

Are All Individual Investors Equally Prone to the Disposition Effect All the Time? New Evidences from a Small Market

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January 2008

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Abstract

Financial theory has identified the tendency of investors to hold losing investments too long and sell winning ones too soon, designated as the “disposition effect” by Shefrin and Statman (1985). This paper investigates the disposition effect on the Portuguese stock market, on the basis of a unique database that consists of trading records of 1496 individual investors. We found strong evidence of the disposition effect, studied on the basis of trades, volume and value traded. This preference for realizing gains to losses was observed every month of the year and for all individual investors. Even in the end of the fiscal year, the disposition effect still holds (in spite of the existence of fiscal incentives for the so-called fiscal effect), as opposed to the evidence found in other markets. We also studied the disposition effect related to market tendency. By partitioning the data period in a bull and a bear period, we found evidence of disposition effect for both periods, but with differences in terms of its intensity. In bull market periods, the disposition effect is even more evident than in bear markets. These results, we believe, can strongly be explained with behavioral reasons. We also investigated the disposition effect related to investors' sophistication. We partitioned investors, classifying sophisticated investors as the ones that trade more frequently, have a higher volume of transactions and a higher portfolio value and found evidence that more sophisticated investors are less prone to the disposition effect than less sophisticated ones, even though both groups exhibit evidence of this effect.

JEL Classification System: G11; G12; G14.

Keywords: Disposition Effect; Investor Behavior; Individual Investors; Market Trends, Small Markets.

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1. Introduction

The tendency of investors to hold losing investments too long and sell winning ones too soon, has sometimes been identified, in the literature. This tendency was denominated the disposition effect by Shefrin and Statman (1985). According to some financial theories, buying and selling decisions should be taken based on price expectations. Thus, comparison of historical prices, namely acquisition prices, with current prices is not a rational criterion for deciding to hold or to sell. If market efficiency holds, even in its weak form, past prices should not be relevant to resource allocation decisions.

The main aim of this research is to study the disposition effect of individual investors, using the Portuguese stock market, which has never been studied for this purpose, based upon a unique database of 1496 Portuguese individual investors' trades, from 1st January 1999 to 31st December 2002 (159 406 trades).

We can identify four central questions that we intend to answer in this study:

- Are Portuguese individual investors prone to the disposition effect?
- Does the so-called fiscal effect reduce or invert that effect?
- Are there significant differences in the disposition effect motivated by market trends, i.e., is the disposition effect level significantly different for bull and bear markets?
- Which investors are more prone to the disposition effect, i.e., does investors' sophistication affect the disposition effect?

We found that the disposition effect was present for the entire period of the study, even at the end of the fiscal year, suggesting that the fiscal effect has no significant impact on investors' preferences. We also found that, in bull markets, the disposition effect is stronger than in bear markets, and that more sophisticated investors (considering sophisticated the ones that trade more frequently, have a higher volume of transactions and a higher portfolio value) are less prone to the disposition effect.

These findings represent new evidence on the disposition effect. Firstly, as far as we know, the Portuguese market is the first market studied where the fiscal effect does not reduce the

disposition effect by the end of the fiscal year, despite the incentives to do so. The legislation is not homogeneous for the investors in the sample and there were changes in the fiscal law during the sampling period. A plausible explanation is that mental accounting plays a role that blinds investors to the real reasons for sustaining losses: they want to close up the year with a good performance and do not take taxes into consideration.

Secondly, we relate the disposition effect to the market trend. Kim and Nofsinger (2002) analyzed the behavior and performance of individual investors in Japan and found that trading behavior varies depending on bull or bear market conditions. Based on this evidence, we aim to analyze if the disposition effect also depends on market trend.

Thirdly, the disposition effect, found in the Portuguese stock market, is stronger than in other markets already studied. This raises the question of how Portuguese investors differ from those in other markets. Various studies, that take into consideration several classes/groups of investors, indicate that different types of investors do not exhibit the disposition effect to the same degree. Grinblatt and Keloharju (2000) have shown that the selling behavior is associated with the investor's sophistication level and investment size. The most sophisticated investors hold larger investments and pursue momentum strategies. Moreover, Odean (1998) found differences in the disposition effect between frequent and infrequent traders. Based on this evidence, we also intend to analyze if investors' sophistication has an impact on the disposition effect.

This paper is organized as follows: first, we describe the nature of the disposition effect as well as discuss the relevant literature on previous studies. Then, we present the database that was used in this study, followed by the methodology and the discussion of the results. We conclude with the summary of the paper.

2. The Disposition Effect and Previous Studies

The disposition effect is related to patterns of realization of gains and/or losses. The explanations, regarding the preference for realizing winning stocks over losing ones are, generally, based on behavioral factors based upon Kahneman and Tversky's (1979) "Prospect Theory" and Thaler's (1985) "Mental Accounting Theory". According to the "Prospect Theory", individuals codify their wealth changes in terms of gains and losses using a reference point, where results above the reference point are seen as gains while those below it are seen as losses. Moreover, individuals also exhibit decreasing sensitivity to outcomes. This means that, when gains (or losses) are distant from the reference point they lose significance.

Investors usually take the acquisition price as their reference point, accounting gains and losses based on it. This explains why investors prefer to realize gains and to defer losses: they prefer to realize a gain because marginal gains are recognized as less valuable than possible marginal losses of the same amount. On the contrary, when they are in the “area” of losses, additional ones will not be recognized so painfully, while a possible recovery has a greater value. Also, in such circumstances, investors are not very sensitive to additional losses, but are very sensitive to possible price recoveries.

Another fundamental aspect of the disposition effect relates to the investors’ mental accounting. Within the context of this frame work, investors consider each stock individually in an account and exhibit different behavior for each of them, instead of considering them as a part of their portfolio. When a new stock is bought, a new mental account is opened taking into account its acquisition price as reference point, from which gains and losses are calculated and selling decisions are made. While stocks are held, gains or losses are not considered real.

The disposition effect has been found in several markets and data periods. Based on US investors’ trading records, it was found evidence of it by Schlarbaum et al. (1978a), for retail brokerage clients, from 1964 to 1970; Odean (1998) also found the same phenomenon based upon discount brokerage clients, from 1987 to 1993, and Locke and Mann (2000) also documented the same behavior for professional futures traders in 1995. The disposition effect was also identified for home buyers and sellers by Case and Shiller (1988) and Genesove and Mayer (2001), as well as in a few other markets, namely: in the Australian Stock Exchange (Brown et al., 2006), in Israel (Shapira and Venezia, 2001), among professional investors, in Finland Grinblatt and Keloharju (2000) found that domestic investors exhibit contrarian behavior and, in Japan, Kim and Nofsinger (2002) found a preference for selling past winners, which is consistent with being disposition-prone.

In terms of measurement methods, we can identify three approaches based on the type of data used: market data; portfolio data and “experimental data”.

The methods based on market data (market perspective) compare volume and changes in market prices (e.g.: Dyl (1977); Lakonishok and Smith (1986); Ferris et al. (1988) and Kaustia, (2000)). In general, the purpose is to identify whether volume changes are motivated by winners or losers. If the disposition effect holds, higher volumes for winners than for losers are expected, which means the existence of a preference for selling winners.

The methods based on portfolio data (investor perspective) allow, in principle, a deeper and more accurate analysis. It makes it possible to look at each investor portfolio composition in

detail and check whether the stocks sold are the winning or the losing ones (e.g. Schlarbaum et al. (1978a); Odean (1998) and Brown et al., 2006).

Finally, the methods based on experimental data attempt to reproduce stock trading to assess the preference for holding losing investments while selling winning ones (see Weber and Camerer (1998); Chui (2001) and Oehler et al., (2003)).

3. Data

This study is based on a unique database of 1496 individual investors' accounts, with detailed data on their registered trades. The data set under analysis goes from 1st January 1999 to 31st December 2002, comprising 159 406 trades. In order to ensure that the accounts represent the entire stock portfolio for each investor, we consider only investors that trade exclusively in the Portuguese market. Otherwise we would be considering partial accounts. According to CMVM (2003),² the domestic market is the main destination of security investments for Portuguese investors (94.3%). We also consider only accounts that do not trade derivatives, since these could influence the underlying asset for hedging or arbitrage purposes, which would undermine our analysis.

The data was provided by a well known discount brokerage firm. The analysis considers 1496 investor accounts that traded, at least, once in the sampling time period. The data consists of: initial positions, both in terms of value and volume, account movements (also in value and in volume), events (e.g.: stock splits, mergers, etc...), and daily closing stock prices. We have excluded all data but that related with stocks, namely that on bonds and on warrants, and obtained a database that comprises 159 406 stock trades (81 914 buys and 77 492 sells). This means, on average, 106.6 trades per account, for the entire period and an average of 159.4 trades per trading day for the entire set of accounts.

Based on this information, we have constructed for each investor an account, and for each day of the sampling period. We have netted all trades, on the same day, and asset for the same investor and ignored all sells for which it was not possible to identify the purchase date and its price (purchases before the 1st of January 1999), because of lack of information. We have also corrected the data for stock splits, mergers and acquisitions.

² CMVM is the Portuguese Securities Market Commission and has the task of supervising and regulating securities and other financial instruments markets, as well as the activity of all those who operate within said markets.

4. Methodology

We start with a test checking whether Portuguese individual investors exhibit the disposition effect, i.e., whether the Proportion of Gains Realized is superior to the Proportion of Losses Realized. In order to accept this hypothesis, we will test the null hypothesis that the investors' proportion of realized gains should not be greater than proportion of realized losses, that is:

H_0 : Proportion of Gains Realized \leq Proportion of Losses Realized.

H_1 : Proportion of Gains Realized $>$ Proportion of Losses Realized.

Then, we analyze if the disposition effect is affected by the fiscal effect. If the fiscal effect holds in the Portuguese market, in December (the end of fiscal year) investors would exhibit a preference for realizing more losses than gains and this would be rather distinct from the other months of the year. However, and opposed to the evidence in other markets, if hedonic reasons hold, we would expect contrary evidence. If investors tend to realize gains, to close up the year with a good performance, then the fiscal effect, if detected would not have enough significance to reduce or reverse the disposition effect. Consequently, we will test the hypothesis that the pattern of realized gains and losses, in December, is not significantly different from the other months of the year.

H_0 : Proportion of Losses Realized in December - Proportion of Gains Realized in December $>$ Proportion of Losses Realized from January to November - Proportion of Gains Realized from January to November.

H_1 : Proportion of Losses Realized in December - Proportion of Gains Realized in December \leq Proportion of Losses Realized from January to November - Proportion of Gains Realized from January to November.

These two tests, that of the disposition effect for the entire sample period and that for their differences but for data subsets, were applied (following Odean (1998)). We will also analyze the disposition effect in relation to the market trend as well as to investor's sophistication.

In the literature, Kim and Nofsinger (2002) used market data to analyze the behavior and performance of individual investors in Japan and found that, trading behavior, varies depending on bull or bear market conditions. Thus, it is relevant to study whether the

disposition effect is affected by market trend, that is the third question that we intend to address.

We will assume bull periods to be those where the daily market capitalization is going up and bear periods to be those where the daily market capitalization is going down. In accordance with the data, the bull market period is from 1st January 1999 to 3rd March 2000 and the bear market period is from 4th March 2000 to 31st December 2002.

The third hypothesis compares the disposition effect in each subperiod:

H_0 : Proportion of Losses Realized in bull periods - Proportion of Gains Realized in bull periods $>$ Proportion of Losses Realized in bear periods - Proportion of Gains Realized in bear periods.

H_1 : Proportion of Losses Realized in bull periods - Proportion of Gains Realized in bull periods \leq Proportion of Losses Realized in bear periods - Proportion of Gains Realized in bear periods

One would expect that, in bull periods, the disposition effect to be attenuated, or even reversed, if investors follow momentum strategies. Nevertheless, we believe it can be even more difficult to realize losses during bull periods, based upon behavioral reasons. In fact, when prices tend, generally, to rise, realization of losses is the acceptance of poor decisions and that may affect investors' confidence. In these situations, mental accounting plays ~~is~~ an important role because investors believe that if losses are not realized they are not real. Then, in order to hide mistakes, investors tend to keep loser investments, hoping for their recovery. Finally, we will also analyze whether individual investors are equally prone to the disposition effect, whatever their level of sophistication. We try to identify the sophistication by subdividing investors into different groups according to their number of trades, their trading volume and also according to their portfolio value.

Some studies suggest that different groups of investors have different degrees of the disposition effect. For example, Grinblatt and Keloharju (2000) show that, the most sophisticated investors, tend to hold larger investments and pursue momentum strategies, while less sophisticated ones would follow contrarian strategies. This suggests that, less sophisticated investors, should show a stronger disposition effect. Dhar and Zu (2006) found that, wealthier investors as well as those with trading experience, exhibit less disposition effect. Odean (1998), already found different intensities as to the disposition effect for

frequent and infrequent traders even though, both groups, have shown a preference for selling winning investments. Finally, Brown et al. (2006) found that more sophisticated investors (considering value of transaction as sophistication criteria) exhibit lower disposition effect, even if large traders prefer to hold their losing investments and sell their winning ones.

Subdividing investors in the sample by the number of trades, allows their comparison based on trading frequency. We assume that more active investors tend to be more sophisticated. However, this ignores the volume per trade, which means that trading one share would have the same significance as trading one thousand. In order to take these differences into account, we will also test differences in behavior based on the number of shares traded, assuming that more sophisticated traders tend to present higher trading volume per trade. We also use the average account value, within the sampling period, which may be the best criterion for identifying investors' sophistication.

For each criterion, we will then test, if there are significant differences in the disposition effect by dividing investors into two groups, being the hypotheses to test the following:

A) Using the number of trades:

H_0 : Proportion of Losses Realized by low frequency traders - Proportion of Gains Realized by low frequency traders \leq Proportion of Losses Realized by high frequency traders - Proportion of Gains Realized by high frequency traders.

H_1 : Proportion of Losses Realized by low frequency traders - Proportion of Gains Realized by low frequency traders $>$ Proportion of Losses Realized by high frequency traders - Proportion of Gains Realized by high frequency traders.

B) Using trading volume:

H_0 : Proportion of Losses Realized by low volume traders - Proportion of Gains Realized by low volume traders \leq Proportion of Losses Realized by high volume traders - Proportion of Gains Realized by high volume traders.

H_1 : Proportion of Losses Realized by low volume traders - Proportion of Gains Realized by low volume traders $>$ Proportion of Losses Realized by high volume traders - Proportion of Gains Realized by high volume traders.

C) Using account value:

H_0 : Proportion of Losses Realized by low portfolio value - Proportion of Gains Realized by low portfolio value \leq Proportion of Losses Realized by high portfolio value - Proportion of Gains Realized by high portfolio value.

H_1 : Proportion of Losses Realized by low portfolio value - Proportion of Gains Realized by low portfolio value $>$ Proportion of Losses Realized by high portfolio value - Proportion of Gains Realized by high portfolio value.

In order to study disposition effect related to investors' sophistication, we will divide the database into percentiles, using the following criteria: trading frequency, trading volume and average account value in the sampling period. We divided investors into two different groups testing differences for the following percentiles: 50%, 75%, 90% and 95%.

In order to test if investors have the tendency for selling winners too soon, while holding losers too long, we have to take into consideration the impact of market trends. In a bullish market, where the majority of share prices raise, there are more winning stocks. Consequently, we observe more opportunities to sell winners than losers, even though investors may be indifferent in selling winners or losers. On the contrary, in a bearish market, with a large number of share prices falling, investors tend to have more loser stocks in their portfolios and, as a result, even if they are indifferent in selling winners or losers, it is expected that they will sell more loser stocks. Again, this may have nothing to do with their human nature but just the result of the downward market, creating more opportunities to sell. Therefore, it is necessary to remove the impact of market tendencies. In such a context, in order to detect investors' behavioral tendencies, the disposition effect will be identified and measured taking into account the selling of winners and losers relative to the potential opportunities for selling winners and losers held in their accounts, computing these proportions as defined below.

We start by computing Realized Gains (RG) and Realized Losses (RL) as the difference between the selling price and the reference price (the average acquisition price for that security).

The average security price is a weighted average considering the number of shares bought in each buying transaction.

If only one buying trade occurred, the average security price is the sole buying price registered in that account, for that specific security. Realized Gains and Losses are computed when a selling trade occurs, for a security, in an account.

Potential Gains (PG) and Potential Losses (PL), in an account, are only calculated when a selling trade is registered in that account, that day. PG and PL are calculated as the difference between the reference price (the average acquisition price) and the closing price of the day.

We calculated RG, RL, PG and PL, 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. Otherwise, we cannot calculate the Potential Gains and Losses as there are no residual securities that could potentially be sold.

Afterwards, the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) were calculated as follows:

$$PGR = \frac{RG}{RG + PG}$$

$$PLR = \frac{RL}{RL + PL}$$

where PGR is as defined below, RG stand for the Realized Gains and PG for Potential Gains. These values are aggregated, for all investors, throughout time. The same methodology was used for calculating the PLR.

As in Odean (1998), we used a t-test for testing the statistical significance of the differences in the proportions of PGR and PLR. A significant negative difference means that investors exhibit a preference to hold losing investments and to sell the winning ones. In other words, if a significant and negative difference is found, the disposition effect exists.

The standard error for the difference in the proportions of PGR and PLR, is given by:

$$\sigma(PLR - PGR) = \sqrt{\frac{PGR(1 - PGR)}{N_{RG} + M_{PG}} + \frac{PLR(1 - PLR)}{N_{RL} + M_{PL}}}$$

where N_{RG} , M_{PG} , N_{RL} and M_{PL} stand, respectively, for the number of Realized Gains, Potential Gains, Realized Losses and Potential Losses.

5. Empirical Results

5.1. The Disposition Effect and the Fiscal Effect

We find evidence of a strong disposition effect for the entire sample, with a difference between the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) of about 0.209. Table 1 shows the results for PGR and PLR, firstly for the entire year, and, secondly, partitioning results from January to November from those observed in December. These tests are based on the number of realized gains, number of realized losses, number of potential gains and number of potential losses. These observations are aggregated for all investors and throughout time, assuming that these observations are independent across investors and time.

Table 1 – Global Disposition Effect

This table shows the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) from 1-1-1999 to 31-12-2002. The number of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across accounts and days.

	Entire Year	December	Jan.-Nov.
RG	25 891	2 334	23 557
RL	21 629	1 363	20 266
PG	55 553	5 597	49 956
PL	176 975	12 829	164 146
PLR	0.109	0.096	0.110
PGR	0.318	0.294	0.320
PLR-PGR	-0.209	-0.198	-0.211
PGR/PLR	2.919	3.064	2.916
σ (PLR-PGR)	0.00178	0.00568	0.00187
t-statistic	-117.735	-34.881	-112.663

The differences for PGR and PLR are significant for the entire year. However, contrary to the evidence from similar studies (such as Odean (1998), Brown et al. (2006)), we found the disposition effect even at the end of the fiscal year. The difference between PGR and PLR in December is 0.198 only slightly lower than the rest of the year. When testing if the difference between PGR and PLR, in December, is significantly different from that obtained from January through November (i.e.: $PLR-PGR$ in December \leq $PLR-PGR$ in January - November), we get a t-statistic of 2.165. Therefore, we conclude that this difference is not significant at a confidence level of 0.01³. Moreover, the preference to sell winners in

³ Given the possibility of the results of the test being distorted due to the lack of independence of the parameters, we used a high confidence level.

December is three times greater than the preference to sell losers. This is even higher than during the period from January to December. Thus, we can conclude that, (for the entire year, including December), investors showed a disposition effect.

The difference found between PGR and PLR is clearly higher than in other similar studies (such as Odean, 1998). We believe, according to the results we got (and shown later in this paper), that this is due to the relatively low level of sophistication of the individual investors. Even though the Portuguese stock market is no longer considered an emergent market, it still exhibits some characteristics of those markets, namely higher volatility and longer crisis recovery time. Investors in such markets tend to reveal lower levels of sophistication, particularly individual investors. Grinblatt and Keloharju (2000) found that, Finish investors, especially individual ones, behave as low sophistication ones, being prone to contrarian behavior and, consequently, to the disposition effect.

Also, as opposed to the evidence found in other markets, we observed the disposition effect for the entire year, even in December (the end of fiscal year), in spite of the existence of fiscal incentives to engage in tax-motivated selling. Somehow, this is not completely unexpected (that the fiscal effect would have a low impact on realized gains and losses). Firstly, because the legislation was not homogeneous for the investors within the sample period and, secondly, because there were changes in the fiscal law during that period as well. Even if some investors decide to realize capital losses for tax purposes, there are other investors that are not motivated by the fiscal aspect and will prefer to realize capital gains at the end of the year to show improved performance. These actions, we believe, result from mental accounting mechanisms that only consider as gains those already realized. The winning stocks in the portfolio are seen as potential gains which, only when sold, become effective gains. Therefore, the fiscal effect and the disposition effect counterbalance themselves and the pattern of realized gains and losses is not significantly modified in December.

Although we found evidence of the disposition effect for individual investors it is relevant to investigate if it is persistent during the sampling period. Table 2 reports the PGR and PLR for each year under analysis. We found, once again, the disposition effect for every year.

Table 2 – The Disposition Effect for Each Year

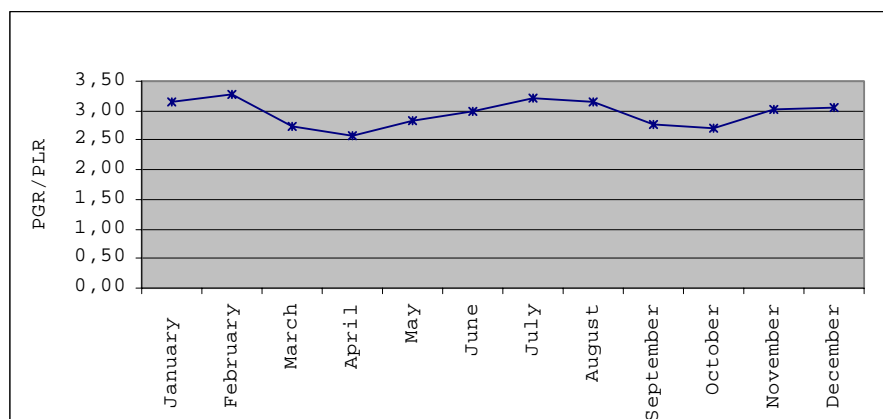
This table shows the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR), for each year, over the period from 1-1-1999 to 31-12-2002. The number of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across accounts and days.

	1999	2000	2001	2002
RG	8 893	11 354	3 231	2 413
RL	5 095	8 334	4 899	3 301
PG	17 809	24 508	7556	5680
PL	46 861	70 442	35434	24238
PLR	0.098	0.106	0.121	0.120
PGR	0.333	0.317	0.300	0.298
PLR-PGR	-0.235	-0.211	-0.178	-0.178
PGR/PLR	3.396	2.993	2.466	2.487
σ (PLR-PGR)	0.00317	0.00269	0.00470	0.00545
t-statistic	-74.230	-78.378	-37.881	-32.722

Graph 1 shows the evolution of the ratio PGR to PLR. The preference to realize winners is, at least, 2.5 times greater than the preference to realize losers, for the entire sampling period. The ratio varies between 2.5 and 3.3. Once again, we observe how fiscal the effect has little influence on the pattern of the realization of gains and losses, showing an increasing preference for realizing winners at the year's end. February, July and August are the months with the highest ratio, while March, April, September and October have the lowest. In terms of the difference between PGR and PLR, for every month, the values are close to 0.2, corroborating the fact that investors consistently prefer realizing winners rather than losers.

Graph 1 – Evolution of PGR/PLR, Aggregated by Month

This graph shows the ratio Proportion of Gains Realized (PGR)/Proportion of Losses Realized (PLR), aggregated by month from 1-1-1999 to 31-12-2002. The number of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across accounts and days.



These tests were developed under the assumption that the number of realized gains, the number of realized losses, the number of potential gains and the number of potential losses are independent across investors and time. Although this assumption does not bias the tests, it can inflate them. As the t-statistics we get are very high, this is not problematic. In spite of this, in order to remove any doubt about the effect, we will also look at an alternative test, suggested by Odean (1998).

Firstly, we started by assuming that independence only exists throughout time. In order to overcome this problem, we calculated PGR, PLR and its difference per investor. Then, we calculated the average PGR, the average PLR and the average of PLR-PGR and then we tested the statistical significance of this difference. The results are shown in Table 3 below: the PGR is 0.57; the PLR is 0.21 and the difference 0.36. In comparison with the previous test (whose results were shown in Table 1 above), we concluded that, and in accordance with this alternative test, both the proportions and the differences found are higher, and so is the t-statistic. As a result, the null hypothesis was also rejected, with a t-test of 184. The same happened with the December data, i.e., the average PGR is significantly superior to the average PLR, exhibiting a t-statistic even higher than that in previous tests.

Table 3 – The Disposition Effect – Alternative Measure to Control Accounts Dependence

This table shows the average Proportion of Gains Realized (PGR) and the average Proportion of Losses Realized (PLR) from 1-1-1999 to 31-12-2002. The number of average Realized Gains (RG), average Realized Losses (RL), average Potential Gains (PG) and average Potential Losses (PL) are aggregated across days.

	Entire Year	December
RG	29.03	6.05
RL	24.19	3.35
PG	62.28	14.50
PL	197.96	31.52
PLR	0.205	0.167
PGR	0.566	0.499
PLR-PGR	-0.360	-0.333
PGR/PLR	2.755	2.994
σ (PLR)	0.17379	0.18999
σ (PGR)	0.24148	0.31106
σ (PLR-PGR)	0.00196	0.00643
t-statistic	-183.985	-51.740

Surprisingly, the test to control for the lack of investors' independence reveals a stronger statistical significance. The higher results for the PGR's and the PLR's, calculated as average, and for their difference, as well as the higher t-statistic, can be explained by the equal weight assigned to each investor in this alternative measure. Each investor has the same weight for

the calculation of the disposition effect regardless the high or low level of transactions in his account. These results suggest that investors, that trade less frequently, exhibit a stronger disposition effect. When we assign higher weights to them, both the PGR, PLR and their difference becomes higher. This means that, PGR and PLR are dependent on the type of investors for which they are calculated. This fact can be considered critical, under this alternative test, since the accounts, with high frequency of transactions, provide a more accurate estimation for the calculation of the proportions. Nevertheless, this test fulfills its purpose of controlling whether the t-test is inflated and also shows that we can accept the conclusion provided by the previous test.

We also need to control for the influence of the decisions dependence over time. For that purpose, we will ignore consecutive sells because the decision to sell a security may not be independent throughout time. Whenever we find more than one sell, within a week (five consecutive trading days) on the same stock, only the first sell will be considered. In a similar way, we only consider the first sell, within the same week, to calculate potential gains and losses. The test is done, once again, by calculating the PGR and the PLR for each investor and then the average for all investors. Table 4, below, shows the results. We can conclude that, after controlling for time dependence, the disposition effect is still evident and it seems even stronger. The difference between PGR and PLR is slightly higher than that observed in the previous test. This procedure does not guarantee that decisions are independent over time. When investors hold loser stocks, the decision can be postponed for a period longer than 5 days. Especially in longer bear periods, one can expect that investors will hold their loser investments for longer periods, expecting to recover their losses in order to achieve, at least, the break-even point. As we have seen previously, the satisfaction provided by this possibility is higher than the pain imposed by additional losses. This is one of the reasons why investors accept risky bets. Also, in a difficult situation, it is always preferable to hold the *status quo* because a non-decision is not as painful as an incorrect one.

Table 4 – The Disposition Effect – Alternative Measure to Control Accounts and Time Dependences

This table shows the average Proportion of Gains Realized (PGR) and the average Proportion of Losses Realized (PLR) over the period from 1-1-1999 to 31-12-2002. The number of average Realized Gains (RG), average Realized Losses (RL), average Potential Gains (PG) and average Potential Losses (PL) are aggregated for each investor and only a sale is counted within 5 trading days.

	Entire Year	December
RG	11.07	3.39
RL	8.50	1.90
PG	12.69	4.43
PL	34.66	9.08
PLR	0.263	0.247
PGR	0.660	0.583
PLR-PGR	-0.397	-0.336
PGR/PLR	2.510	2.363
$\sigma(\text{PLR})$	0.22092	0.30918
$\sigma(\text{PGR})$	0.26941	0.32713
$\sigma(\text{PLR-PGR})$	0.00527	0.01872
t-statistic	-75.369	-17.953

Up to now, PGR and PLR have been calculated on the basis of the number of sells and potential sells. However, to measure the impact of the investors' dimension, it is pertinent to calculate these proportions on the basis of the volume and value of their transactions. When the number of sells and potential sells is taken as a basis to calculate PGR and PLR, all transactions are considered equally important and they are used with the same weight when calculating our instrumental variables. However, it is pertinent to ask whether the disposition effect is still persistent when we take into consideration the number of stocks sold and the number of stocks that could have been sold. Table 5, below, shows the results for PGR and PLR calculated on the basis of stocks instead of sells. The proportions, as well as its difference, are now lower. Nevertheless, the difference is still significant (t-statistic of 89). The lower PGR and PLR can be explained in line with the explanations presented for the alternative tests. Investors with higher transaction volume (and more frequent trades) are now strongly weighted and these investors exhibit lower PGR and lower PLR as well as a lower difference between these proportions. This means they are less prone to the disposition effect.

Table 5 – The Disposition Effect Based on Volume

This table shows the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) over the period from 1-1-1999 to 31-12-2002. The volumes of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across accounts and days.

	Entire Year	December	Jan.-Nov.
RG	16 764 347	1 581 558	15 182 789
RL	20 927 061	1 626 243	19 300 818
PG	58 433 585	6 391 875	52 041 710
PL	233 432 824	20 006 371	213 426 453
PLR	0.082	0.075	0.083
PGR	0.223	0.198	0.226
PLR-PGR	-0.141	-0.123	-0.143
PGR/PLR	2.710	2.639	2.723
$\sigma(\text{PLR-PGR})$	0.00158	0.00499	0.00167
t-statistic	-88.835	-24.661	-85.551

Investors may realize gains or losses of significantly different amounts. Therefore, we also calculated the PGR and PLR based on the value of gains and losses. This is critical, because more important than a gain or loss should be its magnitude. If realized small gains are frequent but large losses are rare, the previous conclusions could not true. Table 6, below, shows the results for value weighted PGR and PLR and the conclusions are similar to previous ones, based on trading volumes: the PLR is 0.06; the PGR is 0.18 and its difference has a t-statistic of 81.5. In comparison with the values of gains and losses, we get lower figures for the proportions. This is probably due to the fact that, investors with a relatively small amount of transactions are more prone to the disposition effect.

Nevertheless, we still continue to observe the disposition effect for the entire sample period and for every month, including December. Brown et al. (2006), when considering transaction values, also arrived at the same conclusions for individual investors, although, for other classes of investors, there is no evidence of, the disposition effect. This indicates that, when considering larger investments, investors with more experience/sophistication are more weighted and are not so eager for realizing gains (the disposition effect is not so evident, coming, from the reduction of PGR, when compared with volume). Looking at the monthly evolution of the ratio PGR/PLR, calculated on the basis of volume and value, we continue to see that the preference for selling winners is always, at least, twice that of the preference for selling losers.

Table 6 – The Disposition Effect Based on Value

This table shows the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) over the period from 1-1-1999 to 31-12-2002. The values of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across accounts and days

	Entire Year	December	Jan.-Nov.
RG	8 156 844	686 055	7 470 789
RL	15 678 820	844 335	14 834 485
PG	36 982 974	4 085 564	32 897 410
PL	236 451 301	15 379 937	221 071 364
PLR	0.062	0.052	0.063
PGR	0.181	0.144	0.185
PLR-PGR	-0.119	-0.092	-0.122
PGR/PLR	2.906	2.763	2.943
t-statistic	-81.562	-21.047	-79.348

In conclusion, individual investors, in the Portuguese market, exhibit the disposition effect for the entire year, including December. The preference to realize winners, instead of losers, is stronger in our study than in other studies, probably because Portuguese individual investors are less sophisticated than in other, more developed markets. Also, contrary to other markets already studied, the disposition effect is neither inverted nor reduced at the end of the fiscal year.

5.2. The disposition effect in bull and bear markets

In bull periods, there are more opportunities for realizing gains, while in bear periods there are more possibilities for realizing losses. However, the measure of the disposition effect which we are using already considers this potential trap. Realized gains and losses are computed in comparison to the actual opportunities due to the market trend. Therefore, if the measure used to compute the disposition effect is not affected by the market trend, the differences that may arise, if any, are the result of investors' preferences under different market conditions. We split the period of analysis into a bull market period (from 1st January 1999 to 3rd March 2000), a bear market period (from 4th March 2000 to 31st December 2002) and repeated the previous tests. Table 7, below, shows the PGR and PLR for each sub-period, calculated on the basis of the number of sells. We found strong evidence of the disposition effect, both in bull and in bear markets, but stronger in bull markets. The difference found between the disposition effect in bull and bear markets is statistically significant.

Table 7 – The Disposition effect in bull and bear markets

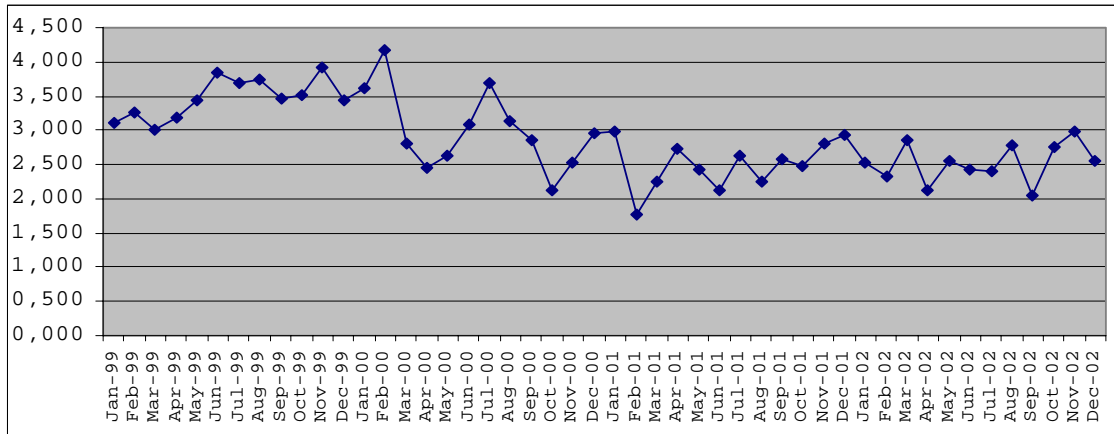
This table shows the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) over the bull period (from 1st January 1999 to 3rd March 2000), and the bear period (from 4th March 2000 to 31st December 2002) and their difference. The number of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across days.

	Bull	Bear
RG	13 890	12 001
RL	6 494	15 135
PG	28 270	27 283
PL	62 065	114 910
PLR	0.095	0.116
PGR	0.329	0.305
PLR-PGR	-0.235	-0.189
PGR/PLR	3.478	2.625
$\sigma(\text{PLR-PGR})$	0.0025	0.0025
t-statistic	-92.138	-76.000
$[(\text{PLR-PGR})_{\text{Bull}} - (\text{PLR-PGR})_{\text{Bear}}]$	-0.046	
t-statistic	-17.909	

For illustration purposes, and also for providing a more detailed insight, when studying the differences between bull and bear markets, Graph 2 below shows the monthly progress of the PGR/PLR ratios and Graph 3 shows PGR, PLR and their difference for each month. Looking at Graph 2, it shows that, during the bull period, the preference for realizing gains is, at least, three times higher than the preference for realizing losses, while during the bear period, the ratio falls (even though, the tendency for realizing gains is still, at least, twice the tendency for realizing losses, except in February 2001, when the ratio falls to a value never reached of 1.77). Graph 3, also shows that the change between bull and bear markets results, essentially, from the decreasing of PGR, while PLR exhibits more stables values for the entire period.

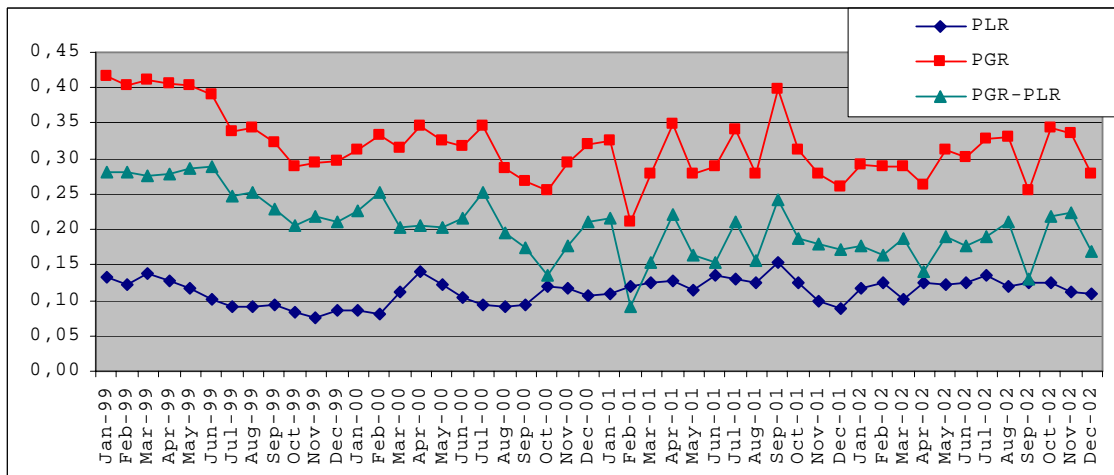
Graph 2 – Evolution of PGR/PLR by Months

This graph shows the ratio: Proportion of Gains Realized (PGR)/Proportion of Losses Realized (PLR), by month from 1-1-1999 to 31-12-2002. The number of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across accounts and days.



Graph 3 – Evolution of PGR, PLR and their difference by Month

This shows reports the Proportion of Gains Realized (PGR), Proportion of Losses Realized (PLR) and its difference by month from 1-1-1999 to 31-12-2002. The number of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across accounts and days.



These results, we believe, can be explained with behavioral reasons. One would expect the opposite: momentum strategies in bull periods, and contrarian strategies in bear periods⁴. The stronger preference for realizing gains and holding losers, in bull markets, is related to the value function (in accordance with the prospect theory), mechanisms of mental accounting and loss aversion. In bull periods, the realization of gains is “easier”: gains are “easily”

⁴ Contrarian strategies lead to the disposition effect.

available and investors will have the desire to realize them because, according to the prospect theory, the satisfaction of a new gain, in terms of value function, is decreasing. This explains why PGR is higher in bull periods. On the contrary, the realization of losses implies the assumption of a wrong decision when the market is going up which is, psychologically, very difficult to accept. As Gervais and Odean (2001) mention, investors learn to be overconfident in bull markets. Then, with reinforced overconfidence, investors want to feel the pride of gains (selling winners) and to avoid the regret of losses, more painful in bull markets (holding their losses and hoping for recovery). Then, investors prefer to hold the stock and avoid the regret of a bad decision. In bear periods, investors are still averse to losses. However, it is easier to accept losses because they can attribute them to external factors. We found a small increase of PLR in the bear period, in comparison with that in the bull (from 0.095 to 0.116). When the market is decreasing sharply, as it was the case, it becomes easier to accept a loss because investors show decreasing sensitivity to additional losses and also because the break-even appears very difficult to achieve. Even so, the increase in PLR is small. As the market was falling down, potential losses increased considerably and, in absolute terms, realized losses increased significantly as well. Simultaneously, the PGR decreased from 0.329 during the bull period to 0.305 in the bear period. When the market is falling, winning stocks are seen as a good choice, which reinforces the investors' confidence to maintain their decisions unchanged. However, according to the mental accounting theory, unrealized gains are not considered real gains and, as a result, investors will wait to realize them. Therefore, the disposition effect still holds.

In conclusion, we found a disposition effect in the bull and bear periods, even though it was significantly stronger in the bull period.

5.3. The disposition effect and investors' sophistication

In order to study the disposition effect in relation to investors' sophistication, we partitioned the investors according to their trade frequency; trading volume and the account value. Since it is difficult to define a "frontier" for deciding whether an investor is a sophisticated one in terms of number of trades, trading volume or portfolio value, we divide the sample of the investors' accounts into two groups, using the percentiles: 50%, 75%, 90% and 95%. The

main purpose is to identify if the disposition effect exists in each group and if there are significant differences between these groups.

Tables 8, 9 and 10 below, show the results for each sophistication criteria. We found a disposition effect, for each group, and also found significant differences among these groups: those assumed less sophisticated have shown a significantly stronger disposition effect than the more sophisticated ones. Odean (1998) also found that less frequent traders have a stronger disposition effect⁵, but the differences we found are much stronger. We also found that, the higher the percentiles, the lower the disposition effect for the frequent traders group. This means that more active investors are less prone to the disposition effect. Consistently, when the percentile considered is higher, the less sophisticated group also exhibits a lower disposition effect because we are moving investors from the frequent traders group to the less frequent one. Taking into account the trading volume, the conclusions are similar: investors in all groups show a disposition effect and groups, with lower trading volume, show a significantly stronger disposition effect.

Table 8 – The Disposition Effect and Investors’ Trade Frequency

This table shows the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) from 1-1-1999 to 31-12-2002 for each group of investors. The values of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across accounts and days.

Percentile	50		75		90		95	
	inferior	superior	inferior	superior	inferior	superior	inferior	superior
RG	1 331	24 560	3 951	21 940	8 436	17 455	11 902	13 989
RL	727	20 902	2 644	18 985	6 267	15 362	9 123	12 506
PG	1 000	54 553	3 830	51 723	9 395	46 158	16 224	39 329
PL	2 836	174 139	12 106	164 869	33 031	143 944	52 828	124 147
PLR	0.204	0.107	0.179	0.103	0,159	0,096	0,147	0,092
PGR	0.571	0.310	0.508	0.298	0,473	0,274	0,423	0,262
PLR-PGR	-0.367	-0.203	-0.329	-0.195	-0,314	-0,178	-0,276	-0,171
PGR/PLR	2.798	2.897	2.833	2.884	2,967	2,845	2,874	2,867
σ (PLR-PGR)	0.01227	0.00179	0.00649	0.00183	0.00417	0.00192	0.00327	0.00206
t-statistic	-29.895	-113.698	-50.634	-106.427	-75.208	-92.809	-84.324	-82.991
(PLR-PGR) _{inf} -(PLR-PGR) _{sup}	-0.164		-0.134		-0.136		-0.105	
t-statistic	-13.335		-20.644		-32.533		-32.107	

⁵ Odean only tests the division using the percentile 90%.

Table 9 – The Disposition Effect and Investors’ Trading Volume

This table shows the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) from 1-1-1999 to 31-12-2002 for each group of investors. The values of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across accounts and days.

Percentile	50		75		90		95	
	inferior	superior	inferior	superior	inferior	superior	inferior	superior
RG	2 091	23 800	5 513	20 378	11 321	14 570	15 317	10 574
RL	1 193	20 436	3 774	17 855	8 397	13 232	11 684	9 945
PG	2 134	53 419	6 185	49 368	15 419	40 134	26 780	28 773
PL	5 919	171 056	19 782	157 193	51 628	125 347	85 218	91 757
PLR	0.168	0.107	0.160	0.102	0.140	0.095	0.121	0.098
PGR	0.495	0.308	0.471	0.292	0.423	0.266	0.364	0.269
PLR-PGR	-0.327	-0.201	-0.311	-0.190	-0.283	-0.171	-0.243	-0.171
PGR/PLR	2.950	2.888	2.942	2.864	3.026	2.789	3.018	2.748
$\sigma(\text{PLR-PGR})$	0.008877	0.001805	0.005197	0.001868	0.003337	0.002048	0.002568	0.002421
t-statistic	-36.857	-111.614	-59.850	-101.821	-84.956	-83.418	-94.748	-70.608
$(\text{PLR-PGR})_{\text{inf}} - (\text{PLR-PGR})_{\text{sup}}$	-0.126		-0.121		-0.113		-0.072	
t-statistic	-14.158		-23.260		-33.752		-28.168	

The other criterion used for defining investors’ sophistication, and probably the most accurate one, is the selection based on the accounts’ (portfolio) value. Investors with a high account value, are expected to base their decision-making processes on more complex criteria and sophisticated models. Consequently, we would expect them to be less influenced by psychological and behavioral factors. According to Table 10 bellow, the 5% group of investors, with higher account values exhibit a difference, between PGR and PLR, of 0.14 (with a t-statistic of 51), while the 50% group of investors, with lower account values, evidence a difference between PGR and PLR of 0.308 (with a t-statistic of 48). This means that the intensity of disposition effect, for the lower account value group, is more than twice than the intensity of the disposition effect shown by the upper account value group. Even so, the disposition effect holds for every group of investors.

We conclude that all individual investors seem to prefer realizing gains to losses, but the more sophisticated ones show a significantly lower disposition effect.

Brown et al. (2006) also test inventors’ sophistication and disposition effect on the basis of the value of investors’ trades and arrived at similar conclusions.

Table 10 – The Disposition Effect and Investors' Account Value

This table shows the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) from 1-1-1999 to 31-12-2001 for each group of investors. The values of Realized Gains (RG), Realized Losses (RL), Potential Gains (PG) and Potential Losses (PL) are aggregated across accounts and days

Percentile	50		75		90		95	
	inferior	superior	inferior	superior	inferior	superior	inferior	superior
RG	4 168	21 723	8 666	17 225	14 859	11 032	19 422	6 469
RL	3 485	18 144	6 932	14 697	12 110	9 519	15 207	6 422
PG	3 904	51 649	10 296	45 257	21 972	33 581	33 883	21 670
PL	13 221	163 754	34 206	142 769	77 495	99 480	112 244	64 731
PLR	0.209	0.100	0.169	0.093	0.135	0.087	0.119	0.090
PGR	0.516	0.296	0.457	0.276	0.403	0.247	0.364	0.230
PLR-PGR	-0.308	-0.196	-0.289	-0.182	-0.268	-0.160	-0.245	-0.140
PGR/PLR	2.475	2.968	2.712	2.954	2.985	2.832	3.054	2.547
$\sigma(\text{PLR-PGR})$	0.006389	0.001826	0.004061	0.001932	0.002799	0.002214	0.002274	0.002728
t-statistic	-48.167	-107.515	-71.043	-94.374	-95.823	-72.233	-107.776	-51.174
$(\text{PLR-PGR})_{\text{inf}} - (\text{PLR-PGR})_{\text{sup}}$	-0.111		-0.106		-0.108		-0.105	
t-statistic	-17.440		-26.143		-38.694		-46.359	

One could, probably infer that, investors tend to sell winners and hold losers because they expect future reverse movements on prices. However, evidence shows that, on average, this expectation is misleading. This preference for realizing winners and holding losers is much more associated with past prices than with expectation about future prices, meaning that it is not the expectation of price reversals the motivation for the disposition effect.

Conclusions

This paper addresses the study of the disposition effect, firstly and more in depth analyzed, at the theoretical level, by Shefrin and Statman (1985). According to this, investors tend to sell winner stocks faster, while holding loser stocks longer. Behavioral finance helps to explain such findings, basing investors' decisions on the apperceived value that investors assign to gains and losses. We use a unique database, for the Portuguese market, composed of 1496 individual investors' accounts and 159 406 trades.

We found a strong preference for investors selling winners and holding losers and this tendency holds whether the basis of measurement is the number of trades, the trading volume or the value of trades. This tendency is far stronger than in other markets previously studied: the Proportion of Gains Realized is 20% higher than the Proportion of Losses Realized. We believe that the main reason for this finding relates to the low level of sophistication of the individual investors.

The preference for realizing winners, and holding losers, is observed for each month of the year. As opposed to the evidence found in other markets, the so-called fiscal effect does not have enough impact to significantly reduce, or invert, the disposition effect (in spite of the existence of fiscal incentives under the Portuguese jurisdiction). Given our results, we might conclude that, even if some investors decide to realize capital losses for fiscal reasons, there are other investors that are not motivated by fiscal aspects and prefer to realize capital gains at the end of the year⁶, balancing each others out. This might mean that, mental accounting mechanisms tend to consider as gains those already realized. Therefore, the fiscal effect and the disposition effect counterbalance each other and the pattern of realized gains and losses is not significantly modified in December.

Furthermore, we also studied differences in the disposition effect, considering market trends. One would expect that, during bull periods, there are more opportunities for realizing gains. However, the measure of the disposition effect used considers the realization of gains and losses compared to the opportunities that exist due to the market trend. We found that, in bull markets, the disposition effect is stronger than in bear markets, and significant for both periods. One would expect the opposite: momentum strategies during bull periods and contrary strategies during bear periods. We believe that these results may be explained on the basis of behavioral factors. In bull periods the realization of gains is "easier": gains are "easily" achievable and the investor will desire to realize them because, according to the

⁶ E.g. to demonstrate improved performance.

prospect theory, the satisfaction of a new gain, in terms of his/her value function, is decreasing. On the contrary, the realization of losses implies assuming a wrong decision when the market is going up which is, psychologically, difficult to accept. Then, investors prefer to hold the stock and avoid the regret of a wrong decision. In bear periods, investors are still averse to losses, but it is easier to accept losses because they can attribute them to external factors.

Finally, we also studied the disposition effect in relation to investors' sophistication. In order to identify differences among them, we partitioned investors into groups in accordance with the following criteria: number of trades; trading volume and portfolio value. We found that less sophisticated investors exhibit a stronger disposition effect, significant for every group. Although the Portuguese stock market is no longer considered as an emergent market, it may be surprising that it still exhibits some characteristics of those markets and so, investors tend to reveal low levels of sophistication in investment behavior, particularly individual investors. In conclusion, our main findings are: firstly, the high level of disposition effect found for the entire data set calculated considering trades, volumes and amounts traded. Secondly, the maintenance of the disposition effect at similar levels, at the end of the fiscal year, as opposed to the evidence found in other markets.. Thirdly, the stronger disposition effect during bear markets than in bear markets never analyzed before the way we did, as far as we know. And fourthly, confirming the insights of other studies, that the disposition effect is related to investor sophistication and is reduced as investor sophistication increases.

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