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Abstract

We examine how redemption policies affect daily fund flows in open-end mutual funds. Since short-term trading of fund shares, as manifested in daily fund flows, can have an adverse impact on returns to the fund's shareholders, mutual funds might find it desirable to discourage short-term trading through the use of redemption fees. However, if daily fund flows are due to fund shareholders' legitimate liquidity demands, the redemption fee would have little effect on daily fund flows and possibly adversely affect fund shareholders by imposing a liquidity cost on them. We find that the likelihood of a fund charging a redemption fee is largely a function of its overall fee structure. We also use a sample of funds that imposed redemption fees to examine whether the distribution of daily fund flows changes after the initiation of the redemption fee. We find that the redemption fee is an effective tool in controlling the volatility of fund flows.

1. Introduction

In addition to the potential benefits of professional investment management and diversification, open-end mutual funds offer the privilege of nearly free and unlimited liquidity. Most funds grant shareholders the right to exchange fund shares for cash at its end-of-day per share net asset value (NAV). Shareholders typically pay no direct costs when exercising this right to exchange shares, despite the possibility that these exchanges impose costs on the fund's remaining shareholders through increased expenses and lowered realized returns. While numerous studies explore the performance of funds' portfolio managers, more recent scrutiny focuses on how the liquidity feature of mutual funds affects performance.[1] This paper examines mutual funds' attempts to restrict the sale of fund shares through fund policies such as redemption fees.

Mutual fund shareholders redeem their shares for several reasons. Typically, redemptions are considered to be motivated by infrequent liquidity shocks or regular asset allocation decisions. These liquidity motives are similar to those of the uninformed liquidity traders in the models of Glosten and Milgrom (1985), Kyle (1985), and Admati and Pfleiderer (1988). Liquidity-motivated and infrequent redemptions that are uncorrelated over time should not impact the fund manager's portfolio selection strategy and should not result in significant costs to the fund. However, Edelen (1999) suggests that excessive fund flows can have detrimental effects on mutual fund performance, and attributes the effect on performance to transaction costs arising from the adjustment of the underlying portfolio holdings and the need to carry cash to fund liquidations.

[1] Studies of overall fund performance include Carhart (1997), Grinblatt and Titman (1994), Gruber (1996), Hendricks, Patel, and Zeckhauser (1993), Ippolito (1989, 1992), and Jensen (1968). Studies that consider the liquidity of fund shares and its impact on performance include Alexander, Cici, and Gibson (2005) Bergstresser and Poterba (2002), Dickson, Shoven, and Sialm (2000), and Edelen (1999).

Some shareholders might trade fund shares in order to engage in market-timing or short-term speculative trading. Among these traders, some might redeem shares in order to exploit a possible mis-pricing in the fund's per share NAV. Bhargava and Dubofsky (1998), Zitzewitz (2003), and Chalmers, Edelen, and Kadlec (2001) show that funds' NAV's can be mis-priced on average due to the stale prices of the fund's underlying assets. Greene and Hodges (2002) show that traders have exploited stale-priced trading opportunities in international funds, significantly diluting fund returns. In addition to the adverse impact of strategically timed fund flows, the shifting of capital-gains tax liabilities to passive investors can lead to even greater dilution of after-tax fund returns, as suggested by Dickson, Shoven, and Sialm (2000).

Fund managers might attempt to limit the effects of these fund exchanges. Chordia (1996) presents a model in which fund managers choose policies (an exchange fee in the model) to entice investors to self-select into funds based on their liquidity needs. Nanda, Narayanan, and Warther (2000) construct a model in which the heterogeneity of managerial ability and the differences in investors' liquidity needs determine the fees charged by a fund. Managers who can earn higher returns may be able to charge higher fees to deter liquidity traders. Similarly, Nanda and Singh (1998) construct a model in which the endogenous liquidity needs of investors lead them to form a mutual fund, while also determining the fee structure and size of the fund. In their model, funds that are more efficient in managing transaction costs (including the costs arising from fund redemptions and taxes) will have lower penalties for early withdrawal. Because these models depend on the power of transaction fees to discourage fund flows, it is important to examine empirical evidence on the impact of redemption fees on investors' liquidity demands as reflected in fund flows.

Besides controlling flows by restricting active trading of fund shares, fund managers who are compensated based on assets under management have an incentive to discourage shareholders from redeeming fund shares. Since redemption fees could be a way for managers of poorly performing funds to "capture" investors by imposing a fee for exit, the U.S. Securities and Exchange Commission (SEC) historically was reluctant to encourage widespread use of these fees (Stanton 2000a). The SEC has encouraged mutual funds to set redemption fees based on an estimation of the costs that the redemption imposes on the fund (SEC, 2002) – usually a function of the transaction costs the fund paid to liquidate shares of its underlying assets. In the face of increased attention on the impact of market-timing, the SEC shifted its position in March 2005 and gave its blessing and encouragement to impose redemption fees, particularly for short-term holding periods. With the adoption of Rule 22c-2 to the Investment Company Act of 1940, the SEC requires all funds either to charge a redemption fee, or to determine that such a fee is not necessary (Burns 2005). Even with these justifications, the SEC continues to discourage fees exceeding 2%, although Rule 22c-2 does not state a formal cap on redemption fees.[2]

Funds make clear in their prospectuses that redemption fees exist specifically in order to discourage market timing strategies. For example, the prospectus for the UAM McKee International Equity fund states that the fund "… charges the redemption fee to discourage market timing by those shareholders initiating redemptions to take advantage of short-term market movements" (UAM, 2000).

This paper empirically examines two competing explanations of why funds use redemption fees. An agency cost hypothesis for redemption fees implies that poor performing funds are more likely to have such fees, while a liquidity cost hypothesis suggests that funds with

[2] For example, Stanton (2000b, 2000c) explains how Fidelity's Small Cap Stock Fund reduced its redemption fee from 3% to 2% at the insistence of the SEC. Fidelity argued that costs imposed by short-term traders justified a 3%

greater potential transaction costs would be more likely to employ redemption fees. In addition, we explore how effectively redemption fees affect investors' exchange behavior. We take two approaches in our examination. First, we examine whether the characteristics of a fund's structure explains the use of redemption fees. To do this, we compare the characteristics of funds that have redemption fees with those that do not. Our second approach relates the fund's redemption fee to its shareholders' exchange activity. In this context, we examine how redemption fees affect the distribution of frequent (daily) fund flows.

In practice, fund managers have several exchange policies at their disposal for inhibiting shareholders' ability to exchange fund shares, including prospectus-stated exchange restrictions, market timing language, exchange or redemption fees, minimum holding periods, and load fees. We choose to focus on redemption fees for several reasons. First, redemption fees typically are charged to the person performing an exchange and are paid directly to the fund. This is in contrast to load fees or some exchange fees that are paid to the fund management company or a third party (e.g., a broker). Thus, redemption fees impose costs on investors leaving the fund and compensate existing shareholders for any costs the fund must pay to rebalance the portfolio. Although many studies have examined the impact of fees and transaction costs on investment performance, existing empirical work suggests that investors' flows respond more to reported returns than the fee structure (Odean, Barber, and Zheng, 2006). It is also important to note that almost all of the published studies cited here were conducted in the period prior to the SEC's new focus on redemption fees as a tool to combat excessive fund flows. This paper documents the impact of redemption fee changes on daily mutual fund flows during the final period when

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fee.

funds were free to initiate redemption fees as they saw fit and offers evidence on their effectiveness in controlling liquidity and performance[3].

The importance of fees in deterring investors' share redemptions is also relevant to models of financial intermediation. Several of these models employ production technologies where value is lost if investments are liquidated early. Diamond and Dybvig (1983) note that such a result would be equivalent to a transaction cost on liquidating the investment. The importance of this cost of withdrawing funds from an investment is a major factor in the models of Diamond and Dybvig (1983), Jacklin (1993), and Chan, Greenbaum, and Thakor (1992), just to name a few. Most of these papers concentrate on bank deposits, but the use of fees to deter frequent trading of mutual funds has many similarities. Therefore, a better understanding of the influence of redemption fees on investors' willingness to withdraw from certain investments is important for the applicability of these models as well.

The remainder of this paper is organized as follows. The following section establishes the methodology and key predictions that we examine using a sample of all Lipper and CRSP listed mutual funds. Using this sample, we conduct cross-sectional analysis of funds with and without redemption fees. We examine daily fund flows in section 3, where we conduct both cross-sectional analysis and a time-series event study of funds that initiate redemption fees during our sample periods. Section 4 summarizes and offers concluding remarks.

2. Cross-Sectional Analysis

2.1 Methodology

[3] We note that the impact of a redemption fee might be different in an environment in which relatively few competing funds have a redemption fee compared to an environment in which most funds have one.

Fund managers often claim that redemption fees are used to decrease redemption-generated liquidity costs imposed on remaining shareholders. However, the SEC's refusal to raise the 2% cap on redemption fees implies that there exists the potential for a serious agency problem where fund managers impose unnecessary fees on shareholders. Therefore, it is important for shareholders, fund managers, and financial regulators to know if funds really use redemption fees when they are faced with high liquidity costs, or alternatively, when they are faced with high potential agency costs.

An agency cost explanation for redemption fees implies that managers use redemption fees to prevent investors from leaving the fund. Managers could be motivated to capture investor dollars in this way whenever conditions exist that benefit fund managers but hurt investors. Such funds could be characterized by high expenses and/or poor performance. High expense ratios, especially the management (non-12b-1) portion of expenses, would lead to greater payments to fund managers, without directly benefiting shareholders.[4] Alternatively, investors in poorly performing funds would have an incentive to shift assets to a better managed fund, unless discouraged from doing so by a redemption fee. Since fund manager compensation usually depends on the size of assets under management, they would have a strong incentive to prevent such defections. The ability of redemption fees to prevent defections from poorly performing funds holds particular importance in potentially helping to explain the asymmetric relation between mutual fund flow and performance[5]. Costs, such as redemption fees, that prevent investors from leaving poorly performing funds could help explain such asymmetries by showing why investors remain in funds with persistently low returns.

[4] Gruber (1996), Carhart (1997), and Chalmers, Edelen, and Kadlec (1999), all show that funds with higher expense ratios do not necessarily provide investors with higher returns.

[5] Sirri and Tufano (1998) document an asymmetric relationship between fund flow and performance, with well-performing funds attracting large inflows, although most poorly-performing funds do not experience large outflows.

A final consideration in fund managers' motivations to use redemption fees is to examine how redemption fees influence the growth of a fund's assets. If redemption fees lead to slower fund growth then we could expect that smaller funds would be less likely to use redemption fees to induce higher growth rates. However, once a fund's size reaches a suitable level, then management's concern with asset growth could lessen, and redemption fees may become a more attractive means of controlling investors' behavior.

The liquidity explanation for redemption fees suggests that managers use these fees to control liquidity costs that could reduce investors' returns. Under this explanation, managers act in the best interests of long-term shareholders when imposing redemption fees. As Bhargava and Dubofsky (1998), Zitzewitz (2003), Chalmers, Edelen, and Kadlec (2001), and Greene and Hodges (2002) show, investors taking advantage of short-term market-timing strategies can earn excess returns at the expense of passive shareholders. This occurs because stale prices lead to some predictability in mutual fund NAVs, while free redemptions allow for unlimited and costless liquidity to be provided to short-term traders at the expense of passive investors.

We employ two separate data sources to examine how mutual funds use redemption fees. First, we examine data for the years 2000-2003 from Lipper, Inc., which indicates if a fund charges a redemption fee. We then merge this sample with the CRSP mutual fund database to obtain returns, fund characteristics, and fees. This sample admits an examination of the characteristics of funds that utilize redemption fees compared with those that do not. To select our sample of funds, we require that CRSP have non-missing data for the following mutual fund characteristics for at least two of the four sample years: total net assets (TNA), annual returns, turnover, expense ratios, 12b-1 fees, cash holdings, and investment objective. We then identify funds by broad investment objective: domestic equity funds, domestic bond funds, and

international equity funds. International bond funds, balanced or mixed funds, money market funds, and others that do not clearly fit our classifications are discarded. We also remove funds that report average annual total net assets of less than $10 million.

Lipper also provides an additional database of daily TNA's for all funds in our sample, from which we can compute daily fund flows. Although Lipper reports daily ending TNA for each fund, this TNA figure does not reflect the current day's net fund flows[6]. Therefore, we calculate daily flows as:

$$c_t = \frac{a_{t+1}}{(1+r_{t+1})} - a_t, \tag{1}$$

where a_t is total net assets on day t, r_t is the fund's return on day t, and c_t is fund flow on day t. To get percentage flows we then divide (1) by $a_t/(1+r_t)$.

We take two approaches in examining the characteristics of funds charging redemption fees. First, we use cross-sectional analysis to compare funds that have redemption fees to those that do not. As with any cross-sectional comparison, suspicion may arise as to whether the characteristics that influence daily fund flows are suitably controlled. Therefore, our second approach relies on an event-study of funds that initiate redemption fees. Our event study sample comprises fifty-eight funds that initiated redemption fees during our four-year sample period. This complements our cross-sectional analysis by holding the characteristics of the fund constant and examining only the changed fund policy with respect to redemption fees.

[6] Funds' reporting of TNA and the inclusion of the current day's net flows is an issue of concern in other databases of daily fund flows such as the Trimtabs database used by Greene and Hodges (2002), Zitzewitz (2003), and Chalmers, Edelen, and Kadlec (2001). We follow the procedure of Greene and Hodges (2002) and match a sub-sample of our funds to the semi-annual SEC N-SAR filings in order to validate the timing of the TNA figure reported by Lipper. This confirms that Lipper does report the TNA consistently for the vast majority of our funds. In our cross-sectional analysis we assume that all funds report TNA pre-flow, as misclassified figures for TNA are unlikely to affect this portion of our analysis. Moving to a more detailed examination of flows in the next section,

2.2 Cross-Sectional Sample Data

Table 1 offers descriptive statistics of funds with valid data from the merged sample, with means over the sample period of fund characteristics reported separately for funds with and without redemption fees. The overall sample includes 190 funds with redemption fees and 4,379 funds without redemption fees. Counted among these "funds" are multiple classes of the same fund (e.g., Class A or B shares). Because redemption fees often apply to only one class of shares, we conduct all analysis at the share class level, and we do not aggregate separate classes into one fund.

Table 2 presents a more detailed description of the redemption fees charged by our sample funds. Overall, in 2000 there are 57 domestic equity growth funds (5.1%) with redemption fees, 9 domestic equity income funds (2.1%), 33 international equity funds (8.5%), and 33 domestic bond funds (2.9%). By 2003 the percentage charging redemption fees had steadily increased for all investment objectives, with 250 domestic equity growth funds (11.4%), 45 domestic equity income funds (6.1%), 252 international equity funds (37.0%), and 116 domestic bond funds (5.1%) charging redemption fees.

While the average redemption fee charged for most fund classes rose over the sample period, most funds levying a redemption fee set it at the maximum allowed fee of 2%. The proportion of funds charging this maximum fee also steadily increased, from 57.9% of domestic equity growth funds with redemption fees in 2000 to 86.4% in 2003, with other investment objectives displaying a similar pattern.

2.3 Cross Sectional Empirical Results

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we verify each fund against the N-SARs and adjust the flow calculation for any funds that report daily TNA using the current day's flows.

Our cross-sectional results are consistent with redemption fees being part of an overall fee structure. In the univariate tests presented in Table 1, marketing (12b-1) fees and loads are consistently and significantly lower for funds charging redemption fees. Management fees are significantly lower for domestic income and bond funds with redemption fees. Other variables show mixed or insignificant differences. The lower marketing fees and loads for funds charging redemption fees seem consistent with the idea that funds are "locking in" investors. However, lower marketing expenses could benefit infrequent traders who do not face an expected redemption cost. Evidence concerning fund size and the level of fund flows is inconclusive in these tests[7]. There is no evidence that funds charging redemption fees suffer from worse performance or higher fees than other funds. In fact, domestic growth and international equity funds charging redemption fees have significantly higher risk-adjusted performance.

Table 3 reports probit model estimates of fund characteristics that determine if a fund has a redemption fee. The probit model takes the form:

$$Redemption\ Fee\ Dummy_i = \beta_0 + \beta_1 Alpha_i + \beta_2 ManagementFees_i + \beta_3 MarketingFees_i$$
$$+ \beta_4 Size + \beta_5 Turnover + \beta_6 CashHoldings + \beta_7 FrontLoad_i + e_{i,} \quad (2)$$

For Growth and Income funds, performance is measured by a 1-factor market model of monthly returns with the S&P 500 Index as a benchmark. Each fund's monthly returns over the sample period are regressed on the monthly returns for the S&P 500 index. The intercept from this model measures performance and is referred to as *alpha*[8]. One-factor models for International

[7] An additional variable that is inconclusive when included in these tests is the serial correlation of daily fund flows. This variable could be used as a measure of a fund's susceptibility to market-timing trading. We do find in t-tests between groups that international funds charging a redemption fee have significantly smaller levels of negative serial correlation of daily flow than funds not charging redemption fees. However, this variable is not significant in any probit regressions and does not change the coefficients for any other variables, and is therefore omitted from our analysis.

[8] Our results are robust to the use of several alternative performance measures, such as raw returns, expense-adjusted returns, and multi-factor return models including market, book-to-market, size, and momentum factors. We also obtain similar results when using daily returns instead of monthly returns to measure performance.

and Bond funds are calculated similarly, except that for international funds we use the MSCI EAFE index as the benchmark, and for bond funds we use the Fed Reserve AA Aggregate Corporate Bond Index as a benchmark. *MarketingFees* is the 12b-1 portion of fund *i*'s expense ratio, and *ManagementFees* is the non-12b-1 portion. *Turnover* is the fund's turnover ratio. *Size* is the natural log of a fund's average daily total net assets and *Cash Holdings* is the percentage of a fund's assets in cash and cash equivalents. *FrontLoad* represents the maximum front-end load that may be charged for this fund class. Because deferred loads demonstrate a complicated interaction with redemption fees, we do not include them now, but present a more detailed analysis of them in the next section.

The probit results in Table 3 are fairly similar across fund objectives and reveal some interesting findings. The pseudo-R^2 statistics range from 23.5% for domestic growth funds to 29.3% for international equity funds. As in the univariate analysis, there is no significant evidence that funds with redemption fees have worse performance; indeed, international equity and domestic growth funds actually have significantly positive coefficients for risk-adjusted returns. Management fees take a positive coefficient but are only significant for domestic growth funds, while cash holdings and turnover show no consistent or significant patterns across investment objectives. The strongest results are for marketing fees and front loads, which have significant negative coefficients. The strength of the findings for 12b-1 fees and front loads, combined with the lack of significance for portfolio-based variables such as turnover and cash holdings, indicates that the likelihood of a fund charging a redemption fee is largely a function of its overall fee structure and marketing strategy, and not determined by its portfolio characteristics.

Funds that charge marketing based fees (12b-1 fees and front loads) are less likely to use redemption fees. This is consistent with our agency explanation of redemption fees. The significant positive coefficients for management fees for funds with redemption fees support this interpretation. Cash holdings are insignificant in the probit model for all types of funds, suggesting that funds do not hold less cash when a redemption fee is present.

2.4 Cross Sectional Analysis of Redemption Fees and Deferred Loads

Because deferred loads (contingent deferred sales loads, or CDSLs) bear such a strong resemblance to redemption fees, we take a closer look at the relationship between these two types of fees. After merging the CRSP and Lipper databases, we discovered that the CRSP database occasionally misclassified redemption fees as deferred loads. Further investigation (via internet and/or contacting the fund families directly for the subsample of our funds that initiated redemption fees) confirmed that the fees in question were indeed redemption fees and not deferred loads. This motivated us to omit the variable for deferred loads from the analysis in the previous section. Had we included the deferred load variable, as reported by CRSP, it would take a significant positive coefficient for all investment objectives, while management fees become insignificant for domestic income and domestic bond funds (results available from the authors). Instead of including deferred loads in our probit model, we present Table 4, where funds are classified by whether or not they charge a deferred load (as reported by CRSP), and the probit model is run separately for each group.

The results presented in Table 4 are consistent across all fund investment objectives and are robust to our alternative performance measures. Overall, the significant negative coefficients for marketing (12b-1) fees, and the power of our probit models in general (measured by the

pseudo-R-square) applies only for funds that charge deferred loads. We also find that management fees now take a significant negative coefficient for domestic growth and bond funds that also charge deferred loads. For funds without deferred loads, our probit model has little power to explain which funds charge redemption fees. Therefore, it seems that for funds charging a deferred load, redemption fees and 12b-1 fees are strongly negatively related. For funds that do not charge a deferred load, redemption fees are largely unrelated to the variables included in our model. This provides further evidence that redemption fees are part of a fund's overall marketing strategy and fee structure.

2.5 Cross Sectional Analysis of Other Market Timing Restrictions

In this section, we extend the results of Greene and Hodges (2002) by examining how fund flows are affected by other restrictions on shareholders' purchases and redemptions. To examine these issues, we partition the year-2003 data[9] by investment restrictions including redemption fees, minimum initial investment amounts, purchase constraints, front-end loads, and deferred loads. We then conduct a t-test for the difference in means and an F-test for differences in standard deviations for funds with and without each restriction or fee. "Purchase constraints" refer to limits on fund access, such as when a fund is closed to new investors, closed to all investors, or restricted to investors from certain groups, such as employees in a certain profession. Minimum initial investment amounts and purchase constraints are obtained from the Morningstar Principia database. Loads are from the CRSP mutual fund database and all other data are from Lipper.

[9] For clarity, we report results only for year-2003 data in this section, although the use of alternative sample years yields similar findings.

Table 5, Panel A, shows the average level and standard deviation of daily fund flows for the sample, partitioned by investment restrictions. Panel B presents these statistics for absolute daily flows, which are more relevant when considering the overall response of investors to redemption fees. Most of these alternative restrictions on fund flows do not demonstrate a consistent impact, especially across investment objectives. Funds with redemption fees tend to have a lower standard deviation of daily flows (except for domestic income funds), but a higher standard deviation of absolute flows. Minimum initial investment amounts of greater than $1,000 significantly decrease the standard deviation of both daily flows and absolute flows, which would be consistent with small retail investors creating the volatility in fund flows. Funds with deferred loads also tend to have significantly lower absolute flows and lower standard deviations of absolute flows, although they have a higher standard deviation of signed flows for domestic income and bond funds. Purchase constraints do not have a consistent impact in flows across investment objectives.

A challenge in the cross-sectional examination of fund flows and redemption fees, as well as other trading restrictions, is that we can not distinguish between cause and effect. Although we can clearly observe the characteristics of funds that charge redemption fees, we cannot determine whether the fees cause the fund to have such characteristics, or if those characteristics cause the fund to charge a redemption fee. For example, do redemption fees serve to decrease the standard deviation of daily fund flows by suppressing trading, or do funds with unusually volatile absolute flows choose to charge redemption fees in order to try to control those flows? Our next section attempts to disentangle the nature of causality by examining only those funds that initiate redemption fees during our sample period.

3. Analysis of Redemption Fee Initiations

3.1 Event-Study Methodology

Redemption fees for most funds are only applied to redemptions within a certain minimum holding period, generally lasting between one week and one year. Because these fees do not penalize shareholders who redeem after longer holding periods, they appear to be aimed at thwarting fund shareholders who trade more actively than do other shareholders. Whether daily fund flows reflect the liquidity demands of short-term traders or those of long-term traders in each fund is unknown. If daily fund flows typically reflect the long-term shareholders' liquidity demands, then the redemption fees might fail to curb exchanges. This would result in no significant change in fund flows after the initiation of a redemption fee. Alternatively, if daily fund flows originate from traders who engage in market timing or other strategic trading, these redemption fees should raise their costs and significantly affect their trading activity. It is important to note that redemption fees might not be enforceable on all shareholders who actively trade fund shares. Some shareholders might exchange fund shares through a third party, such as a fund supermarket or retirement plan. In these cases, third parties typically batch exchange orders and transmit a single net exchange order to the fund company. This renders detection of individual traders impossible, unless the third party enforces each fund's policy. Whether the redemption fee event causes a decrease in daily fund flows depends on whether any fund traders who were previously engaged in active trading change their behavior because of the redemption fee.

The use of redemption fees recently has been targeted at thwarting flows from strategic traders. Greene and Hodges (2002) and Zitzewitz (2003) show that traders of international mutual fund shares exploit significant serial correlation by following a simple trading rule. The

trading rule is to exchange into an international mutual fund at the close of trading on days that the U.S. market is up (i.e., has a positive return) and exchange out of the fund when the U.S. market drops. This strategy profits from the correlation of international markets with the U.S. market. Greene and Hodges estimate a significant transfer of wealth from passive, buy-and-hold shareholders to these active market timers. To a lesser extent, this strategy could also work for domestic equity and bond funds as long as their holdings are illiquid enough to allow for stale prices when the end-of-day NAV is calculated. By raising trading costs to this strategy through a redemption fee, funds might be able to reduce this market timing activity. We examine this possibility with those funds in our sample that initiate redemption fees.

Consider the following regression model that explains daily fund flows[10], f_t. We use two variables to capture the trading signal in the U.S. market as an indicator of international stale prices. First, we use the S&P500 index return, $SP500_t$, each day. If timing is taking place, flows should be positively correlated with this variable. Since a trader would not exchange into a fund on successive positive return days, we also use a trading variable, $Signal_t$, that captures the signal to exchange into or out of a fund only on reversal days. This variable takes on the value of 1 (-1) when the S&P500 return is positive (negative) following a negative (positive) return day. We add the dummy variable, $PreFee_t$, which takes on a value of 1 to indicate the period prior to the redemption fee and interact this dummy variable with the intercept and the slopes. This results in the following regression model for daily fund flows:

[10] We verify that the funds do report the correct daily TNA, by matching all funds in the event study sample to the SEC's N-SAR forms, and then following the procedure of Greene and Hodges (2002) to adjust any flow calculations for funds that report pre-flow TNA. Overall, 11 out of 58 funds report pre-flow TNA. For these 11 funds, we therefore calculate flows as:

$$c_t = a_t - [(a_{t-1})(r_t)], \qquad (3)$$

where a_t is total net assets on day t, r_t is the fund's return on day t, and c_t is fund flow on day t. To get percentage flows we then divide (1) by the TNA on day $t-1$, which is a_{t-1}.

$$f_t = \beta_0 PreFee_t + \beta_1 SP500_t PreFee_t + \beta_2 Signal_t PreFee_t + \gamma_0 + \gamma_1 SP500_t + \gamma_2 Signal_t + e_t . \quad (4)$$

A significant positive coefficient for β_0 in Equation 4 would indicate that flows are higher in the pre-fee period. A significant positive coefficient for β_1 would suggest that flows are positively correlated with the S&P 500 index in the pre-fee period, while a significant positive coefficient for γ_1 indicates that flows are correlated with the S&P 500 index over the entire event window. A significant positive coefficient for β_2 indicates the presence of market-timing trades in the pre-fee period, while significance for γ_2 suggests the same for the entire event window. We do not expect all funds to show the same patterns in coefficient significance, as all funds show different vulnerability to market-timing traders. However, if a significant proportion of the fund's daily flows are motivated by strategic traders, this model should explain a significant proportion of the flows, and therefore have a high R^2. Moreover, if redemption fees are effective at limiting strategic trading, then the model parameter estimates in the period prior to the redemption fee (β_0, β_1, and β_2) should be positive and significant

While international fund managers might target the elimination of strategic fund flows, they might also be concerned about frequent liquidity flows. We can interpret the residuals from equation (4) as the noise- or liquidity-components of daily fund flows. We use the Glesjer (1969) test to determine whether the redemption fee changes the variance of the error term. This test involves a regression of the absolute value of the error term on an indicator of whether or not the fund is charging a redemption fee. If the redemption fee only eliminates strategic fund flows, then we would fail to reject a change in the level of noise trading in the daily fund flows, as measured by the variance of the residuals.

3.2 Event Study Empirical Results

Fifty-eight mutual funds in our sample initiate redemption fees during our sample period. Figures 1 through 4 provide a graphical representation of absolute daily flows for each investment objective before and after the redemption fee is initiated. We could identify no funds that eliminated redemption fees during this period. Of the funds initiating redemption fees, eighteen are domestic equity growth funds, eight are domestic bond funds, twenty-one are international equity funds, and the other eleven are domestic equity income funds. Our figures indicate that domestic income funds are the only category that does not experience a sharp decrease in the same level of flow volatility after the imposition of a redemption fee. Table 6 reports statistics on how daily fund flows compare between the 90-day period before the redemption fee versus the 90-day period after the redemption fee[11].

Although daily flows show little change after a redemption fee begins to be charged, their standard deviations are significantly reduced for the majority of funds in each investment objective, except for domestic income funds. The absolute values of flows are also consistently reduced following the imposition of a redemption fee for all objectives except domestic income funds. As columns 4 and 5 of Table 6 document, far more funds exhibit significant decreases than increases in absolute flows and flow volatility after the redemption fee is initiated. However, there is no clear pattern of change in signed flows. From this evidence it seems that redemption fees are effective in reducing the level of daily fund flows without causing a large distortion in the overall direction of flows. That is, the initiation of a redemption fee appears to neither attract new net assets to the fund nor encourage en masse redemptions from the fund.

[11] For robustness, we also repeat all further tests with a correction for the contemporaneous effect of daily flows to all funds. To do this we calculate excess daily flows by subtracting the average daily percentage flow for all funds not initiating redemption fees and with the same investment objective from the daily flow for fund *i*. All results for excess daily flows are similar to our results for unadjusted daily flows and are therefore not reported.

Table 7 reports the regression parameter estimates for Equation 4. Consistent with the greater vulnerability of international funds to stale pricing, more of the variation is explained for flow in international equity funds (25%), and less for domestic bond funds (5%). Overall, the Glesjer test rejects the null of no heteroskedasticity for about half of our sample of funds (between 45 and 62 percent), indicating that the redemption fee only sometimes significantly lowers the noise or liquidity components of daily fund flows. We find this test to be most significant with the predicted sign for international funds (62% positive and significant), which is consistent with these funds being most susceptible to trading by market-timers (Greene and Hodges, 2002). However, it is possible that our empirical model does not capture all of the variation in strategic fund flows and that strategic fund flows still occur after redemption fees are initiated. In summary, many of the international funds had daily fund flows that were consistent with trading strategies that exploited stale prices. The redemption fee eliminated much of these flows.

4. Conclusions

We examine how redemption policies affect daily fund flows in open-end mutual funds. We find mixed evidence for the argument that fund managers use redemption fees in order to "capture" investor dollars. We base this conclusion on the fact that management fees are significantly and positively related to the likelihood that a fund will charge a redemption fee, but that marketing fees and front-loads are negatively related. Our cross-sectional comparisons provide no evidence that funds charging redemption fees have worse performance. These findings are consistent with redemption fees being used in conjunction with the other marketing policies of a fund. If marketing fees do not benefit existing fund shareholders and redemption

fees protect long-term shareholders from potential costs associated with trading of fund shares, then funds that have the best interest of long-term shareholders at heart might be more likely to have lower marketing fees and higher redemption fees as our evidence suggests.

We also examine a sample of funds that enacted redemption fees during our sample period to determine whether the distribution of daily fund flows changes after the initiation of the redemption fee. For funds that experienced large turnover of fund shares that was consistent with investor exchanges, we find that redemption fees drastically reduce fund flows. We observed a decrease in the magnitude of daily fund flows of 78% for domestic equity funds, 58% for international funds, and 77% for domestic bond funds. Only domestic income funds showed an increase in the magnitude of daily flows. Moreover, redemption fees affected the nature of the exchanges. Prior to the fees, several international funds experienced large daily flows consistent with strategic trading that would be expected to dilute fund returns. After the redemption fees are initiated, strategic flows of this kind are much less evident.

In total, our results suggest that redemption fees are effective in reducing the level of daily fund flows, especially in international and growth funds. However, our results also suggest that many redemption fees are negatively related to a fund's marketing spending. Although this could arise from funds reaching an optimal size and then switching their strategy from attracting new investors to simply retaining existing investors, we find no relationship between fund size or growth and the tendency to charge a redemption fee.

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Table 1: Descriptive Statistics

This table reports averages of fund characteristics for funds *with* and *without* redemption fees. Variables are annual averages over our sample period from 2000 to 2003. Expense ratios are decomposed into management (non-12b-1) and marketing (12b-1) components. *Alpha* is the intercept from a market model of monthly returns for fund *i,* with the S&P 500 index as a benchmark for domestic growth and income funds. The MSCI EAFE index is the benchmark for international equity funds and the Federal Reserve's AA Aggregate Corporate Bond index is the benchmark for bond funds. All variables are percentages, except fund size, which is in millions of dollars. * and ** indicate significant differences between funds with and without redemption fees at the 5- and 1-percent levels, respectively.

	International Equity	Domestic Growth	Domestic Income	Domestic Bond
Annual Return (with redemption fee)	-4.79	21.71**	-5.76	26.78*
(w/o redemption fee)	-13.71	-7.87**	-6.65	28.69*
Alpha (with redemption fee)	0.5547**	0.8987**	0.3826	0.4114
(w/o redemption fee)	0.2782**	0.3838**	0.3554	0.4217
Management Fee (with redemption fee)	1.34	1.12	0.54**	0.51**
(w/o redemption fee)	1.44	1.12	0.89**	0.71**
Marketing Fee (with redemption fee)	0.26**	0.25**	0.27**	0.26**
(w/o redemption fee)	0.45**	0.40**	0.40**	0.36**
Size ($Millions) (with redemption fee)	185.49	327.85	679.11	370.28*
(w/o redemption fee)	264.95	353.26	452.07	212.44*
Turnover (with redemption fee)	91.65	127.76	31.64**	120.65
(w/o redemption fee)	99.58	111.84	73.06**	94.42
Cash Holdings (with redemption fee)	3.55	5.07	1.80**	4.58
(w/o redemption fee)	4.42	4.73	3.52**	3.89
Front Load (with redemption fee)	0.30**	0.36**	0.00**	0.12**
(w/o redemption fee)	1.36**	1.38**	1.32**	1.36**
Deferred Load (with redemption fee)	1.21	0.90*	0.85	0.79
(w/o redemption fee)	1.42	1.16*	1.17	1.05
Daily Flow (with redemption fee)	0.0366	0.0950*	0.0466	0.0831
(w/o redemption fee)	-0.0018	0.0255**	0.0160	0.0394
Absolute Daily Flow (with redemption fee)	0.5955*	0.4595	0.3072	0.3452
(w/o redemption fee)	0.8603*	0.4530	0.3097	0.3472
N (with redemption fee)	53	80	16	41
(w/o redemption fee)	357	1510	565	1947

Table 2: Redemption Fee Characteristics

This table presents statistics on the short-term redemption fees charged by the funds in our sample each year. Redemption fee data is from Lipper, Inc. Fund investment objectives are from the CRSP mutual fund database.

	2000	2001	2002	2003
Total International Equity Funds:	388	483	529	682
Funds charging a redemption fee:	33 (8.5%)	85 (17.6%)	114 (21.6%)	252 (37.0%)
Average fee (%):	1.59	1.87	1.90	1.88
Redemption fees set at 2%:	21 (63.6%)	74 (87.1%)	103 (90.4%)	225 (89.3%)
Total Domestic Growth Funds:	1,115	1,502	1,736	2,201
Funds charging a redemption fee:	57 (5.1%)	99 (6.6%)	159 (9.2%)	250 (11.4%)
Average fee (%):	1.56	1.78	1.84	1.86
Redemption fees set at 2%:	33 (57.9%)	73 (73.7%)	132 (83.0%)	216 (86.4%)
Total Domestic Income Funds:	427	525	604	743
Funds charging a redemption fee:	9 (2.1%)	16 (3.0%)	24 (4.0%)	45 (6.1%)
Average fee (%):	1.36	1.89	1.78	1.84
Redemption fees set at 2%:	5 (55.6%)	14 (87.5%)	19 (79.2%)	38 (84.4%)
Total Domestic Bond Funds:	1,132	1,672	2,020	2,255
Funds charging a redemption fee:	33 (2.9%)	41 (2.5%)	87 (4.3%)	116 (5.1%)
Average fee (%):	1.57	1.54	1.62	1.71
Redemption fees set at 2%:	20 (60.6%)	26 (63.4%)	58 (66.7%)	87 (75.0%)

Table 3: Probit Analysis of Redemption Fees

This table reports ordered probit parameter estimates. The dependent variable is a dummy variable equal to 1 if a fund has a redemption fee, and equal to zero otherwise. Chi-squared statistics are given in parentheses. The model is:

$$Redemption\ Fee\ Dummy_i = \beta_0 + \beta_1 Alpha_i + \beta_2 ManagementFees_i + \beta_3 MarketingFees_i + \beta_4 Size + \beta_5 Turnover + \beta_6 CashHoldings + \beta_7 FrontLoad_i + e_i.$$

Alpha is the intercept from a market model of monthly returns for fund *i,* with the S&P 500 index as a benchmark for domestic growth and income funds. The MSCI EAFE index is the benchmark for international equity funds and the Federal Reserve's AA Aggregate Corporate Bond index is the benchmark for bond funds. *MarketingFees* is the 12b-1 portion of fund *i*'s expense ratio, and *ManagementFees* is the non-12b-1 portion. *Turnover* is the fund's turnover ratio. *Size* is the natural log of a fund's average monthly total net assets. *Cash Holdings* is the percentage of a fund's holdings in cash and cash equivalents. The Pseudo R^2 calculation is from McFadden (1974). * and ** indicate significant coefficients at the 5- and 1-percent levels, respectively.

	International Equity	Domestic Growth	Domestic Income	Domestic Bond
Intercept	-0.0349	-1.1090**	-0.3175	-1.7138**
	(0.00)	(12.84)	(0.18)	(14.38)
Alpha	34.3469*	28.5191**	-12.2871	-54.2755
	(5.79)	(14.14)	(0.13)	(1.57)
Management Fees	19.3251	30.1096*	8.2510	5.1094
	(1.97)	(4.23)	(0.17)	(0.04)
Marketing Fees	-294.4690**	-204.7545**	-267.3008**	-195.6937**
	(34.74)	(34.46)	(7.17)	(13.35)
Size	-0.0133	-0.0259	-0.1086	0.1388*
	(0.03)	(0.33)	(1.28)	(5.11)
Turnover	0.0508	0.0051	-0.8436	0.0698
	(0.53)	(0.02)	(3.31)	(1.89)
Cash Holdings	-0.0360	-0.0075	-0.1004	-0.0205
	(1.37)	(0.72)	(2.35)	(1.22)
Front Load	-27.3871**	-20.2673**	-1705.4140	-33.3181**
	(21.12)	(26.44)	(0.00)	(15.77)
Pseudo R^2	29.3%	23.5%	26.3%	28.1%

Table 4: Probit Analysis of Redemption Fees and Deferred Loads

This table reports ordered probit parameter estimates. The dependent variable is a dummy variable equal to 1 if a fund has a redemption fee, and equal to zero otherwise. Chi-squared statistics are given in parentheses. The model is:

$$Redemption\ Fee\ Dummy_i = \beta_0 + \beta_1 Alpha_i + \beta_2 ManagementFees_i + \beta_3 MarketingFees_i + \beta_4 Size + \beta_5 Turnover + \beta_6 CashHoldings + \beta_7 FrontLoad_i + e_i.$$

Alpha is the intercept from a market model of monthly returns for fund *i,* with the S&P 500 index as a benchmark for domestic growth and income funds. The MSCI EAFE index is the benchmark for international equity funds and the Federal Reserve's AA Aggregate Corporate Bond index is the benchmark for bond funds. *MarketingFees* is the 12b-1 portion of fund *i*'s expense ratio, and *ManagementFees* is the non-12b-1 portion.. *Turnover* is the fund's turnover ratio. *Size* is the natural log of a fund's average monthly total net assets. *Cash Holdings* is the percentage of a fund's holdings in cash and cash equivalents. The Pseudo R^2 calculation is from McFadden (1974). * and ** indicate significant coefficients at the 5- and 1-percent levels, respectively.

	International Equity		Domestic Growth		Domestic Income		Domestic Bond	
	With Deferred Load	No Deferred Load	With Deferred Load	No Deferred Load	With Deferred Load	No Deferred Load	With Deferred Load	No Deferred Load
Intercept	5.5884*	-1.8702	3.2686**	-1.7792**	6.7112*	-1.5009	-1.1796	-2.4760**
	(7.48)	(3.73)	(18.46)	(11.28)	(5.23)	(1.41)	(1.22)	(7.70)
Alpha	-12.6101	0.4957	24.4421	-5.3202	-127.7069	19.4243	36.9717	-53.8305
	(0.05)	(0.00)	(2.63)	(0.19)	(1.86)	(0.16)	(0.05)	(0.45)
Management Fees	36.2401	16.0102	-101.5437**	32.7748	55.4512	96.0750	-197.8085**	34.1980
	(0.63)	(0.44)	(12.43)	(1.68)	(0.51)	(2.24)	(8.01)	(0.35)
Marketing Fees	-1304.213**	122.376	-585.5844**	-81.2922	-1072.739*	-215.6399	-648.2235**	-36.1622
	(16.99)	(1.18)	(96.02)	(0.61)	(6.35)	(0.59)	(33.63)	(0.06)
Size	-0.2358	-0.0507	-0.1153	-0.0243	-0.3810	-0.0619	0.3099*	-0.0019
	(0.72)	(0.12)	(1.39)	(0.14)	(1.65)	(0.16)	(5.10)	(0.00)
Turnover	0.0245	-0.0470	0.2175	0.0070	-1.1629	-0.3319	0.2677*	0.1652**
	(0.01)	(0.50)	(1.97)	(0.03)	(0.48)	(0.33)	(4.58)	(7.43)
Cash Holdings	0.0668	0.0414	0.0187	0.0013	-0.0936	-0.0352	-0.0259	-0.0130
	(0.42)	(0.59)	(1.81)	(0.02)	(0.16)	(0.25)	(0.32)	(0.18)
Front Load	-29.0492	-396.4729	-31.2684	-12.8375**	-1487.691	-369.0924	-1954.427	-15.6881
	(3.48)	(0.00)	(3.49)	(7.43)	(0.00)	(0.00)	(0.00)	(2.64)
Pseudo R^2	86.7%	26.5%	68.3%	7.6%	75.1%	21.5%	75.9%	13.1%
N	181	179	602	988	221	360	665	1276

Table 5, Panel A: Daily Fund Flows Conditional on Trading Restrictions

Daily fund flow statistics are reported for sub-samples portioned by investment restrictions and redemption fees, as of year-end 2003. Funds with 'purchase constraints' are those funds that are closed to new investors, closed to all investors, or are restricted to certain groups of investors. We conduct a t-test of the null hypothesis that the means between the two sub-samples are the same, and an F-test that the standard deviations of the two groups are the same. * represent significance at the 1% level and ** at the 5% level. Minimum Initial Investments, loads, and purchase constraints are from the CRSP mutual fund database while flows and redemption fees are from Lipper.

	International Equity			Domestic Growth			Domestic Income			Domestic Bond		
	Mean	St. Dev.	N	Mean	St. Dev.	N	Mean	St. Dev.	N	Mean	St. Dev.	N
With redemption fee	0.0961**	0.2195*	252	0.0726	0.1782**	250	0.0491	0.1701**	45	0.0395*	0.1442	116
Without redemption fee	0.0474**	0.2460*	430	0.0543	0.2069**	1951	0.0378	0.1041**	698	0.0077*	0.1625	2139
Minimum Initial Investment < $1,000	0.0841	0.2596**	223	0.0615	0.2200**	751	0.0370	0.1984**	258	0.0094	0.1539**	824
Minimum Initial Investment > $1,000	0.0563	0.2150**	459	0.0537	0.1583**	1450	0.0393	0.1475**	485	0.0093	0.1402**	1431
With front-end load	0.0845	0.2365	212	0.0671	0.1878	603	0.0601	0.2052**	194	0.0130	0.1455	758
Without front-end load	0.0568	0.2277	470	0.0523	0.1793	1598	0.0309	0.1504**	549	0.0074	0.1453	1497
With deferred load	0.0493	0.2197	334	0.0343**	0.1720**	807	0.0289	0.1802*	270	0.0085	0.1555**	787
Without deferred load	0.0808	0.2400	348	0.0691**	0.1860**	1394	0.0440	0.1586*	473	0.0098	0.1397**	1468
With purchase constraints	0.0534	0.2002**	204	0.0572	0.1702**	629	0.0360	0.1487**	228	0.0142	0.1644**	605
Without purchase constraints	0.0705	0.2425**	478	0.0560	0.1862**	1572	0.0396	0.1744**	515	0.0076	0.1377**	1650

Table 5, Panel B: Absolute Daily Fund Flows Conditional on Trading Restrictions

Daily fund flow statistics are reported for sub-samples partitioned by investment restrictions and redemption fees, as of year-end 2003. Funds with 'purchase constraints' are those funds that are closed to new investors, closed to all investors, or are restricted to certain groups of investors. We conduct a t-test of the null hypothesis that the means between the two sub-samples are the same, and an F-test that the standard deviations of the two groups are the same. * represent significance at the 1% level and ** at the 5% level. Minimum initial investments, loads, and purchase constraints are from the CRSP mutual fund database while flows and redemption fees are from Lipper.

	International Equity			Domestic Growth			Domestic Income			Domestic Bond		
	Mean	St. Dev.	N	Mean	St. Dev.	N	Mean	St. Dev.	N	Mean	St. Dev.	N
With redemption fee	0.6544	1.3280**	252	0.3783	0.7425**	250	0.3320	0.4997*	45	0.3192	0.3128**	116
Without redemption fee	0.7244	0.8751**	430	0.3611	0.3763**	1951	0.2782	0.3835*	698	0.2971	0.2036**	2139
Minimum Initial Investment < $1,000	0.6858	1.1175	223	0.5093**	1.1396**	751	0.3499*	0.7758**	258	0.3271**	0.4052**	824
Minimum Initial Investment > $1,000	0.7047	1.2116	459	0.2873**	0.2780**	1450	0.2449*	0.2222**	485	0.2816**	0.2332**	1431
With front-end load	0.9818**	1.4205**	212	0.3085**	0.3052**	603	0.2685	0.2908**	194	0.2971	0.2824**	758
Without front-end load	0.5708**	1.0317**	470	0.3836**	0.8116**	1598	0.2860	0.5476**	549	0.2988	0.3205**	1497
With deferred load	0.4722**	0.7446**	334	0.2614**	0.2510**	807	0.2418*	0.2599**	270	0.2647**	0.1641**	787
Without deferred load	0.9157**	1.4519**	348	0.4219**	0.8668**	1394	0.3040*	0.5852**	473	0.3162**	0.3613**	1468
With purchase constraints	0.4901**	0.4610**	204	0.3474	0.5047**	629	0.2922	0.5947**	228	0.3441**	0.4631**	605
Without purchase constraints	0.7875**	1.3689**	478	0.3693	0.7777**	1572	0.2767	0.4417**	515	0.2814**	0.2240**	1650

Table 6: Daily Fund Flows and Redemption Fee Initiations

The *prefee* and *postfee* columns of this table report average daily percentage flows, averaged across funds, for 3-month periods before and after the funds initiated redemption fees. The average (across funds) of the standard deviations of daily flows are given in parentheses. The same statistics for absolute flows are given in the next two rows. The third column gives the percentage of funds with decreasing flows after the initiation of a redemption fee, with the percentage of funds with decreasing standard deviations of daily flows given in parentheses. Statistical tests are conducted for the difference between pre-fee and post-fee means (*t*-test) and standard deviations (*F*-test) of daily flows, with the percentage of funds yielding significant results (at the 95% level) reported in columns 4 and 5.

	Prefee flow	*Postfee flow*	*Funds with decreasing flows (%)*	*Funds with significantly increasing flows (%)*	*Funds with significantly decreasing flows (%)*
International Equity Funds (N=21)					
Daily Flow	0.0362	-0.0077	52	0	0
	(0.2118)	(0.2030)	(71)	(10)	(57)
Absolute Daily Flow	1.6921*	0.7169*	90	0	62
	(1.8694**)	(0.5337**)	(71)	(24)	(67)
Domestic Growth Funds (N=18)					
Daily Flow	-1.5532	0.0818	39	28	6
	(4.2427)**	(0.2233)**	(72)	(17)	(50)
Absolute Daily Flow	4.3447*	0.9382*	78	0	50
	(5.5211)**	(0.8143)**	(72)	(17)	(61)
Domestic Income Funds (N=11)					
Daily Flow	0.2464	0.9679	55	9	0
	(0.3059)**	(2.7146)**	(73)	(27)	(55)
Absolute Daily Flow	1.1025	1.6745	64	18	36
	(1.5194)*	(3.2911)*	(73)	(27)	(73)
Domestic Bond Funds (N=8)					
Daily Flow	1.2343	0.0423	88	0	25
	(3.1492)**	(0.2321)**	(75)	(0)	(75)
Absolute Daily Flow	1.8358	0.4187	88	13	38
	(3.6910)**	(0.2742)**	(75)	(0)	(75)

Table 7: Components of Daily Fund Flows

Simple statistics for coefficient estimates are reported for a time-series model of daily fund flows. The percentage of funds with positive coefficient estimates is reported, as well as the percentage of funds with significant positive and significant negative coefficient estimates (at the 95% level). The estimated model is

$$f_t = \beta_0 PreFee_t + \beta_1 SP500_t PreFee_t + \beta_2 Signal_t PreFee_t + \gamma_0 + \gamma_1 SP500_t + \gamma_2 Signal_t + e_t ,$$

where f_t is the percentage fund flow on day *t*, $SP500_t$ is the return on the S&P 500 index, $Signal_t$ is a market-timing trading signal indicating a signed S&P 500 return reversal from day *t*-1 to day *t*, and $PreFee_t$ is an indicator variable that is equal to 1 on days prior to the redemption fee and zero on days after the redemption fee. Based on Glesjer (1969), we also report the estimate for ϕ_1 from the model

$$| e_t | = \phi_0 + \phi_1 PreFee_t + u_t .$$

Motivated by the heteroskedasticity indicated by the Glesjer test, weighted least squares are used to estimate the former model. The sample includes 58 funds initiating redemption fees over our sample period.

		β_0	β_1	β_2	γ_0	γ_1	γ_2	φ_0	φ_1
International Equity	funds with positive estimates (%)	33	71	76	38	86	67	100	90
(N=21)	positive and significant (%)	0	24	10	5	14	19	100	62
Avg. R^2 = 25%	negative and significant (%)	14	5	0	24	0	0	0	0
Domestic Growth	funds with positive estimates (%)	44	61	44	44	67	50	100	78
(N=18)	positive and significant (%)	6	17	6	6	44	0	100	56
Avg. R^2 = 19%	negative and significant (%)	0	0	0	17	11	0	0	6
Domestic Income	funds with positive estimates (%)	64	64	64	55	73	55	100	73
(N=11)	positive and significant (%)	0	0	9	9	0	9	91	45
Avg. R^2 = 11%	negative and significant (%)	0	0	0	0	0	0	0	18
Domestic Bond	funds with positive estimates (%)	88	63	50	50	37	50	100	88
(N=8)	positive and significant (%)	13	0	0	0	0	0	100	50
Avg. R^2 = 5%	negative and significant (%)	0	0	0	0	0	0	0	12

Figures 1-4

These figures illustrate average absolute daily fund flows, normalized by daily TNA, for the 90 days before and after a redemption fee was imposed. Day 0 is the day when the redemption fee first took effect.