The Behavior of Mutual Fund Investors

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Abstract

We analyze the mutual fund purchase and sale decisions of over 30,000 households with accounts at a large U.S. discount broker for the six years ending in 1996. We document three primary results. First, investors buy funds with strong past performance; over half of all fund purchases occur in funds ranked in the top quintile of past annual returns. Second, investors sell funds with strong past performance and are reluctant to sell their losing fund investments; they are twice as likely to sell a winning mutual fund rather than a losing mutual fund and, thus, nearly 40 percent of fund sales occur in funds ranked in the *top* quintile of past annual returns. Third, investors are sensitive to the form in which fund expenses are charged; though investors are less likely to buy funds with high transaction fees (e.g., broker commissions or front-end load fees), their purchases are relatively insensitive to a fund's operating expense ratio.

We argue that the *representative heuristic* leads investors to buy past winners, the *disposition effect* renders investors reluctant to sell their losers, and *framing effects* cause investors to react differently to various forms of fund expenses. Given extant evidence on the persistence of mutual fund performance, one can reasonably argue that the purchase of last year's winning funds is rational. However, we argue that selling winning fund investments and neglecting a fund's operating expense ratio when purchasing a fund is clearly counterproductive.

Introduction

For many investors, mutual funds are the investment vehicle of choice. And, this is increasingly so. From 1991 to 1999 in the U.S., the value of corporate equities held by mutual funds increased ten-fold, from $309 billion in 1991 to $3.4 trillion in 1999. In contrast, direct ownership of common stock increased only three-fold during the same period, from $2.6 trillion to $7.8 trillion. In 1991, 6.4 percent of common stocks were held indirectly through mutual funds; in 1999, that figure had grown to 18 percent.[1] In 1999, nearly half of all U.S. households owned a mutual fund.[2] Given the size and growing importance of mutual fund investors, it is important to gain a better understanding of their behavior.

In this paper, we attempt to shed light on the behavior of mutual fund investors by separately analyzing their fund purchase and sale decisions. To do so, we analyze a unique data set that consists of mutual fund positions and trades for over 30,000 households at a large discount brokerage firm over a six-year period ending in 1996.

We document that fund investors appear to use different decision methods when deciding what to purchase versus what to sell. When purchasing mutual funds, we argue that investors use a representativeness heuristic. Investors believe that recent performance is overly representative of a fund's future prospects. Thus, investors predominantly chase past performance. Over half of all purchases occur in funds that rank in the top quintile of past annual returns. When buying mutual funds, investors act as though past returns predict future performance.

In contrast, when selling mutual funds, the disposition effect -- the tendency to hold losers too long and sell winners too soon -- dominates investors' decisions. When selling mutual funds, investors *do not* behave as though past returns predict the future.

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[1] Flow of Funds Accounts of the United States, 1991-1999, Board of Governors of the Federal Reserve System, Table L.213, p.82.

[2] The Investment Company Institute, Mutual Fund Factbook, 2000, reports as of year-end 1999 48.4 million households own mutual funds. In December, 1998, there were roughly 103 million households in the U.S.

Consistent with this conclusion, we document a *positive* relation between past performance and mutual fund sales. Nearly 40 percent of all sales occur in funds that rank in the top quintile of past annual returns; less than 15 percent of all sales occur in funds that rank in the bottom quintile. As is the case for many other investments, mutual fund investors hold their losers and sell their winners.

Our results provide a simple behavioral explanation for the positive, but asymmetric, relation between net mutual fund flows (purchases less sales) and performance documented by Ellison and Chevalier (1997) and Sirri and Tufano (1998). The large net inflows to top-performing funds result from a strong tendency for purchases to follow past performance. The relatively modest net outflows from the worst-ranked funds result from reluctance on the part of investors to sell their losing investments.

Mutual fund investors face a dilemma: Is there sufficient persistence in the performance of successful mutual fund managers to offset the costs of chasing past good performance? In most professional fields, such as corporate management and law, practitioners vary in ability. Professionals are evaluated on the basis of past performance. By analogy, one would expect mutual fund managers to vary in ability and past performance to be indicative of ability. Yet academic studies find only modest and short-term persistence in the performance of successful funds.

For the individual investor, there are at least two potential drawbacks to chasing past performance. First, if one sells a currently held fund to buy a winner, this will accelerate the recognition of capital gains, thus imposing a tax penalty when done in a taxable account. Second, top performing funds tend to charge higher operating expenses and to have higher turnover. High operating expenses and high turnover represent a drag on a fund's gross performance, while high turnover further accelerates the recognition of capital gains.[3] Thus, if the fund's superior gross performance fails to persist, its performance net of fees, expenses, and taxes is likely to be sub-par.

While a particular investor may benefit from chasing performance, investors in aggregate do not. If investors overestimate their ability to identify superior funds based on past performance, this will lead to over-investment in active management. Performance chasing pours more money into funds with high expense ratios and high turnover. Expense ratios are a drain on investors' returns; in addition to accelerating capital gains taxes, high turnover increases trading costs. In aggregate, fees, taxes, and trading costs represent an unambiguous loss to investors (though a boon to those who charge these fees). Grossman and Stiglitz (1980) show that in equilibrium rational investors allocate money to active and passive strategies in proportions that lead to equal risk-adjusted expected returns to both strategies. Behavioral finance models that incorporate overconfidence (e.g., Odean (1998a)) provide an even stronger prediction: active investment strategies will underperform passive investment strategies. Historically, active management has underperformed passive management, suggesting that too many resources have been devoted to security research, resulting in sub-optimal returns to investors.

In addition, by chasing performance, investors create agency conflicts with fund managers (and more generally fund providers). As noted by several studies (e.g., Chevalier and Ellison (1997), Brown, Harlow, and Starks (1996)), the convex relationship between cash flows and performance may lead managers to focus on obtaining top performance status rather than focusing on maximizing risk-adjusted expected returns. And fund providers may start many funds with the intention of continuing (and advertising) only those with good performance. This practice is likely to give investors a biased view of how well the average fund is performing and to encourage further performance chasing.

Selling winning funds, while holding your losers, is clearly an investment mistake. There is strong empirical evidence that losing mutual funds repeat. Thus, divesting one's losing funds would enhance investor returns. And, again, selling winning

[3] Furthermore, some mutual fund purchases may incur commissions or fees.

rather than losing funds leads to the unnecessary recognition of capital gains, thus imposing a tax penalty when done in a taxable account.

Finally, we document that the investors react differently to various fund expenses. Investors are less likely to buy funds that incur salient in-your-face fees, such as a brokerage commissions or front-end loads. However, their purchases are relatively insensitive to a fund's operating expenses. Neglecting a fund's operating expenses when purchasing a fund is clearly counterproductive, since it is well documented that mutual funds with low operating expenses tend to earn higher net returns than funds with high operating expenses. Though operating expense ratios are disclosed to investors, we conjecture that many investors overlook these expenses, since the total dollar cost of these expenses is not disclosed to investors and their effect on the performance of a particular mutual fund is easily masked by the volatility of a fund's returns.

The remainder of this paper is organized as follows. We survey related literature in section I. We describe our data and methods in section II. In section III, we present results regarding the relation between past fund performance, purchases, and sales. In section IV, we discuss the welfare implications of these relations. In section V, we analyze the relation between various fund expenses, purchases, and sales. Concluding remarks are made in section VI.

I. Background and Related Literature

We argue that mutual fund investors use simple decision heuristics when selecting mutual funds to purchase or sell. (After presenting our empirical results, we discuss whether these heuristics affect investor welfare.) When purchasing funds, we posit that investors use a representativeness heuristic, where recent performance is deemed overly representative of a fund manager's true ability. When selling funds, this representativeness heuristic is more than offset by investors' reluctance to realize losses (the disposition effect).

A. The Fund Purchase Decision

There are thousands of mutual funds available for purchase. Choosing a mutual fund for ones investments is a decision fraught with uncertainty. In general, when faced with uncertain choices, people use heuristics or rules of thumb to make judgments (Tversky and Kahneman (1974)). Using a representativeness heuristic, people believe small samples to be overly representative of the population from which they are drawn (Tversky and Kahneman (1971), Kahneman and Tversky (1972)). Gilovich, Vallone, and Tversky (1985) document that people systematically underestimate the chance of observing streaks, such as a run of heads in the flip of an unbiased coin, in a random sequence. Thus if people do observe streaks of heads or tails when an unbiased coin is flipped, they are likely to conclude that the coin is biased.

We posit that investors use this representativeness heuristic when buying mutual funds.[4] A fund's recent performance is viewed as overly representative of a fund manager's skill and, thus, of the fund's future prospects. The abundance of mutual fund rankings and salient stories about successful fund managers (e.g., Peter Lynch and Warren Buffet) reinforce the representativeness heuristic. If investors rely on a representativeness heuristic when selecting mutual funds, they will underestimate the tendency of fund performance to mean revert and thus anticipate better relative performance than is realized.

The fact that more money is invested in active than passive funds despite the superior historical performance of the latter is prima facie evidence that most investors believe that some mutual fund managers have the ability to consistently beat the market. Surveys also reveal that investors rely heavily on past performance when evaluating their fund purchase decisions (Goetzmann and Peles (1997); Capon, Fitzsimons, and Prince (1996)).

[4] Rabin (2000) formerly models this notion by assuming people believe in the "Law of Small Numbers," exaggerating the degree to which a small sample resembles the population from which it is drawn. He concludes that people may pay for financial advice from "experts" whose expertise is entirely illusory.

B. The Fund Sale Decision

The decision to sell a mutual fund is quite different from the decision to purchase a fund. Most investors hold few funds. In 1998, the average household held five mutual funds.[5] Thus, unlike purchases where investors have thousands of funds to choose from, investors have only a handful of funds from which to choose when selling.

Using the representativeness heuristic, investors would view poor fund performance as overly representative of a manager's skill and sell losing fund investments. However, this representativeness heuristic is partially offset by investors' desire to avoid the recognition of losses or loss aversion. In contrast to the representativeness heuristic, loss aversion predicts that investors will sell their winning funds, while holding their losers.

Kahneman and Tversky (1979) argue that people are loss averse: they have an asymmetric attitude to gains and losses, getting less utility from gaining, say, $100 than they would lose if they lost $100 (having started $100 wealthier). If investors use the purchase price of their mutual funds as a reference point, prospect theory predicts that mutual fund investors would be more likely to sell their winning mutual funds than their losers. The disposition to sell winners and hold losers has been dubbed the "disposition effect" (Shefrin and Statman (1985)).

The disposition effect has a large effect on the investors selling decisions for many asset classes, including individual common stocks (Odean (1998), Grinblatt and Keloharju (2000)), company stock options (Heath, Huddart, and Lang (1999)), residential housing (Genesove and Mayer (1999)), and futures (Locke and Mann (1999)).

It is not at all obvious that these findings would extend to mutual funds. On the one hand, investors may view the decision to sell a mutual fund as an investment decision like any other. In this "investment" frame, the investor holds responsibility for the

[5] The Investment Company Institute, Mutual Fund Factbook, 2000, p.47.

performance of the mutual fund and the role of the mutual fund manager is secondary. Thus, investors using this frame will be reluctant to realize losses (the disposition effect).

On the other hand, investors may view mutual fund managers as agents, who are responsible for the management of their money. In this "agency" frame, the selling decision is more like a firing decision: Shall I fire my mutual fund manager for delivering poor performance? Using this frame, it is easy for the investor to blame an external factor -- the poor ability of the mutual fund manager -- for the fund's poor performance. Thus, they will be willing to realize losses (i.e., fire the mutual fund manager).

We suspect that investors use both the investment frame and the agency frame. Which frame dominates in the selling decisions of mutual fund investors is an empirical question, which we address in this research. We provide strong evidence that it is the disposition effect, rather than the agency frame, that determines which funds investors sell.

II. Data and Methods

A. Mutual Fund Account Data

The primary data set for this research is information from a large discount brokerage firm on the investments of 78,000 households from January 1991 through December 1996[6]: 42 percent of the sampled households reside in the western part of the United States, 19 percent in the East, 24 percent in the South, and 15 percent in the Midwest. The data set includes all accounts opened by each household at this discount brokerage firm. This data set has two main advantages over the fund level cash flow data in many earlier studies: 1) it enables us to separately analyze purchase and redemption decisions, 2) it discloses the exact timing and amount of money flows so that the cash flow measures are more reliable than the estimates from TNA and fund returns; the earlier estimates impose simplified timing assumptions upon cash flows.

[6] The month-end position statements for this period allow us to calculate returns for February 1991 through January 1997. Data on trades are from January 1991 through November 1996.

In this research, we focus on the mutual fund investments of households. We exclude from the current analysis investments in common stocks, American depository receipts (ADRs), warrants, and options. Of the 78,000 sampled households, 32,199 (41 percent) had positions in mutual funds during at least one month; the remaining accounts either held cash or investments in securities other than mutual funds. Seventeen percent of the market value in the accounts was held in mutual funds and 64 percent in individual common stocks. There were over 3 million trades in all securities. Mutual funds accounted for 18 percent of all trades; individual common stocks accounted for 64 percent.

Of the 32,199 households with positions in mutual funds, the average held 3.6 mutual funds worth $36,988. Both of these numbers are positively skewed. The median household held 2 mutual funds worth $12,844 dollars. For these households, the positions in mutual funds and individual common stocks were roughly equal. Forty-two percent of the market value in these accounts was held in mutual funds and 39 percent in individual common stocks. In aggregate, these households held 1,073 mutual funds worth $1.4 billion in December 1996.

In **Table I**, we present descriptive information on the trading activity for our sample. Panel A presents information on purchases, while Panel B contains information on sales. There were roughly twice as many purchases (379,253) as sales (168,497) during our sample period, though the average value of funds sold ($13,914) was greater than the value of funds purchased ($8,119). As a result, the aggregate value of purchases ($3 billion) was 30 percent greater than the aggregate value of sales ($2.3 billion). In contrast, the 78,000 households that compose our sample bought and sold equal amounts of individual common stocks ($12 billion each). These patterns are consistent with overall economic trends during our sample period. According to Federal Reserve Flow of Funds data, households directly held 49.9 percent of U.S. equities in 1990 and 47.4 percent in 1996. In contrast, the holdings of U.S. equities by mutual funds more than doubled -- from 6.6 percent in 1990 to 14.5 percent in 1996.

For each household, we calculate the purchase turnover rate for mutual fund holdings as the sum of purchases divided by the sum of monthly positions. We calculate sales turnover similarly. To reduce the effect of outliers, monthly turnover is winsorized at 100 percent. For the average household, purchase turnover was 97 percent annually, while sales turnover was 65 percent. Both turnover rates are positively skewed; for the median household, purchase turnover was 44 percent, while sales turnover was 16 percent. Aggregate purchase (or sales) turnover is calculated by summing purchases (or sales) and positions across all accounts and taking the ratio of the two sums. In aggregate, purchase turnover was 74 percent; sales turnover was 56 percent. Fund turnover rates are similar to those for individual common stocks. Barber and Odean (2000) report average, median, and aggregate turnover rates of 75 percent, 31 percent, and 79 percent, respectively, for individual common stocks held by these households.

With the exception of load and exit fees, mutual fund investors can generally purchase mutual funds directly from the fund complex at zero transaction costs. When purchasing mutual funds through a broker, a commission is charged for the purchase or sale of some funds. Generally fund complexes will pay a fee to the broker to gain status as a non-transaction fee (NTF) fund. These fees are designated as 12b-1 fees by the fund complex. In our sample, 76 percent of fund purchases and 49 percent of sales are NTF funds.

For each trade in excess of $1,000, we calculate the percentage commission as the commission divided by the value of the trade. The average purchase costs 0.28 percent, while the average sale costs 0.40 percent. We also calculate the trade-weighted (weighted by trade size) commissions. These figures can be thought of as the total cost of conducting the $5.3 billion in fund trades ($3 billion in purchases and $2.3 billion sales). In aggregate, these investors paid 0.16 percent for purchases and 0.22 percent for sales. (Loads are transaction costs that investors pay when they trade and are not included in the calculation here.)

For the investor, it is cheaper to trade mutual funds than individual common stocks. In our sample, the average round-trip cost of trading mutual funds is 0.68 percent, while the average round-trip cost of trading individual common stocks is 4 percent (Barber and Odean, 2000). (The latter cost reflects round-trip commissions of 3 percent and a round-trip bid-ask spread of 1 percent.) In short, the investor who buys or sells a mutual fund pays a relatively small direct cost for trading.

However, in aggregate, investors pay an indirect cost for their trading. When a fund investor purchases shares in an open-end mutual fund, the fund manager will invest the new money in individual common stock. Similarly, when an investor sell shares, the manager must divest some stock holdings.[7] Though the investor pays no commission for the purchase or sale of the fund share, she is indirectly affected since her purchases and sales generate trades, and their attendant costs, at the fund level. Edelen (1999) documents that these trades cost the average fund more than 1 percent annually, while Chalmers, Edelen, and Kadlac (2000) document fund performance is negatively related to the level of trading costs. Note that trading costs are born equally by all investors in the fund, not just those who transact frequently. Thus, long-term buy-and-hold investors subsidize the trading of fickle fund investors.[8]

B. Returns Data

Monthly mutual fund returns data are from the Center for Research in Security Prices (CRSP) mutual fund database. Consistent with many prior mutual fund studies, we restrict our analysis to diversified U.S. equity mutual funds.[9] Thus, we exclude from

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[7] Edelen (1999) estimates that 70 percent of mutual fund flows generate trade. The remaining 30 percent are either crossed or generate trading that would have occurred anyway.

[8] To mitigate this externality for long-term buy-and-hold investors, some mutual funds charge purchase or redemption fees when investors buy and sell mutual funds. These fees are added to funds assets and are designed to offset trading costs generated by fund flows.

[9] We select funds based on four sets of criteria. First, we select funds with the following ICDI objectives: aggressive growth, growth and income, long-term growth, or total return (only if they have the following Strategic Insight's fund objectives: flexible, growth, or income growth). If ICDI objectives are missing, we select funds with the following Strategic Insight's fund objectives: aggressive growth, growth & income, growth, income growth, or small company growth. If both ICDI and Strategic Insight's objectives are missing, we select funds with the following Weisenberger fund types: AAL, AGG, G, G-I, G-I-S, G-S, G-S-I, GCI, GRI, GRO, I-G, I-G-S, I-S, I-S-G, MCG, SCG, or TR. If all three of the above criteria are missing, we select funds described as common stocks according to the policy and objective codes.

our analyses bond funds, international equity funds, and specialized sector funds. In addition, we are not able to accurately match to the CRSP mutual fund database 5 percent of mutual fund trades.[10] Our final sample consists of 226,592 mutual fund purchases and 85,731 mutual fund sales.

C. Calculation of Proportion of Gains or Losses Realized (PGR and PLR)

To determine whether mutual fund investors sell winners more readily than losers, it is not sufficient to look at the number of funds sold for gains versus the number sold for losses. Suppose investors are indifferent to selling winners and losers. Then in an upward-moving market they will have more winners in their portfolios and will tend to sell more winners than losers even though they had no preference for doing so. To test whether investors are disposed to selling winners and holding losers, we must look at the frequency with which they sell winners and losers relative to their opportunities to sell each.

By going through each household's trading records, we construct for each date a portfolio of funds for which the purchase date and price are known.[11] Each day that a sale takes place in a portfolio of two or more funds, we compare the selling price for each fund to its average purchase price to determine whether the fund was sold for a gain or a loss. Each fund that is in that portfolio at the beginning of that day, but is not sold, is considered to be a paper (unrealized) gain or loss. On days when no sales take place in an account, no gains or losses (realized or paper) are counted. Realized gains, paper gains, realized losses, and paper losses are summed over time for each account and across accounts. Based on these counts, two ratios are calculated:

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[10] We match funds from the two data sets primarily by matching the series of month-end NAVs. We also double check by matching CUSIP identifiers and fund names when available.

[11] Since we are working with monthly returns for mutual funds, we calculate gains and losses by assuming mutual funds are bought and sold on the last day of the month, rather than the actual trade date. We further assume that distributions are reinvested in the fund that paid them, which is a common practice for fund investors.

$$\text{Proportion of gains realized (PGR)} = \frac{\text{Realized gains}}{\text{Realized gains} + \text{Paper gains}};$$

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

A large difference in the proportion of gains realized (PGR) and the proportion of losses realized (PLR) indicates that investors are more willing to realize either gains or losses.

D. Evaluating Mutual Fund Selection Ability

If mutual fund investors enhance their returns by trading, the returns on mutual funds bought should exceed the returns on those sold. To formally test whether this is the case, we construct a portfolio comprised of those mutual funds purchased in the preceding twelve months. The returns on this portfolio in month t are calculated as:

$$R_t^p = \frac{\sum_{i=1}^{n_{pt}} T_{it}^p R_{it}}{\sum_{i=1}^{n_{pt}} T_{it}^p}$$

where T_{it}^p is the aggregate value of all purchases of mutual fund *i* from month t-12 through t-1, R_{it} is the gross monthly return of mutual fund *i* in month *t*, and n_{pt} is the number of different mutual funds purchased from month t-12 through t-1. (Alternatively, we weight by the number rather than the value of trades.) There is an analogous calculation for mutual fund sales.

We calculate four measures of risk-adjusted performance. First, we calculate the mean monthly market-adjusted abnormal return for fund purchases or sales by subtracting the return on a value-weighted index of NYSE/ASE/Nasdaq stocks from the return on the purchase or sale portfolio.

Second, we employ the theoretical framework of the Capital Asset Pricing Model and estimate Jensen's alpha by regressing the monthly excess return of the fund purchase

or sale portfolio on the market excess return. For example, to evaluate the fund purchase portfolio return, we estimate the following monthly time-series regression:

$$\left(R_t^{\mathrm{p}} - R_{ft}\right) = \alpha + \beta\left(R_{mt} - R_{ft}\right) + \varepsilon_t \ ,$$

where:

R_{ft} = the monthly return on T-Bills,[12]

R_{mt} = the monthly return on a value-weighted market index,

α = the CAPM intercept (Jensen's alpha),

β = the market beta, and

ε_i = the regression error term.

Third, we employ an intercept test using the three-factor model developed by Fama and French (1993). For example, to evaluate the performance of fund purchase portfolios, we estimate the following monthly time-series regression:

$$\left(R_t^{\mathrm{p}} - R_{ft}\right) = \alpha + \beta\left(R_{mt} - R_{ft}\right) + sSMB_t + hHML_t + \varepsilon_t \ ,$$

where SMB_t is the return on a value-weighted portfolio of small stocks minus the return on a value-weighted portfolio of big stocks and HML_t is the return on a value-weighted portfolio of high book-to-market stocks minus the return on a value-weighted portfolio of low book-to-market stocks.[13] The regression yields parameter estimates of $\alpha, \beta, s,$ and h . The error term in the regression is denoted by ε_t .

Finally, we use the four-characteristic model as in Carhart (1997). Specifically, the Fama-French three-factor model is augmented with a fourth independent variable formed on the basis of recent return performance (price momentum). The additional independent variable is a zero-investment portfolio, which is the equally-weighted month *t* average return of the firms with the highest 30 percent return over the eleven months

[12] The return on T-bills is from Stocks, Bonds, Bills, and Inflation, 1997 Yearbook, Ibbotson Associates, Chicago, IL.

[13] The construction of these portfolios is discussed in detail in Fama and French (1993). We thank Kenneth French for providing us with these data.

through month *t*-2, less the equally-weighted month *t* average return of the firms with the lowest 30 percent return over the eleven months through month *t*-2.

III. Results

A. Proportion of Gains and Losses Realized

In Table II, panel A, we present the calculation of the proportion of gains realized (PGR) and the proportion of losses realized (PLR) for all accounts. For this analysis, we only analyze investors who had a choice to sell a fund for a gain or a fund for a loss. Thus, investors must have held at least one fund for a gain and one fund for a loss at the time of a sale to be included in the analysis. (Our results are qualitatively similar if we relax this requirement.) Consistent with the predictions of the disposition effect, investors prefer to sell funds for a gain, rather than a loss. The difference between PGR and PLR is reliably greater than zero, with t-statistics greater than 10. On average, investors are twice as likely to sell a fund for a gain, rather than a loss.

Are taxes an important consideration in the selling decision of mutual fund investors? One would expect investors to realize losses -- particularly late in the year -- so that these losses can be used to shelter the realization of capital gains. To analyze this issue, we calculate PGR and PLR for taxable and tax-deferred accounts (e.g., Keoghs and 401(k) accounts). If taxes are an important determinant of investors' selling decision, we would expect losses to be realized at a greater rate in taxable, as opposed to tax-deferred accounts. We also calculate PGR and PLR for sales made in January through November versus those made in December. If taxes are an important determinant of investors' selling decision, we would expect losses to be realized at a greater rate in December, as opposed to January through November.

The results of this analysis are presented in panels B and C of Table II. In Figure 1, we plot the ratio of PGR to PLR for taxable and tax-deferred accounts. If investors are equally likely to realize gains and losses (relative to their opportunities realize each), this ratio would be one. There is, at best, weak evidence that taxes are an important determinant of investors' selling decision. The ratio of PGR to PLR is slightly higher for

tax-deferred accounts than for taxable accounts. However, even in taxable accounts, investors are *still* almost twice as likely to realize a gain rather than a loss. Furthermore, there is no discernible pattern in investors' willingness to realize losses throughout the year. The ratio of PGR to PLR is roughly the same in December as it is from January through November.

Odean (1998) documents that investors tend to sell stocks for a gain, while holding their losing stock investments. It is interesting to compare the disposition effect for stocks to that documented here for mutual funds. In Figure 2, we present the ratio of PGR and PLR for stocks held by the households we analyze. The calculations of PGR and PLR for stocks are analogous to that for mutual funds. The figure confirms the results of Odean (1998); there is a strong disposition effect in stocks. For most of the year, the ratio of PGR and PLR is similar for stocks held in taxable or tax-deferred accounts. However, in stocks, as opposed to mutual funds, investors are more willing to sell losers from their taxable accounts at year-end. In taxable accounts, investors are slightly more likely to realize a loss rather than a gain in December. In summary, there is a disposition effect in both stocks and mutual funds. However, in contrast to stocks, we find no evidence that taxes are an important determinant of the decision to sell a mutual fund.[14]

B. Flow-Performance Relations

Ellison and Chevalier (1997) and Sirri and Tufano (1998) document an asymmetric relation between performance and net new money for mutual funds. The top-performing funds receive large inflows of new money, while the worst performing funds experience relatively modest outflows. We are able to shed light on this flow-performance relation by separately analyzing the purchases and sales of mutual fund investors. The brokerage data set allows us to measure the exact timing and amount of cash flows; all other fund level cash flow measures are estimated from TNA and fund returns by making simplified assumptions about the timing of newly invested money. To

[14] Though we document that the realization of losses is not a primary determinant of mutual fund sales, it is possible that investors consider the tax efficiency of a mutual fund when buying funds. Bergstresser and Poterba (2000) document that mutual fund inflows are positively related to after-tax returns.

do so, in month *t*, we partition funds into deciles on the basis of their 12-month return through month *t-1*. We then measure the intensity of buying (or selling) in each performance decile.

We summarize these results in Table III. Columns two and three of the table present the average fund size and the proportion of all funds in each performance decile. Small funds appear more often in the extreme deciles, particularly the worst-performing funds.

Investors chase performance when purchasing funds. Columns four and five of the table reveal that investors predominantly buy funds with strong past performance; the top two performance deciles represent roughly one-fifth of all mutual fund investments (21 percent), but account for over half of all purchases (54 percent). In light of the flow-performance relations documented by Ellison and Chevalier (1997) and Sirri and Tufano (1998), these patterns perhaps are not surprising.

What is surprising, is the intensity of selling activity in the top-performing mutual funds. Consistent with the disposition effect documented in the prior section, the top two performance deciles account for 38 percent of all sales, while the bottom two account for merely 14 percent of sales (and 12.5 percent of mutual fund investments).

We calculate the ratio of proportion of buys to proportion of all funds for each performance decile. If purchases are proportional to fund size and independent of performance, this ratio will be one for each performance decile. A similar calculation is made for sales. These two ratios are graphed in Figure 3. In only the top two performance deciles, funds experience a disproportionate amount of purchases. The top two performance deciles also experience a disproportionate amount of sales. In the bottom performance decile, the sales ratio is modestly greater than one.

The asymmetry in the relation between flows and performance is largely a result of much higher volume of trade (both purchases and sales) in the top performing decile.

As seen in the last column of Table III, the proportion of all trades that are buys decreases nearly linearly when one moves from the top performance decile to the bottom performance decile. For example, the percentage of all trades that are buys is 66 percent in the top performance decile and 35 percent in the bottom performance decile. Thus, if trading volume were equal in the two extreme deciles, the relation between flows and performance would be symmetric; poor performing funds would experience outflows at roughly the same rate that top performing funds experience inflows. But a disproportionate amount of fund trades occur in the top performance decile.

The purchase and sale behavior that we document yields a positive, but asymmetric, relation between mutual fund flows and performance. A strong tendency for purchases to follow strong past performance yields large net inflows to top-ranked funds. The reluctance of investors to sell losing funds moderates the outflows of poorly ranked funds.

IV. Welfare Implications of Investor Behavior

Do the behaviors that we document -- chasing performance and holding losers -- affect investor welfare? To address this issue, we first analyze the performance of the investors studied here. Neither chasing performance nor holding losers improved the performance of the investors we study. However, we are well aware that the short sample period that we study (six years) may yield insufficient power for definitive conclusions. Thus, we also consider the implications of prior empirical research on mutual fund performance persistence and the fund selection ability of individual investors. Ultimately, we can make a strong case that selling winners, while holding losers, is counterproductive. However, it is ambiguous whether it is prudent to chase performance when purchasing funds.

A. Sample Performance

In Figure 4, we present the market-adjusted returns of funds bought and sold relative to the month of the transaction. The return patterns prior to the transaction date confirm our prior evidence. Investors are buying and selling funds that, on average, beat the market by a wide margin prior to the trade. However, both the funds bought and

those sold fail to beat the market following the trade. Furthermore, the returns on funds bought are roughly equal to the returns on those sold.

In Table IV panel A, we present the returns earned on funds bought and funds sold subsequent to the trade. The portfolios consist of funds bought (or sold) in the prior 12 months and returns are weighted by the total value of trades during those months.[15] The funds that investors buy lag the market by 15 basis points per month, while those they sell lag the market by 11 basis points. The difference in the returns of funds bought and those sold are not reliably different from zero. The results are robust to controlling for size, book-to-market, or momentum effects. These investors did not improve their investment performance by chasing performance.

In Table IV panel B, we compare the returns of winners sold to those of losers held. The "winners sold" portfolio consists of all funds sold for a gain in the prior twelve months, weighted by the total number of trades. The "losers held" portfolio consists of funds held for a loss on the date the winner was sold. The winners sold lag the market by 13 basis points per month, while the losers held lag the market by 16 basis points per month (though neither shortfall is reliably different from zero). These investors did not improve, and may have hurt, their performance by selling their winning, rather than losing funds.

B. Related Evidence

It is not surprising that investors do not materially affect their performance by trading mutual funds, since both their purchases and sales tend to be concentrated in the same group of funds -- the top performing mutual funds. However, our results are contrary to those of Gruber (1996) and Zheng (1999), who document a "smart money" effect in mutual funds.[16] Specifically, these studies document that funds with net cash inflows outperform those with net cash outflows. However, both of those studies use net flows (i.e., purchases less sales), since data on purchases and sales of mutual funds were

[15] The results are qualitatively similar if we construct portfolios based on trades in the preceding four, rather than 12, months.

[16] Zheng (1999) points out that the "smart money" effect exists mainly for small funds.

not available to them. Portfolios formed on the basis of net flows obviously distort the average experience of investors, since the majority of sales take place in the same group of funds that experience the largest net inflows -- the top performing funds.

Nonetheless, the "smart money" effect of Gruber (1996) and Zheng (1999) is sufficient to conclude funds purchased by investors earn higher returns than those sold. Thus, the difference in the results of these studies and our own can be explained either by a different sample period (ours is much shorter than theirs) or the use of different data (Gruber and Zheng use aggregate fund flows, while ours are based on trades at a single discount broker).

Based on auxiliary analyses, we conclude that the difference in our results emanates mainly from our short sample period, rather than the use of different data. Specifically, we construct a positive new money portfolio, which consists of funds with positive net cash flows in the previous quarter (weighted in proportion to the net cash inflow for the fund). Similarly, we construct a negative new money portfolio. Regardless of whether we base inflows and outflows solely on the brokerage house data used in this study or, alternatively, on aggregate flows (as in Zheng (1999)), the cash flow weighted positive new money portfolio earns monthly returns that are virtually identical to that earned on the cash flow weighted negative new money portfolio.[17] Zheng (1999) documents that most of the returns earned by these new money portfolios can be attributed to performance persistence in mutual funds. Thus, the lack of significant results can likely be attributed to relatively weak fund performance persistence during our sample period. When we replicate the results of Carhart (1997) for our sample period, the funds ranked in the top decile based on prior-year performance beat the bottom decile

[17] Using the brokerage house data, the positive new money portfolio earned returns that were 1.5 basis points per month less than the negative new money portfolio (p-value = 0.87). Using aggregate flow data, the positive new money portfolio earned returns that were 1.1 basis points per month greater than the negative new money portfolio (p-value = 0.88). There is some marginal evidence that the equally weighted positive new money portfolio outperforms the negative one for our sample period when we shift from the brokerage house data to the aggregate flow data. However, we believe that implications we get from the cash flow weighted portfolios are more relevant in addressing the welfare question. The "smart money" effect is also stronger when we focus on a subset of smaller funds.

funds by 28 basis points per month; this return difference is less than half that reported by Carhart. We elaborate on the crucial link between fund performance persistence and the sagacity of investors' mutual fund purchases and sales in the next section.

C. Is Chasing Performance Rational ?

Is it rational for investors to chase performance when purchasing mutual funds? That depends on the degree to which past fund performance can predict future fund returns and on the costs associated with chasing performance.

Empirically, there is evidence that past fund performance is useful in predicting future returns (Hendricks, Patel, and Zeckhauser (1993), Grinblatt and Titman (1992), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), Gruber (1996), Carhart (1997), and Wermers (2000)). For example, Carhart (1997) ranks mutual funds based on annual return performance in each year from 1963 to 1993. He documents that the top decile of funds beat the market by more than two percent in the post-ranking year. However, Carhart (1997) concludes that the performance persistence is ephemeral, lasting about one year—and therefore unlikely to be due to differences in fund managers' ability. This short-term persistence is largely explained by short-term momentum effects in stocks (Jegadeesh and Titman (1992)). Thus, to capitalize on the performance persistence in mutual funds, investors would need to change their mutual fund holdings annually.

Based on this empirical evidence, one can conclude that it may be reasonable for investors to chase performance when buying mutual funds. For the individual buying a mutual fund, trading is virtually free. If the empirical evidence of performance persistence emanates from a stationary economic relation (albeit one we do not yet understand well), investors would improve their performance by buying last year's winning funds. However, if the empirical evidence regarding performance persistence is spurious, investors would be better off buying a simple index fund rather than chasing performance, since past winners tend to be actively-managed, have greater trading costs, and higher operating expenses than do index funds.

Unless one's investment horizon is short, chasing performance in one's taxable account is of dubious benefit. The extant empirical evidence indicates performance persistence is short-lived and thus requires annual trading of one's mutual fund holdings. In a taxable account, this frequent trading accelerates the recognition of capital gains tax, hurting one's after-tax return performance. The penalty for accelerating the realization of capital gains increases with one's investment horizon. Gruber (1996) estimates that investors would need an investment horizon of less than nine years to warrant chasing mutual fund performance in one's taxable account.

While the individual may benefit from chasing performance, this behavior can lead to externalities that adversely affect other investors. As discussed above, the buying and selling of funds by investors necessitates stock trades by fund managers. The costs of these trades are borne by all investors in the fund. Performance chasing may also lead fund managers to assume more portfolio risk than is in the best interest of investors. As noted by several studies (Chevalier and Ellison (1997), Brown and Starks), the relation between new money and performance resembles the payoff diagram for a call option. Since fund manager compensation is closely tied to assets under management, performance chasing encourages fund managers to take on more portfolio risk in much the same way that stock options encourage corporate managers to accept riskier projects. However, unlike the risks associated with corporate projects, investors cannot easily diversify away the risks taken on by their mutual fund managers. Mutual funds are intended to diversify away idiosyncratic risk, not to create them.

In summary, one can argue that though there are negative externalities associated with chasing mutual fund performance, it may be reasonable for each investor to do so However, just as basketball players, coaches, and fans have a strong conviction that streak shooting exists (despite strong contrary evidence (Gilovich, Vallone, and Tversky (1985)), we suspect mutual fund investors would bet heavily on last year's winning funds, even without empirical evidence of persistence. Indeed, prior to there being any reliable published evidence of persistence in mutual fund performance, new money

poured into the top performing funds at a very high rate (for example, during the 1960s and 1970s).

D. Is Selling Winners Rational?

Selling winning funds, while holding losing funds, is clearly counterproductive. Poor past fund performance tends to persist. The persistence of poor fund performance is also more pronounced and somewhat longer-lived than the persistence of strong fund performance. For example, Carhart (1997) documents that funds ranked in the bottom decile of return performance underperform the market by over four percent in the year following ranking. Based on extant empirical evidence, investors should rationally sell their losing, rather than winning, funds. If investors are responding rationally to the evidence of performance persistence in the funds they purchase, their reading of this evidence is limited; investors tend to sell funds with strong performance, despite evidence that poor performance also persists. Furthermore, selling winning rather than losing funds, which leads to the unnecessary recognition of capital gains, imposes a tax penalty when done in a taxable account.

It is difficult to reconcile the selling behavior of fund investors with rational motivations. The heavy volume of selling in the top performing funds that we document can best be explained by the disposition effect. As is the case for many other assets (e.g., common stock, futures, real estate, and executive stock options) and consistent with the prediction of prospect theory, mutual fund investors are simply reluctant to realize their losses.

V. Expenses and Mutual Fund Investor Behavior

In June 2000, The General Accounting Office issued the following recommendation:

> Although most industry officials GAO interviewed considered mutual fund disclosures to be extensive, others, including some private money managers and academic researchers, indicated that the information currently provided does not sufficiently make investors aware of the level of fees they pay. These critics have called for mutual funds to disclose to each investor the actual dollar amount of fees paid on their fund shares. Providing such information could reinforce to investors the fact that they pay fees on their mutual funds and provide them information with which to evaluate the services their funds provide. In addition,

> having mutual funds regularly disclose the dollar amounts of fees that investors pay may encourage additional fee-based competition that could result in further reductions in fund expense ratios. GAO is recommending that this information be provided to investors.

The implicit assumption in the GAO recommendation is that mutual fund investors are sensitive to the form in which fund expenses are disclosed to investors. Though we cannot test this assumption directly, we can determine whether investors treat various expenses incurred when purchasing a mutual fund differently.

Several academic studies have documented a negative relation between a fund's operating expense ratio and performance (e.g., Gruber (1996) and Carhart (1997)). Thus, it is sensible for investors to eschew the purchase of funds with high operating expenses. Generally, investors pay fees to mutual funds through operating expense ratios applied to assets under management or through load fees charged when investors purchase (or less commonly sell) a mutual fund. When purchased through a broker, investors pay a commission to the broker for some mutual funds, while others are designated as non-transaction fee (NTF) funds.

In general, consumers' perception of price affects their purchase decisions. For example, consumers are more responsive to a nominal discount of $200 on a $2,000 purchase than they are to a 10 percent discount on the same purchase, while the converse is true for low-priced products (Chen, Monroe, and Lou (1998)). Front-end load fees and commissions, which are paid when the fund is purchased and generally revealed (or obvious) in nominal terms on the first statement following the transaction, are transparent and thus salient in-your-face expenses for investors. Operating expenses are less so. Investors never receive a bill for holding the mutual fund and the true cost of holding the fund is masked by the considerable volatility in the returns on equity mutual funds. We believe that investors are more sensitive to salient expenses (commissions and load fees) and less sensitive to fees that are paid while they hold the fund (operating expenses).Finally, Tversky and Kahneman (1986) demonstrate that peoples' preferences for states of the world are highly dependent on the frames by which those states are

described. Thaler (1985) shows that people prefer the experience of a loss and a larger gain when the loss and gain are integrated rather than separated. Similarly, they prefer to experience one integrated loss rather than two losses of the same combined value reported separately. Front-end loads and commissions constitute loses to investors that are reported separately from any gains or losses the fund may earn. Fund expenses, on the other hand, are losses to investors that are first integrated with fund gains and losses before being reported. Investors are likely to feels these loses less acutely.

To test this conjecture using the brokerage data previously described, we estimate three cross-sectional regressions. The dependent variables are alternatively the total value of buys, the total value of sells, and the total value of buys less the total value of sells for a fund; each dependent variable is scaled by the beginning-of-month total net asset value for the fund. To reduce the effect of outliers on the coefficient estimates, the dependent variables are winsorized at the first and 99th percentile.

To understand how expenses and loads affect the purchase and sale decisions of investors, we include a fund's expense ratio, maximum front-end load fee, and other load fees (typically a back-end load). In each monthly cross-sectional regression, we use the last reported expense ratio or load fee for each fund. We also include a dummy variable that takes on a value of one if a fund can be traded without a commission (a non-transaction fee (NTF) fund).[18] Finally, we include fund turnover as an independent variable; some argue that since trading is costly, investors should avoid high turnover funds.[19]

To control for the effect of performance on the purchases and sales of funds, we include the annual market-adjusted return on the fund and that return squared. The annual market-adjusted return is the fund return during the prior 12 months less the return

[18] We define a fund as a non-transaction fee fund if more than 90 percent of the trades in the fund were executed without a commission during our sample period.

[19] In keeping with this argument, Carhart (1997) documents a negative relation between turnover and performance. However, Wermers (2000) documents a positive relation between turnover and performance. Chalmers, Edelen, and Kadlec (2000) document a negative relation between trading costs and fund performance.

on the CRSP NYSE/ASE/Nasdaq value-weighted index. We include the squared return to capture the nonlinear relation between performance and fund purchases or sales. This squared term has an appealing economic interpretation; it is a simple measure of the extent to which a fund departs from a market index strategy. On the one hand, a fund that tracks the overall market (e.g., the Vanguard Total Market Index Fund) will have a squared return of zero. On the other hand, an actively managed fund with a portfolio concentrated in a few stocks will not track the market closely and will thus have a large squared market-adjusted return.

In addition to fund fees, turnover, and past performance, we include a fund's monthly return standard deviation and the log of total net asset value as independent variables in the regression. Monthly return standard deviation measures the short-term volatility of a fund, while the log of total net asset value provides a measure of fund size. All independent variables in this regression, with the exception of a fund's NTF status, are from the CRSP mutual fund database.[20]

The average coefficient estimates across the 71 monthly regressions are presented for buys, sells, and buys less sells in the fourth through sixth columns of Table V, respectively. Test statistics are based on the mean coefficient estimate and the standard deviation of the 71 coefficient estimates.[21]

There is a strong nonlinear relation between past performance and fund purchases. The significant coefficient estimates on the annual market-adjusted return and that return squared indicate a convex relation between purchases and performance. There is a similar convex relation for sales. However, the convexity of the sales-performance

[20] The CRSP mutual fund database reports zero operating expenses and turnover for a large number of funds. Based on our discussions with CRSP, zero operating expenses and turnover likely indicate missing information. Thus, we exclude funds with either zero operating expenses or zero turnover from these analyses. From 1990 to 1995, CRSP reports nonzero operating expense ratios for 87 percent of funds and nonzero turnover for 65 percent of funds. Turnover data for 1991 is particularly problematic, since CRSP reports zero turnover for 96 percent of funds. For 1990, CRSP reports zero turnover for 25 percent of funds. Thus, we use 1990 turnover data for each fund as a proxy for 1991 turnover.

[21] CRSP does not report data on other loads prior to 1992. Thus, the coefficient estimates for other loads are based on 47 rather than 71 months of data.

relation is less pronounced, leaving a convex relation between net flows (purchases less sales) and performance. This convex relation between performance and net flows provides an incentive for fund managers to actively manage their portfolios, since the rewards to beating the market are greater than the penalty suffered from underperformance. However, this affect is moderated by a negative relation between short-term volatility (a fund's monthly return standard deviation) and net flows. Though investors are more likely to *both* buy and sell funds with high short-term volatility, the propensity to sell these funds is greater than the propensity to buy.

As conjectured, the regression results indicate that investors do not treat all fund expenses equally. On the one hand, investors are less likely to buy funds with high load fees, exit fees, or fund for which they are charged a brokerage commission (transaction fee funds). On the other hand, they are *more* likely to buy funds with high operating expense ratios. Since these fund expenses are relatively stable over time and investors must sell funds that they previously purchased, the relation between the expense variables and fund sales are similar to, but weaker than, those for fund purchases. Thus, there is a weak *positive* relation between net flows and operating expense ratios, though net flows are lower for funds with load fees or funds for which investors are charged a brokerage commission. (Though investors tend to disproportionately buy and sell funds with higher turnover, there is no relation between net flows and turnover.)

To evaluate the robustness of these relations, we estimate an analogous regression where the dependent variable is the quarterly net flow for each diversified U.S. equity mutual fund from 1970 to 1999. The quarterly net flow for mutual fund *i* is defined as $\frac{TNA_{it} - TNA_{i,t-1}(1+R_{it})}{TNA_{i,t-1}}$, (the dependent variable is the quarterly flow divided by 3) where TNA_{it} is the total net asset value of fund *i* in quarter *t* and R_{it} is the return on fund *i* in quarter *t*. Returns and total net asset values are from the CRSP mutual fund database. The independent variables in this regression are identical to those previously described except that we drop other loads (since this information is not available prior to 1992) and

the non-transaction fee dummy (since we are analyzing aggregate flows rather than purchases and sales at a particular broker).

The results of this regression are presented in the last column of Table V. The results are quite similar to those previously reported using only six years of data from a particular brokerage firm. There is a convex relation between fund flows and performance. Investors are sensitive to load fees, but not operating expenses. (The only difference between these results and those using solely the brokerage data is that we now find a weak negative relation between turnover and net fund flows.) The results are also consistent across each of the three decades that we analyze -- the 1970s, 80s, and 90s.

Coefficient estimates from regression analyses can be sensitive to a few influential observations. Thus, it is natural to ask whether the expense-flow relations that we document appear in univariate analyses. They do. In Figure 5, we present the average quarterly net flow in year *t* to deciles formed on the basis of operating expense ratios in year *t-1*.[22] Confirming the results of our regression analyses, there is an obvious, nearly monotonic, *positive* relation between operating expenses and net flows. The decile of funds with the highest operating expense ratios experience significantly more average net flows than the decile of funds with the lowest operating expense ratios (p-value < 0.001). (There is also a strong negative relation between expense ratios and total net asset value; the funds with the lowest expense ratios tend to be larger funds.)

We conduct a similar analysis for front-end load fees. In this analysis, we measure the average quarterly net flow to no-load versus load funds. We further partition load funds into five load categories, from lowest (less than or equal to 4 percent) to highest (greater than 8 percent). The results of this analysis are presented in Figure 6. Confirming the results of our regression analyses, no-load funds garner more average net flows than do load funds (p-value < 0.001). Furthermore, among load funds, those with higher loads

[22] The quarterly net flow for a particular decile is the aggregate new money for that decile scaled by the aggregate total net asset value for the decile. These ratios are averaged across 119 quarters -- from 1:1970 to 3:1999. Tests for differences in average net flow are based on the time-series of net flows for each decile.

have significantly lower average net flows than do the low-load funds (p-value < 0.001) or no-load fund (p-value < 0.001).

Our univariate analyses and regression results indicate that the framing of fund expenses -- as operating expenses versus load fees -- affects the purchase decisions of investors. Investors are sensitive to expenses that are seen as a direct charge to an investors account at the time of a trade (commissions or load fees). However, operating expense ratios, which affect the net return earned by investors but are not incurred when an investor trades, are largely ignored. (Indeed, there is a *positive* relation between operating expense ratios and net flows.)[23] Given these relations, mutual fund managers have an obvious incentive to charge their fees in the form of operating expense ratios rather than load fees.

From 1962 to 1999, the average operating expense charged by mutual funds has steadily increased (see Figure 7), while the proportion of funds charging load fees and the level of those load fees has declined (see Figure 8). One plausible explanation for this secular change in the way mutual funds charge expenses is the recognition by mutual fund managers that investors are sensitive to load fees, but less so to operating expenses.

VI. Conclusion

Mutual fund investors display systematic patterns in the mutual funds that they buy and sell. They tend to purchase funds with strong past performance, while generally neglecting operating expenses charged by the fund. Investors tend to sell funds that have posted strong returns. We argue that decision-making biases can explain these patterns.

When purchasing mutual funds, investors use a representativeness heuristic. Investors believe that recent performance is overly representative of a fund's future prospects. Thus, they predominantly chase past performance; over half of all purchases

[23] Sirri and Tufano (1998) document a negative relation between total fund fees and net flows. They define total fund fees as a fund's operating expense ratio plus one-seventh of the fund's load fee, which assumes an investor holds a fund for seven years. We find a similar negative relation between total fees so defined and net fund flows from 1970 to 1999.

occur in funds that rank in the top quintile of past annual returns. This behavior may be reasonable, since there is empirical evidence that top-performing mutual funds tend to repeat. However, we believe it is more likely that investors are unrealistically optimistic about the odds that fund performance will persist than it is that they have rationally interpreted the empirical evidence regarding performance persistence (particularly since this evidence was only well known since the late 1980s).

When selling mutual funds, the disposition effect -- the tendency to hold losers too long and sell winners too soon -- dominates investors' decisions. In contrast to their purchases of mutual funds, when selling mutual funds investors *do not* behave as though past returns predict the future. Consistent with this conclusion, we document a *positive* relation between past performance and mutual fund sales. Nearly 40 percent of all sales occur in funds that rank in the top quintile of past annual returns; less than 15 percent of all sales occur in funds that rank in the bottom quintile. As is the case for many other investments, mutual fund investors hold their losers and sell their winners.

Finally, we argue that the framing of mutual fund expenses affects investor behavior. Consistent with this conclusion, we document that investors spurn the purchase of funds with high salient in-your-face fees, such as front-end load fees or brokerage commissions. In contrast, investors generally neglect a fund's operating expense ratio when buying funds. In fact, after controlling for past performance and other fund characteristics, we document a weak *positive* relation between operating expenses and fund purchases. This result raises the intriguing possibility that the more salient disclosure of mutual fund operating expenses could affect investor behavior.

Though buying past winners can be reasonably justified (based on extant evidence regarding performance persistence), selling one's winners rather than losers and neglecting a fund's operating expenses when buying a mutual fund cannot. Poor mutual fund performance persists (perhaps even more so than strong performance), and the realization of losses can be used to shelter taxable income. Mutual funds with high operating expenses earn lower net returns than funds with low operating expenses. Thus,

investors should buy funds with low operating expenses and sell their losing fund investments. Unfortunately, they do not.

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Table I

Descriptive Statistics on Trade Size, Trade Price, Transaction Costs, and Turnover

The sample is account records for32,199 households with mutual fund investments at a large discount brokerage firm from January 1991 to December 1996. Commission is calculated as the commission paid divided by the value of the trade. Monthly turnover is the sum of purchases (or sales) divided by the sum of mutual fund positions. Aggregate turnover is the aggregate value of purchases (or sales) divided by the aggregate value of positions held during our sample period.

	Mean	25th Perc.	Median	75th Perc.	Std. Dev.	Obs.
Panel A: Purchases						
Trade Size ($)	8,118.79	815.00	2,659.75	7,665.24	21,845.64	379,253
Price/Share	18.27	11.78	15.93	21.98	10.99	379,253
Annual Turnover (%)	97.1	20.4	44.4	102.0	171.5	31,890
Commission (%)*	0.28	0.00	0.00	0.50	0.53	281,618
Panel B: Sales						
Trade Size ($)	13,914.10	2,723.75	5,893.20	14,021.83	29,228.36	168,497
Price/Share	18.86	11.64	15.93	22.66	12.60	168,497
Annual Turnover (%)	64.8	0.0	15.6	63.6	150.4	31,890
Commission (%)*	0.40	0.00	0.20	0.60	0.54	157,398
Panel C: Trade-Weighted and Aggregate Purchases						
Aggregate Monthly Turnover (%)	6.2					
Trade-Weighted Commission (%)	0.16		Not Applicable			
Panel D: Trade-Weighted Sales						
Aggregate Monthly Turnover (%)	4.7					
Trade-Weighted Commission (%)	0.22		Not Applicable			

*Each household's turnover rate is calculated as the sum of buys or sells (2/91-11/96) divided by the sum of positions (1/91-10/96). The household turnover rate is winsorized at 100% per month to reduce the effect of outliers. Commissions are calculated based on trades in excess of $1,000. Including smaller trades results in a mean buy (sale) commission of 0.25 (0.46) percent.

Table II

Proportion of Gains Realized (PGR) and Proportion of Losses Realized (PLR)

PGR is the number of realized gains divided by the number of realized gains plus the number of paper (unrealized gains). PLR is the number of realized losses divided by the number of realized losses plus the number of paper (unrealized) losses. Realized gains, paper gains, realized losses, and paper losses are aggregated over time and across accounts. The t-statistics test the null hypothesis that the differences in proportions are equal to zero assuming that all realized gains, paper gains, realized losses, and paper losses result from independent decisions.

	Entire Year	December	Jan.-Nov.
Panel A: All Accounts			
PGR	0.307	0.317	0.307
PLR	0.149	0.124	0.151
Difference (PGR-PLR)	0.158***	0.192***	0.156***
t-statistic	45.69	13.95	43.60
Panel B: Taxable Accounts			
PGR	0.274	0.288	0.273
PLR	0.144	0.117	0.146
Difference (PGR-PLR)	0.130***	0.171***	0.127***
t-statistic	30.43	10.17	28.83
Panel C: Tax-Deferred Accounts			
PGR	0.365	0.370	0.364
PLR	0.158	0.136	0.159
Difference (PGR-PLR)	0.207***	0.234***	0.205***
t-statistic	35.38	9.83	33.99

*** - significantly different from zero at the 1 percent level, two-tailed test.

Table III

Past Performance and Mutual Fund Purchases and Sales

In month *t*, mutual funds are ranked based on the return in the 12 months ending in *t-1*. Performance deciles are constructed based on this 12-month return. In each month, we calculate the aggregate value of buys for each performance deciles. This number is divided by the aggregate value of all buys to yield the decile buys as a percentage of all buys. Decile TNA as a percentage of all funds is the deciles total net asset value divided by net asset value for all funds. There are analogous calculations for sells. To test whether there are a disproportionate percentage of buys in a performance decile we calculate the difference between the percentage of buys and the percentage of TNA for each month. Test statistics are based on the mean and standard deviation of this time-series.

	Fund Size		Buys		Sells		Order Imbalance
Performance Decile	TNA per fund	Decile TNA as % of All Funds	Decile Buys as % of All Buys	Decile Buys % less TNA %	Decile Sells as % of All Sells	Decile Sells % less TNA %	Decile Buys as % of Decile Trades
10 (Best)	357.39	8.49	39.20	30.43**	24.83	16.05**	65.85
9	511.70	12.31	14.90	2.49**	13.15	0.74	58.46
8	534.20	13.11	10.10	-3.03**	9.10	-4.03**	57.03
7	502.37	12.56	8.83	-3.46**	9.16	-3.14**	53.75
6	501.12	12.23	7.44	-4.43**	8.42	-3.46**	52.39
5	468.17	11.51	6.46	-5.26**	9.26	-2.46**	46.95
4	388.73	9.53	4.48	-5.18**	6.36	-3.29**	46.10
3	311.20	7.77	3.17	-4.75**	5.77	-2.16**	40.86
2	293.16	7.43	3.08	-4.19**	7.34	0.07	32.93
1 (Worst)	206.12	5.06	2.33	-2.61**	6.61	1.66**	34.59
All Funds	407.49	100.00	100.00	0.00	100.00	0.00	55.52

** - significantly different from zero at the one percent level, two-tailed test.

Table IV

Abnormal Returns for Mutual Funds Purchased and Sold

In month t, the buy (sell) portfolios consists of all mutual funds purchased (sold) in the preceding 12 months. Portfolio returns are calculated by weighting each fund in proportion to the value of trades. The market-adjusted return is calculated by subtracting the return on a value-weighted market index. The CAPM intercept is the intercept from a time-series regression of a portfolio's excess return on the market excess return, where excess returns are calculated by subtracting the return on U.S. t-bills. The Fama-French intercept is the intercept from a time-series regression of a portfolio's excess return on the market excess return, a size zero-investment portfolio, and a book-to-market zero-investment portfolio. P-values are in parentheses.

	Market-Adjusted	CAPM Intercept	Fama-French Intercept	Four-Characteristic Intercept
Panel A: All Mutual Fund Trades				
Buys	-0.15 (0.39)	-0.23 (0.20)	-0.05 (0.59)	-0.17* (0.06)
Sells	-0.11 (0.50)	-0.20 (0.25)	-0.04 (0.71)	-0.15 (0.14)
Difference	-0.03 (0.34)	-0.03 (0.40)	-0.01 (0.71)	-0.02 (0.55)
Panel B: Winners Sold versus Losers Held				
Winners Sold	-0.13 (0.49)	-0.22 (0.27)	-0.01 (0.91)	-0.14 (0.16)
Losers Held	-0.16 (0.48)	-0.34 (0.16)	-0.06 (0.60)	-0.22* (0.07)
Difference	0.03 (0.59)	0.11* (0.07)	0.05 (0.33)	0.08 (0.19)

* -- significantly different from zero at the 10 percent level, two-tailed test.

Table V: Cross-Sectional Regressions of Purchases and Sales of Mutual Funds on Fund Characteristics

This table reports the mean coefficient estimates and associated t-statistics (in parentheses) from cross-sectional regressions of fund flows on selected fund characteristics. In each month from January 1991 to November 1996, three cross-sectional regressions are estimated using data on purchases and sales of mutual funds from a U.S. discount broker. The dependent variable is the total value of buys in fund *i* , the total value of sells in fund *i*, and the total value of buys less the total value of sells for fund *i* (each are scaled by the beginning-of-month total net asset value (TNA) for the fund). To facilitate the reporting of coefficient estimates, the dependent variable is multiplied by 1,000,000. The independent variables in the regression include the annual market-adjusted (MA) return for the fund for the past 12 months, the annual market-adjusted return squared, the expense ratio for the fund, the monthly standard deviation of fund returns during the prior 12 months, the maximum load charged by the fund, other loads (typically an exit load) charged by the fund, a dummy variable which takes a value of one if the fund has no transaction fee at the brokerage firm, the turnover ratio for the fund, and the log of beginning-of-month total net asset value. The expense variables and turnover ratio are those most recently reported *prior* to the period over which fund purchases and sales are measured. All independent variables are measured in percentage terms, except the NTF dummy and the log of fund size. The last column of the table reports results of cross-sectional regressions of quarterly net fund flows (scaled by beginning-of-quarter TNA) on selected fund characteristics. To facilitate the reporting of coefficient estimates, the dependent variable in the aggregate flow regressions is multiplied by 10,000.

	Broker Data 1991 to 1996					Aggregate Net Flows 1970-1999
	Descriptive Statistics for Independent Variables		Dependent Variable			Dependent Variable
Independent Variables:	Mean	Standard Deviation	Buys / TNA	Sells / TNA	(Buys-Sells) / TNA	$\frac{TNA_{it} - TNA_{i,t-1}(1+R_{it})}{TNA_{i,t-1}}$
Intercept			-56.29	-139.20***	82.91***	168.9***
			(-1.39)	(-6.20)	(2.68)	(6.20)
Annual Return (MA)	0.797	10.054	11.40***	1.78***	9.63***	12.9***
			(14.19)	(4.20)	(11.23)	(12.60)
Annual Return (MA) Squared	101.720	402.600	0.38***	0.14***	0.24***	0.3***
			(7.06)	(4.21)	(4.75)	(9.75)
Monthly Return Std. Deviation	3.538	1.653	13.29*	32.85***	-19.56***	-16.7***
			(1.90)	(8.35)	(-3.54)	(-4.13)
Expense Ratio	0.994	0.479	81.78***	59.64***	22.14*	21.4**
			(5.86)	(7.20)	(1.90)	(2.22)
Max Load	1.356	2.280	-38.53***	-25.41***	-13.12***	-3.9***
			(-25.03)	(-23.44)	(-7.84)	(-5.35)
Other Load	0.096	0.456	-31.38***	-21.72***	-9.66*	N.A.
			(-5.20)	(-5.93)	(-1.82)	
Non-Transaction Fee Dummy	0.258	N.A.	66.13***	26.16***	39.97***	N.A.
			(5.60)	(4.02)	(4.51)	
Fund Turnover	93.445	105.915	0.34***	0.28***	0.06	-0.1
			(5.22)	(5.53)	(1.17)	(-0.76)
Log Fund Size (TNA $000,000)	5.336	1.813	5.72**	9.06***	-3.34	-17.9***
			(2.37)	(6.43)	(-1.53)	(-7.31)

***, **, * - significant at the 1, 5, or 10 percent level, two-tailed test.

Figure 1: The Ratio of PGR to PLR for Mutual Funds by Month for Taxable and Tax-Deferred Accounts

PGR is the number of realized gains divided by the number of realized gains plus the number of realized gains plus the number of paper (unrealized gains). PLR is the number of realized losses divided by the number of realized losses plus the number of paper (unrealized) losses. Realized gains, paper gains, realized losses, and paper losses are aggregated over time and across accounts.

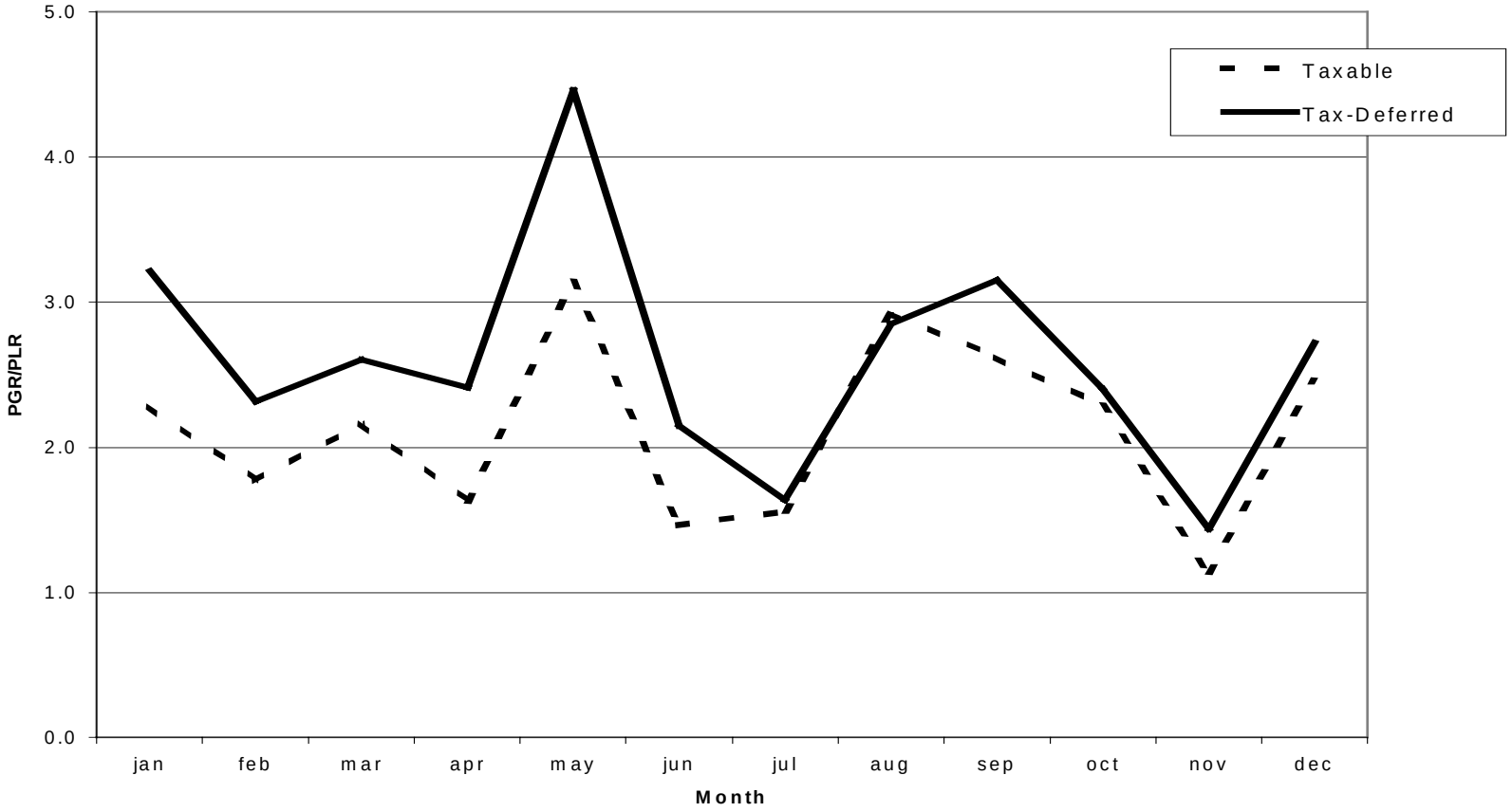

Figure 2: The Ratio of PGR to PLR for Stocks by Month for Taxable and Tax-Deferred Accounts

PGR is the number of realized gains divided by the number of realized gains plus the number of realized gains plus the number of paper (unrealized gains). PLR is the number of realized losses divided by the number of realized losses plus the number of paper (unrealized) losses. Realized gains, paper gains, realized losses, and paper losses are aggregated over time and across accounts.

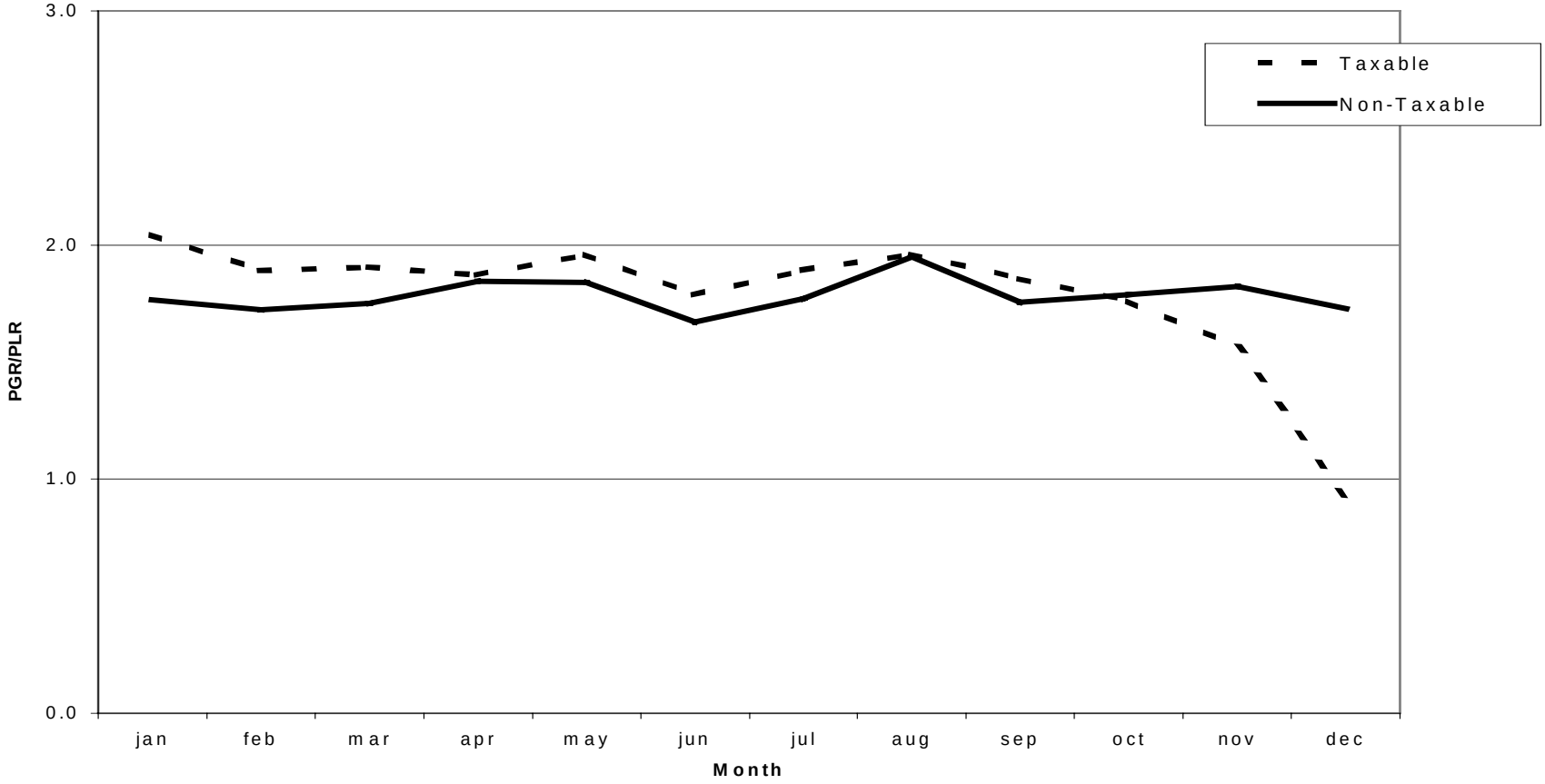

Figure 3: The Ratio of Proportion of Buys to Proportion of all Funds for Mutual Fund Performance Deciles

Mutual fund performance deciles are based on annual returns updated each month. For each decile, the proportion of buys is the value of buys in the decile divided by the value of buys (or sells) in all funds; the proportion of all funds is the total asset value of funds in the decile divided by the total asset value of all funds. The ratio of these two proportions will be one if buying (or selling) intensity if proportional to fund size.

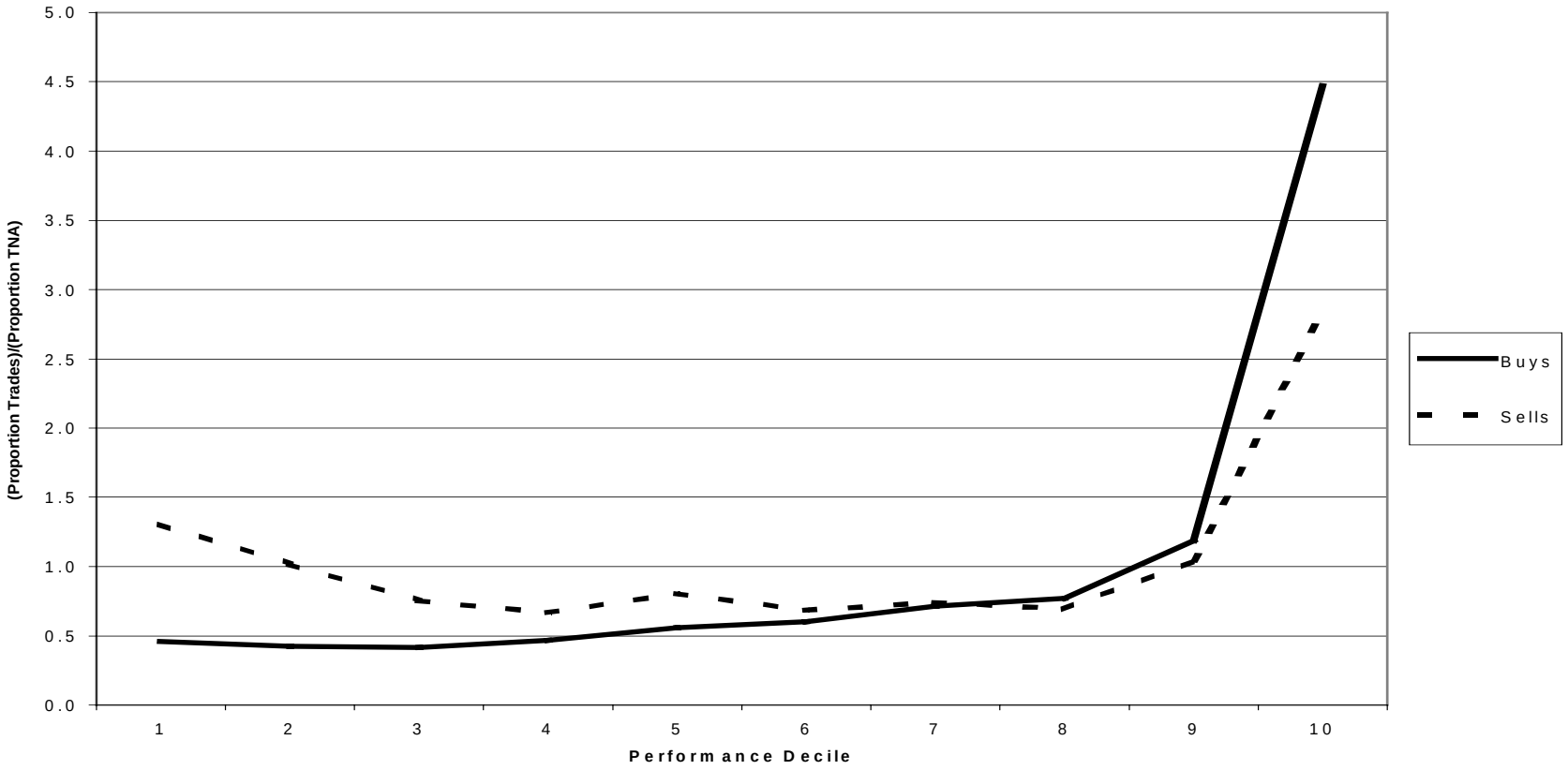

Figure 4: Cumulative Market-Adjusted Returns on Funds Bought and Sold relative to the Month of the Trade (Month 0)

Event month zero is the month of the fund purchase or sale. The market-adjusted return in month *t* is the fund return less the value-weighted CRSP NYSE/ASE/Nasdaq market index. The graph depicts the cumulative mean market-adjusted return beginning in month -24 and beginning in month 1. Means are weighted by the value of trades. Results are similar if we weight each trade equally.

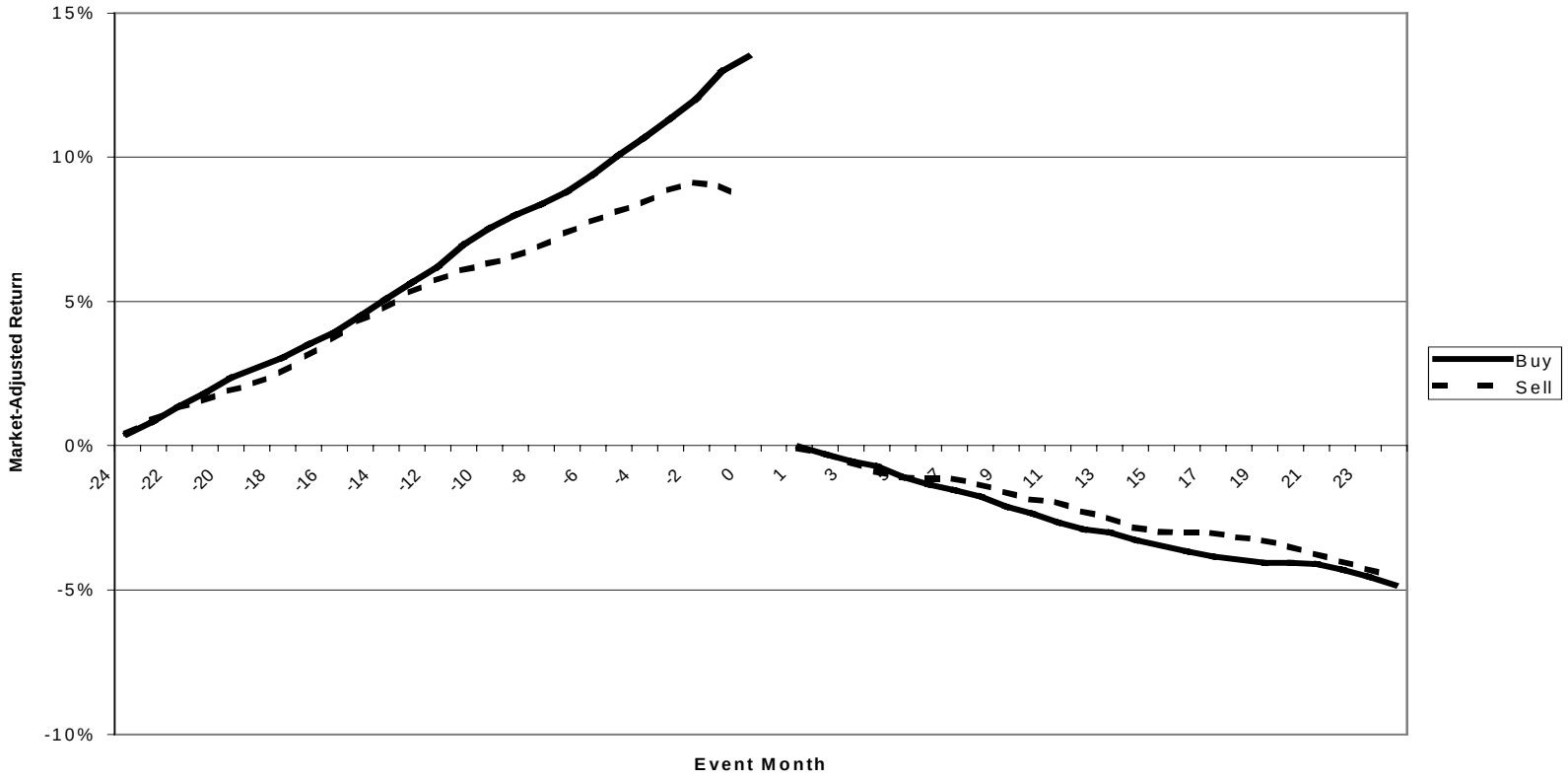

Figure 5: Mutual Fund Operating Expense Ratios and Average Quarterly Net Flows: 1970-1999

Mutual fund deciles are formed on the basis of operating expense ratios in year *t-1*. Funds with the lowest operating expense ratios are placed in the first decile, while funds with the highest operating expense ratios are placed in the tenth. In year *t*, quarterly net flows for each decile are calculated as the sum of new money for each fund ($TNA_{it} - TNA_{i,t-1}(1+R_{it})$) divided by the sum of total net asset value (TNA) for each fund. The figure presents the average of this ratio across 119 quarters ending in third quarter 1999.

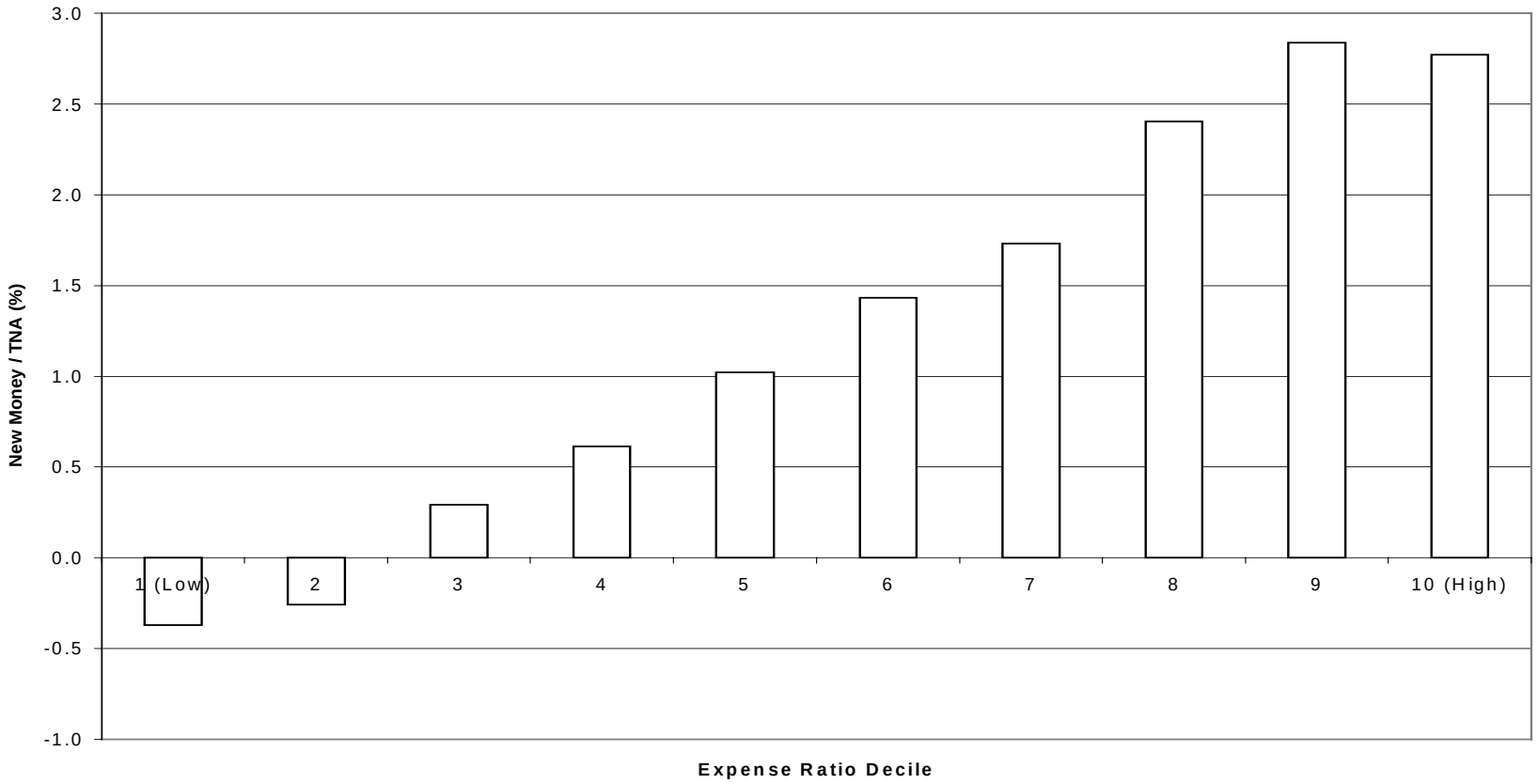

Figure 6: Mutual Fund Front-End Load Fees and Average Quarterly Net Flows: 1970 to 1999

In year *t*, quarterly net flows for no-load funds are calculated as the sum of new money for each fund ($TNA_{it} - TNA_{i,t-1}(1+R_{it})$) divided by the sum of total net asset value (TNA) for each fund. There is an analogous calculation for load funds. Load funds are further partitioned into five categories ranging from low load funds (L<=4 percent) to high load funds (L > 8). The figure presents the average of this ratio across 119 quarters ending in third quarter 1999.

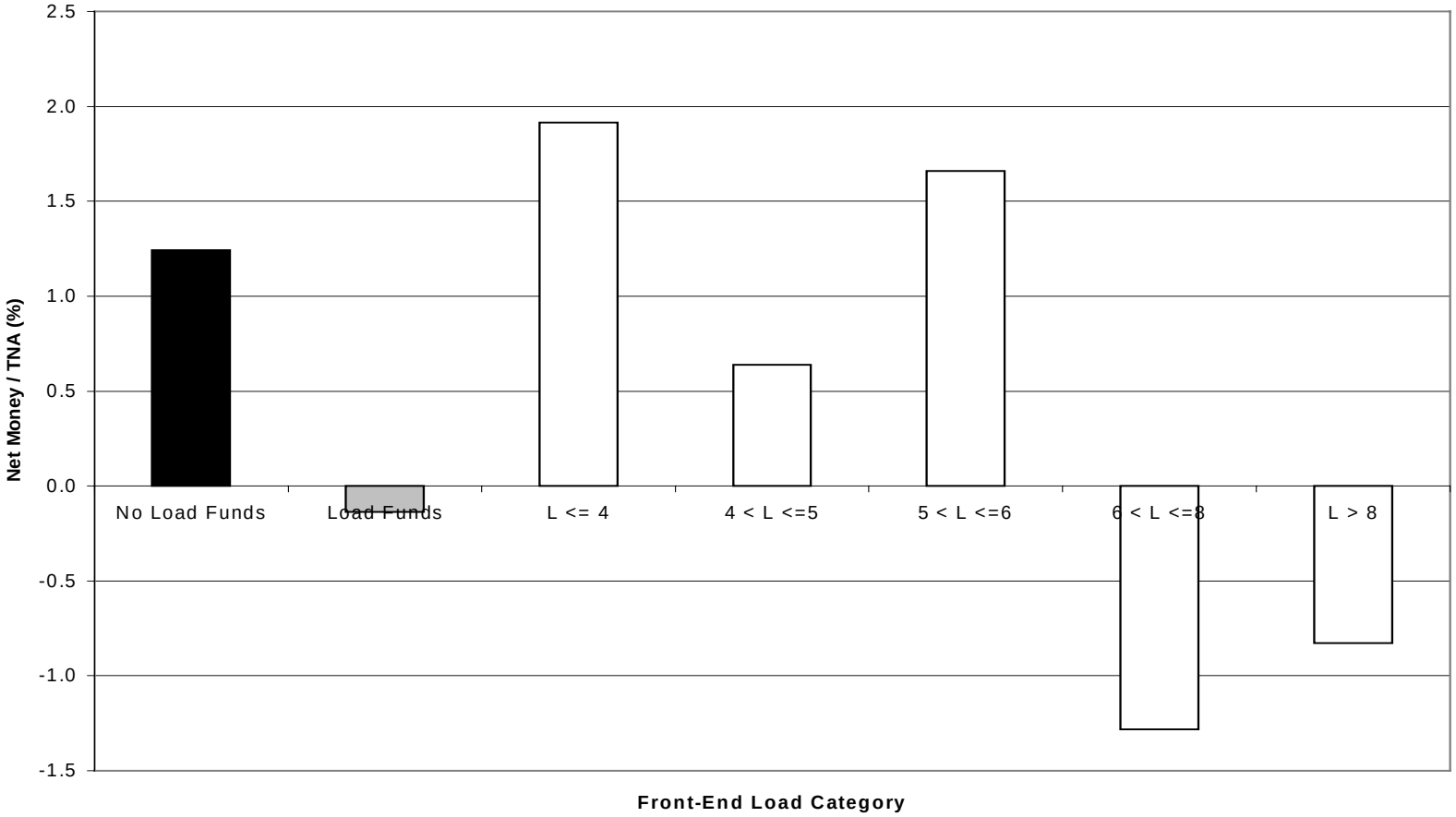

Figure 7: Mean Operating Expense Ratio for U.S. Diversified Equity Mutual Funds: 1962 to 1999

The mean operating expense ratio is calculated based on expense ratios reported in the CRSP mutual fund database for U.S. diversified equity mutual funds and is weighted by fund size. Funds with zero expense ratios are excluded from the calculation of the mean. On average, 97 percent of assets are held in funds with nonzero expense ratios, ranging from 92 percent in 1987 to 100 percent in 1999.

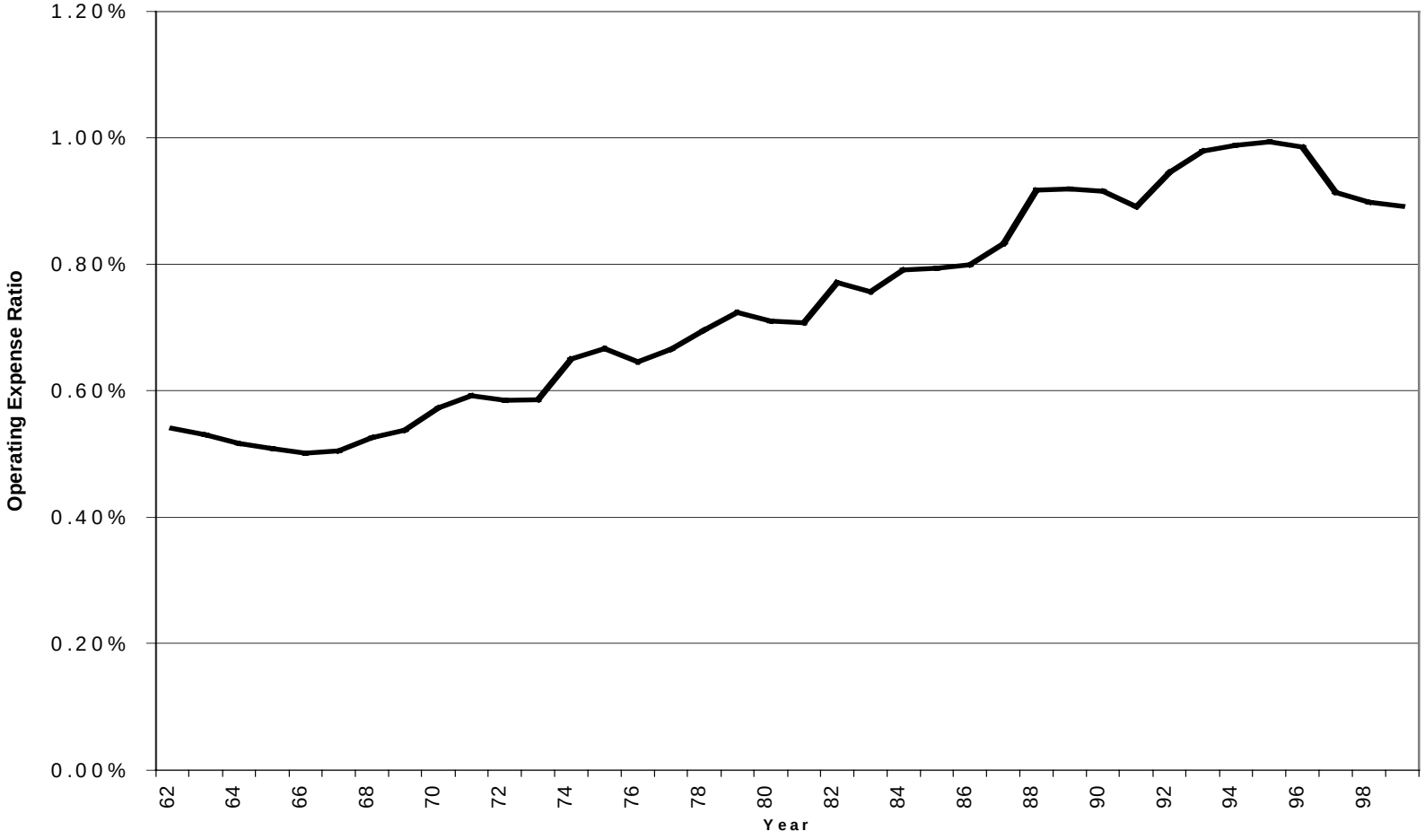

Figure 8: Mean Front-End Load Fee and Percentage of Assets Invested in funds with Front-End Loads for U.S. Diversified Equity Mutual Funds

Front-end load fees are from the CRSP mutual fund database. The mean load fee is based only on funds charging a front-end load and is weighted by fund size.