0.0612
Proportion of prior winners repurchased (PPWR)	0.0481	0.0977
PPLR-PPWR	-0.0194	-0.0365
PPWR/PPLR	1.6743	1.5965
standard deviation	0.0007	0.0013
t-statistic	-28.8560	-27.3173

Table 2: Preferences for repurchasing stocks previously sold for a gain/loss, in value (Euros)

This table shows the Proportion of Prior Winners Repurchased (PPWR) and the Proportion of Prior Losers Repurchased (PPLR) from 1-8-2003 to 31-07-2007, in Euros. The observations are aggregated across accounts and days and are assumed as being independent. The gains and losses are calculated considering the trading costs.

	1 year	3 months
Prior Winners Repurchased	7,393,826	7,921,589
Prior Losers Repurchased	2,513,514	3,053,391
Opportunities to Repurchase Prior Winners	74,572,873	41,443,187
Opportunities to Repurchase Prior Losers	55,689,125	25,485,027
Proportion of prior losers repurchased (PPLR)	0.0451	0.1198
Proportion of prior winners repurchased (PPWR)	0.0991	0.1911
PPLR-PPWR	-0.0540	-0.0713
PPWR/PPLR	2.1967	1.5954
standard deviation	0.0000	0.0001
t-statistic	-1,216.4542	-804.1508

Table 3: Preferences for repurchasing stocks previously sold for a gain/loss, per investor

This table shows the Mean of the Proportion of Prior Winners Repurchased ($\overline{\text{PPWR}}$) and the Mean of the Proportion of Prior Losers Repurchased ($\overline{\text{PPLR}}$) from 1-8-2003 to 31-07-2007. The observations are aggregated across days and are assumed as being independent.

	1 year	3 meses
Mean of Prior Winners Repurchased	15.31	14.26
Mean of Prior Losers Repurchased	4.46	4.03
Mean of Opportunities to Repurchase Prior Winners	332.88	151.29
Mean of Opportunities to Repurchase Prior Losers	152.02	64.05
$\overline{\text{PPLR}}$	0.1521	0.1883
$\overline{\text{PPWR}}$	0.2947	0.3872
$\overline{\text{PPLR}} - \overline{\text{PPWR}}$	-0.1426	-0.1989
$\overline{\text{PPWR}}/\overline{\text{PPWR}}$	1.9381	2.0566
$\vartheta(\overline{\text{PPLR}})$	0.275866684	0.300945117
$\vartheta(\overline{\text{PPWR}})$	0.3016	0.3150
$\vartheta(\overline{\text{PPLR}} - \overline{\text{PPWR}})$	0.001125051	0.001696837
t-statistic	-126.7881	-117.2466

Table 4 exhibits the proportion of stocks up since being sold that were repurchased (PSUSSR) and the proportion of stocks down since being sold that were repurchased (PSDSSR). The results are present for a year and three months window. The results are quite strong in both cases: the differences in the proportion are significant (t of 27). So, we can conclude that investors prefer to repurchase stocks that have lost value subsequent to a prior sell rather than those that have increase in value after the sell. Engaging into mental accounting considerations, when price goes up after the sell, investors realize that they would be in a better situation if they had held their position in that stock instead of selling it. So, they will prefer do not consider to buy it back later. When price goes down after the sell, on the contrary, investors realize that they took a good decision and if they decide to buy the stock again, they will be in a better situation than if they kept the stock in account. So, the repurchase of stocks at a price lower than that for which they had sold emphasizes positive counterfactuals.

Table 5 reports the two previous patterns together. It tabulates the proportion of past winners and down since being sold that were repurchased (PPWDSSR) and the proportion of past losers and up since being sold that were repurchased (PPLUSSR). Whether investors prefer to repurchase stocks previously sold for a gain (rather than for a loss) and also prefer to repurchase stocks that have lost value subsequent to a prior sell (rather than those that have increase in value), then we can expect that, in the case that both preferences occur simultaneously, the preferences become even stronger. These results are calculated for a one year and for three months window period and, in both cases, we conclude that the differences in proportions are quiet strong (t-statistic of -52 and -68, for one year and three months, respectively). In the case of the three months window period, the difference is higher and the results become stronger because it is possible to contemplate more observations and, as a result, the pattern becomes stronger (although the three months period ponders fewer opportunities to do so). Then, we conclude that investors prefer to repurchase stocks previously sold for a gain and that have lost value subsequent to the sale rather than those that were sold for a loss and have increase in value subsequent to the sell. In this situation investors only experience pride and satisfaction.

Table 6 reports the interaction between the two patterns. We compute separately the proportion of stocks up since being sold that were repurchased (PSUSSR) and the proportion of stocks down since being sold that were repurchased (PSDSSR) for prior winners repurchased and for prior losers repurchased. The tendency of investors to repurchase the stock that have lost value after the sell verifies to the prior winners (differences of 0.0325 and 0.0538 for year and quarter windows, respectively), but almost disappears for prior losers (differences of 0.0034 and 0.0138 for year and quarter windows, respectively). In this last case, the values are neither statistically[6]

[6] We demand a confidence level of 0.01givem the possibility of the t-statistic being inflated due to the lack of independence of the parameters.

nor economically significant. This means that investors are much more likely to consider the repurchase of their past winners when the stock price decreases after the sell.

The previous findings are based on the assumption that investors keep the mental accounts opened, even when the stock is sold, and continue monitoring the prices evolution after the sell. The results above are presented using a quarter and a year window. We find that the differences in proportions are higher in the quarter window, for every test realized[7]. It indicates that investors' preferences are reduced over time due to lack of memory constrains or because regret eventually attenuates.

C. Preference for additionally purchasing current losers

The price evolution of stock in portfolio also plays an important anchor in the decision of additional purchase. In the decision making process investors compare the average acquisition price to the actual prices, observing if the stock in account is a winner or a loser. The proportion of winners additionally purchased (PWAP) and the proportion of losers additionally purchased (PLAP) are presented in Table 7. Investors exhibit a clear preference to additionally purchase their actual losers rather than their actual winners. This is consistent with the preference for repurchasing the stocks that decreased in price since sold. Could that be explained with the belief of reversals expectations? If so, investors also would prefer to repurchase their past losers rather than their winners and that is not the case. Hence, we believe that it can be explained in the context of prospect theory function. Aiming to break even, investors will accept riskier bets when they are in the losses zone. The logic behind this behavior is that when buying additionally at a lower price, they lower the average purchase price and consequently the possibility of reaching the breakeven becomes easier to attain. This preference is based in mental accounting thinking, where there are a mental accounting for each security and a reference price (the average acquisition price). This process of lowering the average acquisition price is a risky strategy, especially if it not accompanied of the belief of price reversal. Moreover, many times, they do not believe, they just hope.

These are interesting findings, when observed from a rational point of view. We find that individual investors tend to repurchase stocks that increased in price after being sold. Simultaneously, we find that they tend to additional purchase their current losers. This means that if investor does not have the stock in account, he prefers the ones that increase in price but, if he has the stock in account, he prefers the stocks that decreased in price. These are

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[7] The quarter window statistical significance is not higher in every case (although it is in some cases) because, using a smaller window, we are considering fewer opportunities to that behavior, which means, less observations.

behavioral preferences, based in mental accounting and in the use of past experienced prices as strong anchors in the decision making. As Langer (1975, page 311) refers “there is much overlap between skill and luck” and when accessing their skills individuals create a frame that indices to the illusion of controllability. In the attempt of control, individuals aim to repeat situation where (they believe) their skill was “demonstrated” (winning situations). As much the current chance situation is similar to a skill situation the greater will be the illusion of control. This illusion induces response to familiarity and makes individuals more confident and more likely to accept risk (Langer, 1975). This is a way of magic thinking, where individuals find causal reasoning and erroneously believe that they have some control of the outcome.

Disposition effect, the preference for hold loosing investments too long and sell winning ones to soon, identified by Shefrin and Statman (1985), is a tendency that has critical relevance in the context of investigating the repurchasing behavior. Disposition effect is determined following the same logic of proportions calculation, comparing the winners that were sold to the opportunities to do so and the losers that are sold to the opportunities of selling losers. We calculate Realized Gains, Realized Losses, Potential Gains and Potential Losses for each day where there is one or more sells in an account that has at least two securities and that does not sell the entire portfolio on that day. For methodological detail see Leal, Armada and Duque (2010). Table 8 reports the results, where it is shown a strong preference for realizing gains and holding losers.

Analyzing the repurchasing behavior and disposition effect findings jointly, we find an intriguing puzzle. Concerning to winning stocks, investors prefer to repurchase their past winners and the stocks that increase in price after the sell but they do not want to keep their current winners. Regarding to losing stocks, investors prefer to hold their current losing investments and even enlarge their exposition to those investments but they avoid their past losers. These results support the idea that investors’ anchors are arbitrary and very dependent of framing and mental accounting.

D. Differences among investors

We also seek to find whether these preferences remain homogenous for all investors or whether, eventually, there are differences among investors. In a first overview of the data, we find that investors are under-diversified and trade many times the same stock. We also find that the deviation from the mean is very high, existing large differences in terms of trading and diversification. Table 3, where the preferences are calculated by account and them its average, also gives us some insights about this question, since it ponders every investor equally, giving excessive weight to the ones that trade fewer times than hold fewer stocks, and finds much higher differences in proportions. It raises the question whether the most active or diversified investors have less control over their accounts. All these patterns are based in a strong control over each mental account and probably more active and diversified investors are not able to

keep so strong control over their past prices. Also, it might be the case that, as these investors are more experienced, and being experience a source of learning, one could expect them to be less prone to behavioral biases. Seru, Shumway et al. (2007) found that investors learn to avoid behavioral biases as they become more experienced.

Frequency of trading

We test the preferences identified previously related to investor activity by dividing investors in frequent and infrequent traders. Since there is not a point from which investors become classified as frequent traders, we used as division point the percentiles 50, 75 and 90[8]. Percentiles are calculated after netting all trades for the same investor in the same day (ignores day-trading) and consider only the investors that engage in the repurchasing behavior (or additional purchasing behavior when this is the preference subject of study). Results for repurchasing are presented for a three months window, this is, for the classification of a purchase as repurchase we look three months back.

Table 9 to Table 12 present the results. We find every of those preferences for both groups (frequent and infrequent traders) but also a statistically significant difference in these groups. The frequent traders exhibit a statistically significant less intense preference for every identified pattern.

Table 9 reports the differences in the preferences for repurchasing stocks previously sold for a gain/loss for frequent and infrequent traders using a three a 3 months window. There are 742 investors that engage in the repurchasing past winners/losers. We find that generally investors prefer to repurchase their past winners rather their past losers but that this preference is statically stronger for infrequent traders.

Table 10 presents the proportion of stocks up since being sold that were repurchased (PSUSSR), proportion of stocks up since being sold that were repurchased (PSUSSR) for frequent and infrequent traders and their difference. We observe that different levels of activity exhibit the preference in the same direction and statistically significant. Nevertheless, the most active investors have this preference statistically more tenuous, being the difference for these groups significant. When the divisor percentile increases, the differences between groups fall because we are moving frequent traders to the infrequent group. Then, we can conclude that generally investors prefer to repurchase stocks that were up after the sell rather than those that were down but that this preference is more accentuated for infrequent traders.

[8] Percentiles lower than 50 are not of interest, in statistic terms, because the number of observations for the infrequent group becomes very low.

We also test the preference for repurchasing past winners/losers and down/up since sold together. The results are presented in Table 11. As expected the differences between frequent and infrequent traders increase, in relations to the previous differences, being that this preference is statistically stronger for infrequent traders. However, both exhibit the preference for repurchasing stocks previously sold for a gain and that have lost value subsequent to the sale rather than those that were sold for a loss and have increase in value subsequent to the sell.

Table 12 shows the difference between the Proportion of Winners Additionally Purchase (PWAP) and the Proportion of Losers Additionally Purchased (PLAP) for frequent and infrequent traders. The difference is statistically significant for every division point regardless of its decrease as the division point becomes greater. That happens because we move frequent traders to the infrequent group when percentile becomes higher.

Hence, we can conclude that investor activity has influence in their trading behavior and that frequent investors give less attention to past prices in their trading decision. We believe that are two main reasons to explain this behavior. Firstly, as investors become more active their control over every mental account becomes more difficult due to cognitive and memory limitations. Secondly, active investors accumulate more experience and, as being the experience one of the sources of learning, investors become aware that their past prices are not that important as anchors for future trading decisions.

Diversification

We find in the preliminary overview of the data that investors are under-diversified. Hence, we aim to answer the question if diversification is a relevant characteristic with respect to preferences for repurchasing and additionally purchase. We divide investors taking into account the number of stocks they have into account when have holding positions[9].

Goetzmann and Kumar (2008) report that, generally, investors are under-diversified. However, the degree of diversification varies considerably among individual investors, being related to demographic characteristics and trading characteristics. On the one hand, diversification increases with age, income, wealth and education. On the other hand, diversification also increases with investor sophistication: more experienced and investors who trade options and engage in short selling are better diversified.

[9] This means that the minimum is 1 stock into account (if we also considered the period's investor does not hold any stock the minimum would eventually be lower).

Although we are aware that diversification is not limited to the number of stocks in account but also to the correlation between them, the number of holdings provides good insights. Hence, we segmented the dataset according to the diversification level and tested the tendencies identified previously for each group and its difference. Once again, we tested as division points the percentiles 50, 75, and 90.

Table 13 reports the results for the preference for repurchasing stocks previously sold for a gain/loss for each group and the difference between groups. We find that every group prefers to repurchase stocks previously sold for a gain but that this preference is statistically stronger for under-diversified groups. Note that the difference between the Proportion of prior losers repurchased (PPLR) and the Proportion of prior winners repurchased (PPWR) is higher for the under-diversified group when the division point is the percentile 50 (the less under-diversified group) and the little for the diversified group when the division point for diversification is the percentile 90 (the most diversified group). This decrease of the difference on groups when using the percentile 90 means that we are classifying as under-diversified investors that are reasonably diversified.

Concerning to the preference for additionally purchasing current losers, when segmenting investor according to diversification, we find similar results, as reported in Table 13. Every group exhibits a preference for additionally repurchase their losers but statistically stronger for the under-diversified group. Table 14 analyses the two previously patterns together, finding a preference for repurchasing past winners and that decreased in price since being sold stronger for the under-diversified group. With respect to additional purchase, as reported in Table 16 a tendency for additionally purchasing current losers is found for every group but stronger for the under-diversified one.

Concluding, regarding to diversification we find that the most diversified investors pay less attention to the past experienced prices in the decision of buying but, nevertheless, it remains an important anchor.

Conclusions

Investors make investment decisions on the basis on the basis of their past relation with the assets. Subsequently, prices at which they bought and sold stock are anchors in their mental account for that stock. Our analysis is focused in the repurchasing decision and we find that investors prefer repurchase stocks that (1) are their past winners; (2) have decreased in price since sold; (3) this preference is accentuated when simultaneously the stock is a past winner and has decreased in price since sold; and (4) prefer to additionally repurchase stocks when the

price of the stock has decreased in value. We also test these preferences related to investor activity and diversification. We find every of those preferences for frequent and infrequent, diversified and under-diversified investors. However, they are significantly lower for frequent/diversified traders which mean that active/diversified traders give less importance to their past prices. We have two possible, and eventually competitive, explanations for these findings: (1) active /diversified investors maintain lower control over their past prices (due to cognitive and memory limitations although they also consider the past prices relevant anchors) or (2) active/diversified investors are more experienced and therefore more sophisticated and recognize that past prices are not relevant anchors for the buying decision process.

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PPWR/PPLR	1.5793	1.5110
standard deviation	0.0007	0.0014
t-statistic	-24.1769	-22.6358

Panel B: considering trading costs	1 year	3 months
Prior Winners Repurchased	9,412	10,032
Prior Losers Repurchased	3,700	3,793
Opportunities to Repurchase Prior Winners	195,478	102,657
Opportunities to Repurchase Prior Losers	128,659	61,964
Proportion of prior losers repurchased (PPLR)	0.0288	0.0612
Proportion of prior winners repurchased (PPWR)	0.0481	0.0977
PPLR-PPWR	-0.0194	-0.0365
PPWR/PPLR	1.6743	1.5965
standard deviation	0.0007	0.0013
t-statistic	-28.8560	-27.3173

Table 2: Preferences for repurchasing stocks previously sold for a gain/loss, in value (Euros)

This table shows the Proportion of Prior Winners Repurchased (PPWR) and the Proportion of Prior Losers Repurchased (PPLR) from 1-8-2003 to 31-07-2007, in Euros. The observations are aggregated across accounts and days and are assumed as being independent. The gains and losses are calculated considering the trading costs.

	1 year	3 months
Prior Winners Repurchased	7,393,826	7,921,589
Prior Losers Repurchased	2,513,514	3,053,391
Opportunities to Repurchase Prior Winners	74,572,873	41,443,187
Opportunities to Repurchase Prior Losers	55,689,125	25,485,027
Proportion of prior losers repurchased (PPLR)	0.0451	0.1198
Proportion of prior winners repurchased (PPWR)	0.0991	0.1911
PPLR-PPWR	-0.0540	-0.0713
PPWR/PPLR	2.1967	1.5954
standard deviation	0.0000	0.0001
t-statistic	-1,216.4542	-804.1508

Table 3: Preferences for repurchasing stocks previously sold for a gain/loss, per investor

This table shows the Mean of the Proportion of Prior Winners Repurchased ($\overline{\text{PPWR}}$) and the Mean of the Proportion of Prior Losers Repurchased ($\overline{\text{PPLR}}$) from 1-8-2003 to 31-07-2007. The observations are aggregated across days and are assumed as being independent.

	1 year	3 meses
Mean of Prior Winners Repurchased	15.31	14.26
Mean of Prior Losers Repurchased	4.46	4.03
Mean of Opportunities to Repurchase Prior Winners	332.88	151.29
Mean of Opportunities to Repurchase Prior Losers	152.02	64.05
$\overline{\text{PPLR}}$	0.1521	0.1883
$\overline{\text{PPWR}}$	0.2947	0.3872
$\overline{\text{PPLR}} - \overline{\text{PPWR}}$	-0.1426	-0.1989
$\overline{\text{PPWR}}/\overline{\text{PPWR}}$	1.9381	2.0566
$\vartheta(\overline{\text{PPLR}})$	0.275866684	0.300945117
$\vartheta(\overline{\text{PPWR}})$	0.3016	0.3150
$\vartheta(\overline{\text{PPLR}} - \overline{\text{PPWR}})$	0.001125051	0.001696837
t-statistic	-126.7881	-117.2466

Table 4: Preferences for repurchasing stocks up/down since being sold

This table shows the Proportion of stocks up since being sold that were repurchased (PSUSSR) and the Proportion of stocks down since being sold that were repurchased (PSDSSR) from 1-8-2003 to 31-07-2007. The observations are aggregated across accounts and days and are assumed as being independent. Panel A presents the figures without considering the trading costs. Panel B presents the same figures considering the trading costs of the buy and of the sell. When the buy occurs in more than one moment, it is considered the average unit trading cost of the buy.

	1 year	3 months
Stocks up since being sold that were repurchased	6428	6164
Stocks down since being sold that were repurchased	6278	7139
Opportunities to repurchase stocks up since being sold	193367	90628
Opportunities to repurchase stocks down since being sold	115297	66204
Proportion of stocks down since being sold that were repurchased (PSDSSR)	0.0545	0.1078
Proportion of stocks up since being sold that were repurchased (PSUSSR)	0.0332	0.0680
PSDSSR-PSUSSR	0.0212	0.0398
PSUSSR/PSDSSR	0.6105	0.6307
standard deviation	0.0008	0.0015
t-statistic	27.0933	27.1400

Table 5: Addictive effect: Preferences for repurchasing past winners/losers and down/up since sold

This table shows the Proportion of past winners and down since being sold that were repurchased (PPWDSSR) and the Proportion of past losers and up since being sold that were repurchased (PPLUSSR) from 1-8-2003 to 31-07-2007. The observations are aggregated across accounts and days and are assumed as being independent.

	1 year	3 months
Past winners and down since being sold that were repurchased	4,917	5,604
Past losers and up since being sold that were repurchased	1,529	1,417
Opportunities to repurchase past winners and down since being sold	72,625	44,356
Opportunities to repurchase past losers and up since being sold	53,540	24,860
Proportion of past winners and down since being sold that were repurchased (PPWDSSR)	0.0286	0.0570
Proportion of past losers and up since being sold that were repurchased (PPLUSSR)	0.0677	0.1263
(PPWDSSR)-(PPLUSSR)	-0.0391	-0.0693
(PPLUSSR)/(PPWDSSR)	2.3707	2.2165
Standard deviation	0.0008	0.0010
t-statistic	-52.0200	-68.1400

Table 6: Interaction effects: Preferences for repurchasing past winners/losers and down/up since sold

This table shows separately the Proportion of stocks up since being sold that were repurchased (PSUSSR) and the Proportion of stocks down since being sold that were repurchased (PSDSSR) for prior winner repurchased and for prior losers repurchased, from 1-8-2003 to 31-07-2007. The observations are aggregated across accounts and days and are assumed as being independent. Panel A presents the figures without considering the trading costs. Panel B presents the same figures considering the trading costs of the buy and of the sell. When the buy occurs in more than one moment, it is considered the average unit trading cost of the buy.

Panel A: Prior Winners Repurchased		
	1 year	3 months
Stocks up since being sold that were repurchased	4,742	4,595
Stocks down since being sold that were repurchased	4,917	5,604
Opportunities to repurchase stocks up since being sold	134,761	63,361
Opportunities to repurchase stocks down since being sold	72,625	44,356
Proportion of stocks down since being sold that were repurchased (PSDSSR)	0.0677	0.1263
Proportion of stocks up since being sold that were repurchased (PSUSSR)	0.0352	0.0725
PSDSSR-PSUSSR	0.0325	0.0538
PSUSSR/PSDSSR	0.5197	0.5740
standard deviation	0.0011	0.0019
t-statistic	30.7101	28.5647
Panel B: Prior Losers Repurchased		
	1 year	3 months
Stocks up since being sold that were repurchased	1,529	1,417
Stocks down since being sold that were repurchased	1,252	1,425
Opportunities to repurchase stocks up since being sold	53,540	24,860
Opportunities to repurchase stocks down since being sold	39,120	20,137
Proportion of stocks down since being sold that were repurchased (PSDSSR)	0.0320	0.0708
Proportion of stocks up since being sold that were repurchased (PSUSSR)	0.0286	0.0570
PSDSSR-PSUSSR	0.0034	0.0138
PSUSSR/PSDSSR	0.8923	0.8055
standard deviation	0.0011	0.0023
t-statistic	3.0107	5.9089

Table 7: Preference for additionally purchasing their current winners/losers

This table shows the Proportion of Winners Additionally Purchase (PWAP) and the Proportion of Losers Additionally Purchased (PLAP) from 1-8-2003 to 31-07-2007. The observations are aggregated across accounts and days and are assumed as being independent.

	Global
Number of winners additionally purchased	8,870
Number of losers additionally purchased	12,852
Number of opportunities to additionally repurchase winners	75,571
Number of opportunities to additionally repurchase losers	81,388
Proportion of Losers Additionally Purchased (PLAP)	0.158
Proportion of Winners Additionally Purchase (PWAP)	0.117
PLAP-PWAP	0.041
PWAP/PLAP	0.743
standard deviation	0.00173
t-statistic	23.386

Table 8: Disposition Effect

This table shows the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) from 1-8-2003 to 31-07-2007. The observations are aggregated across accounts and days and are assumed as being independent. When considering trading costs, the unit transactions costs for the potential sells are considered to be equal to the buy.

	without trading costs	with trading costs
Realized Gains	29,522	27,646
Realized Losses	11,666	14,159
Potential Gains	91,301	82,517
Potential Losses	111,201	123,903
PLR	0.095	0.103
PGR	0.244	0.251
PLR-PGR	-0.149	-0.148
PGR/PLR	2.573	2.447
σ(PLR-PGR)	0.00156	0.00159
t-statistic	-95.561	-93.151

Table 9: Differences in the preferences for repurchasing stocks previously sold for a gain/loss for frequent and infrequent traders (3 months)

This table shows the proportion of prior winners repurchased (PPWR) and the proportion of prior losers repurchased (PPLR) from 1-8-2003 to 31-07-2007 and their difference. The observations are aggregated across accounts and days and assumed as being independent. Percentiles are calculated after netting all trades for the same investor in the same day (ignores day-trading) and consider only the investors that engage in repurchasing behavior. Percentile 50 corresponds to 50 trades; percentile 75 corresponds to 130 trades and percentile 90 corresponds to 310 trades, for the entire data period.

	P50		P75		P90	
	Infrequent traders	Frequent traders	Infrequent traders	Frequent traders	Infrequent traders	Frequent traders
Prior Winners Repurchased	898	9,670	2,352	8,216	4,781	5,787
Prior Losers Repurchased	161	2,825	517	2,469	1,172	1,814
Opportunities to Repurchase Prior Winners	2,200	109,950	9,123	103,027	28,893	83,257
Opportunities to Repurchase Prior Losers	559	47,323	2,972	44,910	10,763	37,119
Proportion of prior losers repurchased (PPLR)	0.4045	0.0635	0.2106	0.0582	0.1222	0.0514
Proportion of prior winners repurchased (PPWR)	0.6897	0.0964	0.3474	0.0867	0.1983	0.0747
PPLR-PPWR	-0.2852	-0.0329	-0.1368	-0.0285	-0.0761	-0.0233
PPWR/PPLR	1.7050	1.5189	1.6495	1.4896	1.6226	1.4538
standard deviation	0.0230	0.0014	0.0090	0.0014	0.0039	0.0015
t-statistic	-12.4088	-23.0156	-15.2172	-20.1992	-19.3456	-15.9283
$[(PPLR\text{-}PPWR)_{infrequent} - (PPLR\text{-}PPWR)_{frequent}]$	-0.2522		-0.1083		-0.0528	
t-statistic	-10.9754		-12.0483		-13.4164	

Table 10: Preferences for repurchasing stocks up/down since being sold for frequent and infrequent traders (3 months)

This table shows the Proportion of stocks up since being sold that were repurchased (PSUSSR) and the Proportion of stocks up since being sold that were repurchased (PSUSSR) from 1-8-2003 to 31-07-2007 and their difference. The observations are aggregated across accounts and days and assumed as being independent. Percentiles are calculated after netting all trades for the same investor in the same day (ignores day-trading) and consider only the investors that engage in repurchasing behavior. Percentile 50 corresponds to 50 trades; percentile 75 corresponds to 130 trades and percentile 90 corresponds to 310 trades, for the entire data period.

	P50		P75		P90	
	Infrequent traders	Frequent traders	Infrequent traders	Frequent traders	Infrequent traders	Frequent traders
Stocks up since being sold that were repurchased	517	5,647	1,360	4,804	2,785	3,379
Stocks down since being sold that were repurchased	515	6,624	1,458	5,681	3,066	4,073
Opportunities to repurchase stocks up since being sold	1,651	88,977	6,988	83,640	23,068	67,560
Opportunities to repurchase stocks down since being sold	1,026	65,178	4,836	61,368	15,684	50,520
Proportion of stocks down since being sold that were repurchased (PSDSSR)	1.0078	0.1131	0.4316	0.1020	0.2430	0.0877
Proportion of stocks up since being sold that were repurchased (PSUSSR)	0.4559	0.0678	0.2416	0.0609	0.1373	0.0526
PSDSSR-PSUSSR	0.5519	0.0454	0.1900	0.0411	0.1057	0.0350
PSUSSR/PSDSSR	0.4524	0.5990	0.5599	0.5973	0.5651	0.6004
standard deviation	0.0119	0.0015	0.0088	0.0015	0.0041	0.0015
t-statistic	46.2255	30.2444	21.6554	27.8424	25.7348	22.9981
$[(PSDSSR\text{-}PSUSSR)_{infrequent} - (PSDSSR\text{-}PSUSSR)_{frequent}]$	0.506560		0.148887		0.070636	
t-statistic	42.426473		16.972498		17.201077	

Table 11: Preferences for repurchasing past winners/losers and down/up since sold for frequent and infrequent traders (3 months)

This table shows the Proportion of past losers and up since being sold that were repurchased (PPLUSSR) and the Proportion of past winners and down since being sold that were repurchased (PPWDSSR) from 1-8-2003 to 31-07-2007 and their difference. The observations are aggregated across accounts and days and assumed as being independent. Percentiles are calculated after netting all trades for the same investor in the same day (ignores day-trading) and consider only the investors that engage in repurchasing behavior. Percentile 50 corresponds to 50 trades; percentile 75 corresponds to 130 trades and percentile 90 corresponds to 310 trades, for the entire data period.

	P50		P75		P90	
	Infrequent traders	Frequent traders	Infrequent traders	Frequent traders	Infrequent traders	Frequent traders
Past winners and down since being sold that were repurchased	434	5,170	1,200	4,404	2,462	3,142
Past losers and up since being sold that were repurchased	76	1,341	253	1,164	553	864
Opportunities to repurchase past winners and down since being sold	823	43,533	3,550	40,806	11,109	33,247
Opportunities to repurchase past losers and up since being sold	321	24,539	1,556	23,304	5,814	19,046
Proportion of past winners and down since being sold that were repurchased (PPWDSSR)	0.3102	0.0578	0.1942	0.0526	0.1051	0.0475
Proportion of past losers and up since being sold that were repurchased (PPLUSSR)	1.1157	0.1348	0.5106	0.1210	0.2847	0.1044
(PPWDSSR)-(PPWDSSR)	-0.8055	-0.0770	-0.3165	-0.0684	-0.1796	-0.0568
(PPLUSSR)/(PPWDSSR)	3.5966	2.3313	2.6299	2.3012	2.7087	2.1963
Standard deviation	0.0226	0.0022	0.0131	0.0022	0.0059	0.0023
t-statistic	-35.6750	-34.7733	-24.2049	-31.4090	-30.5738	-24.9586
$[((PPWDSSR)-(PPWDSSR))_{infrequent} - ((PPWDSSR)-(PPWDSSR))_{frequent}]$	-0.728519		-0.248063		-0.122761	
t-statistic	-32.266433		-18.972779		-20.896825	

Table 12: Preference for additionally purchasing their winners/losers for frequent and infrequent traders (3 months)

This table shows the Proportion of Winners Additionally Purchase (PWAP) and the Proportion of Losers Additionally Purchased (PLAP) from 1-8-2003 to 31-07-2007 and their difference. The observations are aggregated across accounts and days and assumed as being independent. Percentiles are calculated after netting all trades for the same investor in the same day (ignores day-trading) and consider only the investors that engage in additional purchasing behavior. Percentile 50 corresponds to 43 trades; percentile 75 corresponds to 119 trades and percentile 90 corresponds to 288 trades, for the entire data period.

	P50		P75		P90	
	Infrequent traders	Frequent traders	Infrequent traders	Frequent traders	Infrequent traders	Frequent traders
Number of winners additionally purchased	488	8,382	1,517	7,353	3,221	5,649
Number of losers additionally purchased	613	12,239	1,958	10,894	4,359	8,493
Number of opportunities to additionally repurchase winners	1,488	74,083	5,751	69,820	15,618	59,953
Number of opportunities to additionally repurchase losers	1,178	80,210	5,265	76,123	16,205	65,183
Proportion of Losers Additionally Purchased (PLAP)	1.0850	0.1801	0.5921	0.1670	0.3680	0.1498
Proportion of Winners Additionally Purchase (PWAP)	0.4880	0.1276	0.3583	0.1177	0.2598	0.1040
PLAP-PWAP	0.5970	0.0525	0.2338	0.0493	0.1082	0.0458
PWAP/PLAP	0.4498	0.7085	0.6051	0.7048	0.7061	0.6944
standard deviation	0.0095	0.0018	0.0093	0.0018	0.0052	0.0019
t-statistic	63.0409	28.7049	25.2317	27.0780	20.9440	24.4452
$[(\text{PLAP-PWAP})_{\text{infrequent}} - (\text{PLAP-PWAP})_{\text{frequent}}]$	0.544472		0.184486		0.062362	
t-statistic	57.498356		19.910779		12.076682	

Table 13: Differences in the preferences for repurchasing stocks previously sold for a gain/loss related to diversification (3 months)

This table shows the proportion of prior winners repurchased (PPWR) and the proportion of prior losers repurchased (PPLR) from 1-8-2003 to 31-07-2007 and their difference. The observations are aggregated across accounts and days and assumed as being independent. Percentiles are calculated considering only the investors that engage in repurchasing behavior and only days when investors have holdings in account. Percentile 50 corresponds to 2.2 stocks; percentile 75 corresponds to 4.1 and percentile 90 corresponds to 7.3 trades.

	P50		P75		P90	
	Under-diversified	Diversified	Under-diversified	Diversified	Under-diversified	Diversified
Prior Winners Repurchased	1781	8787	4704	5864	7055	3513
Prior Losers Repurchased	488	2498	1282	1704	2022	964
Opportunities to Repurchase Prior Winners	7439	104711	29216	82934	51592	60558
Opportunities to Repurchase Prior Losers	3117	44765	11196	36686	20216	27666
Proportion of prior losers repurchased (PPLR)	0.1856	0.0591	0.1293	0.0487	0.1111	0.0361
Proportion of prior winners repurchased (PPWR)	0.3148	0.0916	0.1919	0.0761	0.1584	0.0616
PPLR-PPWR	-0.1292	-0.0325	-0.0626	-0.0274	-0.0473	-0.0255
PPWR/PPLR	1.6958	1.5500	1.4841	1.5620	1.4254	1.7058
standard deviation	0.0088	0.0014	0.0039	0.0015	0.0027	0.0015
t-statistic	-14.6716	-22.7742	-15.9689	-18.8431	-17.2954	-17.1320
$[(PPLR\text{-}PPWR)_{underdiversified} - (PPLR\text{-}PPWR)_{diversified}]$	-0.0967		-0.0352		-0.0218	
t-statistic	-10.9793		-8.9848		-7.9728	

Table 14: Preferences for repurchasing stocks up/down since being sold related to diversification (3 months)

This table shows the Proportion of stocks up since being sold that were repurchased (PSUSSR) and the Proportion of stocks up since being sold that were repurchased (PSUSSR) from 1-8-2003 to 31-07-2007 and their difference. The observations are aggregated across accounts and days and assumed as being independent. Percentiles are calculated considering only the investors that engage in repurchasing behavior and only days when investors have holdings in account. Percentile 50 corresponds to 2.2 stocks; percentile 75 corresponds to 4.1 and percentile 90 corresponds to 7.3 trades.

	P50		P75		P90	
	Under-diversified	Diversified	Under-diversified	Diversified	Under-diversified	Diversified
Stocks up since being sold that were repurchased	1102	5062	2961	3203	4346	1818
Stocks down since being sold that were repurchased	1118	6021	2909	4230	4561	2578
Opportunities to repurchase stocks up since being sold	5947	84681	24313	66315	43270	47358
Opportunities to repurchase stocks down since being sold	4272	61932	15304	50900	27139	39065
Proportion of stocks down since being sold that were repurchased (PSDSSR)	0.3545	0.1077	0.2347	0.0906	0.2020	0.0707
Proportion of stocks up since being sold that were repurchased (PSUSSR)	0.2275	0.0636	0.1387	0.0508	0.1117	0.0399
PSDSSR-PSUSSR	0.1270	0.0441	0.0960	0.0399	0.0904	0.0307
PSUSSR/PSDSSR	0.6417	0.5904	0.5909	0.5599	0.5527	0.5650
standard deviation	0.0091	0.0015	0.0041	0.0015	0.0029	0.0016
t-statistic	13.9330	29.3773	23.5314	26.0419	31.4924	19.4764
$[(PSDSSR\text{-}PSUSSR)_{underdiversified} - (PSDSSR\text{-}PSUSSR)_{diversified}]$	0.0829		0.0561		0.0596	
t-statistic	9.0943		13.7564		20.7805	

Table 15: Preferences for repurchasing past winners/losers and down/up since sold related to diversification (3 months)

This table shows the Proportion of past losers and up since being sold that were repurchased (PPLUSSR) and the Proportion of past winners and down since being sold that were repurchased (PPWDSSR) from 1-8-2003 to 31-07-2007 and their difference. The observations are aggregated across accounts and days and assumed as being independent. Percentiles are calculated considering only the investors that engage in repurchasing behavior and only days when investors have holdings in account. Percentile 50 corresponds to 2.2 stocks; percentile 75 corresponds to 4.1 and percentile 90 corresponds to 7.3 trades.

	P50		P75		P90	
	Under-diversified	Diversified	Under-diversified	Diversified	Under-diversified	Diversified
Past winners and down since being sold that were repurchased	869	4735	2281	3323	3559	2045
Past losers and up since being sold that were repurchased	237	1180	637	780	998	419
Opportunities to repurchase past winners and down since being sold	2893	41463	10451	33905	18376	25980
Opportunities to repurchase past losers and up since being sold	1607	23253	6015	18845	10987	13873
Proportion of past winners and down since being sold that were repurchased (PPWDSSR)	0.1730	0.0535	0.1184	0.0432	0.0999	0.0311
Proportion of past losers and up since being sold that were repurchased (PPLUSSR)	0.4293	0.1289	0.2792	0.1087	0.2402	0.0854
(PPWDSSR)-(PPWDSSR)	-0.2564	-0.0755	-0.1607	-0.0655	-0.1403	-0.0543
(PPLUSSR)/(PPWDSSR)	2.4819	2.4116	2.3571	2.5166	2.4041	2.7435
Standard deviation	0.0132	0.0022	0.0061	0.0022	0.0043	0.0023
t-statistic	-19.4501	-34.1440	-26.5651	-29.1422	-32.9595	-23.8504
$[((PPWDSSR)-(PPWDSSR))_{underdiversified} - ((PPWDSSR)-(PPWDSSR))_{diversified}]$	-0.1809		-0.0953		-0.0860	
t-statistic	-13.7247		-15.7436		-20.2029	

Table 16: Preference for additionally purchasing their winners/losers related to diversification (3 months)

This table shows the Proportion of Winners Additionally Purchase (PWAP) and the Proportion of Losers Additionally Purchased (PLAP) from 1-8-2003 to 31-07-2007 and their difference. The observations are aggregated across accounts and days and assumed as being independent. Percentiles are calculated considering only the investors that engage in repurchasing behavior and only days when investors have holdings in account. Percentile 50 corresponds to 2.25 stocks; percentile 75 corresponds to 4.0 and percentile 90 corresponds to 7.0 trades.

	P50		P75		P90	
	Under-diversified	Diversified	Under-diversified	Diversified	Under-diversified	Diversified
Number of winners additionally purchased	1116	7754	2454	6416	4227	4643
Number of losers additionally purchased	1424	11428	3734	9118	6517	6335
Number of opportunities to additionally repurchase winners	2181	73390	7480	68091	18003	57568
Number of opportunities to additionally repurchase losers	2666	78722	9325	72063	21060	60328
Proportion of Losers Additionally Purchased (PLAP)	1.1465	0.1698	0.6679	0.1449	0.4481	0.1173
Proportion of Winners Additionally Purchase (PWAP)	1.0479	0.1181	0.4883	0.1040	0.3068	0.0877
PLAP-PWAP	0.0987	0.0517	0.1796	0.0408	0.1413	0.0296
PWAP/PLAP	0.9140	0.6956	0.7311	0.7182	0.6847	0.7477
standard deviation	-	0.0018	0.0076	0.0018	0.0049	0.0018
t-statistic	-	28.8461	23.7484	23.2341	29.1088	16.7942
$[(\text{PLAP-PWAP})_{\text{underdiversified}} - (\text{PLAP-PWAP})_{\text{diversified}}]$	-		0.1388		0.1117	
t-statistic	-		18.3497		23.0097	