Do Investment Flows Drive the Disposition Effect on Fund Managers?

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Abstract

This paper analyzes the relationship between fund flow and fund managers' trading behavior with regard to the disposition effect, which is as the tendency of fund managers cash more winner stocks of portfolio holdings rather than losers. The evidence shows that the disposition effect (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 for fund managers. Moreover, we find fund managers with a DE trading bias would incur greater losses when there is fund inflow. Which suggests that higher exit cost of fund redemption fees could efficiently reduces flow uncertainty and trading bias possibility. On the contrary, selling winners is more prevalent among worse performing funds, while the tendency of selling winners seems brings short-term benefit for those outflow funds. We contribute to the literature by further examine how fund managers deal with winning or losing holdings under conditions of flow pressure and evaluate how flow-motivated trade of institutional investors influence on fund performance.

Keywords: Disposition Effect, fund flow, behavioral finance, fund performance, mutual fund

1 Introduction

The existing academic literature on fund flow mostly devotes attention on the lead-lagged relationship between fund flow and fund performance. Greater fund performance induces increased fund inflow, with investors chasing smart money. In contrast, bad performing funds suffer from outflows, leading to asset sales or even liquidation, therefore putting downward pressure on the fund price. These evidences indicate that fund flows influence the decisions of market investment and asset allocation for fund managers. However, surprisingly little empirical research has examined the impact of irrational behavior caused by flow pressure on fund performance.

This paper investigates whether fund flow induces the disposition effect (hereafter DE), which is the higher propensity of selling loss stock holdings than profit ones; and how fund performance is related to this anomalous trading behavior along with flow pressures. The study motivation of how fund flow drives stock selling of fund starts from the argument of trading incentive of fund managers. Chevalier and Ellison (1997) document that the risk preference of fund portfolio is more significantly related with the incentive to maximizing the fund's inflow rather fund investors' profit. Funds aim at increasing capital inflows by altering the asset allocation of mutual fund. On the other hand, the effect of flow-in-and-out to fund also forces trading. 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. Therefore, flow-motivated trade influences the trading ability of institutional investors.

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 might cause significant damage to a fund's finances, with an extreme example being Long-Term Capital Management Company (LTCM), which collapsed may be attributed to selling winning and

high liquidity stocks in order to meet redemption demand. The phenomena of selling winners and riding losers, the so called DE, 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 DE 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 of 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 DE in the regression analysis, such as tax-sensitive selling overhang, 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 DE, 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 fund inflow, the DE still exists, with a value of 2.2%, which is 1.2% lower than when there is fund outflow. In addition, comparing the high inflow and high outflow deciles, outflow with a larger DE has lower fund returns.

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 Relationship between Fund Flow on Trading Behavior

The deviations in fund investment may be accounted by the flow-performance relationship. A vast number of paper documents that the phenomena of chasing hot money exist for professional managers. Wermers (1999, (2003) 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. The evidence shows 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, (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.

However, some evidence shows that investment flow has a negative influence on fund performance. The flow impact has been examined by Nanda et al. (2000), who found that the liquidity needs of fund investors reduce the management abilities of funds. Keim (1999) and Edelen (1999) report that flow enforces the adjustment of portfolio holdings to the benchmark; however, it causes a higher cost of liquidity-motivated trading.

Kacperczyk and Seru (2007) found that higher sensitivity of investors' holdings to changes in market information would reduce managerial skills. Friesen and Sapp (2007) use cash flow measurement for the timing ability of fund investor, found that these flow-motivated trading as a poor timing largely impair gains from good-performing 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 a lack 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. 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. Reconcile these findings, we propose that the behavioral bias of stock investment is pronounced under outflow condition, and there is asymmetric effect on asset allocation and trading behavior of fund manager for inflow and outflow fund portfolio. Therefore, one way to avoid the negative influence of flow on trading is that funds with higher performance should impose a costly exit fee structure or to spend more on marketing to prevent investors from withdrawing.

2.2 Disposition Effect

The explanations for the trading biases associated with the DE have been documented, with one attribute to the psychology level, the risk preference of investors toward the profit and loss of holding positions. As Kahneman and Tversky (1979) posit that investors tend to be risk-averse when they profit and risk-taking when they have losses, the empirical evidence for aggregate individual data in securities trading also examined by Shefrin and Statman (1985) and Odean (1998). On the other hand, Dhar and Zhu (2006) examine the difference of DE across individual investors, they display the magnitude of DE is correlated with the investors' literacy level and trading frequency.

Another highlights the importance factor of DE is tax considerations in investors' decisions to delay selling losers. With regard to tax-sensitive selling, large capital gains discourage selling stocks. 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 DE 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, fund inflows increase the cost of purchased stocks and outflows dampen the selling profit.

In our analyses, we study the effect of fund 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 the first hypothesis as stated as follows:

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

In addition, 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. Thus, we also investigate how the unexpected shocks of flow have an impact on DE. If actual 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. By combining these two findings on the influence of unexpected flow and the DE, we provide the hypothesis as follows:

Hypothesis 2: The higher the unexpected outflow, the greater the DE and post price drift.

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 DE is neither due to portfolio allocation, nor to good performance. However, investor's underreaction driven by the DE 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 DE 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. Consequently, the third hypothesis is presented as follows.

Hypothesis 3: Fund managers with higher DE have lower fund performance.

2.4 Fund Characteristics

Whether or not flow pressure causes the DE maybe due to the characteristics of the fund in questions. Since this paper focuses on the relationship between flow pressure and DE, we need to control other factors, 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 DE 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 fee 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 obtain holding information of the fund portfolios from MorningStar database during the period of Jannuary 1995 to December 2006. We select equity funds and exclude portfolios categorized as bond, convertible, government, preferred, index, and REIT from our analysis. Since the regulations require the funds to report at least every half year, the holding data in our database includes monthly, quarterly, and semi-year reports. Among our sample, fifty percent of the fund portfolios have report once every two months, and 85% report quarterly. Thus, in this paper, we quarterly collect holding data for sample analysis. 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. Monthly stock prices and information on splits are obtained from the CRSP stock database and adjusted for the holding shares. The information of fund flow and fund characteristics, such as turnover ratio, fund size, front-end load, and fund type, are obtained from the CRSP

mutual fund database. We matched our fund sample with the MorningStar[1] database by fund ticker and names. The final sample consists of 8,357 funds in the period studied.

3.2 Measuring Fund Flow

We calculate the flow ratio of fund i at time t, ($Flowret_{i,t}$), which is defined as:

$$Flowret_{i,t} = [TNA_{i,t} - TNA_{i,t-1} \times (1 + R_{i,t})] / TNA_{i,t-1} \times 100 \quad (1)$$

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).[2]

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

[1] The CRSP mutual fund database only contains data for the period from year 2003 to 2007, and therefore, we choose the fund holding data from the MorningStar database. Jin and Scherbina (2005) and Chevalier and Ellison (1997) use MorningStar database to study the behavior of fund managers. 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. 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% to1%, 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.

[2] See Coval and Stafford (2007).

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 differences of the returns and characteristics of fund in this two categories are correlated to fund flow. The last column shows that higher flow funds have on average 0.48% (0.27% in median) 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, for which 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 actual flow, we estimate the following regression , used in Coval and Stafford (2007)[3], to forecast quarterly fund flows ratio(QF).

$$QF_{j,t} = a + \sum_{k=1}^{K} b_k \times QF_{j,t-k} + \sum_{h=1}^{H} c_h \times R_{j,t-h} + \varepsilon_{j,t} \qquad (2)$$

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

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.

[Insert Table 2 here]

Table 2 reposts estimates of the coefficients from equation (2) for the entire 1995-2006 period. The result of estimates shows that flow positively correlates with past flows and returns. According to the adjusted R square of fund flow regression, we select 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.

3.4 Measuring the DE and Tax Overhang

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

$$RP_t = \sum_{n=0}^{t} V_{t,t-n} P_{t-n} \Big/ \sum_{n=0}^{t} V_{t,t-n} \,, \tag{3}$$

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}. We further calculate the capital gains overhang for each stock holding, which is defined as follows.

$$g_t = \left(P_t - RP_t\right) / P_t \tag{4}$$

For each time t the mental account of holding stocks is referred to as a paper gain if the closing price is greater than reference price (RP), or $g_t > 0$, and as a paper loss 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 DE is the difference between the two measures.

$$\text{Proportion of Gains Realized (PGR)} = \frac{\text{Realized Gains Obs.}}{\text{Realized Gains Obs. + Paper Gains Obs.}}, \quad (5)$$

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

[Insert Table 3 here]

Table 3 shows the aggregate sample statistic of DE is 0.018, and the equal-weighted statistic of sample funds is 0.0229. On average, the results shows the DE for the fund managers is lower than for individual investors data, which is examined in Odean (1998) with DE value of 0.051. Based on the median of quarterly flow ratio, we divide sample funds into high and low flow fund groups, the result shows fund with lower flow ratio significantly carriers higher DE than those funds with high flow ratio. Moreover, the last quarter has a lower DE (an average of 0.016) than the other quarters do (an average of 0.025), which is consistent with the tax-loss selling hypothesis. Moreover, based on the differences of the two categories, high and low flow fund sample, the results shows that funds with higher flow-in have lower DE except for the statistics in the last quarter, which indicates that high flow-in funds tends to sell winner in the last quarter.

4 Empirical Results

4.1 Flow Shocks on the DE

To test the hypothesis that fund inflows and outflows have asymmetrical pressure effects on the DE, 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 DE (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 (2) 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 outflow (or inflow) would induce the sale (or purchase) of stock. It can be seen that the tendency of DE is negatively correlated with fund flow, and the correlation coefficient is about 0.038. Therefore, the evidence shows that fund managers exhibit higher DE behavior when outflows occur.

Frazzini (2006) found that the higher fund return, the lower the DE. To exclude the endogenous effect between actual 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. Even though greater prior period fund return leads an investment of fund with inflow, however, the correlation between the expected flow and the concurrent fund returns is not pronounced. The evidence shows that the predictable flow has a less significant influence on behavioral bias, whether selling winner or loser is not mainly attributed to the changes of expected flow of funds.

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 a linearly negative relationship between DE and unexpected fund flow, fund managers tend to hold losers and cash winning holding shares under the condition of unexpected outflow pressure.

4.2 Determinant of DE

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 DE. A number of papers in experimental studies provide evidence of tax-loss hypothesis, which suggests that investors, especially tax-sensitive investors, delay selling of stock holdings with high capital gain, e.g. Shefrin and Statman (1985), Odean (1998), Grinblatt and Keloharju (2001), Bergstresser and Poterba (2002), and Li (2006). To explore this issue of the tax sensitivity to fund's gains, we calculate each fund's value-weighted capital gain overhang

on the basis of the market value of share holding to proxy for the tax gain overhang, denoted as TAXOVER. We further control some relevant factors of fund characteristic variables, which are widely used in the related literature[4], and we analyze the quarterly and yearly data by running the Fama-Macbeth regression.

[Insert Table 5 here]

Table 5 shows the regression results for determinant factors of DE for the analyses of quarterly and yearly frequency data. The evidence strongly shows that the magnitude of fund flow is negatively related to DE, which indicates that fund outflow has a higher behavior bias on manager's trading. The tax overhang of fund, calculated by the value-weighted gains overhang for fund stock holding, is negatively correlated with DE. 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 not significant which implies that the impact of fund outflows on DE is not relevant to the tax overhang of fund. Moreover, among the fund characteristics, rear-load fee is significantly and negatively correlated with DE, therefore redemption fee structure seems to influence the likelihood of selling behavior 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 significant for regression models (1), (2), and (3). In contrast, the evidence shows that unexpected flow is significantly and

[4] 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 between ownership of fund managers and fund performance, using fund assets, expenses, front-end load, back-end load and portfolio turnover rate as control variables

negatively correlated with DE, which indicates that unexpected outflow shock would significantly induce a higher propensity to sell winners. Using yearly frequency, the phenomena of DE under unexpected flow shock are more reinforced. Other variables fund characteristics are consistent with the results of Table 5.

4.3 **The Impact of DE on Flow Predictability**

This section is aims to test whether the predictability of flow with regard to fund performance is related with disposition effect. As it's well known that fund flow predict fund's performance, winner funds have higher inflow to time the market and continue to profit. However, the previous section in this paper provides the evidence that higher outflow would lead to higher possibility of selling winner stocks as well as the trading bias of DE. As Frazzini (2006) argued that if investors under react to news, information would transfers slowly and fund manager trading can not immediately reveal information content, which would leading to post price drift.

Chevalier and Ellison (1997) used the data of mutual fund over the period of 1982-1992 to test how flow-performance relationship is relevant with fund manager's psychology. He document that the flow-performance relationship influences the riskness magnitude of fund's portfolio allocation, and thus creates herd behavior of fund manager, while this behavior is not significantly related with the incentive scheme of career concern. Thus we examine whether this DE anomaly as a moderator intervenes the results of the flow-performance relationship and whether selling winner decision under the outflow condition could generate the signal of unsound asset allocation.

We divide sample fund into four portfolios, Inflow-Low DE, Inflow-High DE, Outflow-Low DE, and Outflow-High DE groups, on the basis of the intersection of Low/High funds and Inflow/Outflow funds. Low/ High DE funds are those funds with DE lower/greater than the median value of disposition effect. For the portfolios of

Inflow/Outflow funds, we rank all funds into quintile portfolios on the basis of quarterly (actual / expected / unexpected) fund flow% for each quarter, and obtain the extreme inflow (first quintile) and extreme outflow (fifth quintile) groups. We calculate the time-series average monthly returns for the four fund portfolios and use OLS to run the regression of monthly excess returns on the Fama and French (1993) three factors and the Carhart momentum factor, the regression model is as follows:

$$\left(\bar{R}_{p,t} - rf_t\right) = \alpha_P + \beta_{1,P}\left(RM_t - rf_t\right) + \beta_{2,P}SMB_t + \beta_{3,P}HML_t + \beta_{4,P}UMD_t + \varepsilon_{p,t} \quad (6)$$

The dependent variable is the average fund excess return. Alpha is the intercept from the above equations, which is the performance proxy of fund portfolio. *SMB* is the value-weighted portfolio return of small firms minus those of big firms , *HML* is the returns of a high book-to-market portfolio minus those of a low book-to-market portfolio, *UMD* is the one-year momentum anomaly calculated by the difference in returns between previously high-performing and poor-performing stocks, *rf* is the monthly return on T-bills, *RM* is the monthly return on a value-weighted market index, and ε is the regression error term. The monthly data of risk-free rate, SMB, HML, and UMD are obtained from French's web.

[Insert Table 7 here]

Table 7 displays the impact of the interaction of DE and fund flow on fund performance. First, the results shows inflow fund portfolios have higher alphas than outflow funds. Second, the strategy of long lower DE funds yields significantly positive abnormal returns for those funds with flow-in investment. However, the influence of DE on fund performance has opposite results for those funds with outflow. The results suggest that DE propensity with selling winner would dampen fund's returns when fund has greater performance history and attracting investment. On the contrary, the strategy of selling

winner stocks seems more proper than selling losers when fund has extreme outflow. As the statistics in regression in Panel A, the lower DE portfolio with outflow performs worst, with negative returns of 0.611%, higher DE funds with outflow have greater 9.5 basis points of returns. The result shows that DE has asymmetry effect on returns for inflow and outflow portfolios. Third, the prediction of fund performance is more significant and consistent for the unexpected flow analysis in Panel C than the results of the expected flow analysis in Panel B.

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 DE 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 DE is higher when fund 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 anomaly. However, higher redemption fee cost is able to efficiently reduce the possibility of holding losers and selling winners.

We contribute to literature on the DE and prospect theory by examining the impact of fund flows on funds' portfolio’s holdings. The negative correlation of flow and the DE suggests that the practice of significantly selling winners is more prevalent among worse performing funds, while the tendency of selling winners seems brings short-term benefit for those outflow funds.

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, *FLOW(%)*, is the sum of monthly flow ratios over the corresponding quarter. The monthly flow for fund is defined as equation (1). 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 proxies for the fund size. 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 our sample funds' quarterly flow. 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 FLOW	Low FLOW	High-Low
FLOW(%)				
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 reports the estimate coefficients of equation (2) by using Fama-MacBeth and pooled data regressions models. The dependent variable is quarterly flows ratio, *QF*, which is the sum of monthly flows over the corresponding quarter. 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, Q*F(t-k)*, and the lagged fund's returns, *R(t-h)*. Model (1) and (2) are cross-sectional regressions, which are run quarterly with the method presented in Fama and MacBeth (1973), and then obtain the time-series average of coefficients and the standard errors adjusted for heteroskedasticity and autocorrelations using GMM correction. Pooled Data regression is run by OLS. The adjusted $\overline{R}^2$ is time-series average adjusted R^2, and ***, **,* represent 1%, 5%, 10% confidence levels, respectively.

Quarterly Data	Fama-MacBeth Regression		Pooled Data regression	
Model	(1)	(2)	(3)	(4)
Dependent Var.	*QF(t)*	*QF(t)*	*QF(t)*	*QF(t)*
Intercept	-0.591	-1.092	0.319***	-0.388***
QF(t-1)	0.258***	0.249***	0.262***	0.249***
QF(t-2)	0.118***	0.117***	0.132***	0.138***
QF(t-3)	0.057***	0.053***	0.061***	0.065***
QF(t-4)	0.038***	0.029***	0.038***	0.031***
QF(t-5)		0.022***		0.025***
QF((t-6)		0.013**		0.015***
QF(t-7)		0.005		0.006***
QF(t-8)		0.012***		0.011***
R(t-1)	0.408***	0.359***	0.128***	0.124***
R(t-2)	0.219***	0.207***	0.071***	0.063***
R(t-3)	0.160***	0.154***	0.007*	0.004
R(t-4)	0.073**	0.111***	-0.005	-0.005
R(t-5)		0.012		0.003
R(t-6)		-0.022		0.026***
R(t-7)		-0.003		-0.016***
R(t-8)		0.003		0.018***
Adjusted $\overline{R}^2$	0.244	0.229	0.207	0.182
N	46	44	180,224	150,014

Table 3 Sample Statistics of Disposition Effect

This table displays disposition effect for our sample 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 DE (DE) as in equation (5). All statistics are calculated using the stock holding number with paper gains, realized gains, paper losses, and realized losses as showed in the equation (5). Panel A shows the statistics for aggregate sample data and Panel B shows the equal-weighted statistics for the sample funds. *** represents a 1% confidence level of T test.

Panel A. Aggregate data			
	Entire Year	4th Quarter	1th ~3th Quarters
PGR	0.1885	0.1905	0.1877
PLR	0.1704	0.1743	0.1692
DE=PGR-PLR	0.0181***	0.0162***	0.0186***

Panel B. Equal-weighted of sample funds			
	Entire Year	4th Quarter	1th ~3th Quarters
All			
PGR	0.1904	0.1879	0.1902
PLR	0.1674	0.1715	0.1653
DE=PGR-PLR	0.0229***	0.0164***	0.0249***
High-Flow Funds			
PGR	0.1762	0.1715	0.1754
PLR	0.1543	0.1587	0.1511
DE=PGR-PLR	0.0218***	0.0127***	0.0241***
Low-Flow Funds			
PGR	0.2045	0.1999	0.2045
PLR	0.1804	0.1808	0.1790
DE=PGR-PLR	0.0241***	0.0191***	0.0256***
Difference (High minus Low Flow Funds)			
PGR	-0.0282***	-0.0284***	-0.0291***
PLR	-0.0261***	-0.0221***	-0.0279***
DE=PGR-PLR	-0.0022***	0.0064***	-0.0015

Table 4 The Relationship Between the DE 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 DE (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 quarterly fund flows as shown in Panel A, B, and C, respectively. The expected flows are estimated from equation (2) 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. Below each Panel shows the difference statistics between first and last deciles for all variables and the Pearson correlation coefficients with flow ratio. ***, **, and * represent 1%, 5%, and 10% confidence levels, respectively.

Decile	Flow (%)	PGR	PLR	DE	R(t) (%)	R(t-1) (%)
Panel A (inflow)	Variables sorted by actual fund flow					
P1	40.355	0.134	0.113	0.022	4.442	4.332
2	12.504	0.147	0.122	0.025	3.305	3.398
3	6.374	0.157	0.131	0.027	2.869	2.815
4	2.997	0.166	0.138	0.029	2.527	2.514
5	0.758	0.179	0.149	0.030	2.335	2.271
6	-0.975	0.195	0.165	0.031	2.067	1.977
7	-2.565	0.212	0.178	0.034	1.828	1.701
8	-4.309	0.232	0.201	0.032	1.616	1.339
9	-6.712	0.250	0.216	0.034	1.280	0.859
P10 (outflow)	-16.140	0.277	0.244	0.034	0.969	0.746
P1-P10	56.499***	-0.143***	-0.131***	-0.012***	3.474***	3.586***
Corr.	1.000	-0.237	-0.210	-0.038	0.118	0.1044
Panel B (inflow)	Variables sorted by expected fund flow					
1	22.607	0.150	0.123	0.027	3.051	5.685
2	11.211	0.154	0.127	0.027	2.825	4.741
3	6.631	0.162	0.134	0.029	2.752	4.219
4	3.752	0.170	0.141	0.029	2.440	3.583
5	1.745	0.183	0.153	0.031	2.301	2.862
6	0.274	0.194	0.163	0.032	2.197	2.173
7	-1.270	0.210	0.177	0.033	2.029	1.477
8	-2.429	0.225	0.193	0.032	1.972	0.544
9	-3.962	0.241	0.211	0.029	1.817	-0.502
10 (outflow)	-5.610	0.262	0.233	0.029	1.876	-2.736
P1-P10	29.788***	-0.112***	-0.110***	-0.002*	1.175***	8.421***
Corr.	1.0000	-0.202	-0.205	0.006	-0.0169	0.410

(Continue Table 4)

Panel C Variables sorted by unexpected fund flow

Decile	Flow (%)	PGR	PLR	DE	R(t) (%)	R(t-1) (%)
(inflow)						
1	36.184	0.151	0.128	0.023	4.590	2.356
2	9.343	0.169	0.144	0.025	3.247	1.084
3	4.347	0.175	0.149	0.026	2.804	0.952
4	1.822	0.182	0.154	0.028	2.483	1.195
5	0.214	0.192	0.163	0.029	2.229	1.564
6	-0.938	0.203	0.172	0.031	2.074	1.93
7	-1.887	0.208	0.176	0.032	1.761	2.405
8	-2.741	0.214	0.182	0.033	1.573	2.944
9	-3.790	0.220	0.185	0.034	1.360	3.548
10	-9.889	0.237	0.202	0.035	1.150	3.913
(outflow)						
P1-P10	49.782***	-0.087***	-0.075***	-0.012***	3.440***	-1.557***
Corr.	1.000	-0.138	-0.106	-0.045	0.139	-0.186

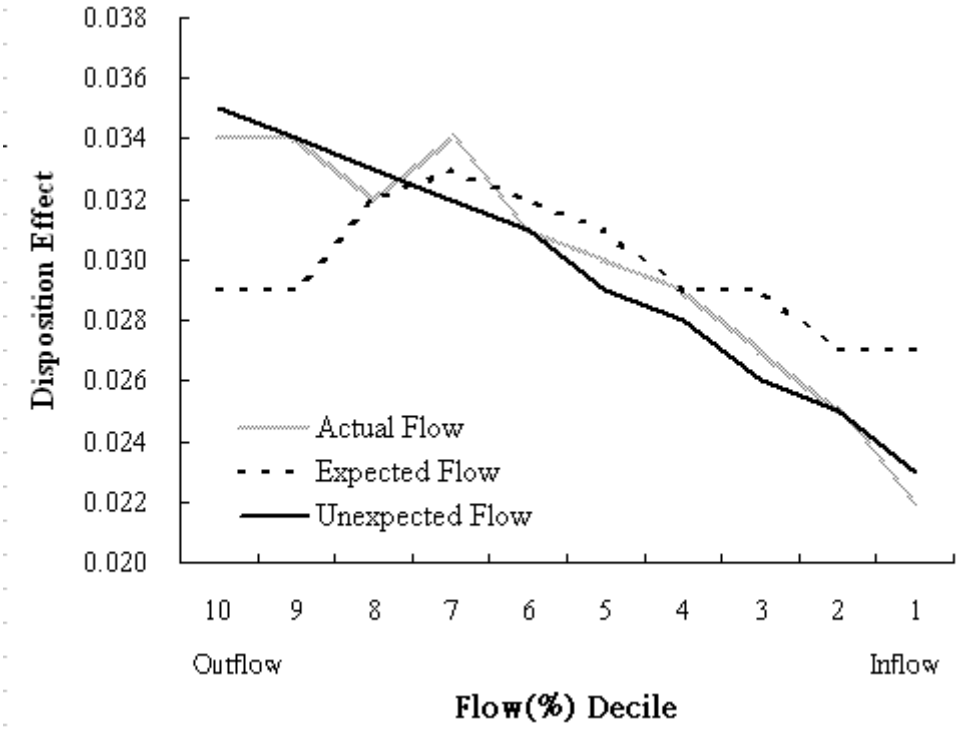

Table 5 The Determinant of the DE for the Actual Flow Analysis

This table reports several determinant factors for the DE. The dependent variable is the DE 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 tax overhang, the log of total net asset (LNTNA), front-end load fee (Frontload), rear-load fees (REAR), fund Expenses, and turnover ratio (TURN). Models (1), (2), (3) are analyzed by using quarterly data, models (4) and (5) are analyzed by using yearly frequencies. These cross-sectional regressions are run for each time period, 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. ***, **,* represent 1%, 5%, 10% confidence levels, respectively. The adjusted $\overline{R}^2$ is time-series average adjusted R^2.

Dependent Variable	Quarterly DE				Yearly DE	
	(1)	(2)	(3)		(4)	(5)
Intercept	3.329***	3.545***	3.523***			
QF(t)	-0.015***	-0.014***	-0.015***			
QF(t-1)	-0.005	-0.006*		Intercept	2.644***	3.011**
QF(t-4: t-1)			-0.002	Yearly average QF	-0.015*	-0.011
TAXOVER(t)	-0.005***	-0.051***	-0.052***	Yearly average TAXOVER	-0.033*	-0.041*
$I_{[QF(t)<0]} \times$ TAXOVER(t)	1.031	0.014	0.014	$I_{[\text{Yearly average } QF<0]} \times$ Yearly average TAXOVER	-0.004	0.003
LNTNA(t)		-0.070*	-0.066*	Yearly average LNTNA		-0.072
FRONTLOAD(t)		0.010	0.011	Yearly average FRONTLOAD		-0.045
REARLOAD(t)		-0.090**	-0.091**	Yearly average REARLOAD		-0.094**
EXPENS(t)		0.151	0.157	Yearly average EXPENS		0.019
TURN(t)		0.057	0.055	Yearly average TURN		0.077
AGE		-0.001	-0.001	Yearly average AGE		0.011
Adj. $\overline{R}^2$	0.012	0.017	0.017	Adj. $\overline{R}^2$	0.0216	0.0278

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

This table reports several determinant factors for the DE by using expected and unexpected flow data. The dependent variable is the DE ratio, which is computed by PGR (proportion of gains realized) minus PLR (proportion of loss realized). The expected flows (EQF) are estimated from equation (2), with the independent variable of four lagged quarterly flows ratio and four lagged quarterly returns. The unexpected flows (UEQF) are the difference between the actual and expected flows. The tax overhang of fund (TAXOVER) is calculated by value-weighted capital gains overhang of fund portfolio. We also include some control variables including the log of total net asset (LNTNA), front-end load fee (FRONTLOAD), rear-load fee (REARLOAD), fund expenses (EXPENS), 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. ***, **,* represent 1%, 5%, 10% confidence levels, respectively. The adjusted $\overline{R}^2$ is time-series average adjusted R^2.

Dependent Variable	Quarterly DE				Yearly DE		
Model	(1)	(2)	(3)		(4)	(5)	(6)
Intercept	3.185***	3.003***	3.114***	Intercept	3.139**	3.06**	3.145**
EQF(t)	-0.005		0.020	Yearly average EQF	0.001		0.016
EQF(t-4:t-1)	-0.002		-0.002	Yearly average UEQF		-0.022***	-0.027**
UEQF(t)		-0.017***	-0.015***	Yearly average TAXOVER	-0.043	-0.041	-0.043*
UEQF(t-4:t-1)		-0.008***	-0.011***	Yearly average LNTNA	-0.089	-0.094	-0.097
TAXOVER(t)	-0.056***	-0.053***	-0.058***	Yearly average FRONTLOAD	-0.053	-0.053	-0.053
LNTNA(t)	-0.041	-0.037	-0.04	Yearly average REARLOAD	-0.108***	-0.121***	-0.111***
FRONTLOAD(t)	-0.009	-0.005	-0.003	Yearly average EXPENS	0.054	0.016	0.035
REARLOAD(t)	-0.131***	-0.153***	-0.129***	Yearly average TURN	0.076*	0.083**	0.083**
EXPENS(t)	0.167	0.125	0.148	Yearly average AGE	0.007	0.006	0.007
TURN(t)	-0.124	-0.098	-0.118				
AGE(t)	0.004	0.001	0.003				
Adj. $\overline{R}^2$	0.0258	0.0247	0.0284	Adj. $\overline{R}^2$	0.0331	0.032	0.0348

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

This table reports the impact of disposition effect on flow-performance relationship. We divide sample fund into four portfolios, Inflow-Low DE, Inflow-High DE, Outflow-Low DE, and Outflow-High DE groups, on the basis of the intersection of Low/High funds and Inflow/Outflow funds. Low/ High DE funds are those funds with DE lower/greater than the median value of disposition effect. For the portfolios of Inflow/Outflow funds, we rank all funds into quintile portfolios on the basis of quarterly (actual / expected / unexpected) fund flow% for each quarter, and obtain the extreme inflow (first quintile) and extreme outflow (fifth quintile) groups. We calculate the time-series average monthly returns for the four fund portfolios and use OLS to run the regression of monthly excess returns on the Fama-French (1993) three factors and the Carhart momentum factor, the regression model is as follows:

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

The dependent variable is the average fund excess returns, alpha is the intercept from the above equations, SMB is the value-weighted portfolio return of small firms minus those of big firms , HML is the returns of a high book-to-market portfolio minus those of a low book-to-market portfolio, UMD is the one-year momentum anomaly calculated by the difference in returns between previously high-performing and poor-performing stocks, rf is the monthly return on T-bills, RM_t is the monthly return on a value-weighted market index, and ε_{pt} is the regression error term. The monthly data of risk-free rate, SMB , HML , and UMD are obtained from French's web. ***, **,* represent 1%, 5%, 10% confidence levels, respectively.

	Inflow-Low DE	Inflow-High DE	Diff.	Outflow-Low DE	Outflow-High DE	Diff.
Panel A Actual Flow						
Alpha	0.410***	0.310***	0.100***	-0.611***	-0.515***	-0.095***
R_m-R_f	0.953***	0.96***	-0.007	1.015***	1.041***	-0.026***
SMB	0.254***	0.307***	-0.053***	0.092***	0.163***	-0.071***
HML	-0.022	0.055**	-0.077***	0.204***	0.195***	0.009
UMD	0.110***	0.074***	0.036***	-0.094***	-0.079***	-0.016**
Adj. R^2	0.956	0.965	0.365	0.938	0.941	0.486
Panel B Expected Flow						
Alpha	-0.045	-0.086	0.042	-0.212	-0.081	-0.131***
R_m-R_f	0.996***	1.007***	-0.011	0.994***	1.018***	-0.024**
SMB	0.345***	0.394***	-0.049***	0.050	0.114***	-0.063***
HML	-0.042	0.022	-0.064***	0.12**	0.109**	0.010
UMD	0.235***	0.192***	0.043***	-0.24***	-0.252***	0.012
Adj. R^2	0.962	0.970	0.342	0.904	0.909	0.358
Panel C Unexpected Flow						
Alpha	0.573***	0.472***	0.101**	-0.745***	-0.655***	-0.09**
R_m-R_f	0.961***	0.965***	-0.004	1.037***	1.063***	-0.027**
SMB	0.156***	0.234***	-0.078***	0.269***	0.337***	-0.067***
HML	-0.020	0.044	-0.064***	0.118***	0.139***	-0.021
UMD	-0.070***	-0.089***	0.019**	0.137***	0.136***	0.001
Adj. R^2	0.912	0.932	0.247	0.946	0.957	0.258

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