Do Investment Flows Drive the Disposition Effect on Fund Managers?

Hsin-Yi Huang
Institute of International Business
National Cheng Kung University
Tainan, TAIWAN

Min-Hsien Chiang
Institute of International Business
National Cheng Kung University
Tainan, TAIWAN

Hsin-Yi Huang
Institute of International Business
National Cheng Kung University
1 University Rd.
Tainan, TAIWAN
Email: r6894102@mail.ncku.edu.tw

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Abstract

This paper analyzes the relationship between fund flow and fund managers' trading behavior with regard to the disposition effect (DE), which is as the tendency of fund managers cash more winner stocks of portfolio holdings rather than losers. The evidence shows that DE exists among professional fund managers and the effect is linearly and negatively correlated with the magnitude of fund flow. We find that the trading behavior is sensitive to unexpected outflow, which leads to a higher DE and underreaction to news. Moreover, fund managers with a DE trading bias would incur greater losses when there is fund outflow.

Keywords: Disposition effect, fund flow, behavioral finance, fund performance

1 Introduction

The existing literature on fund flow mostly considers the relationship between changes in fund flow and fund performance. It has been found that greater fund performance induces increased fund inflow, with investors chasing smart money. In contrast, bad performing funds suffer from outflows, leading to a lack of assets or even liquidation, therefore putting downward pressure on the fund price. Therefore, fund flows influence the decisions of market investment and asset allocation for fund managers.

This paper investigates whether fund flow induces the disposition effect and how fund performance is related to this anomalous trading behavior along with flow pressures. Coval and Stafford (2007) showed that fund flow pressure can force managers' buying and selling behavior and amplify post price drift in equity markets, with outflow causing instant pressure to sell holdings and inflow bringing instant purchases. However, the details of how fund managers deal with winning or losing holdings under conditions of flow pressure still requires further study.

The question of whether to sell winning or loser holdings when there is flow pressure is an important one for fund managers. Highly volatile flow can cause significant damage to a fund's finances, with an extreme example being Long-Term Capital Management Company (LTCM), which collapsed after being was forced to sell winning and high liquidity stocks in order to meet redemption demand. The phenomena of selling winners and riding losers, the so called disposition effect, was introduced by Shefrin and Statman (1985) with regard to security trading, and was applied in the analysis for a great number of individual accounts by Odean (1998). The evidence shows that investors are risk taking when they have profits and risk averse when they have losses. However, the trading behavior of fund managers may be influenced by the investment activities of individual investors or market sentiment. To test the fund flow pressure, we categorize the flow shocks as inflow and outflow to study the influence of flow pressure on fund manager, and whether disposition effect relies on the extent of flow.

In addition, we argue that the regular investment of fund manager is based on rational expectation of fund flow, which is fund manager predict fund flow by considering past returns and past fund flow. Conversely, the unexpected flow, as an exogenous factor, may result in a shock on investment decisions of fund managers. To test the hypothesis of whether or not flow shocks impact the holding behavior and asset allocation of mutual fund managers, we study the reaction of investors to unexpected flows information by controlling the effect of predictable flow. The examination of the impact of flow on fund managers' trading behavior allows us to depict the asset allocation in a portfolio, and to predict how managers choose to reallocate their resources when faced with price pressure.

To answer these questions, we use twelve years of data on equity mutual funds in the United State during the period of 1995 to 2006 in order to analyze the allocation of resources to winners and losers under fund flow pressure. The sample period includes a complete business cycle and the stock holding details. Moreover, we further control some vital factors with regard to the disposition effect in the regression analysis, such as tax-sensitive selling overhang[1], fund returns, asset value, and fund characteristics, in order to offer a plausible explanation for the trading bias.

We find strong evidence that fund managers show a disposition effect, especially when there is outflow, when they tend to cash winning positions to meet the redemption pressure from investors. In addition, even though a selling requirement is rare when there is capital inflow, the disposition effect still exists, with a value of 2.2%, which is 1.2% lower than when there is capital outflow. In addition, comparing the high inflow and high outflow deciles, outflow with a larger DE has lower fund returns.

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[1] The measurement of capital gains overhang is wildly applied by Frazzini (2006) and Strobl (2006) for investigation on under reaction to news.

In our analysis of the determinants of DE, we use the regression model presented in Fama and MacBeth (1973) with adjustment of residual autocorrelation. The results show that concurrent and lagged flow ratios negatively correlate with DE, which indicates that the behavioral bias consistently destabilizes the trading strategy when there is outflow. In addition, the results of the regression analysis show that rear-load fee is negatively correlated with DE. Strict redemption policy would reduce flow shock impacts and thus increase fund performance.

The rest of this paper is organized as follows. In Section 2, we provide a review of the theoretical literature and the existing empirical evidence of how flow impacts fund manager behavior. In Section 3 we describe the data set and the method of variable measurement, while Section 4 discusses how fund flow relates to the behavioral bias of disposition. Finally, Section 5 concludes the paper with some implications for practitioners and directions for future research.

2 Theoretical foundation and the related literature

2.1 The impact of fund flow on trading behavior

How fund flow generates institutional trading has been well documented in the literature. Keim (1999) and Edelen (1999) found that flow enforces the adjustment of portfolio holdings to the benchmark. In addition, the phenomena of chasing hot money has also been shown to exist for profession managers, and Wermers (1999) posits that such herding behavior is a trading strategy of fund managers responding to fund flow. He found that this behavior is most common in growth oriented mutual funds, in which the fund manager can undertake positive-feedback trading to make higher profits than with negative feedback trading.

In addition, the deviations in fund investment may be accounted for by the positive relationship between flow and fund performance. Wermers (2003) posited that investors are performance chasers, and therefore winning funds have higher inflows and their managers will invest more money in momentum stocks, thus pushing up stock prices. Edelen and Warner (2001) presented evidence for the price pressure caused by fund flow, and also demonstrated that price impact is accounted for by the feedback trading of fund flow and return, and the information shock responses on flow and returns. Their results for investors of performance chasing, or following smart money, are consistent with results by Grinblatt and Titman (1989, Grinblatt and Titman (1993), Gruber (1996), and Zheng (1999). No matter whether investors chase smart or dumb money, the fund flow is highly sensitive to past performance, which is an important factor to consider in flow prediction.

Meanwhile, Frazzini and Lamont (2008) found that investment flow contributes to market sentiment. Individuals tend to chase money from funds with low recent returns to funds with high recent returns. Such fund investors are dumb in the sense that their reallocations reduce their wealth in the long run. A plausible explanation of why investors chase actively managed funds even though those funds have lower adjusted returns than index has been given by Gruber (1996), who argues that the ability of fund managers is not yet been priced and investors would thus pay more for the open-end mutual fund. He also found that superior management could be predicted by perceiving the changes of fund flows, although, there is no profit guarantee for sequential inflows.

Some evidence also shows that investment flow has a negative influence on fund performance. Friesen and Sapp (2007) examined the timing ability of fund investor by using cash flow measurement, and found that poor timing largely offsets the risk-adjusted alpha gains from good-performing funds. Nanda et al. (2000) argued that the liquidity needs of fund investors reduce the management abilities of funds. Coval and Stafford (2007) used mutual fund data to study how the flow pressure from extreme flow influences manager trading strategy, and they found that if there is alack of corresponding demand for such stocks, the funds still suffer from fire-sale losses and the counter trading party is likely to have positive post-fire-sale abnormal returns. Therefore, the authors suggested that one way to avoid the negative influence of flow on trading is for funds with higher performance to impose a costly exit fee structure or to spend more on marketing to prevent investors from withdrawing their capital. Their results is consistent with Greene et al. (2007), who found that even a redemption fee has no significant adverse impact on fund returns, it can be used to efficiently control the volatility of fund flow. These evidences show that the behavioral bias of stock investment seems pronounced under outflow condition, and there is asymmetric effect on asset allocation and trading behavior of fund manager for inflow and outflow fund portfolio.

2.2 Disposition effect and under reaction to news

Several explanations for the trading biases associated with the disposition effect have been documented, with one attributing them to the psychology level (the mental account) of investors toward the profit and loss of holding positions, and another highlighting the importance of tax considerations in investors' decisions to delay selling losers. With regard to tax-sensitive selling, large capital gains discourage selling and large losses encourage it. Grinblatt and Keloharju (2001) used logit regressions to separately analyze the sell versus hold decision and the sell versus buy decision, and found that investors are reluctant to realize losses, that they engage in tax-loss selling practices, and that past returns and historical price patterns affect trading. Bergstresser and Poterba (2002) also found that after-tax returns have more explanatory power than pretax returns in explaining inflows. In addition, D'Mello et al. (2003) reported that there is asymmetrical selling pressure for capital gain and loss stocks, with investors tending to sell capital gain stocks prior to the year-end month and delay selling winners until a new year. This result is consistent with the tax-loss selling hypothesis. Frazzini (2006) showed that investors acting with a disposition effect are prone to under react to news, which slows down information transfers and then leads to a drift in post prices. Strobl (2006) also put forward a similar idea, constructing a theory model and finding that informed investors, e.g. institutional investors, sell stocks with profits and hold those with losses when information is released. However, the literature also shows that this under reaction to news by professional institutional investor exerts price pressure on post stock price. With regard to information transformation, Hong and Stein (1999), and Hong et al. (2000) posited that information diffuses gradually, leading to positive returns autocorrelation. Hereof, momentum trader, as a counter party, takes profit from underreact investors. Therefore, they noted that larger firm size and higher analyst coverage could increase information flow and reduce the momentum profit. In contrast, Cohen et al. (2002) found that even though institutional investors are well-informed, their trading activities are too conservative and limited to take advantage of the under reaction of individuals. They suggested that plausible reasons for this are the constraints of such investors' trading strategies or the possibility of heterogeneity of investors in the equity market.

Coval and Stafford (2007) modeled a selling pressure index to examine stock transaction behavior under extreme flows, and found that fire sale pressure emerges in financial and economic crises and pushes market prices away from their fundamental value. Therefore, capital inflows increase the cost of purchased stocks and outflows dampen the selling profit.

In our analyses, we study the effect of capital inflow and outflow on trading behavior of fund managers. We conjecture that inflow and outflow have asymmetric pressure effects on fund managers, in that they tend to hold losers and cash winning shares under extreme outflow pressure, and this paper's first hypothesis as stated as follows:

Hypothesis 1: Fund with capital outflows has a higher disposition effect than those with new money inflows.

2.3 Fund performance

To answer the question of how fund flow influences fund performance, Odean (1998) used the individual investor accounts to measure the ratio of realized winners to losers. The evidence shows that the disposition effect is neither due to portfolio allocation, nor to good performance. However, investor's underreaction driven by the disposition effect may be accounted by momentum trading behavior. Jegadeesh and Titman (1993) found that in the short run, past winners profit more than losers, but the performance of winners is worse than the losers in the long run. The good performance of relatively strong portfolios is not permanent, and thus there is a short term overreaction. Such asset pricing anomalies are further explained by Grinblatt and Han (2005), who showed that capital gains overhang (unrealized profit) is a significant factor in explaining the cross-section profit differences between winners and losers than an examination of past returns is. Thus, fund managers operating with the disposition effect are more likely to under react to news, and, thus, have achieve lower profits less profit in the short run since they sell winners too soon to cause long-run positive price drift. Consequently, the second hypothesis is presented as follows.

Hypothesis 2: Fund managers with higher disposition effect have lower fund performance.

In addition, we also investigate how the unexpected shocks of flow have an impact on DE. If real flow is far from the expected flow, assuming that the expected flow is a function of past fund performance, then unexpected flow shocks, such as significant as news events influence the psychology of investors. Consequently, under reaction to flow may lead to post price drift. Edelen and Warner (2001) studied the flow-return relationship on daily-flow basis, and found that stock return depends on the unexpected component of flow rather than expected part. Higher concurrent unexpected flow results in greater price pressure. By combining these two findings on the influence of unexpected flow and the disposition effect, the third hypothesis is as follows:

Hypothesis 3: The higher the unexpected outflow, the greater the disposition effect and post price drift.

2.4 The fund characteristics

Whether or not flow pressure causes the disposition effect maybe due to the characteristics of the fund in questions. Since this paper focuses on the relationship between flow pressure and disposition effect, we need to keep other factors unchanged, such as fund characteristics, policy, and fee structure, as these variables may influence the fund flows, and they are chosen due to their importance in the related literature. Friesen and Sapp (2007) found that the fund performance gap of timing ability positively correlates with fund size, while the relationship is not significant for small funds with relatively small managed assets. Wermers (2000) concluded that active funds with higher stock picking ability and higher turnover rate outperform than passive index funds. Greene and Hodges (2002) found that daily fund flows appear larger in front-end load funds than in no-load ones. Coval and Stafford (2007) mentioned that large investors have the ability to liquidate large positions in an orderly way. Finally, Frino et al. (2004) found that the disposition effect exists among on-floor professional futures traders. Therefore, the control variables in this work are the end-of quarter data of total net assets and net asset value to proxy fund size; front-end load fee and rear-load ree represent fee structure, and are used for fund investment and redemption, respectively. Fund expenses ratio is the ratio of investment payments to operating expenses.

Turnover is the ratio of minimum of aggregated sales or aggregated purchases of securities divided by the average 12-month Total Net Assets of the fund.

3 Data and Methodology

3.1 Data sources and sample statistics

We examine the relationship between the disposition effect and fund flow during the period of Jan 1995 to Dec 2006. We collect fund flow and fund characteristics, such as turnover ratio, fund size, front-end load, and fund type, from the CRSP mutual fund database[2], and all data contain end-of-month information.[3] We matched our fund sample with the MorningStar database[4] by fund ticker and names to obtained monthly holding information of the fund portfolios. Since the regulations require the funds to report at least every half year, the holding data includes monthly, quarterly, and semi-year reports. Fifty percent of the fund portfolios have report once every two months, and 85% report quarterly. We evaluate the holding data to calculate the cost of holding shares each month. The cost of shares purchased, derived from the increase in shares held since the last period, is evaluated from the corresponding end-of-month stock prices. Stock prices and information on splits are obtained from the CRSP stock database and adjusted for the holding shares. We select equity funds and exclude portfolios categorized as bond, convertible, government, preferred, index, and REIT from our analysis. The final sample consists of 8,357 funds in the period studied.

[2] The CRSP mutual fund database only contains data for the period from year 2003 to 2007, and therefore, we collect fund holding data from the MorningStar database. The stock holdings are reported on the basis of a fund portfolio, and the portfolio may be held by one or many classes of funds.

[3] Jin and Scherbina (2005) and Chevalier and Ellison (1997) use MorningStar database to study the behavior of fund managers.

[4] Comparing the CRSP and Morningstar mutual funds, Elton et al. (1996) found that the latter's overall performance measures are inflated by between 0.4% to 1%, and the survivorship bias also has a significant positive average alpha when the true average performance was negative. However, the CRSP mutual fund database has no traditional survivorship bias, although the omission bias (see Elton et al. (2001)) and upward bias in any month , and merger and liquidation dates are often inaccurate. Here we assume the trading behavior of fund managers for active and dead funds have a similar propensity.

3.2 Measuring fund flow

We calculate the flow ratio of fund i at time t, ($Flowret_{i,t}$), which is defined as $Flowret_{i,t} = [TNA_{i,t} - TNA_{i,t-1} \times (1 + R_{i,t})] / TNA_{i,t-1} \times 100$. Where $TNA_{i,t}$ is fund i's monthly total net asset at time t; $R_{i,t}$ is the corresponding holding period returns over time $t-1$ to t. The net flow ratio is the proportion of total asset changes, but this excludes the return from holding assets. To reduce the heterogeneity of fund size, we exclude funds with $TNA_{j,t}$ < \$1 million or for which the changes in TNA ($\Delta TNA / TNA$) are too extreme and out of the range of (-0.5~2.0)[5].

To match the data frequency to the frequency of stock holdings, we convert the monthly figures to quarterly data. The quarterly flows are the sum of monthly flows over the corresponding quarter, while the quarterly returns are the geometric returns computed by compounding each month's return over the quarterly period. The characteristics of funds are based on the quarter-end data and obtained from the CRSP mutual fund database.

Table 1 shows the cross-section average of sample statistics for the 8,357 mutual funds during the period from January1995 to December 2006. We obtain sample statistics by calculating the time-series average of quarterly data for each mutual fund, and further average the cross-section data for the corresponding variables. The difference for the higher and lower flow groups is demarcated by the median of Flowret, which is also shown in Table 1.

[Insert Table 1 here]

The results show that that the high flow group has eight times (in median) the flow ratio than the lower group, and that the magnitude of fund flow is positively related to fund returns. The last column shows that higher flow funds have on average 0.48% (0.27% in median)

[5] See Coval and Stafford (2007).

higher returns than those of loser flow group, which indicates that funds with higher current performance would attract more investment.

Another interesting observation is that the higher flow funds have an average 0.23% lower front-end load fee, although, the redemption fee (denoted as the rear-load fee) is set higher than for lower flow funds. The higher flow funds have a higher expenses ratio, which supports the theory that the fund managers of funds with higher returns trade more aggressively and have higher operating costs and turnover rates.

3.3 Expected and unexpected fund flow

To evaluate the expected divergence of fund managers from the real flow, we estimate the following regression , used in Coval and Stafford (2007)[6], to forecast fund flows.

$$Flowret_{j,t} = a + \sum_{k=1}^{K} b_k \times Flowret_{j,t-k} + \sum_{h=1}^{H} c_h \times R_{j,t-h} \qquad (1)$$

We use Fama-MacBeth and pooled regressions to analyze the quarterly flow rate for the lagged- k quarters of fund flows and lagged- h quarters of returns. The regression outputs are shown in Table 2.

[Insert Table 2 here]

According to the adjusted R square of fund flow regression, we use four-lags of past fund flows and four-lags of past fund returns as the explanatory variables for fund flow forecasting, and the unexpected flow ratios are obtained as in regression residuals.

[6] Coval and Stafford (2007) use lagged returns and lagged flows to predict flow to forecast fund flows, which is similar to the method in Edelen and Warner (2001) that is used to predict daily fund flows. Another method is found in Cooper et al. (2005), who calculated abnormal flows to study the flow diversities of name-changed funds from matching funds.

3.4 Measuring the disposition effect and capital gains overhang

Before testing flow impact, we conduct a trial test of the disposition effect with regard to mutual fund managers. We select the mutual funds that have issued a holding report between January 1995 and December 2006. The database has no selling or buying prices and the holding data are reported at the end of each month or quarter, and thus we use the monthly closing prices as the transaction prices. As in Frazzini (2006), the mental accounting reference prices are obtained with the month-end data, and we use the first-in-first-out (FIFO) method to identify the cost of mental accounting holding shares, and which is defined as follows:

$$RP_t = \sum_{n=0}^{t} V_{t,t-n} P_{t-n} \Big/ \sum_{n=0}^{t} V_{t,t-n} \ , \quad (2)$$

Where $V_{t,t-n}$ is the holding shares at time t which are purchased at time $t-n$, and the associated cost is denoted as P_{t-n}. Others items for the reference prices are derived from Ferris et al. (1988) and Grinblatt and Han (2005). We further calculate the capital gains overhang for each fund, which is defined as follows.

$$g_t = \left(P_t - RP_t\right) / P_t \quad (3)$$

For each time t the mental account of holding stocks is referred to as a paper gain (PG) if the closing price is greater than reference price (RP), or $g_t > 0$, and as a paper loss (PL) if the closing price is smaller than the reference price, or $g_t < 0$. Investors have realized a gain if the realized price is greater than RP, and otherwise they have realized a loss. We then separately aggregate the number of stocks with paper gains, realized gains, paper losses, and realized losses for each fund at quarter t. Following Odean (1998), the propensity to sell winners or losers is derived by calculating the proportion of gains realized (PGR) and the proportion of losses realized (PLR), as in the following equation, and the statistics for the disposition effect (DE) is the difference between the two measures.

$$\text{Proportion of Gains Realized (PGR)}=\frac{\text{Realized Gains Obs.}}{\text{Realized Gains Obs. +Paper Gains Obs.}} \quad (4)$$

$$\text{Proportion of Losses Realized (PLR)}=\frac{\text{Realized Losses Obs.}}{\text{Realized Losses Obs. +Paper Losses Obs.}}.$$

[Insert Table 3 here]

Table 3 shows the aggregate sample statistics for the disposition effect for the sample data to be 0.018, and the equal-weighted statistics for the sample funds to be 0229. The disposition effect for the fund managers is lower than for individual investors, as documented in Odean (1998) of 0.051. Moreover, the DE for mutual funds is significant, and the last quarter has a lower DE (an average of 0.016) than the other quarters do (an average of 0.025).

4 Empirical Results

4.1 Flow shocks on the disposition effect

To test the hypothesis that capital inflows and outflows have asymmetrical pressure effects on the disposition effect, we examine the stock holding and realization propensity for winners and losers according to the decile of fund flows.

[Insert Table 4 here]

Table 4 reports the variations in the proportion of gains realized (PGR), the proportion of losses realized (PLR), the statistics for the disposition effect (DE), and quarterly fund return across the mutual fund deciles. We sorted fund flow into deciles based on actual, expected, and unexpected fund flow, as shown in Panels A, B, and C, respectively. The expected flows are estimated from equation (1) with four lagged quarterly flows ratio and returns, and the unexpected flows are due to forecasting errors. We define the first decile of flow as extreme inflow and the last decile as extreme outflow, and calculate the difference between inflow and outflow fund portfolios. Panel A shows that outflow portfolios have a higher realization selling behavior than the inflow decile, and that PGR and PLR increase when flow decreases, which indicates that fund managers tend to increase the realization of shares when outflow occurs. This result is consistent with Coval and Stafford (2007), who found that an extreme level of flow would induce the sale or purchase of stock. It can be seen that the disposition effect is negatively correlated with fund flow, and the correlation coefficient is about 0.04. Therefore, the evidence shows that fund managers exhibit DE behavior when outflows occur.

Frazzini (2006) found that the higher fund return, the lower the DE. To exclude the endogenous effect between real flow and fund return, we further separately look at the influence from driving sources of expected or unexpected flow. Panel B gives the fund decile on the basis of expected flow, and it can be seen that is less correlated with the changes in flow, and the difference in DE for the first decile of fund portfolio with inflow and tenth decile of fund portfolio with outflow is only 0.002. The evidence shows that the predictable flow has a less significant influence on behavioral bias. The small difference of DE in the expected inflow and outflow deciles may be due to the smaller changes in expected flows.

In contrast to the expected flow, Panel C shows that the unexpected flow has a significant impact on DE, and the higher the outflow, the greater the DE and the lower the fund returns. The difference in DE between the inflow minus the outflow decile is -0.012, which is equivalent to the DE value in Panel A for the actual flow. This result provides strong evidence that trading bias is attributed by the unexpected part of fund flows. In summary, the results show that fund managers tend to hold losers and cash winning shares under the condition of unexpected outflow pressure.

4.2 Determinant of Disposition Effect

The main objective of this paper is to assess whether fund flow influences the magnitude of DE, as the results in prior sections based on univariate sorting of fund flow show strong evidence of a negative relationship between flow and the disposition effect. To explore this issue, we examine the impact of flow by controlling some relevant factors, namely tax-gain overhang, fund return, fund size, the fee structure of front-end load and rear load, operating expenses, and fund turnover rate. These fund characteristic variables are widely used in the related literature[7], and we analyze the quarterly data by running the Fama-Macbeth regression.

[Insert Table 5 here]

Table 5 shows the relationship between concurrent and lagged fund variables and DE. The evidence shows that flows are negatively related to DE, which indicates that fund outflow has a higher behavior bias on trading. The tax overhang of fund is a value-weighted capital gains overhang for fund portfolio holding. The last column in Table 5 shows that tax overhang is negatively correlated with DE, while lagged one period of tax overhang is positively correlated. The result of the regression coefficients shows that when a fund has higher tax overhang, fund managers would have less propensities to sell stocks with positive returns and followed with lower DE. These results of capital gains tax delays selling are consistent with the findings in Li (2006). Notice that the interaction effect of outflow and tax overhang on DE is also significant. Which suggests that even higher tax-overhang funds, but with capital outflows, still have significant DE. Moreover, among the fund characteristics, rear-load fee is significantly and negatively correlated with DE, and the redemption fee structure seems to

[7] E.g. Barber et al. (2005) examined the relationship between fund characteristics and new money in a fund. In addition, Friesen and Sapp (2007) studied the plausible explanation for fund timing ability. Meanwhile, Wermers (2000) examined whether active funds with higher turnover rate can cover their transaction costs. Finally, Khorana et al. (2007) studied the relationship the ownership of fund managers and fund performance, using fund assets, expenses, front-end load, back-end load and portfolio turnover rate as the control variables.

influence the likelihood of selling pressure on the fund manager.

[Insert Table 6 here]

Table 6 shows the results of fund flow shock, and the regression results show that the influence of expected flow on selling behavior is not consistent for all regression models. In contrast, the evidence shows that unexpected flow is significantly and negatively correlated with DE, which indicates that unexpected outflow shock would significantly induce a higher propensity to sell winners. Other variables are consistent with the results of Table 5.

4.3 Fund flow predictability (alpha), the relationship between flow and fund performance

This section is aims to test the predictability of flow with regard to fund performance. As Frazzini (2006) argued that if investors under react to outflow, then information transfers slowly and fund manager trading can not immediately reveal information content, which would leading to post price drift. Therefore, the strategy of long positive capital gains and short negative capital gains overhang portfolios has positive and significant returns.

The previous section noted that higher outflow would lead to higher DE. We thus construct long-short strategy to examine the impact of inflow and outflow on fund performance. Each quarter, we rank all funds into quintile portfolios on the basis of quarterly (actual / expected / unexpected) fund flow ratio and obtain the inflow (first quintile) and outflow (fifth quintile) groups, and then we further sort each fund group into quintile portfolios based on the quarterly value weighted capital gains overhang[8] for a fund's holdings

[8] The output of the equal weighted capital gains method has a similar pattern.

to obtain the top and bottom 20% portfolios. We construct a long-short portfolio by long funds with the largest capital paper gains, and short funds with the largest paper losses, and update the portfolio contents of funds quarterly following the ranking method introduced above. We calculate the time-series average monthly return to test the risk-adjust performance of the long-short portfolio, for the long-short portfolios. We use OLS to run the regression of monthly excess returns over the Treasury bill rate as in Fama and French (1993), mimicking the portfolios and the Carhart momentum factor[9]. The regression is thus as follows:

$$\left(\bar{R}_{p,t}-r_t\right)=\alpha_P+\beta_{1,P}\left(R_{mt}-r_t\right)+\beta_{2,P}SMB_t+\beta_{3,P}HML_t+\beta_{4,P}UMD_t+\varepsilon_{p,t} \tag{5}$$

Where the dependent variable is the average fund excess returns. Fund abnormal return, α_p, is the intercept from the above equations, SMB_t is the returns on a value-weighted portfolio of small firms minus those of a value-weighted portfolio of big firms, HML_t is the returns of a high book-to-market portfolio minus those of a low book-to-market portfolio, UMD_t is the one-year momentum anomaly calculated by the differences in the returns between previously high-performing and poor-performing stocks, r_f is the monthly return on T-bills, r_m is the monthly return on a value-weighted market index, and ε_{pt} is regression error term.

[Insert Table 7 here]

Panel A in Table 7 shows that the long-short strategy yields significantly positive abnormal returns. The abnormal returns of long higher capital gains portfolio and short

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[9] The monthly data of risk-free rate, r_f, and the factors of SMB, HML, and UMD are all obtained from French's web.

bottom capital gains portfolio in the inflow fund group are higher than those in outflow fund group, as shown in Panels A and B. This result is consistent with prior research, and thus the evidence shows that fund managers with higher DE would have losses if they use the contrary strategy, and market arbitragers would be able to profit from that. The flow category is ranked on the basis of unexpected outflows, as shown in Panel C. The lower capital gains portfolio performance is worst, with negative returns of 1.77%, and thus if an arbitrager undertakes a long-short strategy they will be able to profit from a DE trader. Therefore, fund managers that tend to operate with the disposition effect would suffer from greater levels of capital withdrawal.

5 Conclusions and Suggestion for Practitioners and Future Research

This paper studies the impact of fund flow on fund manager trading from 1995 to 2006. We find that the disposition effect exists among professional fund manager, although their propensity to sell winners is lower that of individual investors. In addition, the results of this paper also show that the disposition effect is higher when capital outflow occurs. Moreover, the propensity to sell winners is greater when the outflow is unexpected.

Fund characteristics, such as fund size, net asset value, operating expense, and turnover rate are unrelated to the trading bias. However, higher redemption fee cost is able to efficiently reduce the possibility of holding losers and selling winners.

We contribute to literature on the disposition effect and prospect theory by examining the impact of capital flows on funds' portfolio’s holdings. The negative correlation of flow and the disposition effect suggests that the practice of significantly selling winners is more prevalent among worse performing funds and those that suffer from capital outflow.

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Table 1 Sample Statistics

This table shows the cross-section average of sample statistics for the 8,357 mutual funds from the CRSP mutual fund database during the period of 1995/1 to 2006/12. We obtain sample statistics by calculating the time-series average of quarterly data for each mutual fund and further average the cross-section data for corresponding variables. The quarterly flows ratio, *Flowret*, is the sum of monthly flows over the corresponding quarter. The quarterly returns, *Rt(%)* are geometric returns computed by compounding each month's return over one quarterly period. Total net assets (TNA) and net asset value (NAV) are end-of quarter data. Front-End Load Fee and Rear-Load are fees charged for fund investment and redemption, respectively. Fund expenses ratio (Expenses %) is the ratio of investment that investors pay for fund's operating expenses. Turnover (TURN) is the ratio of minimum of aggregated sales or aggregated purchases of securities divided by the average 12-month Total Net Assets of the fund. We divide the sample into Higher and Lower Flow categories by the median of Flowret. The last column shows the statistical test of equality mean and median for the two samples in the high and low flow categories by using the T test and non-parametric Mann-Whitney-Wilcoxon test, and the levels of statistical significance are shown in parentheses. ***, **,* represent 1%, 5%, 10% confidence levels, respectively.

Quarterly Data		All	High *Flowret*	Low *Flowret*	High-Low
Observation	N	8,357	4,177	4,180	
Flowret	Mean	12.94	24.12	1.76	22.38***
	Median	8.11	16.61	2.15	14.46***
	STD	20.09	23.22	4.21	
Rt (%)	Mean	2.56	2.80	2.32	0.48***
	Median	2.68	2.84	2.57	0.27***
	STD	2.07	2.21	1.89	
NAV (net asset value per share)	Mean	16.86	16.71	17.02	-0.31
	Median	14.15	14.22	14.08	0.14***
	STD	12.50	9.22	15.07	
TNA (total net asset)	Mean	309.81	135.59	483.91	-348.33***
	Median	34.56	26.89	48.07	-21.19***
	STD	1785.70	441.11	2474.04	
Front-end-load fee (%)	Mean	0.89	0.77	1.01	-0.23***
	Median	0	0	0	0***
	STD	1.70	1.56	1.81	
Rear-load fee (%)	Mean	1.05	1.06	1.03	0.03
	Median	0.48	0.75	0.32	0.43***
	STD	1.38	1.31	1.45	
Expense (%)	Mean	1.52	1.57	1.47	0.10***
	Median	1.45	1.52	1.36	0.17***
	STD	0.63	0.61	0.64	
TURN (%)	Mean	116.77	136.62	97.13	39.50***
	Median	73.28	70.14	76.03	-5.89***
	STD	232.96	303.10	127.63	

Table 2 Regressions of Mutual Fund Flows (1995-2006)

This table shows the quarterly coefficients of Fama-MacBeth and pooled data regressions of mutual fund flows. The dependent variable of fund flow is defined as $Flowret_{i,t} = [TNA_{i,t} - TNA_{i,t-1} \times (1 + R_{i,t})] / TNA_{i,t-1} \times 100$, where $TNA_{i,t}$ is fund i's total net assets at time t, and $R_{i,t}$ is the monthly holding period return of fund i from $t-1$ to t. The quarterly returns are geometric returns computed by compounding each month's return over the quarterly period, and the quarterly flows are the sum of monthly flows over corresponding quarter. The independent variables are the lagged flows, *FLOW(t-k)*, and the lagged fund's returns, *R(t-h)*. These cross-sectional regressions are run quarterly with the method presented in Fama and MacBeth (1973). We obtain the time-series average of coefficients and the standard errors are adjusted for heteroskedasticity and autocorrelations using GMM correction. p-values are given in parentheses below the coefficient estimates. The adjusted $\bar{R}^2$ is time-series average adjusted R^2, and ***, **,* represent 1%, 5%, 10% confidence levels, respectively.

	Fama-MacBeth Regression		Pooled Data regression	
Dependent	*Flowret(t)*	*Flowret(t)*	*Flowret(t)*	*Flowret(t)*
Intercept	-0.5907	-1.0923	0.3185***	-0.3882***
Flowret(t-1)	0.2581***	0.2488***	0.2622***	0.2492***
Flowret(t-2)	0.1176***	0.1172***	0.1321***	0.1382***
Flowret(t-3)	0.0572***	0.0534***	0.0614***	0.0645***
Flowret(t-4)	0.0382***	0.0288***	0.0381***	0.0314***
Flowret(t-5)		0.0223***		0.0250***
Flowret(t-6)		0.0133**		0.0152***
Flowret(t-7)		0.0054		0.0061***
Flowret(t-8)		0.0120***		0.0110***
R(t-1)	0.4081***	0.3585***	0.1279***	0.1242***
R(t-2)	0.2186***	0.2066***	0.0710***	0.0628***
R(t-3)	0.1600***	0.1535***	0.0066*	0.0041
R(t-4)	0.0733**	0.1108***	-0.0045	-0.0053
R(t-5)		0.0121		0.0033
R(t-6)		-0.0220		0.0264***
R(t-7)		-0.0034		-0.0162***
R(t-8)		0.0029		0.0181***
Adjusted $\bar{R}^2$	0.2442	0.2292	0.2073	0.1822
N	46	44	180,224	150,014

Table 3 Sample Statistics of Disposition Effect

This table summarizes the number of stocks by aggregating the number with paper gains, realized gains, paper losses, and realized losses for all fund portfolios from January 1995 to December 2006. We calculate the proportion of gains realized (PGR), the proportion of losses realized (PLR), and the statistics for the disposition effect (DE) for the sample data and the equal-weighted statistics for the sample funds. *** represents a 1% confidence level.

Sample Data				
	All	4^{th} Quarter	1^{th} ~3^{th} Quarters	Odean(1998)[10]
Number of Paper Gains	23,634,215	6,153,259	17,480,956	79,658
Number of Realized Gains	5,488,857	1,448,323	4,040,534	13,883
Number of Paper Losses	13,790,904	3,211,333	10,579,571	110,348
Number of Realized Losses	2,831,778	677,861	2,153,917	11,930
PGR	0.1885	0.1905	0.1877	0.1484
PLR	0.1704	0.1743	0.1692	0.0976
DE = PGR-PLR	0.0181***	0.0162***	0.0186***	0.0509
Std. error	(0.0001)	(0.0002)	(0.0001)	

Equal Weighted of sample funds				
		All	4^{th} Quarter	1^{th} ~3^{th} Quarters
Mean	PGR	0.1904	0.1879	0.1902
	PLR	0.1674	0.1715	0.1653
	DE=PGR-PLR	0.0229***	0.0164***	0.0249***
Median	PGR	0.1883	0.1837	0.1865
	PLR	0.1615	0.1667	0.1588
	DE=PGR-PLR	0.0221***	0.0145***	0.0239***

[10] This column is taken from Odean (1998) table.

Table 4 The Relationship Between the Disposition Effect and Fund Flow

This table reports the variation in the proportion of gains realized (PGR), the proportion of losses realized (PLR), the statistics for the disposition effect (DE), and the quarterly fund return across all mutual fund deciles during the period from January 1995 to December 2006. The decile portfolios are formed on a quarterly basis, with actual, expected, and unexpected fund flows. The expected flows are estimated from equation (1) with four lagged quarterly flows ratio and returns, and the unexpected flows are from forecasting errors. We average the variables for the deciles across all available quarters. For each time t, we calculate PGR, PLR, DE for each fund and rank these variables into decile portfolios. PGR is the ratio of the number of realized gains divided by the number sum of realized and paper gains; PLR is the ratio of the number of realized losses divided by the number sum of realized and paper losses; and DE is the difference between PGR and PLR. Fund flow is the proportion of total asset changes, but this excludes the returns from assets and is defined as $flow_{i,t} = [TNA_{i,t} - TNA_{i,t-1} \times (1 + R_{i,t})] / TNA_{i,t-1}$, where $TNA_{i,t}$ is fund i's monthly total net assets at time t, and $R_{i,t}$ is the monthly holding period returns of fund i from $t-1$ to t. Quarterly flows are the sum of monthly flows over the corresponding quarter. ***, **,* represent 1%, 5%, 10% confidence levels, respectively, and the last row shows the Pearson correlation coefficients.

Decile	Actual Flow (%)	PGR	PLR	DE	Return (%)
Panel A Variables sorted by actual fund flow					
1 (inflow)	40.355	0.134	0.113	0.022	4.442
2	12.504	0.147	0.122	0.025	3.305
3	6.374	0.157	0.131	0.027	2.869
4	2.997	0.166	0.138	0.029	2.527
5	0.758	0.179	0.149	0.030	2.335
6	-0.975	0.195	0.165	0.031	2.067
7	-2.565	0.212	0.178	0.034	1.828
8	-4.309	0.232	0.201	0.032	1.616
9	-6.712	0.250	0.216	0.034	1.280
10 (outflow)	-16.14	0.277	0.244	0.034	0.969
P1-P10	56.499***	-0.143***	-0.131***	-0.012***	3.474***
Correlation	1.000	-0.237	-0.210	-0.038	0.118
Panel B Variables sorted by expected fund flow					
1 (inflow)	22.607	0.150	0.123	0.027	3.051
2	11.211	0.154	0.127	0.027	2.825
3	6.631	0.162	0.134	0.029	2.752
4	3.752	0.170	0.141	0.029	2.440
5	1.745	0.183	0.153	0.031	2.301
6	0.274	0.194	0.163	0.032	2.197
7	-1.270	0.210	0.177	0.033	2.029
8	-2.429	0.225	0.193	0.032	1.972
9	-3.962	0.241	0.211	0.029	1.817
10 (outflow)	-5.610	0.262	0.233	0.029	1.876
P1-P10	29.788***	-0.112***	-0.110***	-0.002*	1.175***
Correlation	1.0000	-0.202	-0.205	0.006	-0.0169
Panel C Variables sorted by unexpected fund flow					
1(inflow)	36.184	0.151	0.128	0.023	4.590
2	9.343	0.169	0.144	0.025	3.247
3	4.347	0.175	0.149	0.026	2.804
4	1.822	0.182	0.154	0.028	2.483
5	0.214	0.192	0.163	0.029	2.229
6	-0.938	0.203	0.172	0.031	2.074
7	-1.887	0.208	0.176	0.032	1.761
8	-2.741	0.214	0.182	0.033	1.573
9	-3.790	0.220	0.185	0.034	1.360
10 (outflow)	-9.889	0.237	0.202	0.035	1.150
P1-P10	49.782***	-0.087***	-0.075***	-0.012***	3.440***
Correlation	1.000	-0.138	-0.106	-0.045	0.139

Table 5 The Determinant of the Disposition Effect for the Actual Flow Analysis

This table reports several determinant factors for the disposition effect. The dependent variable is the disposition effect ratio, which is computed by PGR (proportion of gains realized) minus PLR (proportion of loss realized). The independent variables are actual flow ratio (Flowret), tax overhang of funds (TAXOVER) calculated by value-weighted capital gains overhang of fund portfolio, the intersection between the indicator variable of one with flow less than zero and capital gains overhang, and lagged fund returns (Rt), the log of total net asset (TNA), Front-End Load Fee (Frontload), Rear-Load Fees (REAR), Fund Expenses, and Turnover ratio (TURN). These cross-sectional regressions are run quarterly, as in Fama and MacBeth (1973). We obtain the time-series average of coefficients and the standard errors are adjusted for heteroskedasticity and autocorrelations using GMM correction. p-values are given in parentheses below the coefficient estimates. ***, **,* represent 1%, 5%, 10% confidence levels, respectively. The adjusted $\bar{R}^2$ is time-series average adjusted R^2.

Dependent variable: DE(t)	(1)	(2)	(2)
Intercept	3.409***	3.314***	2.848***
	(0.00)	(0.00)	(0.00)
Flowret(t)	-0.018***	-0.018***	-0.019***
	(0.00)	(0.00)	(0.00)
Flowret(t-1)	-0.007**	-0.009**	-0.007*
	(0.02)	(0.01)	(0.08)
TAXOVER(t)		-5.487***	-8.976***
		(0.00)	(0.00)
TAXOVER(t-1)			3.993***
			(0.01)
$I_{[\text{Flowret(t)}<0]}$ ×TAXOVER(t-1)			1.794**
			(0.03)
R(t-1)	0.033*	0.066***	0.064***
	(0.10)	(0.00)	(0.01)
Log TNA(t)	-0.08*	-0.072*	-0.046
	(0.08)	(0.09)	(0.14)
FRONTLOAD(t)	0.013	0.012	0.008
	(0.54)	(0.54)	(0.75)
REARLOAD(t)	-0.08**	-0.084**	-0.086*
	(0.02)	(0.02)	(0.06)
EXPENS(t)	0.117	0.164	0.109
	(0.48)	(0.34)	(0.52)
TURN(t)	0.076	0.06	-0.026
	(0.23)	(0.31)	(0.77)
Adj. $\bar{R}^2$	0.011	0.019	0.028

Table 6 The Determinant of the Disposition Effect for the Expected and Unexpected Flow Analysis

This table reports several determinant factors for the disposition effect. The dependent variable is the disposition effect ratio, which is computed by PGR(proportion of gains realized) minus PLR (proportion of loss realized). The expected flows are estimated from equation (1), with the independent variable of four lagged quarterly flows ratio and four lagged quarterly returns. The unexpected flows are the difference between the actual and expected flows. The independent variables are real flow ratio (Flowret), tax overhang of funds (TAXOVER) calculated by value-weighted capital gains overhang of fund portfolio, the intersection between flow and tax overhang, and lagged fund returns (Rt), the log of total net asset (TNA), Front-End Load Fee (Frontload), Rear-Load Fees (REAR), Fund Expenses, and Turnover ratio (TURN). These cross-sectional regressions are run quarterly, as in Fama and MacBeth (1973). We obtain the time-series average of coefficients and the standard errors are adjusted for heteroskedasticity and autocorrelations using GMM correction. p-values are given in parentheses below the coefficient estimates. ***, **,* represent 1%, 5%, 10% confidence levels, respectively. The adjusted $\bar{R}^2$ is time-series average adjusted R^2.

Dependent Variable : DE(t)	(1)	(2)	(3)	(4)
Intercept	3.359***	2.89***	2.853***	2.882***
	(0.00)	(0.00)	(0.00)	(0.00)
Expected Flowret(t)	-0.031**	0.197	-0.026	0.223*
	(0.04)	(0.10)	(0.12)	(0.07)
Expected Flowret(t-1)		-0.158*		-0.176**
		(0.07)		(0.05)
Unexpected Flowret(t)	-0.019***	-0.022***	-0.016***	-0.017***
	(0.00)	(0.00)	(0.00)	(0.00)
Unexpected Flowret(t-1)		-0.065**		-0.071**
		(0.04)		(0.03)
TAXOVER(t)	-5.491***	-8.841***	-8.656***	-8.531***
	(0.00)	(0.00)	(0.00)	(0.00)
TAXOVER(t-1)		4.086**	4.528***	4.111***
		(0.01)	(0.00)	(0.01)
Expected Flowret(t)			-0.122*	-0.164**
×TAXOVER(t-1)			(0.08)	(0.04)
Unexpected Flowret(t)			0.011	0.025
×TAXOVER(t-1)			(0.83)	(0.60)
R(t-1)	0.067***	-0.019	0.068***	-0.023
	(0.01)	(0.72)	(0.01)	(0.66)
Log(TNA)	-0.071*	-0.046	-0.044	-0.046
	(0.1)	(0.14)	(0.17)	(0.15)
FRONTLOAD(t)	0.012	0.008	0.008	0.008
	(0.53)	(0.75)	(0.75)	(0.74)
REARLOAD(t)	-0.078**	-0.082*	-0.084*	-0.083*
	(0.04)	(0.07)	(0.07)	(0.07)
EXPENS(t)	0.162	0.154	0.148	0.178
	(0.34)	(0.35)	(0.37)	(0.28)
TURN(t)	0.055	-0.025	-0.042	-0.039
	(0.35)	(0.78)	(0.65)	(0.67)
Adj. $\bar{R}^2$	0.0198	0.0301	0.0299	0.0319

Table 7 Capital Gains Overhang Predictability by Inflow and Outflow Categories (1996-2006)

This table reports the flow predictability for fund performance. For each quarter, we rank all funds into quintile portfolios on the basis of quarterly (actual / expected / unexpected) fund flow% and obtain the inflow (first quintile) and outflow (fifth quintile) groups, and then we further sort each fund group into quintile portfolios based on quarterly value weighted (and equal weighted) capital gains overhang, *g*, for a fund's holdings[11] to obtain the top and bottom 20% portfolios. We construct a long-short fund portfolio by selecting long funds with the largest capital paper gains and short funds with the largest paper losses, and update the portfolio contents of funds quarterly following the prior ranking method. To test the risk-adjusted performance of the long-short portfolio, we calculate the time-series average monthly returns for the fund portfolios. We use OLS to run the regression of monthly excess returns over the Treasury bill rate, as in Fama-French (1993), mimicking portfolios and Carhart momentum factor. The monthly data of SMB, HML, and UMD are obtained from French's web, and the regression is as follows:

$$\left(\overline{R}_{p,t} - r_t\right) = \alpha_P + \beta_{1,P}\left(R_{mt} - r_t\right) + \beta_{2,P}SMB_t + \beta_{3,P}HML_t + \beta_{4,P}UMD_t + \varepsilon_{p,t}$$

Where the dependent variable is the average fund excess returns, alpha is the intercept from the above equations, SMB_i is the value-weighted portfolio return of small firms minus those of big firms , HML_t is the returns of a high book-to-market portfolio minus those of a low book-to-market portfolio, UMD_t is the one-year momentum anomaly calculated by the difference in returns between previously high-performing and poor-performing stocks, r_f is the monthly return on T-bills, r_m is the monthly return on a value-weighted market index, and ε_{pt} is the regression error term. ***, **,* represent 1%, 5%, 10% confidence levels, respectively.

	Inflow			Outflow		
	Top *g*	Bottom *g*	Long top Short bottom	Top *g*	Bottom g	Long top Short bottom
Panel A Actual Flow						
Alpha	1.448***	-0.338**	1.787***	0.106	-1.275***	1.381***
R_m-R_f	0.852***	1.017***	-0.165**	1.028***	1.068***	-0.039
SMB	0.47***	0.206***	0.264***	0.175***	0.014	0.161***
HML	-0.026	-0.263***	0.236***	0.291***	0.099*	0.192***
UMD	0.246***	-0.025	0.272***	0.144***	-0.314***	0.457***
Adj. R^2	0.822	0.9354	0.412	0.9149	0.885	0.579
Panel B Expected Flow						
Alpha	0.913***	-1.068***	1.981***	0.497***	-0.799***	1.296***
R_m-R_f	0.936***	1.103***	-0.167**	0.989***	1.063***	-0.075
SMB	0.444***	0.347***	0.097	0.001	-0.002	0.003
HML	-0.034	-0.234***	0.2**	0.185***	-0.007	0.192***
UMD	0.368***	0.174***	0.194***	-0.071**	-0.462***	0.391***
Adj. R^2	0.861	0.912	0.287	0.855	0.874	0.517
Panel C Unexpected Flow						
Alpha	1.610***	-0.116	1.726***	0.331**	-1.767***	2.098***
R_m-R_f	0.863***	1.068***	-0.204***	0.947***	1.145***	-0.198**
SMB	0.364***	0.039	0.325***	0.429***	0.133**	0.297***
HML	0.054	-0.138**	0.192*	0.074	-0.005	0.079
UMD	0.126***	-0.409***	0.535***	0.355***	0.027	0.328***
Adj. R^2	0.763	0.887	0.567	0.888	0.809	0.347

[11] The value weighted capital gains overhang for fund i at time t is as follows:
$g_{i,t} = \sum_{j=1}^{S}\left(MV_{jt} \Big/ \sum_{j=1}^{S} MV_{jt}\right) \times g(i,j,t) = \sum_{j}^{S} w_{jt} \times g_{ijt}$, where j =1,…,s stocks.