**Mutual Fund Flows and Investor Returns:**
**An Empirical Examination of Fund Investor Timing Ability**

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## Abstract

We examine the timing ability of mutual fund investors using cash flow data at the individual fund level. Over 1991-2004 equity fund investor timing decisions reduce fund investor average returns by 1.56% annually. Underperformance due to poor timing is greater in load funds and funds with relatively large risk-adjusted returns. In particular, the magnitude of investor underperformance due to poor timing largely offsets the risk-adjusted alpha gains offered by good-performing funds. Investors in equity index funds also exhibit poor investment timing. We demonstrate that our empirical results are consistent with investor return-chasing behavior. Investor underperformance due to timing is economically small among bond funds and non-existent among money market funds.

*JEL Classifications:* G11, G20

*Keywords*: Mutual fund performance, fund cash flows, investor timing, fund clienteles

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# Mutual Fund Flows and Investor Returns: An Empirical Examination of Fund Investor Timing Ability

## Abstract

We examine the timing ability of mutual fund investors using cash flow data at the individual fund level. Over 1991-2004 equity fund investor timing decisions reduce fund investor average returns by 1.56% annually. Underperformance due to poor timing is greater in load funds and funds with relatively large risk-adjusted returns. In particular, the magnitude of investor underperformance due to poor timing largely offsets the risk-adjusted alpha gains offered by good-performing funds. Investors in equity index funds also exhibit poor investment timing. We demonstrate that our empirical results are consistent with investor return-chasing behavior. Investor underperformance due to timing is economically small among bond funds and non-existent among money market funds.

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Mutual fund investors can enhance their returns by selecting superior funds, advantageously timing their cash flows to the fund, or both. Gruber (1996) and Zheng (1999) suggest that investors have the ability to select funds with superior subsequent performance, a result referred to as the "smart money" effect. These studies find that the short-term performance of funds experiencing positive net cash flow appears better than those experiencing negative net cash flow. Sapp and Tiwari (2004), however, demonstrate that the smart money effect is explained by stock return momentum over the short term. Further research by Frazzini and Lamont (2006) suggests that poor fund selection decisions end up costing longer-term investors (those who do not rebalance quarterly) about 0.84% per year, a result they dub the "dumb money" effect.

In this paper we focus on the second possible method by which investors may enhance their returns, which is not explicitly addressed by the above studies. We ask whether mutual fund investors make good investment decisions strictly in the timing of their cash flows. That is, for any given fund, do equity fund investors put cash in and take cash out at the right time on average? It is well established that inflows to mutual funds are strongly correlated with past fund performance (Ippolito (1992)). Less clear is the impact of investor timing decisions on investor returns. And while numerous studies have examined the timing ability of mutual fund managers or other investment professionals, ours is the first comprehensive study to examine the timing ability of mutual fund investors using cash flow data at the individual fund level.[1]

[1] Studies on the timing ability of fund managers include Bollen and Busse (2001), Dellva (2001), Volkman (1999), Lee and Rahman (1990), Cheng and Lewellen (1984), and Henriksson (1984). Timing ability has also been examined in the context of investment newsletter recommendations (Graham and Harvey (1996)), portfolio

We use the dollar-weighted return, derived as the internal rate of return of money under management, to measure the performance of fund investors, and time-weighted returns to measure the performance of the fund itself (i.e. of the fund manager). Because a time-weighted average return ignores month-to-month variation in assets under management, it measures the return earned by the fund manager, or equivalently, the buy-and-hold return on a dollar invested over the entire sample period. In contrast, a dollar-weighted average return explicitly accounts for net cash flows into and out of the fund over time, reflecting the average investor's performance during the sample period. We measure investor timing ability with a statistic hereafter referred to as the "performance gap," defined as the time-weighted return minus the dollar-weighted return.

The dollar-weighted return measure is particularly well-suited to the focus of this paper because dollar-weighted returns carry the implicit assumption that new cash flows are reinvested over future periods, whereas alternative measures focus only on a single period return, possibly weighting this return with current period cashflow. Specifically, other studies examining investor behavior (e.g. Zheng (1999), Sapp and Tiwari (2004)) impute the fund return, or alpha, to the fund investor at a single point in time. These studies implicitly assume that new money is put into the fund for one period, earns the return generated by the fund, and then is immediately taken out. These measures do not track the impact of multiple period returns on a single cash flow. In reality, the current month's positive net cash flows often remain, either in whole or in part, invested in the fund for multiple periods. Moreover, the impact of cash outflows should include not only the current month's missed return, but the opportunity cost of missed returns in future months as well. The dollar-weighted return methodology captures the interaction between

managers (Elton and Gruber (1991)) and investment advisors (Kleiman, Sahu and Callaghan (1996); Cumby and Modest (1987)).

all cash flows and returns to a fund over the entire sample period, thus measuring the full impact of investor cash flow timing decisions.

Prior studies have examined investors' dollar-weighted returns, but none have used cash flows at the individual fund level. For example, Nesbitt (1995) examines time-weighted and dollar-weighted returns at the aggregate level for 17 categories of mutual funds over the 1984-1994 period. He reports that, on average, investors' dollar-weighted annual returns from these categories are 1.08% less than time-weighted returns. Dalbar (2003) assumes that aggregate equity fund cash flows are invested each month in the S&P 500 index and computes the dollar-weighted return earned on these cash flows. Thus, the dollar-weighted return represents the return active investors would have earned had they invested only in the passive S&P 500 index. The Dalbar study reports that while the S&P 500 Index earned an average annual return of 12.98% from 1984-2003, the average equity fund investor would have earned only 3.51% per year during the same period by investing in the S&P 500. Braverman, Kandel, and Wohl (2005) examine aggregate mutual fund flows and report that the annual dollar-weighted return is significantly lower than the buy-and-hold return over multiple time periods. They speculate that this finding may possibly be due to either time-varying expected returns or investor sentiment.

In testimony to the United States Senate, investment guru John Bogle (2003) argued that the Dalbar (2003) study ignores an additional "selection cost" borne by investors, whereby investors place a disproportionate amount of money into actively managed funds that subsequently underperform the S&P 500 index. Bogle suggests that after accounting for this selection cost, the average mutual fund investor return over the 1984-2002 period is actually *negative*. We note that, in order to properly control for investors' fund choices as Bogle alludes to, it is necessary to compute dollar-weighted returns on a fund-by-fund basis.

The use of aggregate cash flow data in these prior studies potentially biases one's inferences about investor behavior for two reasons. First, aggregation of data, and in particular of individual fund net cash flows and returns, which can be either positive or negative, discards potentially important information.[2] Second, this approach precludes any possibility of investor fund selection ability and does not afford an opportunity to examine possible differential timing performance among various fund clienteles  By using fund-level data, we are able to individually measure the timing performance of investors who choose "good" funds and investors who choose "poor" funds. Thus, the current study contributes to the literature by measuring investor timing ability while also explicitly controlling for any fund selection ability investors may possess.  Our fund-level approach also has the benefit of allowing for an extensive analysis of the cross-sectional variation in investor timing performance in order to shed additional light on fund investor behavior.

For the 7,125 equity mutual funds in our sample we compute monthly dollar-weighted returns over 1991-2004 and find that the geometric average monthly return is 0.62%, while the average monthly dollar-weighted return is 0.49%.  Thus, investors under-perform by about 0.13% per month, or 1.56% annually, relative to the funds they invest in.  This performance gap is twice as large for load funds (0.16% per month) as for no-load funds (0.08% per month).  In order to distinguish between investors based on the quality of fund they choose, we compute the risk-adjusted performance (alpha) of each fund over the sample period according to both the Fama-French (1993) 3-factor model and the Carhart (1997) 4-factor model. Using either

[2] To see how this could potentially impact estimation of investor timing performance, consider two funds, X and Y. Investors in Fund X display poor timing primarily through positive cash flows to the fund that occur ahead of low returns, thus generating a large measured performance gap for Fund X. Investors in Fund Y display poor timing primarily through negative cash flows that occur ahead of high returns, thus generating a large measured performance gap for Fund Y. Upon aggregating the cash flows and returns of these two funds, it is possible that no performance gap at all would be detected in the aggregate data.

measure, we find that poor investor timing is significantly associated with better-performing funds. More interesting yet, we find that the alpha-gain that is potentially available to investors even in good-performing funds under either benchmark measure is largely erased by the poor timing of investors in these funds. This finding is similar in spirit to the story put forth in Frazzini and Lamont (2005), where investors fail to benefit from superior performance due to entering and exiting at the wrong time.

We document further significant cross-sectional variation in the difference between time-weighted and dollar-weighted returns. The performance gap is found to be largest among the largest quintile of funds in our sample. The size of the performance gap is also increasing in fund load, expenses, turnover, and length of fund history. Overall, the evidence suggests that larger, older, more costly funds seem to attract less-sophisticated investors. Even after controlling for other fund characteristics, we still find that poor timing performance is significantly associated with funds that exhibit relatively good risk-adjusted performance.

Analysis of fund style shows that underperformance due to timing is negatively correlated with value-style funds, but is positively associated with momentum-style funds. We also identify and separately examine 416 equity index funds in our sample. Since index funds do not attempt to select securities or time the market, most investors in index funds are generally assumed to be pursuing a completely passive investment strategy. However, we find a significant performance gap for both index and non-index funds, indicating that some index fund investors may also be trying to time their investments through these low-cost vehicles, though the gap is smaller at 0.05% per month, versus 0.13% for non-index funds. Thus, both groups substantially underperform their chosen funds due to poor timing decisions.

To shed some light on the dynamics of our performance gap measure, we conduct a simulation to study the dollar-weighted returns under various specifications for investor behavior. The results suggest that our empirical evidence is most consistent with investors overreacting to recent returns. We also separate funds according to their investment objective, and calculate the average performance gap and average return volatility for each category. Consistent with numerous studies in the experimental psychology literature we find that the gap is largest among objective categories that have the highest return volatility, from 0.25% for aggressive growth funds with the highest volatility, to 0.03% among the lowest-volatility income-growth funds.

To isolate the impact of purchase and withdrawal decisions, we also calculate separately the dollar-weighted returns on positive and negative net cash flows for each fund. The dollar-weighted return on positive net cash flows measures the average return earned on new money into the fund, while the dollar-weighted return on negative net cash flows measures the average future opportunity cost of withdrawn money. We find that the average dollar-weighted return on positive net cash flows is 0.56%, slightly less than the 0.62% average fund return, but well above the 0.49% average dollar-weighted return. This suggests that on average, poorly timed purchase decisions cost investors about 5 basis points per month. In contrast, the dollar-weighted return on negative net cash flows is 0.77%, which can be interpreted as the average future return forgone as a result of investor withdrawals. Relative to the average fund return of 0.62%, this indicates that poorly timed withdrawals cost investors approximately 15 basis points per month.

Finally, for comparison with equity funds, we also examine bond funds and money market funds. We find that the average monthly performance gap over 1991-2004 is much smaller for bond funds at 0.02%, and is nearly flat for money funds at 0.004%. The poor timing phenomenon thus seems to be largely unique to equity mutual funds, suggesting either more sophisticated, or perhaps less active, investors in the bond and money funds.

Our study adds to the growing literature on the behavior and performance of mutual fund investors. By analyzing investor timing at the individual fund level, our methodology preserves cross-sectional differences in the timing performance of investors in individual funds. We not only show that attempts to time the market by fund investors are on average detrimental to investor returns, but we shed light on which fund investors are most likely to exhibit poor timing. Our results are consistent with investor return-chasing behavior. However, it is sobering to reiterate that the performance gap due to poor investor timing largely offsets the value added by actively managed funds in terms of alpha for the subset of funds that does indeed offer a positive alpha. Hence, even investors who are fortunate enough to select the best funds on average sacrifice the potential benefit due to poor timing of cash flows. Overall, our results commend the relative appeal of a simple "buy and hold" strategy to the average investor.

The rest of the paper is organized as follows. Section I describes the data and outlines our return measurement and performance benchmarking methodology. Section II presents the empirical results on investor timing performance and examines the relationship between fund characteristics and the timing performance gap. Section III explores possible explanations for investor return behavior, and Section IV concludes.

## I. Data and Return Measurement Methodology

### *A. Sample Description*

Our sample is taken from the CRSP Survivor-Bias Free US Mutual Fund Database, and includes all domestic common stock funds that exist at any time during the period 1991-2004 for which monthly total net assets (TNA) values exist. Funds with fewer than 12 monthly observations are excluded from the sample. We also exclude international, sector, balanced, and specialized funds, as the benchmarking models employed in our cross-sectional analysis may be inappropriate for these funds. Monthly returns are adjusted to account for multiple fund distributions on the same day, as suggested by Elton, Gruber and Blake (2001).

Since the dollar-weighted return is an internal rate of return measure, it suffers from the multiple solutions problem when monthly fund cash flows repeatedly change sign. However, many of these solutions are either complex numbers or real numbers that are less than –100%. For the vast majority of funds, there exists only one real root greater than –100%. Due to the limited liability constraint inherent in a mutual fund investment, we retain only funds with a unique dollar-weighted return above –100%, which yields a sample of 7,125 funds. Unless otherwise noted, all of our analysis is conducted for these 7,125 funds.

Table 1 reports descriptive statistics for the fund sample. The average fund has nearly half a billion dollars under management and experiences monthly net cash flows of 0.65% of TNA. We also note that average annual fund turnover is 92% of fund assets, the average total load fee is 2.32%, and the average annual fund expense ratio is 1.42%.

*B. Measurement of Returns and Cash Flows*

Denote the return for fund $j$ in month $t$ to be $r_{jt}$. The geometric average monthly return for fund $j$ is calculated as

$$\bar{r}_j^g = \left( \prod_{t=1}^{T} \left(1 + r_{jt}\right) \right)^{1/T} - 1 \tag{1}$$

Geometric returns are appropriate measures of past fund manager performance, and also measure the average return on a dollar invested during the entire sample period. The dollar-weighted average return measures the return weighted by the amount of money invested at each point in time, and thus captures the average return earned by fund investors. The dollar-weighted average monthly return for fund $j$ is defined as the rate of return at which the accumulated value of the initial TNA, plus the accumulated value of net cash flows, equals the actual TNA at the end of the sample period:

$$\bar{r}_j^{dw} : TNA_0\left(1+\bar{r}_j^{dw}\right)^T + \sum_{t=1}^{T} NCF_t\left(1+\bar{r}_j^{dw}\right)^{(T-t)} = TNA_T \qquad (2)$$

where

$$NCF_{j,t} = TNA_{j,t} - TNA_{j,t-1}\left(1+r_{j,t}\right) - MGTNA_{j,t} \qquad (3)$$

Here, $NCF_{j,t}$ denotes the monthly net cash flow for fund $j$ in month $t$, $TNA_{j,t}$ is the total net assets for fund $j$ at the end of month $t$ and $MGTNA_{j,t}$ is the increase in the total net assets due to mergers during month $t$[3]. We follow Gruber (1996) and assume that investors in merged funds place their money in the surviving fund and continue to earn the return on the surviving fund. Finally, because the holdings of the investor are identical to the holdings of the fund itself at any point in time, no risk adjustment is necessary in order to measure investor timing..

### *C. Measurement of Fund Performance*

For our cross-sectional analysis of investor timing ability, we wish to classify funds according to their risk-adjusted performance. We evaluate fund performance using two commonly employed benchmark models: the Fama-French (1993) 3-factor model, and a 4-factor model as in Carhart (1997). Specifically, the Fama-French 3-factor model is given by:

$$r_{p,t} = \alpha_p + \beta_{1,p} RMRF_t + \beta_{2,p} SMB_t + \beta_{3,p} HML_t + e_{p,t} \qquad (4)$$

Here, $r_{p,t}$ is the monthly return on fund $p$ in excess of the one month T-bill return; RMRF is the excess return on a value-weighted market portfolio; and SMB and HML are returns on zero-

[3] While this framework for calculating cash flows is standard in the literature, we also confirm that our results are robust to assuming that cash flows occur at the beginning or middle of the month.

investment factor-mimicking portfolios for size and book-to-market. The Carhart 4-factor benchmarking model is given by:

$$r_{p,t} = \alpha_p + \beta_{1,p} RMRF_t + \beta_{2,p} SMB_t + \beta_{3,p} HML_t + \beta_{4,p} UMD_t + e_{p,t} \quad (5)$$

where $r_{p,t}$, RMRF, SMB, HML are as in the Fama-French three-factor model and UMD is the return on the zero-investment factor-mimicking portfolio for one-year momentum in stock returns. For each model, alpha is computed for each fund from all available return data over the sample period, with a minimum of 12 return observations being required for estimation.

## II. Empirical Results

### *A. Investor Timing Performance*

We compute arithmetic, geometric and dollar-weighted average returns for each fund in our sample, and the results are reported in Panel A of Table 2. For the average fund, investors earn 0.13% less per month (1.56% annually) than the fund itself. For the median fund, the monthly performance gap is 0.11% (1.32% annually). Panels B and C report average returns separately for index and non-index funds, respectively. Interestingly, investors in passively managed funds appear to attempt market timing, though we note that the mean monthly performance gap of 0.13% for actively managed funds is larger than the gap of 0.05% observed for index funds. Panels D and E report average returns for load and no-load funds, respectively. The monthly performance gap of 0.08% for no-load funds is about half the gap of 0.16% observed for load funds. Taken together, Panels A through E in Table 2 suggest that mutual fund investors on average underperform their chosen funds by between 1% and 2% per year due to the timing of their cash flows.

In order to see whether differences in investor timing ability exist between fund objective categories, we sort funds based on their CRSP SI-Objective variable and report summary statistics for each objective category in Table 3. We find that the performance gap is positive and significant for all six major objective categories, although growth-oriented categories in general have the largest performance gaps while income-oriented funds have the smallest. The largest performance gap is seen for aggressive growth funds at 0.25% per month (3.00% annually), and this category also exhibits the largest cross-sectional variability in fund performance.

A potential concern is that our results may be driven by small funds with relatively fewer assets under management. If true, then our reported average performance gap need not represent the performance gap for the average dollar invested in equity funds. However, we find that our results are in fact driven by the larger funds in our sample. In Table 4 we report the performance gap when funds are sorted into quintiles based on total assets. The table reveals a monotonic relationship between the performance gap and fund size categories, where underperformance is the largest for the largest quintile of funds. The timing performance gap is significantly positive for all size categories except for the smallest funds, where it is indistinguishable from zero. The largest quintile of funds has an average monthly performance gap of 0.19% (2.28% annually).This suggests that a simple average of all funds may actually understate the performance gap on the average dollar invested in equity funds, since the performance gap is greatest among the largest funds.

*B. Fund Alphas and the Timing Performance Gap*

By measuring investor timing ability at the individual fund level we are able to examine whether there is any apparent relationship between timing performance and the quality of the fund selected by an investor. For this purpose we compute a risk-adjusted return, or alpha, according to both the Fama and French (1993) 3-factor and Carhart (1997) 4-factor benchmark models for each fund over the sample period. Using this measure of fund quality, we then sort all funds into deciles based on the alpha measure of fund performance.

Panel A of Table 5 sorts funds by 3-factor alpha and reports the mean 3-factor alpha and performance gap for each decile. We first of all note that the timing performance gap is positive and significant for all deciles of alpha-sorted funds. The average annual 3-factor alpha for all funds in the sample is -0.18% per month (-2.18% annually), and only the top three deciles of funds have an average alpha that is positive. The relationship between investor timing underperformance and the risk-adjusted performance of the fund is quite strong, with a Spearman rank correlation of 0.84, significant at the 1% level. For the decile of best performing funds, the 3-factor alpha is an impressive 0.57% per month, but this subset of funds also has the largest performance gap at 0.38% per month due to poor cash flow timing by investors.

The last column of Table 5 reports the net performance realized by investors, computed as the difference between the alpha generated by the fund and the performance gap due to cash flow timing. Only the top decile of best performing funds in terms of 3-factor alpha shows a positive net return to investors. For investors fortunate enough to be in this category, the net performance is 0.19% per month (2.33% annually), even after taking into account poor cash flow timing decisions. On average, however, the net return of equity fund investors is -0.31% per month (-3.71% annually). Of this 3.71% total annual underperformance, we see that 2.18% is attributable to the underperformance of equity funds in general, and the other 1.53% is due to poor timing decisions by investors. We also separately report the average alpha and average performance gap for the subset of 1,902 funds that has a positive alpha. It is interesting to note that the alpha-gains of 0.27% per month offered by these good performing funds is largely offset by average investor underperformance of 0.25% per month due to poor timing decisions.

Panel B of Table 5 ranks funds into deciles according to the 4-factor alpha performance measure and reports the mean 4-factor alpha and performance gap for each decile of funds. Controlling for stock return momentum has no material effect on the results, which are nearly indistinguishable from those of the 3-factor analysis in Panel A. Investors in the better performing funds again exhibit the poorest cash flow timing, which to a large extent offsets the superior performance offered by these funds. For the 1,918 funds that generate a positive alpha, the potential gain of 0.23% per month is only slightly larger than the average investor underperformance of 0.18% per month due to poor cash flow timing.

*C. Determinants of the Performance Gap*

We have conducted several univariate sorts of the data which have revealed some interesting features of investor timing underperformance. We now analyze the determinants of the performance gap controlling for a number of fund characteristics such as fund age, size, expenses, load, turnover, level of cash flow, and a measure of overall performance. For each fund, the mean level of each fund characteristic over the sample period is employed. Model I in Table 6 includes among the regressors the mean return of the fund over the sample period as a measure of performance. Model II replaces the raw return with the fund 3-factor alpha as a measure of performance, and Models III and IV adopt the 4-factor alpha as a performance measure. Model IV also includes the estimated factor loadings for size, book-to-market, and momentum in order to control for fund style.

Results show that the size of the performance gap is increasing in fund expenses, load fees, turnover, and length of return history, although the significance of expenses and load fees is generally marginal. The positive relation between timing underperformance and both fund expenses and fund turnover is particularly intriguing, since both dollar-weighted and geometric returns are measured net of expenses and trading costs. The evidence indicates that older and more expensive funds are associated with an investor clientele that is especially poor at cash flow timing. Also note that neither fund size nor average net cash flow are significant predictors of timing performance after controlling for other fund characteristics. The fact that the level of fund net cash flows has no marginal explanatory power for the performance gap suggests that the overall rate of non-investment growth of the fund is irrelevant to investor timing performance. Load funds are typically purchased with the help of a broker or investment advisor, and our evidence suggests that those investors who are most likely relying on advice from a broker perform especially poorly from a timing standpoint. This is consistent with Bergstresser, Chalmers and Tufano (2006), who find that brokers typically fail to deliver any tangible benefits to their clientele.

Table 6 also confirms that the performance gap is greatest in funds with the best performance, whether measured by raw returns or by either the 3-factor or 4-factor benchmark. This is an interesting finding, because it tells us that there is no necessary connection between being able to select good funds and timing investment cash flows well. In fact the evidence is quite the opposite: investors who are fortunate enough to be in a good fund are nevertheless plagued by particularly poor timing of their cash flows. Finally, we note that a size-based fund style is not correlated with the performance gap, although underperformance due to timing is negatively correlated with value-style funds and is positively associated with momentum-style funds.

*D. An Alternative Measure of Investor Timing Ability*

To further examine the source of timing underperformance exhibited by investors, we separately calculate the dollar-weighted returns on positive and negative cash flows to each fund. Using this approach we are able to separate the effect of net purchase and withdrawal decisions in order to determine whether these have a differential impact on investor timing performance. An additional feature of this approach is that fund total assets are ignored and investor dollar-weighted returns are therefore unaffected by changes in fund size that are due to fund returns.[4] Thus, calculating investor returns separately for positive and negative cash flows also serves as a robustness check on our earlier results. On the other hand, care must be taken in handling these returns because the dollar amounts of positive and negative cash flow from which they are respectively derived may differ substantially.

Note that investors with positive timing ability will systematically invest more money prior to high return periods, producing a dollar-weighted return on positive net cash flows that exceeds the geometric average return. They will also systematically withdraw funds prior to low return periods, generating a dollar-weighted return on negative net cash flows that is less than the fund's geometric average return. From the investor's perspective, high dollar-weighted returns are desirable for positive cash flows, while low dollar-weighted returns are desirable for negative cash flows. In particular, the average return generated by the fund serves as the relevant benchmark against which we compare the average investor returns on positive and negative cash flows.

[4] Note that if low or negative returns occur relatively late in the sample period, when invested assets tend to be highest, then these larger asset-weights can lead to lower investor dollar-weighted returns. However, average returns in the last two years of our sample are positive, and we find that omitting these last two years significantly increases the performance gap. This is noteworthy because it demonstrates that the results reported in Table 2 are economically and statistically significant in spite of the growing asset base in the last two years of the sample.

Define, $NCF^{+}_{j,t} \equiv \max\left(NCF_{j,t},0\right)$ and $NCF^{-}_{j,t} \equiv \min\left(NCF_{j,t},0\right)$. The dollar-weighted return on positive net cash flows only, $\bar{r}^{dw,+}_{j}$, is defined as

$$\bar{r}^{dw,+}_{j} : \sum_{t=1}^{T} NCF^{+}_{j,t}\left(1+\bar{r}^{dw,+}_{j}\right)^{(T-t)} = \sum_{t=1}^{T}\left( NCF^{+}_{j,t}\prod_{s=t+1}^{T}\left(1+r_{j,s}\right)\right) \tag{6}$$

and the dollar-weighted return on negative net cash flows, $\bar{r}^{dw,-}_{j}$, is defined as

$$\bar{r}^{dw,-}_{j} : \sum_{t=1}^{T} NCF^{-}_{j,t}\left(1+\bar{r}^{dw,-}_{j}\right)^{(T-t)} = \sum_{t=1}^{T}\left( NCF^{-}_{j,t}\prod_{s=t+1}^{T}\left(1+r_{j,s}\right)\right) \tag{7}$$

Table 7 reports the dollar-weighted return calculated separately for positive and negative net cash flows, according to equations (6) and (7). We find that the dollar-weighted return on positive net cash flows is 0.56% per month for the average fund, while the dollar-weighted average return on negative net cash flows is 0.77%. Thus the average new dollar invested into the average fund earned 0.56% per month, while the average dollar withdrawn from the average fund would have earned 0.77% had it remained in the fund. If investors had simply foregone all withdrawal decisions and instead left their money in the original fund, it would have earned an average future monthly return of 0.77%. Instead, investors directed their cash to funds where it earned an average return of 0.56%, shaving an average of 0.22% from their monthly return. Moreover, relative to the average fund return of 0.62%, this suggests that poor investor withdrawal decisions hurt investors more than poor purchase decisions, though both clearly play a role in investor underperformance.

One possible explanation of these results is that investors respond to poor fund performance by withdrawing assets, behaving in a manner consistent with the limits-of-arbitrage story of Shleifer and Vishny (1997). In their model, investors withdraw money after negative returns, thereby irrationally selling assets that are in fact undervalued. It is also possible that investor withdrawals are liquidity motivated, and that investor liquidity needs are most acute in periods where fund returns are poor. In either case, we can state that investors systematically withdraw funds prior to relatively good performance, and these withdrawals reduce investor returns.

## III. Exploring Investor Behavior

### *A. Explanations for the Performance Gap*

The empirical finding of a pervasive timing performance gap is consistent with a behavioral explanation where fund investors simply chase large recent returns and flee from low recent returns. Timing underperformance may occur even if investors are able to identify funds that on average outperform their peers and is likely due to a combination of the weak persistence in fund returns and investor failure to rebalance at the right time. Intuitively speaking, if fund returns are serially uncorrelated and investors buy in following returns far above the mean while taking cash out following returns far below the mean, they will on average lose due to the tendency of outcomes to cluster at the mean. Even in the presence of some weak return persistence, investors may overestimate their ability to exploit this persistence. If active investors do not rebalance at the right times, they can still suffer inferior performance due to poor cash flow timing.

To explore the possibility that the performance gap reflects an underlying psychological bias, we re-examine the cross-sectional variation in the performance gap. Numerous studies in the experimental psychology literature demonstrate that individual cognitive biases are often state dependent. For example, overconfidence tends to be most pronounced in situations where information is ambiguous and predictability is low (Griffin and Tversky, 1992) and the task is of moderate to extreme difficulty (Fischoff, Slovic and Lichtenstein, 1977). Overconfident investors over-estimate the precision of their information, trade too frequently, and as a result experience poor investment performance (Odean, 1998).

Kahneman and Tversky (1972) examine the representativeness heuristic, defined as a subjective judgment of the extent to which an event is similar in essential properties to the parent population. They demonstrate that individuals often overestimate the degree to which a single event is similar to the parent population. Mutual fund investors who exhibit the representativeness heuristic will overestimate the predictability of fund returns, believing that a single large return is indicative of a fund with a high mean return. This could lead to return-chasing behavior and generate a performance gap between investor returns and the returns of the underlying fund.

In light of the behavioral evidence, we conjecture that if psychological biases are influencing our results, the performance gap will be most pronounced among the funds with the highest return uncertainty and volatility. In Table 3 we reported the volatility of average returns for the funds in each category sorted by investment objective. The results show a strong positive correlation between return volatility and the performance gap. For example, return volatility and the performance gap are greatest among Aggressive Growth funds, with an annual gap of 3%. The gap and volatility are both smallest for the Income-Growth category of funds, where the average performance gap is barely significant.

While consistent with a behavioral explanation, these results are by no means definitive. They are also consistent with a liquidity-based explanation (described in the next section). In addition, it is possible that the sample distribution of returns may differ across objective categories, which could produce variations in the performance gap independent of investor behavior.

*B. Simulation Evidence*

In this section, we use simulated data to study how our measures of performance vary for different specifications of investor behavior. We simulate a sample of 7,125 funds with 36 monthly return observations each. Monthly returns are calibrated to correspond to the average return in our actual data sample and are assumed to be independent draws from a normal distribution with mean return 0.75% and standard deviation of 5%. Net cash flows are assumed to occur at the end of each month. The net cash flow, as a percentage of the end-of-month TNA (after returns), is determined by one of five specifications. All specifications consist of a random liquidity component, $\varepsilon_{jt} \sim N(0, s.d. = 1\%)$. In addition, specifications 2-5 consist of a behavioral component. The sensitivity of cash flows to returns employed in each model was calibrated through regression using the mutual fund sample.[5] Let

$$I^{+} = \begin{cases} 1 \text{ if } r_{jt} > 0.75\% \\ 0 \text{ otherwise} \end{cases}, \text{ and } \quad I^{-} = \begin{cases} 1 \text{ if } r_{jt} \leq 0.75\% \\ 0 \text{ otherwise} \end{cases}$$

*Specification 1:* $$NCF_{jt} = \varepsilon_{jt} \tag{8a}$$

*Specification 2:* $$NCF_{jt} = \varepsilon_{jt} + 3(r_{jt} - 0.0075) \tag{8b}$$

*Specification 3:* $$NCF_{jt} = \varepsilon_{jt} + 3(r_{jt} - 0.0075) \cdot I^{+} \tag{8c}$$

*Specification 4:* $$NCF_{jt} = \varepsilon_{jt} + 3(r_{jt} - 0.0075) \cdot I^{-} \tag{8d}$$

*Specification 5:* $$NCF_{jt} = \varepsilon_{jt} - 3(r_{jt} - 0.0075) \tag{8e}$$

Under specification 1, net cash flows are random. End-of-month net cash flows are correlated with the current month’s return under specification 2, so that investors make positive investments in funds with above average returns, and withdraw money from funds experiencing below average returns. The magnitude of the cash flow is directly proportional to the difference between the actual return and the average return. In specification 3, investors chase hot funds,

[5] For each fund, we regress percentage net cash flow on lagged mean-centered returns. The average cross-sectional coefficient from these regressions is 3.06, thus motivating our choice of 3.0 for the performance-cashflow sensitivity coefficient in (8b) through (8e).

but net cash flows are random for funds with poor returns. Investors flee from poor performers under Specification 4, but cash flows to hot funds are random. Specification 5 simulates a contrarian strategy, where investors sell funds after above average returns, and buy funds after below average returns.

Table 8 reports summary statistics for the average fund return, average investor dollar-weighted return, and the performance gap. In addition, we calculate the dollar-weighted returns on the signed cash flows and report the difference. With random returns and net cash flows (specification 1), the performance gap is zero, as is the difference between positive and negative cash flow returns. The performance gap is positive for the three momentum based strategies in specifications 2-4, indicating poor timing ability, and is negative for the contrarian strategy, indicating positive timing ability. In addition, the difference between returns on positive and negative net cash flows is negative for specifications 2-4, indicating that the average opportunity cost of withdrawn funds exceeds the average return earned on new investments. Overall, the simulation results in Table 8 show that investor return-chasing behavior is broadly consistent with the negative timing ability and performance gap found empirically.

*C. Timing Performance in Alternative Asset Classes*

Table 7 demonstrates that the opportunity cost of withdrawn equity funds is quite high — higher than the fund’s average return— which we interpret as evidence of negative investor timing. However, this interpretation is invalid if there exist alternative investments with returns that exceed the equity fund’s opportunity cost. Our earlier analysis made the implicit assumption that withdrawals from equity funds were subsequently reinvested in other equity funds. It’s possible that the cash withdrawn from equity funds was subsequently invested in another asset class, such as bonds, to earn a return greater than the foregone equity fund return. While our data do not allow us to track withdrawals nor identify where the withdrawn money is actually reinvested, we do check for this possibility by comparing the average dollar-weighted return on new money into bond funds and money market funds with the corresponding opportunity cost of funds withdrawn from equities.

The bond fund sample consists of all domestic bond funds in the CRSP Survivor-bias Free Mutual Fund database with a unique dollar-weighted average return over the 1991-2004 period. There are 7,222 such funds with an average TNA of $228 million, an average load of 2.40%, and average annual expenses of 1.05%. The sample of money market funds includes 2,730 funds with unique dollar-weighted average returns over the 1991-2004 period, with an average TNA of $825 million, an average load of 0.26%, and average annual expenses of 0.60%. Performance results are reported in Table 9.

We find that there is a smaller performance gap among bond funds. We also note that the average bond fund returns are much lower than the opportunity cost of withdrawn equity funds. Specifically, the average geometric return among bond funds is 0.43% per month, while the average dollar-weighted return is 0.41%, producing an average monthly performance gap of 0.02%. Moreover, the dollar-weighted return on positive bond cash flows is 0.42% per month, while the return on negative bond cash flows is only slightly higher, at 0.45%, which again indicates only modest mis-timing. Similar results are found for money market funds, where the average performance gap is only 0.002% per month. The average return on positive cash flows is slightly higher than the return on negative cash flows (2.54% vs. 2.45% annually).

Overall, the average performance gap is small among bond funds and flat among money market funds, suggesting that negative timing is largely a phenomenon exhibited by equity fund investors. In light of the relatively lower return volatility for bonds and money market funds, these results are also consistent with the behavioral story presented earlier.

## IV. Conclusions

Our study examines the timing ability of mutual fund investors using cash flow data at the individual fund level. We do this by computing the dollar-weighted return earned by investors in each individual fund over the period 1991-2004 and find that the average active fund investor substantially underperforms the growth of a dollar invested in the fund over the entire measurement period. This phenomenon is not only significant for the entire sample but is also found to be robust across various sub-categories of funds whether sorted by size, objective, or risk-adjusted performance. As demonstrated through simulation, this timing underperformance is consistent with investor return-chasing behavior. Furthermore, a comparison of the performance of index fund investors to that of non-index fund investors shows that both groups substantially underperform due to poor timing decisions. This is interesting in that it suggests that a significant number of investors who have decided to take a passive approach to security selection by indexing are not necessarily passive in the timing of their cash flows, perhaps preferring a pure timing strategy through this low-cost vehicle.

Certain fund characteristics such as load fees, expense ratios, turnover, and age are directly correlated with an underperforming active investor clientele. It may be the case that more sophisticated investors are able to locate newer funds to move into as they become available, whereas older and larger funds enjoy significant entropy due to name-brand or a less-mobile or captive investor clientele. Most interesting, however, is the finding that investors who are fortunate enough to be in the best performing funds also exhibit the worst timing performance of all. Thus return chasing can be a costly endeavor, even when a good fund is found.

Overall, our results suggest that a note of caution is in order for fund investors who are considering whether to attempt market timing.  Rather than outperforming a given fund, the average active investor is more likely to underperform a passive dollar invested in the fund.  In fact, given the magnitude of average underperformance of new cash flows we have documented, losses from poor market timing decisions likely would erase any potential gains from investing in an otherwise superior fund.

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**Table 1**
**Sample Statistics**

The table presents summary statistics on the mutual fund sample obtained from the CRSP Survivor-Bias Free US Mutual Fund Database. The sample includes all U.S. equity mutual funds that existed at any time during January 1991 through December 2004 for which monthly total net assets (TNA) values exist. Sector funds, international funds, balanced funds and specialized funds are excluded. The final sample contains 7,125 funds. The monthly net cash flow for fund *j* in month *t* is $NCF_{j,t} = TNA_{j,t} - TNA_{j,t-1}(1 + r_{j,t}) - MGTNA_{j,t}$, where, $NCF_{j,t}$ denotes the monthly net cash flow for fund *j* in month *t*, $TNA_{j,t}$ is the total net assets for fund *j* at the end of month *t*, $MGTNA_{j,t}$ is the increase in the total net assets due to mergers during month *t*, and $r_{j,t}$ is the fund's return in month *t*. Turnover is defined as the minimum of aggregate purchases or sales of securities during the year, divided by the average TNA. Maximum front-end load is the maximum percent charges applied at the time of purchase, while maximum total load fees equals maximum front-end load fees plus maximum sales charges paid when withdrawing money from the fund. The expense ratio is the percentage of total investment that shareholders pay for the fund's operating expenses. For each item, we compute the cross-sectional averages in each year from 1991 to 2004. The reported statistics are computed from the time-series of the 14 annual cross-sectional averages for each item.

| | Mean | Median | 25$^{th}$ percentile | 75$^{th}$ percentile | Standard Deviation |
|---|---|---|---|---|---|
| Total Net Assets ($ millions) | 478.94 | 466.33 | 390.85 | 545.47 | 101.84 |
| Monthly Net Cash Flow ($ millions) | 3.09 | 2.97 | 1.73 | 4.66 | 1.70 |
| Turnover (%/year) | 91.67% | 88.44% | 85.47% | 96.11% | 12.58% |
| Maximum Front-End Load Fee (%) | 1.51% | 1.27% | 1.22% | 1.70% | 0.47% |
| Maximum Total Load Fee (%) | 2.32% | 2.26% | 2.19% | 2.30% | 0.20% |
| Expense Ratio (%/year) | 1.42% | 1.44% | 1.36% | 1.47% | 0.12% |

## Table 2
## Fund Returns and Investor Timing Performance

For each fund, we calculate the average monthly arithmetic, geometric and dollar-weighted returns over the entire sample period. The arithmetic average equals the sum of a fund's reported returns, divided by the fund's number of reported returns. The geometric average return is calculated according to equation (1) in the text, and the dollar-weighted return is calculated according to equation (2) in the text. For each fund, we calculate the difference between geometric and dollar-weighted returns, which we label the fund's Performance Gap. Panel A reports statistics on the full sample of funds. Panel B reports returns separately for index funds, while Panel C reports returns for non-index funds. Panel D reports returns for load funds, and Panel E reports returns for no-load funds. T-statistics for the mean performance gap are reported in parentheses. Returns are percent per month.

| | Mean | Median | 25th percentile | 75th percentile | Standard Deviation |
|---|---|---|---|---|---|
| *Panel A: All Funds (n=7,125)* | | | | | |
| Arithmetic Monthly Return | 0.74 | 0.83 | 0.39 | 1.21 | 0.91 |
| Geometric Monthly Return | 0.62 | 0.69 | 0.24 | 0.11 | 0.96 |
| Dollar-Weighted Monthly Return | 0.49 | 0.62 | 0.02 | 1.07 | 1.02 |
| Performance Gap | 0.13 | 0.11 | -0.11 | 0.35 | 0.53 |
| (*t*-stat) | (20.70) | | | | |
| *Panel B: Index Fund (n=416)* | | | | | |
| Arithmetic Monthly Return | 0.73 | 0.77 | 0.33 | 1.07 | 0.84 |
| Geometric Monthly Return | 0.62 | 0.65 | 0.20 | 0.95 | 0.87 |
| Dollar-Weighted Monthly Return | 0.57 | 0.62 | 0.13 | 1.07 | 0.91 |
| Performance Gap | 0.05 | 0.06 | -0.21 | 0.28 | 0.45 |
| (*t*-stat) | (2.27) | | | | |
| *Panel C: Non- Index Funds (n=6,709)* | | | | | |
| Arithmetic Monthly Return | 0.74 | 0.82 | 0.39 | 1.18 | 0.89 |
| Geometric Monthly Return | 0.60 | 0.68 | 0.24 | 1.06 | 0.94 |
| Dollar-Weighted Monthly Return | 0.47 | 0.59 | 0.01 | 1.04 | 1.01 |
| Performance Gap | 0.13 | 0.11 | -0.10 | 0.36 | 0.54 |
| (*t*-stat) | (19.72) | | | | |
| *Panel D: Load Funds (n=4,408)* | | | | | |
| Arithmetic Monthly Return | 0.68 | 0.76 | 0.34 | 1.11 | 0.81 |
| Geometric Monthly Return | 0.53 | 0.63 | 0.19 | 0.98 | 0.84 |
| Dollar-Weighted Monthly Return | 0.38 | 0.50 | -0.07 | 0.95 | 0.94 |
| Performance Gap | 0.16 | 0.12 | -0.09 | 0.37 | 0.51 |
| (*t*-stat) | (20.83) | | | | |
| *Panel E: No-Load Funds (n=2,717)* | | | | | |
| Arithmetic Monthly Return | 0.85 | 0.90 | 0.48 | 1.31 | 0.98 |
| Geometric Monthly Return | 0.70 | 0.76 | 0.34 | 1.20 | 1.05 |
| Dollar-Weighted Monthly Return | 0.63 | 0.73 | 0.20 | 1.20 | 1.09 |
| Performance Gap | 0.08 | 0.07 | -0.14 | 0.33 | 0.60 |
| (*t*-stat) | (6.95) | | | | |

**Table 3**
**Timing Performance by Fund Objective**

For each fund, we calculate the average monthly arithmetic, geometric and dollar-weighted returns over the entire sample period. The arithmetic average equals the sum of a fund's reported returns, divided by the fund's number of reported returns. The geometric average return is calculated according to equation (1) in the text, and the dollar-weighted return is calculated according to equation (2) in the text. For each fund, we also calculate the difference between geometric and dollar-weighted returns, which we label the fund's Performance Gap. Funds are divided into objective categories using the CRSP SI-Objective variable, and summary statistics are reported for each objective category. Standard deviations are reported for the average geometric return and performance gap. T-statistics for the mean performance gap are reported in parentheses. Returns are percent per month.

| | Mean Values | | | Median Values | | | | |
|---|---|---|---|---|---|---|---|---|
| | Geometric Monthly Return | Dollar-Weighted Monthly Return | Performance Gap | Geometric Monthly Return | Dollar-Weighted Monthly Return | Performance Gap | Std Dev of Avg. Fund Return | Std Dev of Performance Gap |
| Aggressive Growth<br>*N*=456 | 0.37 | 0.13 | 0.25<br>(7.52) | 0.58 | 0.34 | 0.21 | 1.31 | 0.71 |
| Small-Cap Growth<br>*N*=1428 | 0.91 | 0.75 | 0.16<br>(10.25) | 0.90 | 0.79 | 0.14 | 1.00 | 0.59 |
| Mid-Cap Growth<br>*N*=825 | 0.77 | 0.64 | 0.13<br>(6.79) | 0.82 | 0.75 | 0.09 | 0.94 | 0.55 |
| Growth<br>*N*=2509 | 0.40 | 0.26 | 0.14<br>(13.46) | 0.52 | 0.42 | 0.11 | 0.91 | 0.52 |
| Growth & Income<br>*N*=1570 | 0.57 | 0.51 | 0.06<br>(5.32) | 0.63 | 0.56 | 0.06 | 0.70 | 0.45 |
| Income-Growth<br>*N*=319 | 0.71 | 0.68 | 0.03<br>(1.98) | 0.72 | 0.76 | 0.02 | 0.51 | 0.27 |

## Table 4
## Timing Performance by Fund Size

For each fund, we calculate the average monthly arithmetic, geometric and dollar-weighted returns over the entire sample period. The arithmetic average equals the sum of a fund's reported returns, divided by the fund's number of reported returns. The geometric average return is calculated according to equation (1) in the text, and the dollar-weighted return is calculated according to equation (2) in the text. For each fund, we also calculate the difference between geometric and dollar-weighted returns, which we label the fund's Performance Gap. Funds are divided into quintiles based upon average total net assets (TNA). The cross-sectional averages for each TNA-based quintile are reported. Quintile 1 contains the smallest funds and quintile 5 contains the largest funds. Returns are percent per month.

| | (small)<br>Quintile 1 | Quintile 2 | Quintile 3 | Quintile 4 | (large)<br>Quintile 5 |
|---|---|---|---|---|---|
| Average TNA (millions) | 1.295 | 8.556 | 30.700 | 100.786 | 1,251.650 |
| Arithmetic Return | 0.58 | 0.65 | 0.74 | 0.84 | 0.91 |
| Geometric Return | 0.44 | 0.51 | 0.59 | 0.69 | 0.76 |
| Dollar-Weighted Return | 0.43 | 0.39 | 0.45 | 0.52 | 0.57 |
| Performance Gap | 0.01 | 0.12 | 0.14 | 0.17 | 0.19 |
| (*t*-stat) | (0.77) | (8.69) | (11.42) | (13.29) | (17.67) |

## Table 5
## Timing Performance for Deciles Formed on Fund Alpha

Panel A reports the mean alpha and mean performance gap for deciles of funds sorted on three-factor alpha. Panel B reports the mean alpha and mean performance gap for deciles of funds sorted on four-factor alpha. In each case, alpha is computed for each fund from all available return data over the sample period. Investor net performance is computed as alpha minus the performance gap. All returns are percent per month.

Panel A: Performance Ranked on 3-factor Alpha

| 3-factor Alpha Performance Decile | 3-factor Alpha | Timing Performance Gap | Timing Performance Gap t-stat | Investor Net Performance |
|---|---|---|---|---|
| 1 Worst | -0.993 | 0.068 | 2.42 | -1.061 |
| 2 | -0.512 | 0.080 | 4.65 | -0.592 |
| 3 | -0.369 | 0.054 | 3.34 | -0.423 |
| 4 | -0.277 | 0.036 | 2.29 | -0.313 |
| 5 | -0.201 | 0.076 | 5.02 | -0.277 |
| 6 | -0.131 | 0.094 | 5.92 | -0.225 |
| 7 | -0.061 | 0.146 | 8.98 | -0.207 |
| 8 | 0.015 | 0.171 | 9.04 | -0.156 |
| 9 | 0.139 | 0.166 | 7.99 | -0.027 |
| 10 Best | 0.571 | 0.378 | 14.19 | 0.194 |
| | | | | |
| All funds | -0.182 | 0.127 | | -0.309 |
| Alpha>0 funds (*N*=1,902) | 0.273 | 0.252 | | 0.021 |
| | | | | |
| Spearman Rank Correlation | | 0.84*** | | |

Panel B: Performance Ranked on 4-factor Alpha

| 4-factor Alpha Performance Decile | 4-factor Alpha | Timing Performance Gap | Timing Performance Gap t-stat | Investor Net Performance |
|---|---|---|---|---|
| 1 Worst | -0.971 | 0.110 | 3.98 | -1.081 |
| 2 | -0.520 | 0.092 | 4.70 | -0.612 |
| 3 | -0.369 | 0.118 | 6.11 | -0.487 |
| 4 | -0.273 | 0.079 | 4.59 | -0.352 |
| 5 | -0.197 | 0.118 | 7.06 | -0.315 |
| 6 | -0.129 | 0.120 | 7.05 | -0.248 |
| 7 | -0.061 | 0.103 | 6.56 | -0.164 |
| 8 | 0.017 | 0.136 | 8.42 | -0.119 |
| 9 | 0.120 | 0.164 | 8.36 | -0.044 |
| 10 Best | 0.487 | 0.228 | 8.87 | 0.259 |
| | | | | |
| All funds | -0.190 | 0.127 | | -0.316 |
| Alpha>0 funds (*N*=1,918) | 0.233 | 0.182 | | 0.051 |
| | | | | |
| Spearman Rank Correlation | | 0.76** | | |

** Significant at the 5% level
*** Significant at the 1% level

**Table 6**
**Determinants of the Performance Gap**

For each equity mutual fund, we calculate the difference between geometric and dollar-weighted returns, which we label the fund's performance gap. The performance gap is the dependent variable in a linear regression on the fund characteristics listed in the first column of the table. Three-factor and four-factor alphas are estimated for each fund according to equations (4) and (5), respectively, in the text using all available fund returns in the sample period. The regression coefficients are reported with White heteroskedasticity-consistent *t*-statistics in parentheses.

| | Model | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Intercept | -0.129<br>(-1.56) | -0.038<br>(-1.00) | -0.054<br>(-1.40) | -0.046<br>(-1.22) |
| Number of Returns | 0.001<br>(11.23) | 0.001<br>(9.41) | 0.001<br>(10.79) | 0.002<br>(11.55) |
| Average TNA | -0.002<br>(-0.72) | -0.002<br>(-1.19) | -0.002<br>(-1.10) | -0.003<br>(-1.48) |
| Average Fund Expenses | 5.041<br>(1.37) | 5.108<br>(1.99) | 4.585<br>(1.72) | 3.929<br>(1.48) |
| Average Total Load | 0.755<br>(1.73) | 0.658<br>(1.86) | 0.660<br>(1.83) | 0.665<br>(1.85) |
| Average Turnover | 0.019<br>(3.20) | 0.018<br>(3.16) | 0.019<br>(3.26) | 0.013<br>(2.43) |
| Average Net Cash Flow (% of TNA) | -0.001<br>(-0.74) | -0.001<br>(-0.81) | -0.001<br>(-0.75) | -0.001<br>(-0.65) |
| Average Return | 7.866<br>(7.43) | | | |
| 3-Factor Alpha | | 16.881<br>(5.32) | | |
| 4-Factor Alpha | | | 9.381<br>(3.17) | 10.594<br>(3.31) |
| SMB Factor Loading | | | | 0.015<br>(0.52) |
| HML Factor Loading | | | | -0.092<br>(-3.07) |
| UMD Factor Loading | | | | 0.260<br>(4.49) |
| Adj. $R^2$ | 0.039 | 0.038 | 0.026 | 0.041 |

## Table 7
## Investor Returns by Signed Cash Flow

This table reports statistics on fund dollar-weighted monthly returns computed separately on positive and negative net cash flows for the full sample of equity funds. Statistics on the difference in fund returns for positive and negative cash flows is also reported. These returns are calculated according to equations (6) and (7) in the text. Returns are percent per month.

| | Mean | Median | 25th percentile | 75th percentile | Standard Deviation |
|---|---|---|---|---|---|
| Dollar-Weighted Return on Positive Net Cash Flows | 0.56 | 0.63 | 0.11 | 1.12 | 1.04 |
| Dollar-Weighted Return on Negative Net Cash Flows | 0.77 | 0.80 | 0.29 | 1.40 | 1.35 |
| Difference (Positive – Negative) (*t*-stat) | -0.22 (19.55) | -0.14 | -0.53 | 0.13 | 0.95 |

## Table 8
## Returns and Performance Gaps for Simulated Return Data

Returns are simulated for 7,125 funds with 36 monthly return observations. Independent monthly returns are drawn from a normal distribution with mean 0.75% and standard deviation 5%. In Scenario1, monthly net cash flows as a percentage of TNA are equal to a random liquidity component with mean zero and standard deviation 1%. Monthly net cash flows in the four behavioral scenarios (Scenarios 2-5) consist of the same random liquidity component and a behavioral component. The behavioral components are as follows. Scenario 2: symmetric return chasing behavior in which the behavioral net cash flow component is a positive function of the difference between the fund's current return and its mean return; Scenario 3: positive (negative) return chasing behavior only, in which the behavioral component is zero if the fund's current return is below (above) the mean and a positive function of the fund's return otherwise; Scenario 4: negative return chasing behavior, in which the behavioral component is zero if the fund's current return is above the mean and a positive function of the fund's return otherwise; Scenario 5: contrarian behavior in which the behavioral component is negatively related to the fund's return. Returns are percent per month.

| | | Simulated Data | | | | |
|---|---|---|---|---|---|---|
| | Actual Data | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 | Scenario 5 |
| Geometric Average Return | 0.62 | 0.62 | 0.62 | 0.62 | 0.62 | 0.62 |
| Dollar Weighted Return | 0.49 | 0.62 | 0.56 | 0.59 | 0.59 | 0.68 |
| Performance Gap | 0.13 | -0.00 | 0.06 | 0.03 | 0.03 | -0.06 |
| (*t*-stat) | (20.70) | (-1.10) | (74.50) | (25.98) | (21.5) | (-75.30) |
| Dollar-Weighted Return on Positive Net Cash Flows | 0.56 | 0.62 | 0.55 | 0.56 | 0.58 | 0.68 |
| Dollar-Weighted Return on Negative Net Cash Flows | 0.77 | 0.62 | 0.64 | 0.63 | 0.64 | 0.59 |
| Difference (Positive - Negative) | -0.22 | -0.00 | -0.09 | -0.07 | -0.06 | 0.09 |
| (*t*-stat) | (-19.55) | (-0.89) | (-101.04) | (-51.22) | (-46.50) | (101.30) |

## Table 9
## Bond Fund and Money Fund Returns

Bond and Money Market fund datasets include all domestic bond and money market funds in the CRSP Survivor-Bias Free US Mutual Fund Database with returns over the 1991-2004 period. The bond sample consists of 7,222 funds, while the money market sample contains 2,730 funds. For each fund, we calculate the average monthly arithmetic, geometric and dollar-weighted returns over the entire sample period. The arithmetic average equals the sum of a fund's reported returns, divided by the fund's number of reported returns. The geometric average return is calculated according to equation (1) in the text, and the dollar-weighted return is calculated according to equation (2) in the text. For each fund, we also calculate the difference between geometric and dollar-weighted returns, which we label the fund's Performance Gap. Panel A reports statistics on the full sample of bond funds. Panel B reports returns for money market funds.

| | Mean | Median | $25^{th}$ percentile | $75^{th}$ percentile | Standard Deviation |
|---|---|---|---|---|---|
| *Panel A: Bond Funds* | | | | | |
| Arithmetic Monthly Return | 0.44 | 0.44 | 0.35 | 0.53 | 0.29 |
| Geometric Monthly Return | 0.43 | 0.44 | 0.34 | 0.52 | 0.30 |
| Dollar-Weighted Monthly Return | 0.41 | 0.41 | 0.31 | 0.51 | 0.34 |
| Performance Gap | 0.02 | 0.02 | -0.02 | 0.07 | 0.18 |
| (*t*-stat) | (9.44) | | | | |
| *Panel B: Money Market Funds* | | | | | |
| Arithmetic Monthly Return | 0.24 | 0.25 | 0.16 | 0.32 | 0.13 |
| Geometric Monthly Return | 0.24 | 0.25 | 0.16 | 0.32 | 0.14 |
| Dollar-Weighted Monthly Return | 0.24 | 0.23 | 0.13 | 0.32 | 0.13 |
| Performance Gap | 0.004 | 0.0007 | -0.01 | 0.02 | 0.05 |
| (*t*-stat) | (4.18) | | | | |