Disposition bias and overconfidence in institutional trades

Jan Annaert[a], Dries Heyman[b], Michèle Vanmaele[c], Sofieke Van Osselaer[b]

[a]*Department of Accounting and Finance, Antwerp University, Prinsstraat 13, Antwerp, 2000, Belgium*

[b]*Department of Financial Economics, Ghent University, W. Wilsonplein 5D, Ghent, 9000, Belgium*

[c]*Department of Applied Mathematics and Computer Science, Ghent University, Krijgslaan 281, building S9, Ghent, 9000, Belgium*

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Abstract

Using a unique data set of mutual fund transactions, this paper examines two widely acknowledged behavioural biases: overconfidence in trading and disposition behaviour. We test for the first bias by comparing the future profitability of the purchased and sold securities by mutual funds. Our empirical results show that the purchases of mutual funds are not more profitable than the sales, implying that fund managers exhibit overconfidence in their trading capabilities. The disposition bias, i.e. the reluctance of investors to sell losing stocks, is tested by the widely accepted methodology of Odean (1998). In contrast to Odean's findings for individual investors, we reject the disposition hypothesis and instead document a propensity of mutual fund managers to cut losses early.

1. Introduction

Traditional finance theory assumes that markets are efficient and investors have rational expectations and take decisions that maximize their expected utility. Nevertheless, several trading patterns have been observed that do not concur with the rationality assumption and which have been recognized as behavioural biases. For instance, investors seem to trade more than can be rationally justified (see e.g. Barber and Odean (2000); Odean (1999)). Several explanations have been advanced to explain the excessive trading volume observed in financial markets. As with other patterns of investor behaviour, it is difficult to explain this excessive trading volume from a traditional perspective of rational investor behaviour. From a behavioural point of view, *overconfidence* has been proposed as the main reason for this trading activity (see e.g. Statman, Thorley and Vorkink (2006)). Overconfidence is modelled amongst others by the behavioural model of Daniel, Hirshleifer and Subrahmanyam (1998) in which investors overreact to private information, while underreacting to public information. Moreover, this overconfidence may be enforced through *biased self-attribution*, i.e. investors attribute successful investment performance to

their own skills, which further strengthens their overconfidence (see also Gervais and Odean (2001)).

Apart from this irrational trading behaviour, the *disposition bias* predicts that investors sell winners too early and ride losers too long (see Shefrin and Statman (1985)). Such behaviour complies with Kahneman and Tversky's (1979) prospect theory suggesting that investors are averse to realize their losses. More specifically, under prospect theory investors assess potential losses and gains using an S-shaped value function quantifying gains and losses rather than levels of wealth as in standard expected utility theory. In other words, this theory models the responsiveness to changes in wealth rather than to absolute levels. Potential losses and gains are defined according to a reference point. The value function displays concavity in the domain of gains and convexity in the domain of losses and is steeper for losses than for gains (i.e. loss aversion).

While the disposition bias reflects an investor's viewpoint on the individual stocks in his portfolio and their realized performance, the overconfidence bias reveals investors' beliefs about the future performance of the stocks under consideration. Moreover, disposition behaviour will only affect the decision to sell a security, whereas overconfidence will have an impact on both the buying and selling behaviour.

The present paper tests the presence of overconfidence and disposition behaviour in institutional trades. In theory, institutional investors should be less receptive to behavioural biases than individual traders, although their trades may be motivated by more agency-related issues or incentives. [1] We examine the presence of the disposition effect and test the overconfidence hypothesis in an institutional trading context using a unique data set of mutual fund transactions. The data set comprises daily transactions over the period August 2002 to April 2007. Having trade data on such a detailed level of analysis permits us to accurately assess whether institutional traders trade too much and whether they are

[1] For example, institutional traders may engage in *noise trading* to address the moral hazard problem where the principal is unable to monitor the effort level of the agent (see e.g. Dow and Gorton (1997)). Moreover, fund managers tend to alter the composition of their portfolios around disclosure dates (i.e. engage in *window dressing*) in order to receive a positive evaluation from investors (see e.g. Lakonishok, Shleifer, Thaler and Vishny (1991)). Furthermore, compensation in the mutual fund industry is typically based on relative rankings, which triggers low-ranked funds to alter their portfolios in response to their mid-year position in the ranking (see e.g. Sirri and Tufano (1998), Brown, Harlow and Starks (1996); Chevalier and Ellison (1997)). Likewise, relative performance structures may induce fund managers to base their asset allocation decisions on the trades of other managers (i.e. *herding*).

reluctant to realize their losses. Complementary to existing studies for individual investors, our analysis illustrates to what extent the trading behaviour of institutional investors differs from the trading practices of individual investors and whether institutional investors are susceptible to the same behavioural biases as individuals. However, in contrast to prior studies, we do not need to infer the institutional trades from changes in quarterly holdings, nor do we need to make assumptions on the direction of the trades. Instead, we directly observe the exact day of the trade, the number of shares traded and the corresponding broker amount, and whether the trade involves a buy or a sell. Moreover, rather than focusing on a single market, our data set covers an international spread (see table 2 for the percentage of trades on each market). This permits us to test whether the behavioural bias is a global effect or a region-specific trend. In addition, it extends the extant literature on the disposition effect, which predominantly concentrates on U.S. investors.[2]

Our results show that the fund managers in our sample exhibit overconfidence in their trading behaviour. Apparently, the purchased securities do not generate higher post-trade returns than the sold securities, implying that not all fund trades are rationally justified. In fact, this excessive trading behaviour erodes the portfolio performance, because unnecessary transaction costs are incurred. In addition, we find no evidence of disposition behaviour in mutual fund trades. Rather than holding on to losing stocks, they seem to cut losses early.

This paper is organized as follows. Section 2 provides an overview of the existing literature. In section 3 the mutual fund data set is described. Section 4 explains the methodology used to test both behavioural biases. In section 5 the results are discussed and concluding remarks are given in section 6.

2. Review of the existing literature

2.1. Overconfidence in institutional trades

If institutional investors possess managerial skills, the trades they execute should add value to the fund portfolio. More specifically, they should be able to correctly asses the future return of the securities they scrutinize. Ideally, the future return on the securities they buy

[2] From an international perspective, we refer to Grinblatt and Keloharju (2001) for an analysis of the disposition effect among Finnish investors, and Shapira and Venezia (2001) for an analysis among Israeli investors. Chen, Kim, Nofsinger and Rui (2004), and Feng and Seasholes (2005) find supporting evidence for the disposition effect in Chinese stock markets. Barber, Lee, Liu and Odean (2007) report that the individual investors trading on the Taiwan Stock Exchange exhibit the disposition bias, while foreign investors and mutual funds do not.

will outperform the future return of the securities they sell. For trades to be profitable, the difference in return between buys and sells should at least exceed the associated trading costs. If this is not the case, the trade is detrimental to the fund's performance and does not add any value to the portfolio. Odean (1999) shows that for a sample of individual investors, the profitability of the purchases does not exceed the profitability of the sales when trading costs are ignored. Apparently, these investors *overestimate the precision of their information*. In addition to this, Odean (1999) finds that investors exhibit *overconfidence with respect to their ability to interpret information*. Due to this overconfidence, individuals execute trades for which the difference in returns between the bought and sold securities cannot even cover the associated trading costs.

2.2. Disposition behaviour in institutional trades

While the majority of the extant literature tests the disposition behaviour of individual investors (see amongst others Odean (1998)), evidence on this topic in an institutional trading context remains limited (see Locke and Mann (2005); Grinblatt and Keloharju (2001)). Dhar and Zhu (2006) relate the disposition bias to investor characteristics and find that the propensity to sell winners and reluctance to sell losers is significantly smaller for individuals who are wealthier and work in professional occupations. Since institutional investors trade on behalf of their clients and have more trading experience and training, it is likely that the trading behaviour of these investors will diverge from that of individual investors.

The scarce empirical evidence on this bias in an institutional context provides mixed results. Using a unique data set on the Finnish stock market that covers a variety of investor types, Grinblatt and Keloharju (2001) do not only find evidence supporting the disposition effect for individual but also for institutional investors. Shapira and Venezia (2001) examine the behaviour of Israeli investors and conclude that the disposition effect is present both at the individual and institutional level in Israel, although it is weaker for professional than for individual investors. Garvey and Murphy (2004) analyse the trades of U.S. proprietary stock traders and find confirming evidence for the disposition effect. Likewise, Jin and Scherbina (2006) show that U.S. mutual fund managers are susceptible to the disposition bias and illustrate that new fund managers are less reluctant to sell the losers from the inherited portfolio than continuing managers. Examining high-frequency transactions data, Locke and Mann (2005) report a reluctance to sell losers among futures traders on the Chicago Mercantile Exchange. Frazzini (2006) observes a disposition bias among U.S. mutual funds and links this bias to post-announcement price drifts. More specifically, the author argues that upward price trends will trigger disposition investors to realize the gain, thereby suppressing the stock price temporarily to move to the news-updated price level.

Analogously, negative news prevents disposition investors with a capital loss to realize their losses, thereby impeding the price to fully adjust to the lower price level.

In contrast to the above-mentioned supporting evidence of the disposition bias, various papers have pointed out that institutional investors are less prone to the disposition effect. For instance, O'Connell and Teo (2004) examine the currency trading decisions of institutional investors, but find no verification of disposition effects. Instead, the authors find that institutional investors cut losses while riding gains. According to Feng and Seasholes (2005), sophistication and trading experience eliminate the reluctance to realize losses, but only partly remove the propensity to realize gains. Using quarterly portfolio holdings data of U.S. equity mutual funds, Cici (2005) observes a *reverse* disposition effect, i.e. unlike retail investors, mutual fund managers realize losses more eagerly than gains.

3. The Data

The unique data set in this study was provided by a major global custodian and contains mutual fund transactions on a daily basis. It covers all daily transactions from mutual funds that have assigned the custodian to manage their transactions. The mutual funds have an international spread and trade securities from various markets. Although mutual fund identity is not revealed, each transaction is linked to a mutual fund code, the trade date, transaction type, broker amount, and number of shares traded. Spanning the 2002-2007 period, the data base comprises 1,666,449 transactions executed by 1,741 different mutual funds involving 31,445 different securities. Focussing on equities alone, we find that the majority of trades involve equity transactions (1,064,440), which are performed by 1,041 mutual funds. Moreover, these transactions correspond to 10,031 different companies.

We double-check the correctness of the intraday prices in our data set, by comparing the price of each trade to the Datastream low and high price on that trading day. Theoretically, the intraday price should fall in-between. Allowing the intraday price to deviate 20% from the Datastream prices, we find 0.12% trades that do not comply with this objective.[3] This could be due to the incorrectness of either the transactional data or the Datastream data. To ensure the sense of reality of our results, we choose to eliminate these anomalous observations from our sample.

We label a fund as 'equity fund' if more than 70% of its trades involves an equity transaction. Filtering out all equity funds reduces our mutual fund sample to 571 funds.

[3] If we allow the intraday price to deviate only 15% (10%) from the Datastream low and high prices, we still find only 0.15% (0.21%) trades that do not match with this criterion. Requiring the intraday price not to deviate from the Datastream prices (i.e. 0% deviation), yields 7.53% outliers.

Next, we select only the equity funds for which sales events can be traced, which further reduces our sample to 519 funds. Our analysis in the next sections is centred on these 519 equity funds. In addition, we eliminate the lending transactions from our sample and focus only on buy transactions, sell transactions, and receipt free transactions for the construction of the holdings and computation of purchase prices. Table 1 reports some descriptive statistics for the 519 equity funds in our sample.

We split the full sample into geographical subsamples: the euro countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain), the pacific region, rest of Europe, emerging markets, the UK, and the US. Table 2 displays some summarizing trade statistics for each of these markets. For some analyses in this paper, we will focus only on the euro countries, the UK, and the US, since these geographical regions represent respectively 14.95%, 41.89%, and 23.48% of all equity trades in the data base. A fund is labelled as European, UK, or US fund if more than 2/3 of its equity trades are performed on the respective geographical markets. Examining the currency of the trades in our data set, we observe that 36.44% of the trades is in GBP, while 21.92% of the trades is in USD and 12.79% is in EUR. Transaction costs are not taken into account, as professional traders typically face little transaction costs on their trades.

4. Methodology

4.1. Overconfidence

Similar to Odean (1999), we test whether institutional investors actually misinterpret useful information. Under rational expectations, these investors should purchase securities for which the returns equal or exceed the returns on the sold securities. In line with Odean (1999), we calculate the average return on a buy (sell) portfolio, by examining the returns over the subsequent 84, 252, or 504 trading days following the purchase (sale) of a security. Let N denote the number of purchases (sales), T the number of trading days, and τ represent the day of the transaction for security j. Daily returns are obtained from Datastream. The average return on the buy (sell) portfolio is calculated as:

$$R_{P,T} = \frac{\sum_{i=1}^{N} \prod_{\tau=1}^{T} (1 + R_{j_i, t_i+\tau})}{N} - 1 \qquad (1)$$

To test for misinterpretation of useful information, we examine whether the bought securities underperform the sold securities in the period subsequent to the trade. The corresponding null hypothesis predicts that the returns on the purchases equal or exceed the returns on the sales, not taking into account transaction costs. The significance test for this

analysis should take into account that the returns on the traded stocks are not necessarily independent. Indeed, herding behaviour may induce several fund managers to trade the same stocks, so the returns on these trades over the subsequent period are not independent. To address this return dependence, we apply the bootstrapping procedure suggested in Odean (1999). More specifically, by repeatedly drawing replacement securities for the traded securities and computing average returns, an empirical distribution can be constructed of the average return difference between the bought and sold securities. Since our trades have an international spread, we first need to define the set of replacement securities. Splitting our sample into three geographical subsamples (European, UK, and US funds), we construct a replacement universe for each geographical market and for each trading day. In particular, for each trading day, we select all shares (both alive and dead) that were available for the geographical market and download the corresponding return index value, market value and price-to-book ratio for these stocks. Next, we construct size deciles and price-to-book quintiles for each trading day and each geographical subsample. The bootstrapping procedure then requires drawing a security (with replacement) from the set of replacement securities of the same size decile and same price-to-book quintile as the original security on that trading day. For example, for each stock traded by a European fund, we draw a replacement security from the set of all European stocks that belongs to same size decile and same price-to-book quintile as the original stock on the day that the trade was executed. Next, holding period returns over the 84, 252, and 504 trading days subsequent to the trading date of the original stock are computed and returns are averaged over all purchased (sold) securities. Next, the average return difference between the purchased and sold securities is calculated. Repeating this procedure 1000 times, we can construct an empirical distribution from which the p value for the hypothesis test can be inferred. More specifically, the null hypothesis that purchased securities outperform (or equally perform) those they sell is rejected if the observed return difference between purchased and sold stocks is less than the α percentile in the empirical distribution.

Next, we construct calendar-time portfolios consisting of all purchase (sale) events during a portfolio formation period of 4, 12, or 24 months. More specifically, for each purchase (sale) of a security during the formation period, we assign this security to the calendar-time portfolio. If several funds buy (sell) the same security, the security accounts for more than one observation. Next, an equally-weighted portfolio return is calculated for the calendar month subsequent to the formation period. Rolling forward the formation period by 1 month, a time-series of calendar-time portfolio returns for month t+1 is obtained, for which the average return is reported in table 6.

4.2. Disposition effect

To facilitate comparison with previous work on the disposition effect and to ensure that potential divergences in results cannot be attributed to model differences, we implement the methodology of Odean (1998). As in Grinblatt and Keloharju (2004) and Odean (1998), we define capital gains and losses only for stocks that have entered the data set after the starting date in 2002. This implies that all sales must be matched with corresponding purchases. Sales for which the purchase date lies before the starting date of our data set are excluded from the analysis. In addition, split trades are aggregated, i.e. trades of the same fund in the same stock that are spread over the day, are combined to avoid double-counting of realized gains/losses.

Returns adjusted for stock splits and dividends are obtained from Datastream. On each day and for each mutual fund portfolio, we compute both realized and paper gains and losses. The former relates to the gain or loss resulting from the sale of stocks, whereas the latter indicates the hypothetical gain or loss that could have been realized if the stock had been sold instead of held. More specifically, on each day that a mutual fund performs a sell transaction, not only the realized gain/loss from this sell transaction is computed, but also the paper gain/loss resulting from the sales of the remaining stocks in the portfolio is computed (see Odean (1998)). Realized gains/losses for sold stocks are computed by comparing the intraday sell price to the average purchase price of the stock. For the remaining stocks in the mutual fund portfolio, paper results are calculated by comparing the Datastream high and low price on that day to the average purchase price.[4] If both prices exceed the average purchase price, the paper result is labelled as a paper gain, whereas if both prices are below the average purchase price, a paper loss is counted (cfr. Odean (1998)). Following among others Odean (1998) and Lim (2006), gains and losses are defined relative to the volume-weighted average purchase price (i.e. the reference point) from the buy transactions preceding the date of the sale transaction. Average purchase prices are computed using adjusted purchase prices to account for corporate actions (e.g. stock splits).[5] Adjusted prices

[4] Alternatively, paper results can be calculated by comparing the Datastream closing price to the average purchase price (see e.g. Lim (2006)). The results for both procedures are qualitatively the same.

[5] Suppose a 1:5 stock split occurred and instead of holding 100 stocks each valued $20, a fund suddenly holds 500 stocks, now worth $4 per share. Using Datastream adjustment factors we correctly revalue the purchase price. After the stock split, a sale of these stocks at $10 per share would result in a realized gain of $6 per share ($10-$4). However, if we did not take the adjustment of the purchase price into account, a realized loss of -$10 ($10-$20) would be incorrectly identified rather than a $6

are calculated using the Datastream adjustment factors on the day of the sell transaction and the days of the buy transactions.

It should be noted that the trades in our data set are not all pure buy transactions. More specifically, 'receipt free' transactions involve no cash exchange. The absence of a purchase price for these stocks implies that we cannot compute a realized gain/loss. We address this issue by considering the Datastream unadjusted closing price of the particular stock prevailing on the day of the free receipt as a proxy for the purchase price.

To test the hypothesis that mutual fund managers are reluctant to realize their losses, we calculate the ratio of realized gains and realized losses (Odean (1998)):

$$PGR = \frac{n_{realized\_gains}}{n_{realized\_gains} + n_{paper\_gains}} \tag{2}$$

$$PLR = \frac{n_{realized\_losses}}{n_{realized\_losses} + n_{paper\_losses}}, \tag{3}$$

where *PGR* and *PLR* denote the proportion of gains realized and the proportion of losses realized. In this computation, the number of paper gains (n_{paper_gains}) or paper losses (n_{paper_losses}) is aggregated cross-sectionally and over time. Likewise, $n_{realized\_gains}$ ($n_{realized\_losses}$) denotes the total number of gains (losses) realized by all the funds in our sample over the entire sample period. Under the alternative hypothesis, a negative difference is observed between the PLR and PGR ratio ($H_1 : PLR - PGR < 0$). A t-test on difference in proportions is used to evaluate the statistical significance of the results. More specifically, the t-statistic is calculated as follows:

$$t - statistic = \frac{(PLR - PGR) - 0}{\sqrt{\frac{PGR(1-PGR)}{n_{realizedgains} + n_{papergains}} + \frac{PLR(1-PLR)}{n_{realizedlosses} + n_{paperlosses}}}} \tag{4}$$

gain. Mathematically, the purchase price is brought to the same level as the intraday sell price by multiplying this price by the ratio of the adjustment factor on the purchase day to the adjustment factor on the sell day.

5. Results

5.1. Do institutional investors systematically misinterpret information?

Panel A in table 3 reports the returns over various horizons following institutional transactions. As observed for individual investors, we find that on average the returns on the buy transactions do not significantly exceed the returns on the sell transactions in the period subsequent to the trade. Moreover, institutionals appear to purchase securities that have increased more in value in the period prior to the trade than the securities they are currently invested in (see also figure 1). Panels B to D display the results for the European, UK, and US funds in our sample. A fund is classified into these geographical subsamples if more than 2/3 of its equity trades occur on the specific market. While both European and US funds appear to execute trades for which the bought securities underperform the sold securities in the 84 trading days subsequent to the trade, UK fund managers seem to possess some skill, i.e. the returns on their purchases exceed the returns on their sales in the 84 or 252 trading days subsequent to the trade.[6] However, when the holding period equals 504 days, securities sold by UK funds seem to perform better than purchased securities. The opposite holds for European and US funds. This is illustrated graphically in figures 2, 3, and 4.

Table 4 reports the results when the sample is divided into the 10% most frequent traders and the 90% least frequent traders. Intuitively, one would expect frequent traders to be more sophisticated and thus be able to correctly assess the future return of the examined securities. Ideally, the decision to sell a security and replace it by another should at least be profitable enough to cover the corresponding transaction costs. However, the results in table 4 indicate that the securities purchased by frequent traders outperform the sold securities only in the long run. Nevertheless, we find that in general the underperformance of purchased versus sold securities is larger for infrequent than for frequent traders. Surprisingly, we observe that the mutual funds that trade the least, trade securities which generate higher post-trade returns than the securities traded by frequent traders. This holds for all holding periods and for both purchases and sales.

In table 5 we distinguish trades in December from trades during the rest of the year to account for window dressing practices. Indeed, in December fund managers may be inclined to buy stocks which have recently increased in value to brighten up their portfolios. However, the results in panel A contradict this hypothesis. As panel B reveals, on average the securities purchased during the rest of the year have experienced a more significant increase in the period prior to the trade than the securities purchased in December. Furthermore, the mutual fund managers in our sample are not getting rid of 'embarrassing'

[6] Replicating the analysis with local currencies does not yield qualitatively different results.

stocks (i.e. stocks with poor prior performance) in December. In fact, the price of the securities sold in December increased more sharply in the period prior to the trade than the price of the securities sold during the rest of the year.

5.1.2 Calendar-time portfolios

Table 6 displays the results for the calendar-time portfolios for formation periods of 4, 12, or 24 months. It is clear from panel A that an equally-weighted portfolio consisting of all bought securities during the formation period does not significantly outperform a similar portfolio consisting of all securities sold during the same period. Note that securities are counted more than once if they are traded by several funds. The results in panel B, C, and D confirm that the monthly returns on the buy-portfolios of European, UK, and US funds do not outperform the sell-portfolio returns of these funds, regardless of the portfolio formation period used.[7] In fact, in most cases there is a negative return difference between the calendar-time buy and sell portfolio. These results corroborate the results from the holding period return analysis. Moreover, these results are in line with the results found for individual investors (see Odean (1999)).

Next, the relative performance of the buy versus sell portfolio is examined using a CAPM regression of the monthly return difference between the buy and sell portfolio on the market risk premia:

$$R_{Bt} - R_{St} = \alpha + \beta_{EUR}\left(R_{mt\_EUR} - R_{ft\_EUR}\right) + \beta_{UK}\left(R_{mt\_UK} - R_{ft\_UK}\right) + \beta_{US}\left(R_{mt\_US} - R_{ft\_US}\right) + \varepsilon_t \quad (5)$$

The market index for European, UK, and US funds is represented by the MSCI Europe, FTSE, and S&P500 index respectively. The US market risk premium is calculated by subtracting the monthly return on 3-month T-bills from the market index. Likewise, the European and UK market risk premia are obtained by subtracting the German interbank rate and the LIBOR from the European and UK market benchmark respectively. Table 7 shows that Jensen's alpha is not significantly different from zero for this regression for the 4 and 24-month formation period. Moreover, for the 12-month formation period the regression yields a significantly negative alpha, affirming our previous results that the calendar-time buy portfolio underperforms the sell portfolio.

[7] The results do not change qualitatively if local currencies are applied.

5.2. Are professional traders reluctant to realize their losses?

Table 8 provides an overview of how much gains and losses are realized by the equity funds in our data set.[8] In general, more gains than losses are realized, but the funds also hold relatively more paper gains than paper losses. This is revealed in the PLR and PGR ratios: funds sell more losses than gains relative to their opportunities to do so. The PLR statistically significantly exceeds the PGR ratio (revealed by the t-statistic = 30.98). This finding suggests that we cannot reject that the spread between the PLR and PGR ratio is greater than or equal to zero. In other words, the professional investors in our data set do not exhibit the disposition effect, but instead cut losses. Economically, the difference between both ratios is of little importance. Our results corroborate the results of Cici (2005), Ben-David and Doukas (2006), and Xu (2007) for U.S. institutional investors, but diverge from the results of Odean (1998) for retail investors. Barber, Lee, Liu and Odean (2007) examine the trading activity on the Taiwan Stock Exchange and find that individual investors (representing 90% of all trading volume) exhibit a disposition bias, while foreign investors and domestic mutual funds (each representing less than 5% of all trading volume) do not. Similar to our results, the mutual funds trading on the Taiwan Stock Exchange display a modest tendency to realize losses more eagerly than gains. In their analysis, the disposition spread amounts to 0.26%, which is slightly below the spread of 0.39% that we report. Overall, these findings suggest that more sophisticated investors are less prone to behavioural biases, perhaps because their trades are more motivated by incentives.

Table 9 reports the average returns corresponding to the paper results and realized results in table 8. In contrast to Odean (1998), we do not observe that the returns on realized losses are substantially better than those on paper losses. Again, this substantiates the claim that institutional investors are less reluctant to realize their losers than individual investors.

Next, we split our sample into three geographical subsamples (see table 10): the euro countries, the UK, and the US. A fund is classified into each of these groups if more than 2/3 of its trades occur on the specific market. In line with our previous results, we do not observe a disposition bias for European and U.S. mutual funds. However, a low disposition bias shows up for the funds with a majority of trades on the U.K. market. da Silva Rosa, To and Walter (2005) also find evidence of a disposition effect for UK managed funds.

[8] Results are reported only for the equity funds in our sample. Replicating the analysis for the entire sample of funds yields qualitatively the same results.

5.2.1 Choice of the reference point

Although the value function in Kahneman and Tversky's (1979) prospect theory clearly has a typical S-shape, less clarity exists on the location of the reference point. Indeed, in the identification of the disposition effect, the role of the reference point should not be understated, as noted among others by Heath, Huddart and Lang (1999). While the larger part of the extant literature on the disposition effect typically focuses on the average purchase price as reference point, few papers have tested different locations of the reference point. Odean (1998) still finds supporting evidence for the disposition effect when the reference point in his analysis shifts from the average purchase price to the highest purchase price, the first purchase price, or the most recent purchase price. However, Köszegi and Rabin (2006) argue that expectations represent a better reference point than historical purchase prices.

Given that the financial press typically reports the maximum price of a stock over the past year, investors may be inclined to use this price as a benchmark to evaluate the profitability of their trades. According to experimental evidence of Gneezy (2005), people use the historical peak as a reference level to evaluate gains and losses. In line with Ben-David and Doukas (2006), we test whether our results are influenced by the choice of the average purchase price as reference point and consider the ever-high price as an alternative. More specifically, we set the reference point equal to the maximum price[9] defined over the recent three- or six-month period, the past year or two years. Following Huddart, Lang and Yetman (2006), each evaluation period ends 20 trading days before the evaluation day, to ensure that enough observations can exceed the prior maximum. Table 11 displays the results for this sensitivity analysis. To facilitate comparison, the first column in table 11 repeats the results with the average purchase price as benchmark. Investors are neither prone to the disposition effect when gains and losses are coded relative to the highest purchase price, the first purchase price, or the most recent purchase price.

Surprisingly however, a small disposition effect shows up when prior maxima are used as reference point. Regardless of the period over which this prior maximum is computed, a significantly negative difference between the PLR and PGR ratio is observed

[9] In this procedure, the maximum is taken over a range of Datastream *adjusted* closing prices (i.e. prices are calibrated to the current stock price level). However, given that the intraday sell price on a particular trading day is *non-adjusted*, we need to bring both prices to the same level by adjusting the maximum closing price. Therefore, we divide this maximum price by the Datastream adjustment factor prevailing on the sell day for the ISIN traded, in order to bring back the maximum price to a historical value, i.e. the price level prevailing on the sell day.

when prior maxima serve as benchmark. This finding corroborates the results of Ben-David and Doukas (2006) for U.S. investors, who find evidence of a disposition effect once the ever-high price serves as the reference point. Moreover, it underlines the importance of the reference point in coding gains and losses. However, caution is recommended in assigning economic interpretations to these results: even though the difference in proportions is highly significant (due to the number of observations in the sample), the magnitude of the difference is of little economic meaning.

Assuming that institutional investors assess gains and losses in a different way than individual investors, we test a few other reference points. For example, since the compensation of professional traders is linked to their past performance and the number of assets under management, we suggest taking the last trading day of December as reference point, from which they start again with a clean slate. The last column in table 11 points out that institutional investors are not prone to the disposition bias when the last trading day of December is used as benchmark to define gains and losses.

The performance evaluation of a great deal of mutual funds is related to the performance of a benchmark index. For these funds, the performance of the benchmark index can be used as reference point to code gains and losses (see table 12). After splitting our sample into three geographical subsamples (the euro countries, the UK, and the US), we consider the S&P500 as a benchmark for US oriented funds, and the FTSE and MSCI Europe as benchmarks for the UK and the euro countries respectively. Excess returns are calculated for each sell transaction to define whether the transaction resulted in a gain or loss. To this end, we first calculate the return on the realized sell transaction (using the volume-weighted average purchase price as reference point) and next subtract the return on the benchmark from this return. The return on the benchmark index is computed using the index value on the day of the sell transaction and an average purchase price of this index. This index purchase price is determined using the weights used in the calculation of the average purchase price of the sell transaction and combining these weights with the index values prevailing on the day of the buy transactions preceding the date of the sell transaction. In line with the results reported above, we find no evidence of a disposition bias for European and U.S. mutual funds when we use a geographical benchmark as reference point. Again, our results point at a low disposition effect for U.K. oriented funds.

5.2.2 Robustness checks disposition effect

The analysis above is too short-sighted an approach to evaluate the disposition effect. In fact, the analysis heavily relies on the assumption that fund trades are independent over time and across funds. The extant literature on herding (see e.g. Nofsinger and Sias (1999); Scharfstein

and Stein (1990)) and correlation over time of fund trades (e.g. Pomorski (2006)) suggests that this independence assumption is not theoretically justified. To address this issue, we replicate the analysis at the fund level. By calculating the PLR and PGR for each fund separately, we assign an equal weight to each fund and assume independence of the ratios across funds. The first column of table 13 displays the results for this first robustness check. In contrast to our previous finding, we find that on average the funds in our sample show a little bit of disposition behaviour when all funds are equally weighted in the analysis. In economic terms, the difference is of little importance. Indeed, we find that 51.12 percent of all funds have a negative disposition spread, which indicates that the scale only slightly tilts towards disposition behaviour. Figure 5 illustrates the dispersion of the disposition spreads for the funds in our sample.

Next, we address the concern that the results from the disposition analysis are affected by the dispersion of the trades. For example, if a fund A spreads the realization of 10 losses over 10 days, whereas fund B bundles the realization of 10 losses on 1 day, the denominator in equation (3) will assign more weight to fund A than to fund B. On each day that fund A sells a losing stock, the paper losses will be counted, i.e. the paper losses of fund A are counted ten times more than the paper losses of fund B. In general, counting paper results on each day of a sell transaction will blow up the denominator tremendously, resulting in low PGR and PLR ratios. As an alternative, we calculate the PGR and PLR ratios per day across all funds and compute an average disposition spread per day, PLR-PGR. The second column in table 13 shows that when disposition spreads are calculated across funds for each day separately, no disposition effect is observed. This result is graphically illustrated in figure 6, where the distribution of the disposition spreads per day is characterized by a right-skewed distribution.

We next replicate the analysis per month for each fund and calculate an average disposition spread per month for each fund. Table 14 reports the cross-sectional means of these monthly average disposition spreads. Similar to the quarterly results of Cici (2005), the cross-sectional distribution of the average monthly disposition spreads (see figure 7) illustrates that the funds in our sample are not very heterogeneous. While the majority of professional managers does not display disposition behaviour (42.51%), 54.36 percent of the funds is susceptible to this behavioural bias (for 3.13% the disposition spread is zero). Splitting up the analysis per month, we do not find qualitatively different results.

Finally, we check whether the results depend on the trading frequency of the mutual funds in the sample. We split the sample into three groups of traders: infrequent traders, moderate traders, and frequent traders. Each group contains approximately 33% of all stock sells. Results are reported for the analysis where the reference price is the average purchase

price (see table 15). The PLR and PGR ratios in table 15 suggest that none of the three groups exhibits a disposition bias, but instead show a small tendency to realize losses rather than gains. The same conclusion holds when the highest purchase price, the first purchase price, or the most recent purchase price serves as reference point. However, we do find evidence of a disposition bias for all groups once prior maxima over the past one or two years are used as reference point. Using the historical peak level over the past three or six months shows a disposition bias for the first two groups only.

6. Concluding remarks

In this paper two behavioural biases are examined in an institutional trading context, namely overconfidence and disposition behaviour. First, we test whether mutual fund managers are overconfident and thus trade to the detriment of the fund's portfolio by incurring unnecessary transaction costs. We find that the returns on the purchased securities do not significantly outperform the returns on the sold securities. These results corroborate the findings of studies for individual investors. Apparently, institutional investors execute more trades than rationally justified. Further research should shed light on the fundamental cause of this excessive trading behaviour. Possible causes for this trading pattern are herding, window dressing, compensation scheme and rebalancing motives.

In the second part of this paper, we focus on the selling activity of the mutual funds in our sample. We document a propensity to cut losses rather than a reluctance to hold on to losing stocks, as previously documented for retail investors.

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Tables

Table 1 – Descriptive statistics of the database

# equity funds (i.e. >70% trades involve equity transactions)	519
# buy transactions	407902
# sell transactions	355981
# receipt free transactions	54849
# delivery free transactions	51628
# of unique transaction days	1214
# of unique securities traded	12688
Average # of buys per fund	785.94
Average # of sells per fund	685.90
Average # of buys per trading day	336.00
Average # of sells per trading day	293.23

Table 2 – International spread

Geographical region	Countries included	Number of trades on this market	Percentage of trades on this market
Euro countries	(Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain)	130134	14.95%
UK	UK	364630	41.89%
US	US	204330	23.48%
Pacific region	(Australia, Canada, Hong Kong, Japan, New Zealand, Singapore)	111271	12.78%
Rest of Europe	(Denmark, Euromarket, Norway, Sweden, Switzerland)	39257	4.51%
Emerging markets	(Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Jordan, Malaysia, Mexico, Morocco, Pakistan, Peru, Phillipines, Poland, Republic of Korea, Russia, South Africa, Taiwan, Thailand, Turkey)	20738	2.38%

Table 3- Average holding period returns in the trading days prior and subsequent to purchases and sales

Table 3 reports average returns over the 84, 252, and 504 trading days prior and subsequent to a purchase or sale. Returns are obtained from Datastream. Local currencies are converted into euro.

Panel A: all transactions

		HPR return over t trading days before transaction			HPR return over t trading days after transaction		
	observations	t = 84	t = 252	t = 504	t = 84	t = 252	t = 504
Purchases	407902	8.67%	24.84%	59.09%	6.46%	18.62%	40.81%
Sales	355981	6.55%	20.84%	56.22%	6.98%	19.32%	42.04%
Difference	51921	2.12%	3.99%	2.87%	-0.53%	-0.70%	-1.22%

Panel B: European subsample

		HPR return over t trading days before transaction			HPR return over t trading days after transaction		
	observations	t = 84	t = 252	t = 504	t = 84	t = 252	t = 504
Purchases	30753	7.17%	23.72%	61.21%	8.15%	24.66%	51.74%
Sales	28796	7.48%	21.96%	67.58%	8.87%	24.79%	51.69%
Difference	1957	-0.31%	1.76%	-6.38%	-0.72%	-0.13%	0.05%

Panel C: UK subsample

		HPR return over t trading days before transaction			HPR return over t trading days after transaction		
	observations	t = 84	t = 252	t = 504	t = 84	t = 252	t = 504
Purchases	145342	8.34%	23.43%	54.19%	8.54%	22.15%	46.33%
Sales	122549	9.96%	23.47%	54.87%	7.68%	20.89%	46.75%
Difference	22793	-1.62%	-0.04%	-0.68%	0.86%	1.25%	-0.42%

Panel D: US subsample

		HPR return over t trading days before transaction			HPR return over t trading days after transaction		
	observations	t = 84	t = 252	t = 504	t = 84	t = 252	t = 504
Purchases	56007	4.96%	18.00%	45.43%	3.62%	11.06%	25.75%
Sales	38734	3.46%	14.58%	45.95%	4.39%	11.04%	24.22%
Difference	17273	1.50%	3.41%	-0.52%	-0.77%	0.02%	1.52%

Table 4- Average holding period returns in the trading days prior and subsequent to purchases and sales: frequent versus infrequent traders

Table 4 reports average returns over the subsequent 84, 252, and 504 trading days following a purchase or sale by the most and least frequent traders in our sample.

Panel A: 10% most frequent traders

		HPR return over t trading days before transaction			HPR return over t trading days after transaction		
	observations	t = 84	t = 252	t = 504	t = 84	t = 252	t = 504
Purchases	205077	8.07%	24.84%	57.69%	5.97%	17.72%	39.94%
Sales	176404	6.08%	20.15%	54.75%	6.81%	17.79%	39.85%
Difference	28673	1.99%	4.68%	2.94%	-0.84%	-0.07%	0.09%

Panel B: 90% least frequent traders

		HPR return over t trading days before transaction			HPR return over t trading days after transaction		
	observations	t = 84	t = 252	t = 504	t = 84	t = 252	t = 504
Purchases	202825	9.30%	24.83%	60.60%	6.97%	19.56%	41.68%
Sales	179577	7.04%	21.55%	57.75%	7.16%	20.74%	43.97%
Difference	23248	2.27%	3.28%	2.84%	-0.19%	-1.18%	-2.28%

Table 5- Average holding period returns in the trading days prior and subsequent to purchases and sales: December versus non-December trades

Panel A in Table 5 reports average returns over the subsequent 84, 252, and 504 trading days following a purchase or sale in December. Panel B displays the returns for trades executed during the rest of the year. Returns are obtained from Datastream.

Panel A: December trades

		HPR return over t trading days before transaction			HPR return over t trading days after transaction		
	observations	t = 84	t = 252	t = 504	t = 84	t = 252	t = 504
Purchases	30902	9.79%	24.64%	51.35%	8.76%	17.30%	41.14%
Sales	23850	9.50%	25.12%	55.42%	9.20%	18.33%	43.51%
Difference	7052	0.30%	-0.48%	-4.07%	-0.43%	-1.03%	-2.37%

Panel B: Non-December trades

		HPR return over t trading days before transaction			HPR return over t trading days after transaction		
	observations	t = 84	t = 252	t = 504	t = 84	t = 252	t = 504
Purchases	377000	8.58%	24.85%	59.82%	6.31%	18.74%	40.79%
Sales	332131	6.34%	20.53%	56.29%	6.87%	19.39%	41.94%
Difference	44869	2.24%	4.32%	3.53%	-0.56%	-0.65%	-1.15%

Table 6- Calendar-time portfolio returns

Table 6 reports the average returns on the calendar-time portfolios using formation periods of 4, 12, or 24 months. For each purchase (sale) of a security during the formation period, a position is taken in the calendar-time portfolio. If several funds buy (sell) the same security, the security accounts for more than one observation. Equally-weighted portfolio returns are calculated for the calendar month subsequent to the formation period. Rolling forward the formation period by 1 month, a time-series of calendar-time portfolio returns for month t+1 is obtained. Returns are obtained from Datastream. Local currencies are converted into euro.

Formation period	4 months	12 months	24 months
Panel A: all transactions			
Average return buy-portfolio	0.91%	1.38%	0.85%
Average return sell-portfolio	1.13%	1.47%	0.89%
Difference buy-sell portfolio	-0.22%	-0.09%	-0.04%
P-values	0.78	0.88	0.95
Panel B: European subsample			
Average return buy-portfolio	1.21%	1.36%	1.54%
Average return sell-portfolio	1.27%	1.33%	1.53%
Difference buy-sell portfolio	-0.06%	0.03%	0.01%
P-values	0.94	0.96	0.98
Panel C: UK subsample			
Average return buy-portfolio	1.21%	1.17%	1.11%
Average return sell-portfolio	1.16%	1.18%	1.12%
Difference buy-sell portfolio	0.05%	-0.01%	-0.02%
P-values	0.96	0.79	0.96
Panel D: US subsample			
Average return buy-portfolio	0.71%	0.36%	0.70%
Average return sell-portfolio	0.82%	0.38%	0.72%
Difference buy-sell portfolio	-0.11%	-0.02%	-0.02%
P-values	0.91	0.58	0.87

Table 7- Calendar-time portfolio returns: CAPM regressions

Table 7 reports Jensen's alpha and the market beta for the calendar-time portfolios using formation periods of 4, 12, or 24 months. Both coefficients are estimated from a CAPM regression of the monthly return difference between the buy- and sell-portfolio on the market risk premia, $R_{Bt} - R_{St} = \alpha + \beta_{EUR}\left(R_{mt\_EUR} - R_{ft\_EUR}\right) + \beta_{UK}\left(R_{mt\_UK} - R_{ft\_UK}\right) + \beta_{US}\left(R_{mt\_US} - R_{ft\_US}\right) + \varepsilon_t$. The market index for European, UK, and US funds is represented by the MSCI Europe, FTSE, and S&P500 index respectively. The US market risk premium is calculated by subtracting the monthly return on 3-month T-bills from the US market index. Likewise, the European and UK market risk premia are obtained by subtracting the German interbank rate and the LIBOR from the European and UK market benchmark respectively.

Formation period	4 months	12 months	24 months
Jensen's alpha	-0.001	-0.001	0.000
t-statistic	-0.728	-2.114	-1.070
beta Europe	-0.035	-0.049	-0.025
t-statistic	-0.415	-2.023	-0.907
beta UK	0.012	0.038	-0.004
t-statistic	0.141	1.494	-0.153
beta US	-0.125	0.016	0.041
t-statistic	-1.898	0.908	2.871

Table 8- PGR and PLR for the equity funds in the data set

Table 8 reports the number of realized gains, paper gains, realized losses and paper losses for the trades executed by the equity oriented funds (i.e. more than 70% equity trades) in our sample over the period August 2002 – April 2007. Gains and losses are defined relative to the average purchase price (i.e. a volume-weighted average of the buy prices preceding the acquisition of the stock). Aggregating paper and realized results cross-sectionally over the equity funds and over time, we calculate the proportion of losses realized (PLR) as the ratio of the realized losses to the sum of the realized losses and paper losses. Analogously, the proportion of gains realized is calculated as the ratio of the realized gains to the sum of the realized gains and paper gains. Under the null, there is no difference between both the PLR and PGR ratio.

	Equity funds (519 funds)
Realized gains	171745
Paper gains	6460333
Realized losses	70792
Paper losses	2303791
PLR	0.0298
PGR	0.0259
Difference in Proportions	0.0039
t-statistic	30.98

Table 9 – Average realized returns

Table 9 displays the average and median returns resulting from the realized gains, paper gains, realized losses, and paper losses reported in table 8. Gains and losses are defined relative to the average purchase price (i.e. a volume-weighted average of the buy prices preceding the acquisition of the stock).

	Average return	Median return
Return on realized gains	0.2758	0.1752
Return on paper gains	0.2793	0.1748
Return on realized losses	-0.1116	-0.0748
Return on paper losses	-0.1221	-0.0788

Table 10- PGR and PLR for geographical subsamples

Table 10 reports the number of realized gains, paper gains, realized losses and paper losses for the trades executed by the equity oriented funds (i.e. more than 70% equity trades) in our sample over the period August 2002 – April 2007. Gains and losses are defined relative to the average purchase price (i.e. a volume-weighted average of the buy prices preceding the acquisition of the stock). We aggregate paper and realized results over time and according to each fund's geographical orientation (Euro countries, UK, US). Next, we calculate the proportion of losses realized (PLR) as the ratio of the realized losses to the sum of the realized losses and paper losses. Analogously, the proportion of gains realized is calculated as the ratio of the realized gains to the sum of the realized gains and paper gains. Under the null, there is no difference between both the PLR and PGR ratio.

	Euro countries	UK	US
Realized gains	16742	56456	17900
Paper gains	456200	1804950	842710
Realized losses	4487	17643	10022
Paper losses	93413	647089	374269
PLR	0.0458	0.0265	0.0261
PGR	0.0354	0.0303	0.0208
Difference in Proportions	0.0104	-0.0038	0.0053
t-statistic	14.48	-16.20	17.62

Table 11 - PGR and PLR for different reference points (equity funds)

Table 11 reports the number of realized gains, paper gains, realized losses and paper losses for the trades executed by the equity oriented funds (i.e. more than 70% equity trades) in our sample over the period August 2002 – April 2007. Gains and losses are defined relative to various reference points, namely the average purchase price (i.e. a volume-weighted average of the buy prices preceding the acquisition of the stock), the highest purchase price, the first purchase price, the most recent purchase price, prior maxima (3 months, 6 months, 1 year, 2 years), and the last trading day of December. Aggregating paper and realized results cross-sectionally over equity funds and over time, we calculate the proportion of losses realized (PLR) as the ratio of the realized losses to the sum of the realized losses and paper losses. Analogously, the proportion of gains realized is calculated as the ratio of the realized gains to the sum of the realized gains and paper gains. Under the null, there is no difference between both the PLR and PGR ratio.

	Average purchase price	Highest purchase price	First purchase price	Most recent purchase price	Prior maximum (3 months)	Prior maximum (6 months)	Prior maximum (1 year)	Prior maximum (2 years)	Last trading day of December
Realized gains	171745	127276	165374	167350	77592	64977	54403	42745	175257
Paper gains	6460333	4820776	6178900	6307068	2390291	1948219	1648283	1379944	6010470
Realized losses	70792	115193	77096	75133	193466	206083	210970	179707	89486
Paper losses	2303791	3736710	2504655	2430009	6122372	6685715	7045469	6600523	2607039
PLR	0.0298	0.0299	0.0299	0.0300	0.0306	0.0299	0.0291	0.0265	0.0332
PGR	0.0259	0.0257	0.0261	0.0258	0.0314	0.0323	0.0320	0.0300	0.0283
Difference in Proportions	0.0039	0.0042	0.0038	0.0041	-0.0008	-0.0024	-0.0029	-0.0035	0.0049
t-statistic	30.98	37.27	30.76	33.28	-6.20	-16.90	-19.38	-22.72	37.96

Table 12 - PGR and PLR for different reference points: geographical benchmarks

Table 12 reports the number of realized gains, paper gains, realized losses and paper losses for the trades executed by the mutual funds in our sample over the period August 2002 – April 2007. Gains and losses are defined relative to a geographical benchmark index. We aggregate paper and realized results over time and according to each fund's geographical orientation (Euro countries, UK, US). Next, we calculate the proportion of losses realized (PLR) as the ratio of the realized losses to the sum of the realized losses and paper losses. Analogously, the proportion of gains realized is calculated as the ratio of the realized gains to the sum of the realized gains and paper gains. Under the null, there is no difference between both the PLR and PGR ratio.

	Euro countries	UK	US
Benchmark index	MSCI Europe	FTSE	S&P500
Realized gains	13756	37965	13105
Paper gains	387416	1278983	666727
Realized losses	7473	36157	14817
Paper losses	204998	1366843	667525
PLR	0.0352	0.0258	0.0217
PGR	0.0343	0.0288	0.0193
Difference in Proportions	0.0009	-0.0031	0.0024
t-statistic	1.79	-15.45	10.04

Table 13- PGR and PLR per fund and per day

Table 13 reports the number of realized gains, paper gains, realized losses and paper losses for the trades executed by the equity oriented funds (i.e. more than 70% equity trades) in our sample over the period August 2002 – April 2007. Gains and losses are defined relative to the average purchase price (i.e. a volume-weighted average of the buy prices preceding the acquisition of the stock). In the first column, average PLR and PGR ratios are computed for each fund and averaged to compute an average disposition spread per fund. Column 2 reports the results for the analysis where the PLR and PGR ratios are computed across funds for each selling day separately and subsequently averaged.

	Analysis per fund	Analysis per day
Average realized gains	425.38	149.60
Average paper gains	17188.37	6035.98
Average realized losses	175.47	61.67
Average paper losses	6544.07	2298.18
Average PLR	0.0778	0.0272
Average PGR	0.0836	0.0256
Average disposition spread	-0.0058	0.0016

Table 14- Average monthly disposition spread per fund

Table 14 reports the average monthly PLR and PGR ratios and average monthly disposition spread per fund. The PLR and PGR ratios are calculated each month for every fund and time-series means are calculated to find the average monthly disposition spread for each fund. Cross-sectional means of these average monthly disposition spreads and PLR and PGR ratios are reported.

	PLR	PGR	PLR – PGR	% funds with average monthly disposition spread < 0
All months	0.0732	0.0962	-0.0214	54.36%
January	0.0474	0.0604	-0.0170	63.66%
February	0.0453	0.0592	-0.0202	62.64%
March	0.0569	0.0522	-0.0120	57.56%
April	0.0441	0.0621	-0.0194	59.34%
May	0.0463	0.0669	-0.0253	62.54%
June	0.0412	0.0512	-0.0100	55.52%
July	0.0487	0.0593	-0.0111	58.65%
August	0.0532	0.0497	-0.0082	57.01%
September	0.0508	0.0616	-0.0173	53.85%
October	0.0642	0.0626	-0.0178	53.47%
November	0.0455	0.0577	-0.0166	53.13%
December	0.0443	0.0520	-0.0170	56.46%

Table 15 - PGR and PLR for frequent and infrequent traders (equity funds)

Table 15 reports the number of realized gains, paper gains, realized losses and paper losses for the trades executed by the equity oriented funds (i.e. more than 70% equity trades) in our sample over the period August 2002 – April 2007. We split the sample into three groups according to the trading frequency of the funds in the sample. Gains and losses are defined relative to the average purchase price. (i.e. a volume-weighted average of the buy prices preceding the acquisition of the stock). Aggregating paper and realized results over time and separately for each group, we calculate the proportion of losses realized (PLR) as the ratio of the realized losses to the sum of the realized losses and paper losses. Analogously, the proportion of gains realized is calculated as the ratio of the realized gains to the sum of the realized gains and paper gains. Under the null, there is no difference between both the PLR and PGR ratio. We assume independent observations.

	Group 1: infrequent traders	Group 2: moderate traders	Group 3: frequent traders
Number of funds in this group	424	72	23
Percentage of sells	31.62%	33.59%	34.79%
Cumulative percentage	31.62%	65.21%	100.00%
Average # of trades	180.88	1131.63	3668.13
Realized gains	54978	58261	58506
Paper gains	1788614	2305084	2366635
Realized losses	21715	23216	25861
Paper losses	599987	774719	929085
PLR	0.0349	0.0291	0.0271
PGR	0.0298	0.0247	0.0241
PLR - PGR	0.0051	0.0044	0.0030
t-statistic	19.32	20.81	15.31

Figures

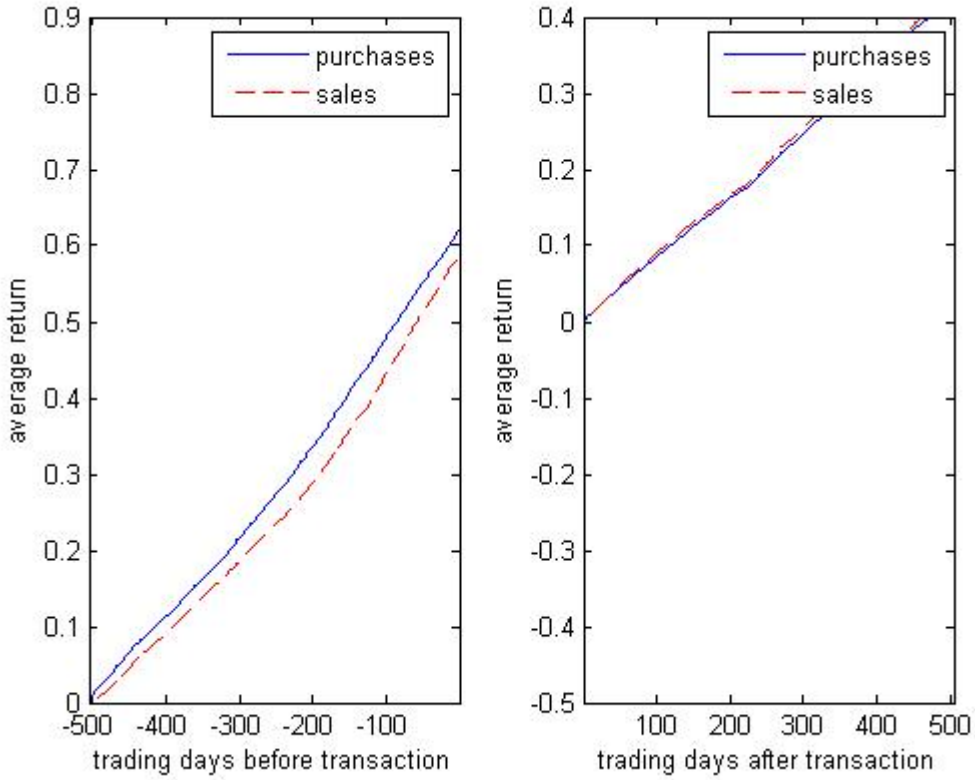

Figure 1 – Average holding period returns in the trading days prior and subsequent to a purchase or sale (total sample)

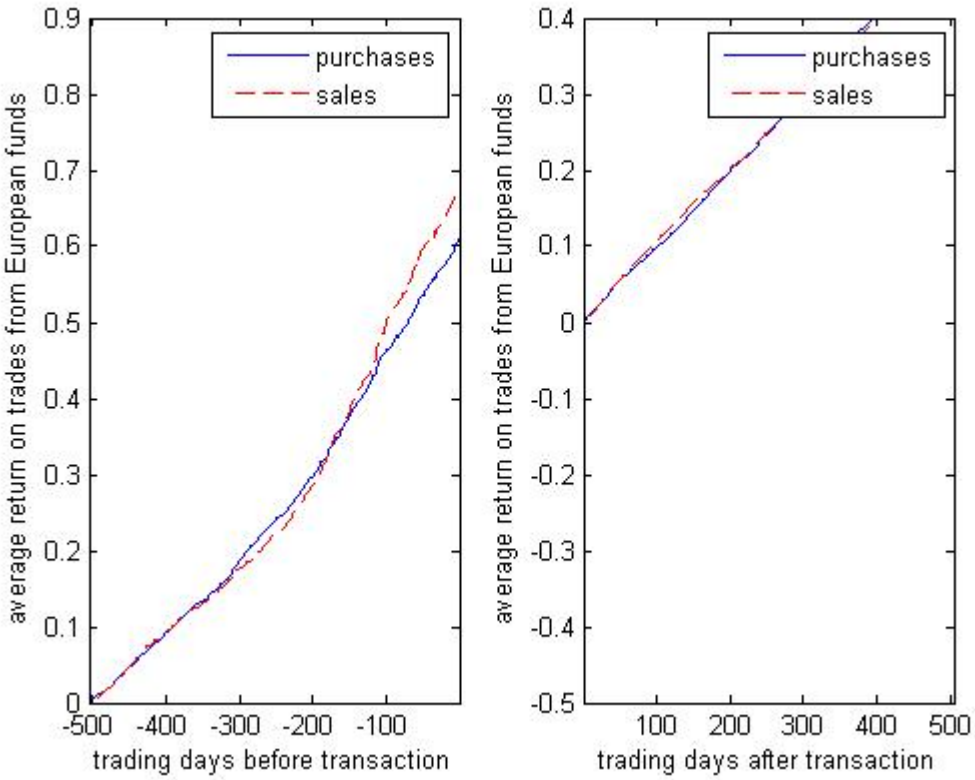

Figure 2 – Average holding period returns in the trading days prior and subsequent to a purchase or sale: European funds

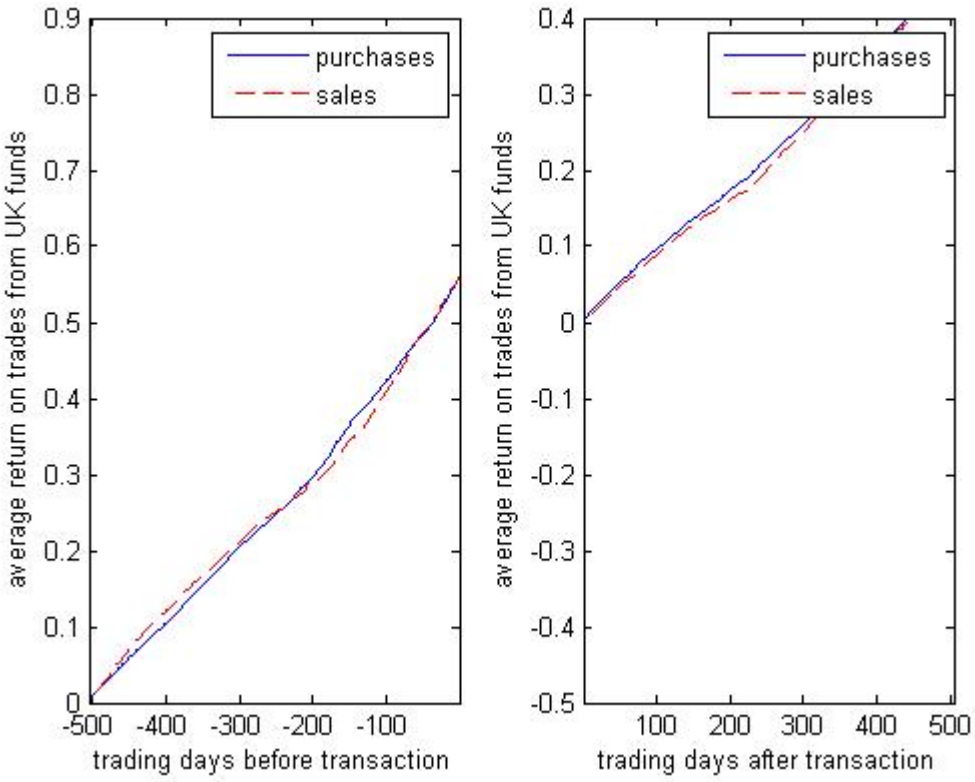

Figure 3 – Average holding period returns in the trading days prior and subsequent to a purchase or sale: UK funds

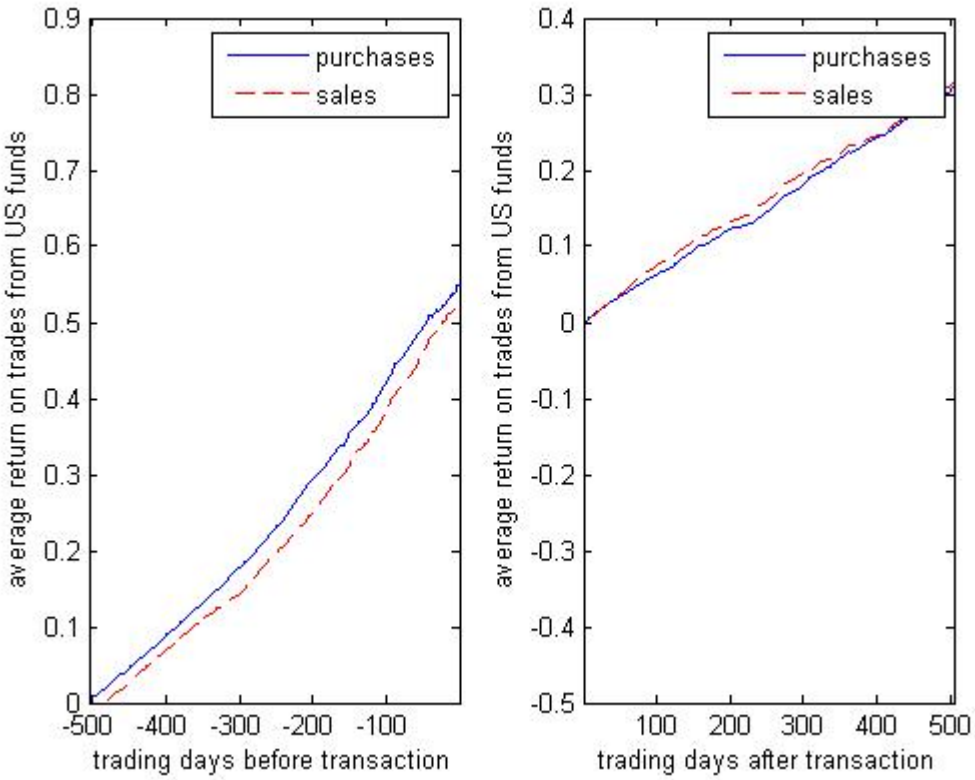

Figure 4 – Average holding period returns in the trading days prior and subsequent to a purchase or sale: US funds

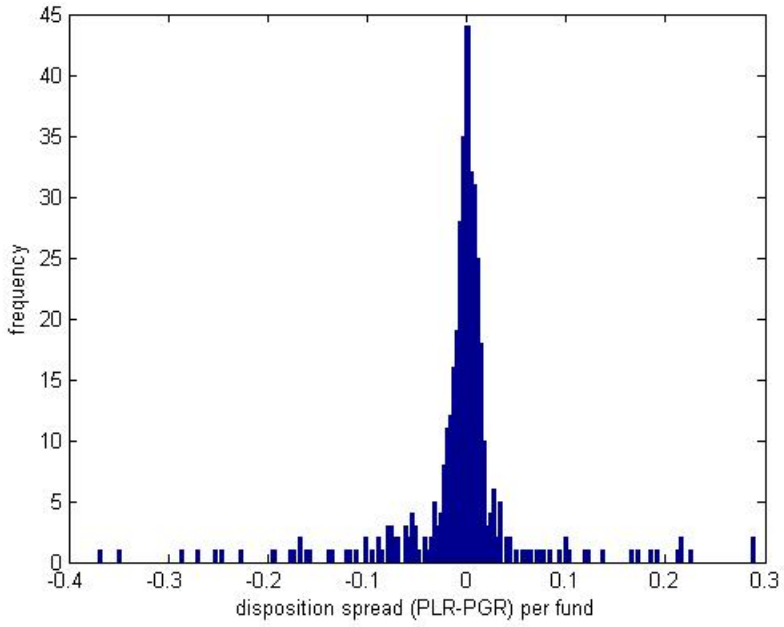

Figure 5 – Distribution of disposition spreads per fund

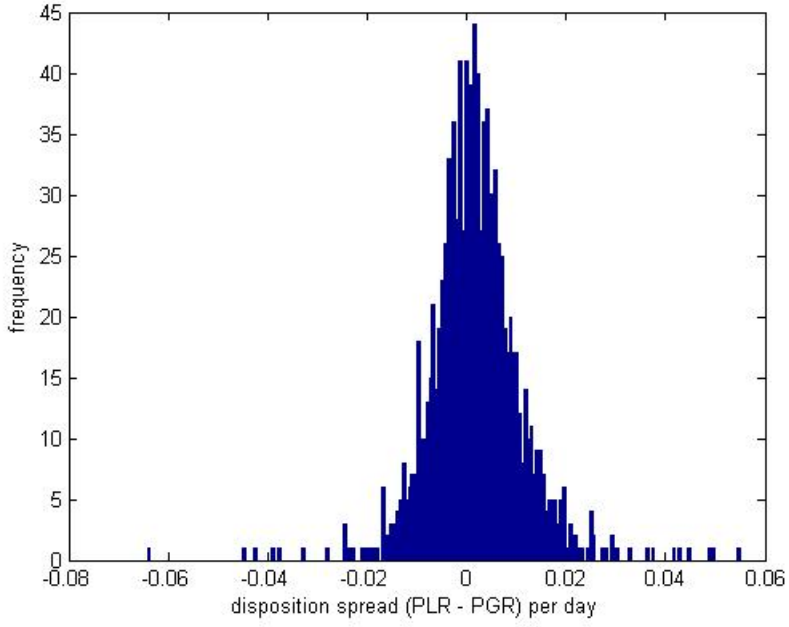

Figure 6 – Distribution of disposition spreads per day

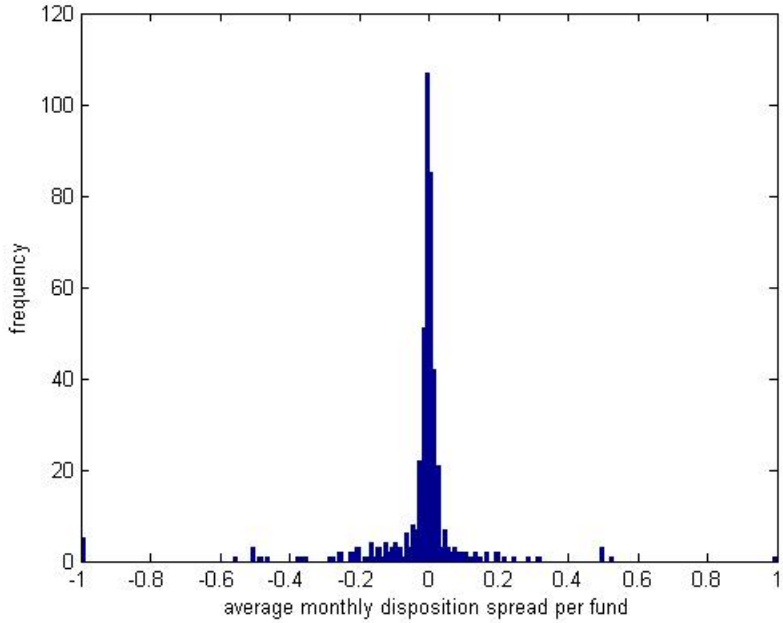

Figure 7 – Distribution of average monthly disposition spreads