

# The Frequency of Mutual Fund Portfolio Disclosure

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## ABSTRACT

The costs and benefits of frequent mutual fund portfolio disclosure have been a strong subject for debate. This study investigates both the determinants and potential effects of portfolio disclosure frequency by comparing funds providing voluntary quarterly disclosure to funds providing only mandatory semiannual disclosure.

We find that funds with higher turnover, higher expense ratios, and higher likelihood of committing fraud, tend to disclose their holdings less frequently. These characteristics are likely proxies for a fund's informational advantage and/or agency problems.

To differentiate between the information effect (i.e. the potential costs of frequent disclosure are higher for funds with informational advantage) and the agency effect (i.e. the potential benefits of frequent disclosure to investors are higher for funds with agency problems), we examine the relation between disclosure frequency and future fund performance conditioned upon fund investment skills. We use past performance as a proxy for fund investment skills. We expect the information effect to outweigh the agency effect for skilled funds and vice versa for unskilled funds. Our findings show a significant asymmetric relation between disclosure frequency and future fund performance for past winners and losers. Consistent with the information effect, past winners who disclose less frequently outperform past winners who disclose more frequently. Consistent with the agency effect, past losers who disclose less frequently underperform past losers who disclose more frequently. These findings are robust to various performance measures.

Finally, we analyze the relation between disclosure frequency and fund new money to examine whether investors reward frequent disclosure. Controlling for other fund characteristics, we find higher new money growth for funds providing more frequent disclosure among poorly performing funds.

JEL classification codes: G1; G2; G28

Keywords: Mutual fund; Portfolio disclosure; Fund performance; Fund cash flow; Agency cost; Information

## 1. Introduction

The potential effects of frequent mutual fund portfolio disclosure have been the focus of a longstanding debate among practitioners, regulators, and academics. Reflecting a belief that more frequent disclosure benefits investors through increased transparency, the U.S. Securities and Exchange Commission (SEC) increased the required portfolio disclosure frequency from every six months to every quarter, effective May 2004. However, some practitioners and researchers caution that more frequent portfolio disclosure reduces total investor returns, due to front-running, free-riding, and other speculative activities against mutual funds.<sup>1</sup> In fact, the SEC reduced the mandatory portfolio disclosure frequency from every quarter to every six months in 1985.

Despite the heated debate, little empirical evidence has been documented on this issue. Of the studies that have been conducted, Frank, Poterba, Shackelford and Shoven (2004) document that the cost of revealing private information can be substantial since the after-expense returns of “copycat” funds are statistically indistinguishable from those of the underlying actively-managed funds. In another study, Wermers (2001) discusses in details the potential costs of frequent portfolio disclosure, including dissemination of private information and the possibility of being “front-run”. George and Hwang (2005) analyze voluntary and mandatory disclosure of portfolio holdings by investment companies in a theoretical model. In this paper, we empirically examine the potential costs and benefits of frequent portfolio disclosure by comparing funds disclosing more frequently to those disclosing less frequently. The fact that some funds provide voluntary quarterly disclosure rather than the required semiannual reporting

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<sup>1</sup> See Wermers (2001). Also, for example, in a letter to Paul Royce, director of the SEC’s Division of Investment Management, ICI (Investment Company Institute) General Counsel Craig Tyle writes: “... it would be a grave error for the Commission to mandate more frequent portfolio holdings disclosure by all funds.” In a comment letter sent to the SEC regarding the proposal that funds publicly file their full holdings electronically on a quarterly basis, Fidelity writes that the rule would let hedge funds know “some of the cards” in funds’ hands.

during our sample period provides us with a useful setting to study the choice and the potential effects of disclosure frequency.<sup>2</sup> We examine three related questions: (1) What factors determine the disclosure frequency choices of mutual funds? (2) How would disclosure frequency potentially affect mutual fund performance and investor returns? (3) How does disclosure frequency affect net new money into mutual funds?

The choice and the potential effects of mutual fund portfolio disclosure are also related to prior research on voluntary disclosure, which was constrained by the difficulty in quantifying disclosure level and proprietary costs (Healy and Palepu, 2001). The mutual fund industry provides a unique setting to investigate voluntary disclosure behavior for several reasons. First, the potential proprietary cost of disclosure is especially important in the mutual fund setting because private information in the form of investment strategies is readily observable through the frequent disclosure of fund holdings. Second, the performance of mutual funds is transparent and thus relatively straightforward to measure, since it is derived from the returns of its underlying assets; while measuring the performance of other types of business is relatively difficult since they involve more complicated operations and accounting procedures. As a result, the potential effects of disclosure on firm (fund) performance are likely more detectable for mutual funds than for other companies. Third, the prior disclosure literature measures the value of disclosure to the disclosing firm by estimating cost of capital, which is not directly observable.<sup>3</sup> In the mutual fund setting, fund new money flows provide a direct measure of the value investors attach to the disclosure policy. Fourth, measuring disclosure level is

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<sup>2</sup>Some funds voluntarily provide quarterly portfolio disclosures to their shareholders, large institutional clients, or fund-tracking firms such as Morningstar Inc.

<sup>3</sup> For example, see Botosan (1997).

straightforward in this setting since funds disclose the same type of information either quarterly or semiannually.<sup>4</sup>

Frank et al. (2004) and Wermers (2001) discuss the potential effects of frequent portfolio disclosure. Potential costs are primarily dissemination of private information and the possibility of being “front-run”, which will lower the returns of a disclosing fund. Potential benefits for investors are mainly improved governance and the ability to make more informed investment decisions.

Those who argue against frequent disclosure cite numerous potential costs of such a policy.<sup>5</sup> First, frequent disclosure may cause a fund to be “front-run” by other investors who bid up (push down) the price of securities the fund intends to buy (sell) based on fund flow information. Second, frequent disclosure reveals a fund’s research outcome to its competitors more often and thus shortens the time horizon during which it can exploit private information. The above two effects can jeopardize the performance of a fund, and therefore, frequent disclosure is against the interest of fund investors. While another cost often discussed in the financial disclosure literature is the direct expenses of reporting and disseminating information, such direct cost is likely to be small in the mutual fund setting.

On the other hand, proponents of frequent disclosure argue that higher transparency benefits investors and, in turn, mutual funds. Frequent disclosure allows investors to monitor fund management more effectively and to improve their investment choices based on timely information. In addition, it enables investors and regulators to detect and deter any illegal or gaming activities by fund management. For example, trading violations and style drifting (deviations from initial fund objectives) are more detectable when holdings information is

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<sup>4</sup> Some funds also choose to disclose their holdings on a monthly basis.

<sup>5</sup> See Wermers (2001) for detailed discussions.

provided more frequently. According to proponents of frequent disclosure, such disclosure provides additional information about the underlying securities held by a fund. Investors can use this information to make better investment decisions. For mutual funds, since some investors may attach substantial value to frequent disclosure, such disclosure may attract more money and a particular investor clientele. Furthermore, more frequent disclosure may boost the returns of a disclosing fund through an increased demand for its underlying securities, which in turn could drive up the prices of these securities.

To provide empirical evidence regarding the effects of disclosure frequency, we analyze a broad sample of diversified U.S. equity funds from 1985 to 1999. We find that funds with higher turnover, higher expense ratios, and a higher likelihood of committing fraud disclose their holdings less frequently. These characteristics are likely proxies for a fund's informational advantage and/or agency problems.

Next, we examine the potential effects of disclosure frequency on fund performance. The agency effect (i.e. the potential costs of frequent disclosure are higher for funds with informational advantage) and the information effect (i.e. the potential benefits of frequent disclosure to investors are higher for funds with agency problems) generate opposite predictions about disclosure frequency and fund performance. Note that both effects may take place simultaneously. However, the relative importance of each effect can differ across funds with different investment skills. For skilled funds, the information effect is likely to outweigh the agency effect so that we expect funds with less frequent disclosure to perform better than funds with more frequent disclosure. On the other hand, for less skilled funds, the agency effect is likely to outweigh the information effect so that we expect funds with more frequent disclosure to perform better than funds with less frequent disclosure.

Our empirical findings are consistent with the above predictions. For the top 20 percent of the funds based on past performance, we find better future performance for funds with less frequent disclosure than for funds with more frequent disclosure. For the bottom 20 percent of the funds, we find just the opposite: funds who disclose less frequently underperform those who disclose more frequently in the future. For the mid-ranked funds based on past performance, we find no significant relation between future fund performance and disclosure frequency. These findings are robust to the various performance measures we use, including market-adjusted returns, the one-factor abnormal returns, the Fama-French (1993) three-factor abnormal returns, and the Carhart (1997) four-factor abnormal returns. Overall, our findings yield strong support for the agency effect as well as for the information effect.

In addition to examining fund performance, we analyze the relation between disclosure frequency and new money flows to study whether investors attach more value to more frequent portfolio disclosure. Similar to the relation between disclosure frequency and fund performance, we find that the relation between disclosure frequency and new money flows is nonlinear with respect to past performance. Specifically, we find that more frequent disclosure has a stronger positive effect on new money flows for funds with poorer past performance than for funds with stronger past performance. For the top 20 percent of funds based on past performance, the relation between disclosure frequency and new money flows is either insignificant or negative. For the middle 60 percent of funds based on past performance, those providing quarterly disclosure attract 1.08-1.78 percent more new money per semiannual period than those providing semiannual disclosure. For the bottom 20 percent of funds based on past performance, the difference in new money growth between funds providing quarterly and semiannual disclosure

increases to 1.60-2.67 percent per semiannual period. This finding indicates that investors attach significant value to transparency and more frequent disclosure when fund performance is poor.

This paper is organized as follows. We discuss the potential effects of more frequent portfolio disclosure in Section 2 and describe our data in Section 3. In Section 4, we present our empirical results. We conclude in Section 5.

## **2. The Potential Effects of More Frequent Portfolio Disclosure**

In this section, we discuss the potential effects of more frequent portfolio disclosure. We identify these potential effects based on Frank et al. (2004) and Wermers (2001). The potential costs for funds and investors include dissemination of private information and the possibility of being “front-run” by other investors. The main potential benefit for investors is a decrease in agency costs due to greater transparency. More frequent disclosure may also drive up the prices of the fund holdings through the increased demand for these securities.

One of the potential costs of frequent disclosure is due to the “information effect”. Disclosure reveals a fund’s private information if any to the public as it exposes the identity of securities held (purchased) by a fund. Managers of actively managed funds carry out costly research to identify superior investment opportunities. Disclosure limits the time horizon over which fund investors are able to reap the private rewards of their managers’ research outcome to the period between the completion of research and the next disclosure date. “Free-riding” on the research of a disclosing fund by other investors can potentially lower the fund returns by moving security prices before a fund can fully implement its investment strategies. According to the information effect, the more private information a fund has, the higher the potential cost of frequent disclosure.

Another potential cost of frequent disclosure results from the “front-running” effect. Mutual funds trade for liquidity reasons due to cash inflows and outflows. The availability of daily net flow estimates to the public combined with timely holdings disclosure may allow other investors to anticipate and front-run cash flow related trades. The front-running activities may result in a price drift and increase mutual fund trading costs, thereby lowering the returns to fund investors. Coval and Stafford (2005) document evidence that investors who trade against constrained mutual funds earn highly significant returns. They point out that the predictability of flow-driven transactions creates an incentive to front-run the anticipated trades by funds experiencing extreme capital flows. Thus, the higher the potential trading impact, the more likely a fund will be front-run and the higher the potential cost of frequent disclosure.

One potential benefit of frequent disclosure is due to the “agency effect”, i.e. the mitigation of the agency costs as a result of more transparency in fund trading activities. Frequent portfolio disclosure will allow regulators and investors to monitor fund activities more closely and thus deter funds from engaging in activities that are not in the best interest of investors. Therefore, the higher the agency cost, the more the potential benefit from frequent disclosure.

Another possible effect of disclosing is an increased demand for its securities if other investors believe that the disclosing fund has private information. We denote this effect the “price effect.” As other investors purchase the same securities, they may drive up the prices of the securities, thereby raising the returns on the fund that discloses. To exploit the price effect, funds that performed well in the past will disclose more frequently since their positions are more likely to be followed by other investors.

### 3. Data

The mutual fund sample is compiled by merging the CRSP Survivorship Bias Free Mutual Fund Database with the CDA/Spectrum holdings database. The CRSP Mutual Fund Database provides information about net asset returns, total net assets, different types of fees, investment objectives, and other characteristics.

The CDA database provides stockholdings of U.S. mutual funds. The main sources of the CDA data are semiannual reports (form N-SAR) filed by mutual funds with the SEC. Mutual funds have been required to file holdings reports with the SEC on a semiannual basis since 1985. In addition to the semiannual reports, CDA also obtains the voluntary reports generated by funds that provide quarterly portfolio disclosures to their shareholders, large institutional clients, or fund-tracking firms such as Morningstar Inc. To determine disclosure frequency, we use the report date provided by CDA. We check the validity of this indicator of disclosure frequency by comparing the number of stocks held by a fund from one quarter to the next. For each semiannual time period, we classify a fund as “Quarterly Disclosure” if two reports are provided and “Semiannual Disclosure” if only one report is provided. The list of mutual fund firms that are under recent investigation by the SEC is obtained from the online *Wall Street Journal* as of March 2004.<sup>6</sup>

Our final sample spans the period of January 1985 to December 1999. We eliminate all bond funds, international funds, and balanced funds, and focus our analyses on diversified equity funds. In addition, we do not count funds with multiple share classes more than once. Finally, we exclude all fund observations where the size of the fund in the previous time period does not exceed \$1 million. Kacperczyk, Sialm and Zheng (2005) discuss the characteristics of the merged mutual fund sample in greater detail. Table 1 presents the summary statistics for our

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<sup>6</sup> The website is: [online.wsj.com/documents: Mutual Funds Scandal Scorecard](http://online.wsj.com/documents/MutualFundsScandalScorecard).

sample of funds. Note that the empirical results are similar when we exclude index funds from our sample.

## **4. Empirical Results**

### **4.1. The Determinants of the Disclosure Frequency**

In this section, we examine the relation between fund characteristics and disclosure patterns to determine what fund characteristics are associated with more frequent disclosure. The determinants of the disclosure choice allow us to gauge the importance of the potential effects of frequent portfolio disclosure.

#### **Descriptive Evidence**

To examine the determinants of disclosure frequency, we begin by presenting basic descriptive statistics for our data partitioned according to disclosure frequency. Table 2 contrasts funds disclosing quarterly with funds disclosing semiannually. We report mean turnover ratios, expense ratios, likelihood of committing fraud, the total net assets (TNA), and fund age based on a fund's disclosure frequency. We also report t-test and Wilcoxon rank sum test results to indicate whether the differences in group means are statistically significant.

From Table 2, we see that funds with semiannual disclosure show significantly higher turnover ratios than funds with quarterly disclosure. Figure 1a plots the frequency of disclosure for fund deciles based on fund turnover ratios. This figure indicates a generally negative relation between turnover ratios and disclosure frequency. Turnover ratios indicate how often a fund trades. If the trades are based on information, turnover ratios can proxy for the amount of private information possessed by a fund. Wermers (2000) documents that funds with higher turnover earn higher risk-adjusted performance based on their portfolio holdings. This evidence indicates

that turnover ratios are correlated with the private information of a fund. As the cost of disseminating private information arises from the limited time period over which a fund can implement its research outcome, presumably the more often a fund trades on information, the more likely it will incur disclosure costs due to inadequate time to fully implement its strategies. Thus, the turnover ratio is probably an important consideration in the disclosure decision. Thus, the relation between turnover ratios and disclosure frequency is consistent with the information effect: the higher the turnover, the more private information a fund possesses, and the less likely that fund is to disclose frequently. Note that, even if a mutual fund manager trades excessively due to overconfidence about her information, this situation would still lead to less frequent disclosure due to the manager's perception that her information is useful.

Funds with semiannual disclosure have higher expense ratios than funds with quarterly disclosure. These differences are significant at less than one percent level. Figure 1b plots the frequency of disclosure for fund deciles based on fund expense ratios. This figure shows a negative relation between a fund's expense ratio and its disclosure frequency. Previous empirical results show that in general high expense ratios are detrimental to shareholders because they lower investors' net returns.<sup>7</sup> Prior research also indicates a significant negative relation between the effectiveness of boards and fund expense ratios.<sup>8</sup> If the expense ratio is a measure of agency cost, as suggested by the prior literature, then the negative relation between the expense ratio and the disclosure frequency is consistent with the agency effect. On the other hand, it is also possible that the expense ratio is higher when a fund spends more resources on research, which may in turn generate useful information. In this case, the negative relation

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<sup>7</sup> Elton et. Al. (1993), Blake, Elton and Gruber (1993), Malkiel (1995), Carhart (1997), Chalmers, Edelen, and Kadlec (2001), Barber, Odean and Zheng (2004) document this relation.

<sup>8</sup> Tufano and Sevick (1997) document that fund expenses are lower when boards are more effective for a sample of 50 largest open-end fund sponsors. Del Guercio, Dann, and Partch (2003) provide evidence that effective boards of closed-end funds are associated with lower expense ratios and value-enhancing restructurings.

between the expense ratio and the disclosure frequency could indicate the information effect. However, there is little empirical evidence that higher fund expenses are related to better information.

We next examine the relation between the likelihood of committing fraud (FRAUD) and disclosure frequency. We find that funds with semiannual disclosure have a higher likelihood of committing fraud than funds with quarterly disclosure. The differences are significant at the one percent level. This relation between FRAUD and the disclosure frequency is consistent with the agency effect that funds with more agency problems are likely to disclose less frequently.

We also find that funds with semiannual disclosure appear to be significantly larger than funds with quarterly disclosure. This result is consistent with the front-running hypothesis, which suggests that funds with large positions are likely to disclose less frequently in order to prevent others front-run their trades.

In sum, the descriptive evidence indicates that funds with higher turnover, expense ratios, and likelihood of committing fraud tend to disclose their holdings less frequently. These findings are consistent with the information effect and/or the agency effect.

### **Logistic Analysis**

The descriptive statistics are interesting, but are insufficient for drawing strong conclusions about the determinants of disclosure frequency and for evaluating the relative importance of the various factors. To further investigate the partial effects of the various factors on fund disclosure choice, we estimate a logit regression.

$$\text{Prob}(\text{Quarterly Disclosure}_{it}) = F(\beta_0 + \beta_1 \text{TURNOVER}_{i,t-1} + \beta_2 \text{EXPENSE}_{i,t-1} + \beta_3 \text{FRAUD}_{i,t-1} + \beta_4 \text{LOGTNA}_{i,t-1} + \beta_5 \text{LOGAGE}_{i,t-1} + \beta_6 \text{STDDEV}_{i,t-1} + \varepsilon_{it})$$

We first define the variables in the above logistic regression. Quarterly Disclosure is defined as an indicator variable, taking on the value of one if the fund provides quarterly disclosure during the semiannual time period and zero otherwise. TURNOVER denotes the turnover ratio of a fund. EXPENSE denotes the annual expense ratio of a fund. FRAUD is defined as an indicator variable, equal to one if the fund family is under current investigation by the SEC and equal to zero otherwise. LOGTNA is the natural logarithm of total net assets. LOGAGE is the natural logarithm of fund age. STDDEV is defined as the standard deviation of the previous 12 monthly market-adjusted fund returns.<sup>9</sup> We include time dummies to control for time-series trends.

In the above logit regression, we examine how fund turnover ratio, expense ratio, likelihood of committing fraud, and total assets affect the choice of disclosure frequency. We include the likelihood of committing fraud as a direct measure of the agency cost.

The results for the logistic analysis are reported in Table 3. Consistent with the descriptive evidence, the regression results in column A indicate that the turnover ratio, the expense ratio, and fund size are negatively related to disclosure frequency. The above coefficient estimates are all significant at the one percent level. The results on turnover and expense ratios are consistent with the information effect and/or the agency effect. The evidence on fund size is consistent with the front-running hypothesis.

The regression coefficient on FRAUD is negative and significant at the one percent level, indicating that frequent disclosure is associated with a lower likelihood of committing fraud. Thus, the higher the agency cost, the less likely a fund family is to disclose frequently.

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<sup>9</sup> We require at least six non-missing observations to calculate the standard deviation of the previous 12 monthly market-adjusted fund returns.

The possibility that funds may follow the same disclosure policy over time can create a potential bias in the pooled-logit estimates. In the second column of Table 3, we include the lagged disclosure variable in the logit regression to control for the stickiness of the disclosure policy. The coefficient on the lagged dependent variable is positive and significant, indicating a significant correlation between past and current disclosure policy. The coefficients on the turnover ratio, the expense ratio, and fund size become smaller in magnitude after including the lagged disclosure variable. Nevertheless, these coefficients retain the same sign and remain statistically significant. Thus, the effects we documented earlier are not entirely driven by the persistence in the disclosure policy.

Overall, we find evidence that funds with more private information/agency problems disclose less frequently than do other funds. To further differentiate between the information effect and agency effect, we examine the interaction between fund performance and disclosure frequency in the next section, since the relative importance of the two effects is likely to differ with investment skill.

#### **4.2. Disclosure Frequency and Fund Performance**

Disclosure frequency would only matter if it affects returns to fund investors. In this section, we study the potential effects of disclosure frequency on fund performance. The relation between disclosure frequency and fund performance conditioned upon investment skills allows us to better differentiate between the information and agency effects in fund disclosure.

The agency effect suggests that frequent disclosure is positively related to fund performance, while the information and front-running effects suggest the opposite. Note that these effects are not mutually exclusive, and can take place simultaneously. While the front-

running effect depends more on trading impact than on fund ability, the relative importance of the information effect versus the agency effect varies with investment skill. For skilled mutual funds, we expect the information effect to dominate the agency effect. Thus we predict a negative relation between fund performance and disclosure frequency for skilled funds. On the other hand, for less skilled funds, we expect the agency effect to dominate the information effect. Thus we predict a positive relation between fund performance and disclosure frequency for less skilled funds. In this analysis, we use past performance as a proxy for investment skill.<sup>10</sup>

If the disclosure frequency is determined exogenously, then we might expect a causal link between the disclosure frequency and fund performance. However, if we acknowledge that the disclosure frequency is largely endogenously determined, we could still expect to find a statistical association between the two. In either case, the performance difference between the funds of different investment skills would provide empirical support for the potential effects of frequent disclosure.

In Figure 2, we plot fund performance for partitions of funds based on past fund performance and disclosure frequency. Fund performance is measured as the market-adjusted return during each semiannual period. Within the top 10 percent of funds based on past performance, funds providing semiannual disclosure outperform funds providing quarterly disclosure. For the remaining funds, those providing semiannual disclosure underperform the ones providing quarterly disclosure, especially within the bottom 10 percent of funds based on past performance. The evidence suggests that both the information effect and the agency effect take place.

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<sup>10</sup> Past performance although noisy is probably still the best proxy for investment skills of fund managers if any. If fund managers do not have investment skills, then we would not find the expected relation between fund performance and disclosure frequency.

To examine whether the asymmetric pattern in Figure 2 is driven by risky investment strategies of the funds in the extreme performance deciles, we plot fund performance normalized by the return standard deviation for the deciles in Figure 3. This figure shows a similar pattern as that indicated in Figure 2. Thus, the asymmetric relation between fund performance and disclosure frequency is unlikely driven by return volatility.

To further examine the relation between disclosure frequency and fund performance, we estimate the following panel regression, controlling for other fund characteristics:

$$\begin{aligned} \text{Abnormal Return}_{i,t} = & \beta_0 + \beta_1 \text{PERF}_{i,t-1} + \beta_2 \text{LOWRANK}_{i,t-1} + \beta_3 \text{HIGHRANK}_{i,t-1} + \beta_4 \text{DISC}_{i,t-1} * \\ & \text{LOWRANK}_{i,t-1} + \beta_5 \text{DISC}_{i,t-1} * \text{MIDRANK}_{i,t-1} + \beta_6 \text{DISC}_{i,t-1} * \text{HIGHRANK}_{i,t-1} + \beta_7 \text{EXPENSE}_{i,t-1} + \\ & \beta_8 \text{TURNOVER}_{i,t-1} + \beta_9 \text{STDDEV}_{i,t-1} + \beta_{10} \text{LOGTNA}_{i,t-1} + \beta_{11} \text{LOGAGE}_{i,t-1} + \varepsilon_{i,t}. \end{aligned}$$

In this regression, DISC is defined as an indicator variable, equal to one if a fund provides quarterly disclosure during the semiannual period and zero otherwise. LOWRANK, MIDRANK and HIGHRANK are indicator variables, each equal to one if a fund's past performance belongs to the bottom quintile, the 2<sup>nd</sup> to the 4<sup>th</sup> quintiles, and the top quintile, respectively. Otherwise, they are each assigned a value of zero. The other variables have the same definitions as in the previous logit model. We include time dummies in our regressions and use panel-corrected standard errors, which adjust for heteroskedasticity and autocorrelation.

To measure risk-adjusted returns, we use models including market-adjusted returns, the one-factor abnormal returns, the Fama-French (1993) three-factor abnormal returns, and the Carhart (1997) four-factor abnormal returns.

$$R_{i,t} - R_{F,t} = \alpha_i + \beta_{i,M} (R_{M,t} - R_{F,t}) + e_{i,t}$$

$$R_{i,t} - R_{F,t} = \alpha_i + \beta_{i,M} (R_{M,t} - R_{F,t}) + \beta_{i,S} \text{SMB}_{i,t} + \beta_{i,V} \text{HML}_{i,t} + e_{i,t}$$

$$R_{i,t} - R_{F,t} = \alpha_i + \beta_{i,M} (R_{M,t} - R_{F,t}) + \beta_{i,S} \text{SMB}_t + \beta_{i,V} \text{HML}_t + \beta_{i,m} \text{MOM}_t + e_{i,t}$$

where the dependent variable is the monthly return on fund  $i$  in month  $t$  minus the risk-free rate, and the independent variables are given by the returns of the zero-investment factor portfolios.  $R_{Mt} - R_{Ft}$  is the excess return of the market portfolio over the risk-free rate.<sup>11</sup>  $SMB$  is the return difference between small and large capitalization stocks.  $HML$  is the return difference between high and low book-to-market stocks, and  $MOM$  is the return difference between stocks with high and low past returns.<sup>12</sup> The intercept of the model,  $\alpha_i$ , is the measure of abnormal performance.

Our primary focus is the relation between disclosure frequency and future fund performance. As we discussed earlier, this relation is likely to be nonlinear since the information effect is most relevant for funds with superior performance and the agency effect is most relevant for funds with inferior performance. Table 4 presents our regression estimates. In Column A, again we find a clear nonlinear relation between disclosure frequency and future fund performance. For the top 20 percent of funds, more frequent disclosure is associated with significantly worse future fund performance. Among past winners, funds with semiannual disclosure outperform funds with quarterly disclosure by 0.24 percent market-adjusted return per month, or 2.88 percent per year. This finding yields support for the information effect and is inconsistent with the price effect. For the mid-ranked funds, we do not find a significant relation between disclosure frequency and future fund performance. This result is consistent with the hypothesis that both the information effect and the agency effect take place for these funds and none of the two effects dominates. For the bottom 20 percent of funds, more frequent disclosure is associated with significantly better future fund performance. Among past losers, funds with

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<sup>11</sup> The market return is calculated as the value-weighted return on all NYSE, AMEX and NASDAQ stocks using the CRSP database. The monthly return of the one-month Treasury bill rate is obtained from Ibbotson Associates.

<sup>12</sup> The size, value, and momentum factor returns were taken from Kenneth French's Web site: [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data\\_Library](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library)

quarterly disclosure outperform funds with semiannual disclosure by 0.17 percent per month, or 2.04 percent per year. This finding yields support for the agency effect.

Column C of Table 4 provides results including more control variables in the regression. The estimates on the variables of our primary focus, disclosure frequency, remain very similar to those of the previous regression in both magnitude and statistical significance. The nonlinear relation documented earlier is robust to the inclusion of the other control variables. As expected, higher expense ratios decrease future performance. Consistent with Wermers (2000), turnover is positively related to future fund performance. Columns B and D include the percentile performance as an additional explanatory variable. The results show that the regression estimates are robust to the performance specification.

In Table 4, we also report the corresponding regression results using the CAPM one-factor alpha, the Fama-French three-factor alpha, and the Carhart four-factor alpha. As we include the additional risk and style factors, the nonlinear disclosure-performance pattern remains similar but the magnitude of the disclosure effect on the best and worst performing funds decreases. Among past winners, funds disclosing semiannually outperform funds disclosing quarterly by 1.32 percent per year using the three-factor model, and by 0.96 percent per year using the four-factor model. Among past losers, funds disclosing quarterly outperform funds disclosing semiannually by 1.32 percent per year using the three- or four-factor model. The test results suggest that part of the differences in the excess market returns can be explained by investment styles and the momentum factor. Nevertheless, the potential effects of disclosure remain economically and statistically significant among the best and the worst performing funds. For the middle quintile funds, the relation between disclosure frequency and future fund performance is again insignificant.

In summary, the asymmetric pattern in the relation between disclosure frequency and fund performance yields strong support for the agency effect and the information effect. Consistent with the agency effect, past losers who disclose less frequently underperform past losers who disclose more frequently. Consistent with the information effect, past winners who disclose less frequently outperform past winners who disclose more frequently. These findings are robust to various performance measures.

### 4.3. Disclosure Frequency and Fund Cash Flows

Timely disclosure of portfolio information may help investors make better investment decisions and monitor funds more closely. As a result, some investors may attach substantial value to frequent disclosure. Funds that provide voluntary frequent disclosure presumably believe that investors attach significant value to such disclosure. Since investors vote with their money, we examine whether they reward voluntary disclosure by comparing the new money flows into funds with quarterly disclosure to the flows into funds with semiannual disclosure.

We estimate the following panel regressions, which control for other determinants of flow.

$$\begin{aligned} \text{New Money Growth}_{i,t} = & \beta_0 + \beta_1 \text{PERF}_{i,t-1} + \beta_2 \text{LOWRANK}_{i,t-1} + \beta_3 \text{HIGHRANK}_{i,t-1} + \beta_4 \text{DISC}_{i,t-1} * \\ & \text{LOWRANK}_{i,t-1} + \beta_5 \text{DISC}_{i,t-1} * \text{MIDRANK}_{i,t-1} + \beta_6 \text{DISC}_{i,t-1} * \text{HIGHRANK}_{i,t-1} + \beta_7 \text{STDDEV}_{i,t-1} + \\ & \beta_8 \text{LOGTNA}_{i,t-1} + \beta_9 \text{LOGAGE}_{i,t-1} + \beta_{10} \text{TOTAL EXPENSE}_{i,t-1} + \varepsilon_{i,t}. \end{aligned}$$

Following Gruber (1996) and Zheng (1999), we calculate new money as a percentage of the beginning-of-period  $TNA$ .

$$\text{New Money Growth}_{i,t} = \frac{TNA_{it} - TNA_{i,t-1}(1 + R_{it})}{TNA_{i,t-1}}, \quad (9)$$

where  $R_{it}$  is the return of fund  $i$  in period  $t$ .

We include percentile performance measures in our regression to control for the well-documented nonlinear relation between performance and fund flows (Chevalier and Ellison 1997, Sirri and Tufano 1998, Del Guercio and Tkac 2001). We also include the short-term volatility of a fund, fund size, age, and total expenses as independent variables, as in Barber, Odean, and Zheng (2004). Total expense is defined as one-seventh of the max front-load plus the expense ratio, as in Sirri and Tufano (1998). Our primary variable of interest is the disclosure indicator variable (DISC). If investors value frequent disclosure, we should find a positive coefficient on DISC. We include time dummies in the regressions and use panel-corrected standard errors, which adjust for heteroskedasticity and autocorrelation.

The regression results are presented in Table 5. As the effect of disclosure frequency on fund performance is nonlinear in past fund performance, the effect of disclosure policy on new money flows may also be nonlinear if investors chase past fund performance. To address this possibility, we estimate the piecewise coefficients of disclosure in our analyses. Indeed, we find the relation between disclosure frequency and new money flows is nonlinear with respect to past performance. Specifically, we find that more frequent disclosure has a stronger positive effect on new money flows for funds with poor past performance than for funds with good past performance.

Columns A-D in Panel A of Table 5 report the results using market-adjusted return to measure past performance. For the top 20 percent of funds based on past performance, the relation between disclosure frequency and new money flows is insignificant in Column A and B, and become significantly negative after controlling for more variables. For the middle 60 percent of funds based on past performance, those providing quarterly disclosure attract 1.43-1.78 percent more new money per semiannual period than those providing semiannual disclosure.

For the bottom 20 percent of funds based on past performance, the difference in new money growth between funds providing quarterly and semiannual disclosure increases to 2.54-2.67 percent per semiannual period. The new money flow analysis indicates that investors attach significant value to transparency and more frequent disclosure when fund performance is poor.

In Table 5, we also report the corresponding regression results using alternative measures for past fund performance: the CAPM one-factor alpha, the Fama-French three-factor alpha, and the Carhart four-factor alpha. Generally, the nonlinear disclosure-new money pattern remains similar. The positive relation between DISC and new money growth among past losers holds consistently across different model specifications and different performance measures. However, there is no consistent relation between DISC and new money growth among past winners as shown in Table 5.

The coefficient estimates on other variables are largely consistent with those documented in the literature. We find a nonlinear relation between flows and past performance, with the winners receiving disproportionately high new money flows. Short-term fund volatility negatively affects new money growth, as do fund size, age and total expenses.

## **5. Conclusion**

This study empirically examines both the determinants and the potential effects of the frequency of mutual fund portfolio disclosure. We analyze a broad sample of diversified U.S. equity mutual funds from 1985 to 1999. During this time period, all funds are required to disclose their holdings semiannually. We find that funds with higher turnover, higher expense ratios, and a higher likelihood of committing fraud, tend to disclose their holdings less frequently.

Our empirical evidence demonstrates a significant asymmetric relation between disclosure frequency and fund performance. We find that, for skilled funds (the top 20% of past performers), funds with semiannual disclosure outperform funds with quarterly disclosure. For unskilled funds (the bottom 20% of past performers), the agency effect seems to dominate the information effect, as funds with semiannual disclosure significantly underperform funds with quarterly disclosure. We also find higher new money growth for funds providing more frequent disclosure among poor-performance funds, after controlling for other fund characteristics.

Our findings contribute to the voluntary disclosure literature as we document strong empirical evidence supporting the information effect and the agency effect. The empirical relation between disclosure frequency and fund performance also sheds light on the debate regarding the portfolio disclosure requirements for mutual funds.

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**Table 1**  
**Summary Statistics**

Panel A presents the summary statistics of the equity mutual funds from 1985 to 1999. Panel B reports the contemporaneous Spearman correlation between the main independent variables used in the paper. *EXPENSE* is the fund operating expense ratio. *TURNOVER* is the fund turnover ratios. *STDDEV* is defined as the standard deviation of the previous 12 monthly market-adjusted fund returns. *TNA* is total net assets of the fund, calculated at the end of each six-month time period. *AGE* is the age of a fund. *DISC* is defined as an indicator variable, equal to one if the fund provides quarterly disclosure during the semiannual time period and zero otherwise. *FRAUD* is defined as an indicator variable, equal to one if that fund family is under investigation by the SEC and zero otherwise.

**Panel A: Fund Characteristics**

	Mean	Median	Std. Dev.	25%	75%
<i>EXPENSE (in %)</i>	1.24	1.16	0.60	0.91	1.49
<i>TURNOVER (in %)</i>	87.09	62.09	120.30	31.00	110.00
<i>STDDEV</i>	0.02	0.02	0.01	0.01	0.03
<i>TNA (in Millions)</i>	676.05	116.07	2879.00	34.27	413.35
<i>AGE (in Years)</i>	14.69	8.00	15.25	4.00	20.00

**Panel B: Spearman Correlation**

Variables	<i>DISC</i>	<i>EXPENSE</i>	<i>TURNOVER</i>	<i>FRAUD</i>	<i>STDDEV</i>	<i>TNA</i>	<i>AGE</i>
<i>DISC</i>	1.000	-0.060***	-0.069***	-0.081***	0.002	0.016**	0.176***
<i>EXPENSE</i>		1.000	0.233***	-0.047***	0.341***	-0.462***	-0.259***
<i>TURNOVER</i>			1.000	0.082***	0.269***	-0.061***	-0.070***
<i>FRAUD</i>				1.000	-0.001	0.116***	-0.041***
<i>STDDEV</i>					1.000	-0.150***	-0.129***
<i>TNA</i>						1.000	0.447***
<i>AGE</i>							1.000

\*\*\* 1% significance; \*\* 5% significance; \* 10% significance

**Table 2**  
**Semiannual versus Quarterly Disclosure:**  
**Descriptive Statistics for Equity Funds**

The sample consists of the equity mutual funds from 1985 to 1999. *TURNOVER* is the fund turnover ratios. *EXPENSE* is the fund operating expense ratio. *TNA* is total net assets of the fund, calculated at the end of each six-month time period. *AGE* is the age of a fund. *DISC* is defined as an indicator variable, equal to one if the fund provides quarterly disclosure during the semiannual time period and zero otherwise. *FRAUD* is defined as an indicator variable, equal to one if that fund family is under investigation by the SEC and zero otherwise.

	<b>Semiannual Disclosure (Mean)</b>	<b>Quarterly Disclosure (Mean)</b>	<b>Difference (Semi – Qtr)</b>	<b>Two-sided p-value for two-sample t test (Wilcoxon rank sum test)</b>
<i>TURNOVER (in %)</i>	89.65	79.15	10.50	<.0001 (<.0001)
<i>EXPENSE (in %)</i>	1.25	1.21	0.04	<.0001 (<.0001)
<i>FRAUD (in %)</i>	12.42	7.41	5.01	<.0001 (<.0001)
<i>TNA (in Millions)</i>	756.93	603.88	153.05	<.0001 (<.032)
<i>AGE</i>	12.25	16.23	-3.97	<.0001 (<.0001)

\*\*\* 1% significance; \*\* 5% significance; \* 10% significance

**Table 3**  
**Determinants of the Decision to Provide Quarterly Disclosure**

$$\text{Prob}(\text{Quarterly Disclosure}_{it}) = F(\beta_0 + \beta_1 \text{TURNOVER}_{i,t-1} + \beta_2 \text{EXPENSE}_{i,t-1} + \beta_3 \text{FRAUD}_{i,t-1} + \beta_4 \text{LOGTNA}_{i,t-1} + \beta_5 \text{LOGAGE}_{i,t-1} + \beta_6 \text{STDDEV}_{i,t-1} + \varepsilon_{it})$$

The sample consists of the equity mutual funds from 1985 to 1999. There are a total of 16,966 observations. This logit regression model the probability of providing quarterly disclosure by an equity mutual fund instead of semiannual disclosure. All of the independent variables are lagged by a semiannual period. *Quarterly Disclosure* is defined as an indicator variable, taking on the value of one if the fund provides quarterly disclosure during the semiannual time period and zero otherwise. *TURNOVER* is the fund turnover ratios. *EXPENSE* is the fund operating expense ratio. *FRAUD* is defined as an indicator variable, equal to one if that fund family is under investigation by the SEC and zero otherwise. *LOGTNA* is the natural logarithm of total net assets. *LOGAGE* is the natural logarithm of age of a fund. *STDDEV* is defined as the standard deviation of the previous 12 monthly market-adjusted fund returns. Time dummies are included in the regression.

	Coefficient (p-value)	
	A	B
<i>Quarterly Disclosure<sub>it-1</sub></i>		1.89*** (0.000)
<i>TURNOVER</i>	-0.058*** (0.002)	-0.041** (0.038)
<i>EXPENSE</i>	-12.358*** (0.000)	-8.838** (0.016)
<i>FRAUD</i>	-0.615*** (0.000)	-0.411*** (0.000)
<i>LOGTNA</i>	-0.042*** (0.000)	-0.036*** (0.005)
<i>LOGAGE</i>	0.164*** (0.000)	0.096*** (0.000)
<i>STDDEV</i>	0.695 (0.653)	-0.026 (0.987)
<i>INTERCEPT</i>	1.278*** (0.000)	0.245 (0.251)
<i>TIME DUMMIES</i>	INCLUDED	INCLUDED
Pseudo R2	11.48%	27.46%

\*\*\* 1% significance; \*\* 5% significance; \* 10% significance

**Table 4**  
**Disclosure Frequency and Fund Performance**

This table reports the coefficients of the semiannual pooled regressions at fund level:

$$Abnormal\ Return_{i,t} = \beta_0 + \beta_1 PERF_{i,t-1} + \beta_2 LOWRANK_{i,t-1} + \beta_3 HIGHRANK_{i,t-1} + \beta_4 DISC_{i,t-1} * LOWRANK_{i,t-1} + \beta_5 DISC_{i,t-1} * MIDRANK_{i,t-1} + \beta_6 DISC_{i,t-1} * HIGHRANK_{i,t-1} + \beta_7 EXPENSE_{i,t-1} + \beta_8 TURNOVER_{i,t-1} + \beta_9 STDDEV_{i,t-1} + \beta_{10} LOGTNA_{i,t-1} + \beta_{11} LOGAGE_{i,t-1} + \varepsilon_{i,t}.$$

The sample includes equity mutual funds and spans the period of 1985-1999. *Abnormal Return* measures the average monthly abnormal returns during the semiannual period *t* using market-adjusted return, one-factor abnormal return, three-factor abnormal return, and four-factor abnormal return. All of the independent variables are lagged by a semiannual period. *DISC* is defined as an indicator variable, equal to one if the fund provides quarterly disclosure during the semiannual period and zero otherwise. *EXPENSE* is the fund operating expense ratio. *TURNOVER* is the fund turnover ratios. A fund's fractional rank (*PERF*) represents its percentile performance and ranges from 0 to 1. In this table, fractional ranks are defined on the basis of the fund's market-adjusted return in columns A - D, one-factor abnormal return in columns E - H, three-factor abnormal return in columns I - L, and four-factor abnormal return in columns M - P, respectively. *LOWRANK* is defined as an indicator variable, equal to one if fund performance belongs to the bottom quintile and zero otherwise. *MIDRANK* is defined as an indicator variable, equal to one if fund performance belongs to the 2<sup>nd</sup> to the 4th quintiles and zero otherwise. *HIGHRANK* is defined as an indicator variable, equal to one if fund performance belongs to the highest quintile and zero otherwise. *STDDEV* is defined as the standard deviation of the previous 12 monthly market-adjusted fund returns. *LOGTNA* is the natural logarithm of total net assets. *LOGAGE* is the natural logarithm of age. All regressions include time dummies and use panel-corrected standard errors, which adjust for heteroskedasticity and autocorrelation. All the coefficients are multiplied by 100.

**Table 4 Continued**  
**Panel A**

	Market-adjusted Return				One-factor Abnormal Return			
	A	B	C	D	E	F	G	H
<i>PERF</i>		0.76*** (0.0000)		0.73*** (0.0000)		0.73*** (0.0000)		0.70*** (0.0000)
<i>LOWRANK</i>	-0.35*** (0.0000)	-0.11** (0.015)	-0.36*** (0.0000)	-0.14*** (0.003)	-0.41*** (0.0000)	-0.20** (0.0000)	-0.36*** (0.0000)	-0.16*** (0.001)
<i>HIGHRANK</i>	0.41*** (0.0000)	0.16*** (0.0000)	0.39*** (0.0000)	0.14*** (0.002)	0.21*** (0.0000)	-0.02 (0.536)	0.26*** (0.0000)	0.02 (0.542)
<i>DISC*LOWRANK</i>	0.17*** (0.001)	0.16*** (0.001)	0.18*** (0.0000)	0.17*** (0.001)	0.20*** (0.0000)	0.20*** (0.0000)	0.19*** (0.0000)	0.19*** (0.0000)
<i>DISC*MIDRANK</i>	-0.01 (0.753)	-0.01 (0.722)	-0.00 (0.991)	-0.00 (0.946)	-0.01 (0.617)	-0.02 (0.480)	-0.01 (0.846)	-0.01 (0.697)
<i>DISC*HIGHRANK</i>	-0.24*** (0.0000)	-0.23*** (0.0000)	-0.24*** (0.0000)	-0.23*** (0.0000)	-0.12*** (0.004)	-0.12*** (0.005)	-0.14*** (0.002)	-0.13*** (0.002)
<i>TURNOVER</i>			0.09*** (0.0000)	0.08*** (0.0000)			0.06*** (0.0000)	0.06*** (0.0000)
<i>EXPENSE</i>			-12.53*** (0.0000)	-11.54*** (0.0000)			-10.98*** (0.0000)	-10.32*** (0.0000)
<i>STDDEV</i>			3.12** (0.043)	3.40** (0.022)			-5.40*** (0.0000)	-4.65*** (0.002)
<i>LOGTNA</i>			0.005 (0.451)	0.002 (0.730)			-0.01* (0.096)	-0.01** (0.048)
<i>LOGAGE</i>			-0.027** (0.019)	-0.023** (0.036)			-0.01 (0.315)	-0.01 (0.400)
<i>INTERCEPT</i>	-0.037 (0.596)	-0.414*** (0.0000)	0.034 (0.708)	-0.331*** (0.0000)	-0.047 (0.475)	-0.53*** (0.0000)	0.177** (0.040)	-0.30*** (0.001)
<i>TIME DUMMIES</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>
<i>No. of Observations</i>	17,886	17,886	17,233	17,233	17,672	17,672	17,054	17,054
Adjusted R-Squared	7.25%	8.80%	8.31%	9.77%	7.59%	9.19%	8.63%	10.10%

\*\*\* 1% significance; \*\* 5% significance; \* 10% significance

**Panel B**

	Three-factor Abnormal Return				Four-factor Abnormal Return			
	I	J	K	L	M	N	O	P
<i>PERF</i>		0.45*** (0.0000)		0.42*** (0.0000)		0.41*** (0.0000)		0.39*** (0.0000)
<i>LOWRANK</i>	-0.21*** (0.0000)	-0.07** (0.032)	-0.21*** (0.0000)	-0.08** (0.011)	-0.23*** (0.0000)	-0.10*** (0.001)	-0.21*** (0.0000)	-0.09*** (0.002)
<i>HIGHRANK</i>	0.31*** (0.0000)	0.16*** (0.0000)	0.28*** (0.0000)	0.15*** (0.000)	0.26*** (0.0000)	0.12*** (0.0000)	0.25*** (0.0000)	0.12*** (0.0000)
<i>DISC*LOWRANK</i>	0.11*** (0.007)	0.11*** (0.007)	0.12*** (0.003)	0.11*** (0.003)	0.11*** (0.002)	0.11*** (0.002)	0.12*** (0.001)	0.12*** (0.001)
<i>DISC*MIDRANK</i>	0.003 (0.814)	0.003 (0.825)	0.008 (0.604)	0.008 (0.611)	0.01 (0.313)	0.01 (0.349)	0.02 (0.128)	0.02 (0.144)
<i>DISC*HIGHRANK</i>	-0.11*** (0.003)	-0.11*** (0.003)	-0.10*** (0.004)	-0.10*** (0.004)	-0.08** (0.016)	-0.08** (0.017)	-0.08** (0.017)	-0.08** (0.018)
<i>TURNOVER</i>			0.04*** (0.003)	0.04*** (0.002)			0.02** (0.027)	0.02** (0.023)
<i>EXPENSE</i>			-9.25*** (0.0000)	-8.94*** (0.0000)			-9.73*** (0.0000)	-9.34*** (0.0000)
<i>STDDEV</i>			2.18** (0.031)	2.12** (0.030)			0.24 (0.804)	0.26 (0.777)
<i>LOGTNA</i>			0.004 (0.439)	0.003 (0.549)			-0.01 (0.227)	-0.01 (0.165)
<i>LOGAGE</i>			-0.04*** (0.0000)	-0.04*** (0.0000)			-0.05*** (0.0000)	-0.05 (0.0000)
<i>INTERCEPT</i>	-0.15*** (0.009)	-0.37*** (0.0000)	0.137** (0.057)	-0.23*** (0.002)	-0.16*** (0.003)	-0.27*** (0.0000)	0.07 (0.307)	-0.04 (0.568)
<i>TIME DUMMIES</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>
<i>No. of Observations</i>	17,672	17,672	17,054	17,054	17,672	17,672	17,054	17,054
<i>Adjusted R-Squared</i>	4.62%	5.90%	5.41%	6.59%	4.83%	6.11%	5.57%	6.80%

\*\*\* 1% significance; \*\* 5% significance; \* 10% significance

**Table 5**  
**The Impact of Disclosure Frequency on Fund New Money**

This table reports the coefficient estimates and associated p-values (in parentheses) from the pooled regression of fund flows from 1985 to 1999.

$$\begin{aligned} \text{New Money Growth}_{i,t} = & \beta_0 + \beta_1 \text{PERF}_{i,t-1} + \beta_2 \text{LOWRANK}_{i,t-1} + \beta_3 \text{HIGHRANK}_{i,t-1} + \beta_4 \text{DISC}_{i,t-1} * \\ & \text{LOWRANK}_{i,t-1} + \beta_5 \text{DISC}_{i,t-1} * \text{MIDRANK}_{i,t-1} + \beta_6 \text{DISC}_{i,t-1} * \text{HIGHRANK}_{i,t-1} + \beta_7 \text{STDDEV}_{i,t-1} + \\ & \beta_8 \text{LOGTNA}_{i,t-1} + \beta_9 \text{LOGAGE}_{i,t-1} + \beta_{10} \text{TOTAL EXPENSE}_{i,t-1} + \varepsilon_{i,t}. \end{aligned}$$

The dependent variable is the semiannual net fund flows scaled by the beginning-of-period TNA. All of the independent variables are lagged by one semiannual time period. A fund's fractional rank (*PERF*) represents its percentile performance and ranges from 0 to 1. In this table, fractional ranks are defined on the basis of the fund's market-adjusted return in columns A - D, one-factor abnormal return in columns E - H, three-factor abnormal return in columns I - L, and four-factor abnormal return in columns M - P, respectively. *LOWRANK* is defined as an indicator variable, equal to one if lagged performance belongs to the bottom quintile and zero otherwise. *MIDRANK* is defined as an indicator variable, equal to one if lagged performance belongs to the 2<sup>nd</sup> to the 4th quintiles and zero otherwise. *HIGHRANK* is defined as an indicator variable, equal to one if lagged performance belongs to the highest quintile and zero otherwise. *DISC* is defined as an indicator variable, equal to one if the fund provides quarterly disclosure during the semiannual period and zero otherwise. *LOGTNA* is the natural logarithm of total net assets. *STDDEV* is defined as the standard deviation of the previous 12 monthly fund returns. *LOGAGE* is the natural logarithm of age. *TOTAL EXPENSE* is defined as operating expenses plus one-seventh of a fund's load fee. The dependent variable is winsorized at the 98<sup>th</sup> percentile. All regressions include time dummies and use panel-corrected standard errors, which adjust for heteroskedasticity and autocorrelation. All the coefficients are multiplied by 100.

**Table 5 Continued**  
**Panel A**

	Dependent Variable = New Money Growth							
	Performance measured by Market-adjusted Return				Performance measured by One-factor Abnormal Return			
	A	B	C	D	E	F	G	H
<i>PERF</i>		14.80*** (0.0000)		15.96*** (0.0000)		13.57*** (0.0000)		15.67*** (0.0000)
<i>LOWRANK</i>	-5.92*** (0.0000)	-0.496 (0.575)	-6.32*** (0.0000)	-0.46 (0.601)	-5.79*** (0.0000)	-0.882 (0.317)	-6.37*** (0.0000)	-0.70 (0.428)
<i>HIGHRANK</i>	7.51*** (0.0000)	1.99** (0.022)	9.21*** (0.0000)	3.23*** (0.0000)	6.78*** (0.0000)	2.44*** (0.004)	8.59*** (0.0000)	3.21*** (0.0000)
<i>DISC*LOWRANK</i>	2.59*** (0.006)	2.67*** (0.005)	2.54*** (0.005)	2.66*** (0.004)	2.24** (0.019)	2.34** (0.014)	2.43*** (0.008)	2.53*** (0.006)
<i>DISC*MIDRANK</i>	1.74*** (0.002)	1.78*** (0.001)	1.43*** (0.007)	1.53*** (0.004)	1.47*** (0.007)	1.51*** (0.006)	1.15** (0.029)	1.21** (0.021)
<i>DISC*HIGHRANK</i>	-0.22 (0.808)	-0.35 (0.696)	-2.56*** (0.004)	-2.71*** (0.002)	0.71 (0.425)	-0.17 (0.841)	-1.83** (0.040)	-2.22*** (0.010)
<i>STDDEV</i>			-60.64** (0.036)	-54.36*** (0.0000)			-34.78 (0.229)	-32.66 (0.239)
<i>LOGTNA</i>			-0.96*** (0.0000)	-0.95*** (0.0000)			-0.92*** (0.0000)	-0.99*** (0.0000)
<i>LOGAGE</i>			-5.57*** (0.0000)	-5.53*** (0.0000)			-5.52*** (0.0000)	-5.57*** (0.0000)
<i>TOTAL EXPENSE</i>			-183.94*** (0.0000)	-166.43*** (0.0000)			-183.29*** (0.0000)	-178.50*** (0.0000)
<i>INTERCEPT</i>	0.538 (0.755)	-6.85*** (0.0000)	17.35*** (0.0000)	8.84*** (0.0000)	-7.76*** (0.0000)	-5.83*** (0.001)	25.04*** (0.0000)	9.40*** (0.0000)
<i>TIME DUMMIES</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>
<i>No. of Observations</i>	17,886	17,886	17,233	17,233	17,672	17,672	17,054	17,054
<i>Adjusted R-Squared</i>	4.67%	5.26%	7.58%	8.59%	4.01%	5.08%	7.58%	8.59%

\*\*\* 1% significance; \*\* 5% significance; \* 10% significance

**Panel B**

	Dependent Variable = New Money Growth							
	Performance measured by Three-factor Abnormal Return				Performance measured by Four-factor Abnormal Return			
	I	J	K	L	M	N	O	P
<i>PERF</i>		10.89*** (0.0000)		12.26*** (0.0000)		10.58*** (0.0000)		10.80*** (0.0000)
<i>LOWRANK</i>	-3.81*** (0.0000)	0.268 (0.757)	-4.72*** (0.0000)	-0.06 (0.943)	-4.61*** (0.0000)	-0.657 (0.453)	-5.27*** (0.0000)	-1.17 (0.183)
<i>HIGHRANK</i>	5.36*** (0.0000)	1.79** (0.040)	6.23*** (0.0000)	1.98** (0.024)	6.01*** (0.0000)	2.66*** (0.002)	7.67*** (0.0000)	4.04*** (0.0000)
<i>DISC*LOWRANK</i>	1.60* (0.088)	1.71* (0.068)	1.69* (0.059)	1.78** (0.048)	1.85** (0.050)	1.91** (0.045)	1.80** (0.048)	1.82** (0.046)
<i>DISC*MIDRANK</i>	1.55*** (0.004)	1.59*** (0.003)	1.08** (0.038)	1.14** (0.029)	1.70*** (0.002)	1.72*** (0.001)	1.47*** (0.005)	1.48*** (0.004)
<i>DISC*HIGHRANK</i>	1.23 (0.180)	0.46 (0.609)	-0.88 (0.333)	-1.18 (0.180)	0.715 (0.435)	-0.11 (0.898)	-1.93** (0.035)	-2.27*** (0.010)
<i>STDDEV</i>			-58.83** (0.050)	-72.42** (0.014)			-57.69** (0.051)	-69.39** (0.016)
<i>LOGTNA</i>			-1.05*** (0.0000)	-1.14*** (0.0000)			-0.99*** (0.0000)	-1.07** (0.0000)
<i>LOGAGE</i>			-5.56*** (0.0000)	-5.59*** (0.0000)			-5.52*** (0.0000)	-5.56*** (0.0000)
<i>TOTAL EXPENSE</i>			-212.69*** (0.0000)	-213.84*** (0.0000)			-200.96*** (0.0000)	-201.57*** (0.0000)
<i>INTERCEPT</i>	0.572 (0.742)	-4.59** (0.012)	26.90*** (0.0000)	21.77*** (0.0000)	0.553 (0.750)	-4.43** (0.015)	17.53*** (0.0000)	13.19*** (0.0000)
<i>TIME DUMMIES</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>	<i>INCLUDED</i>
<i>No. of Observations</i>	17,672	17,672	17,054	17,054	17,672	17,672	17,054	17,054
<i>Adjusted R-Squared</i>	3.40%	4.14%	6.24%	7.20%	3.62%	4.40%	6.77%	7.67%

\*\*\* 1% significance; \*\* 5% significance; \* 10% significance

## Figure 1. Frequency of Quarterly Disclosure and Fund Characteristics

The sample includes equity mutual funds and spans the period of 1985-1999. The mutual funds are ranked based on their fund characteristics for each semiannual period. *TURNOVER* is the fund turnover ratios. *EXPENSE* is the fund operating expense ratio. The sorting variables are lagged by one semiannual period.

Figure 1a. Frequency of Quarterly Disclosure based on Fund Turnover

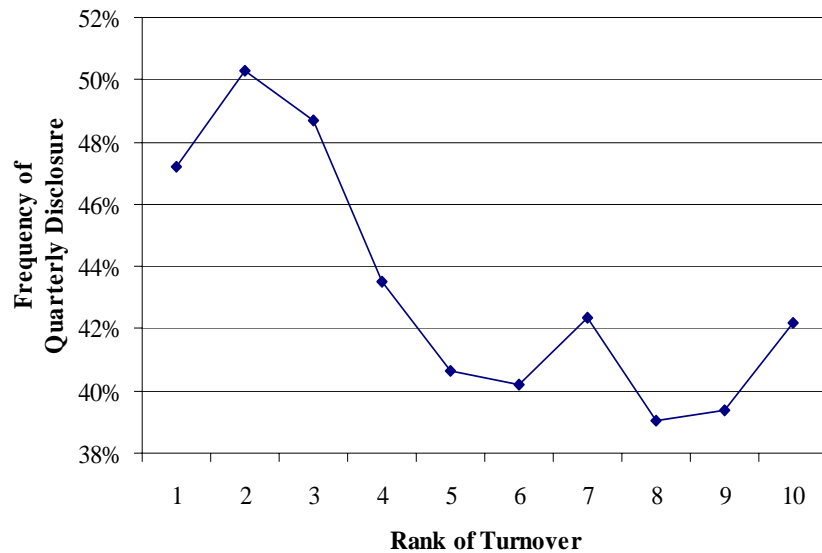
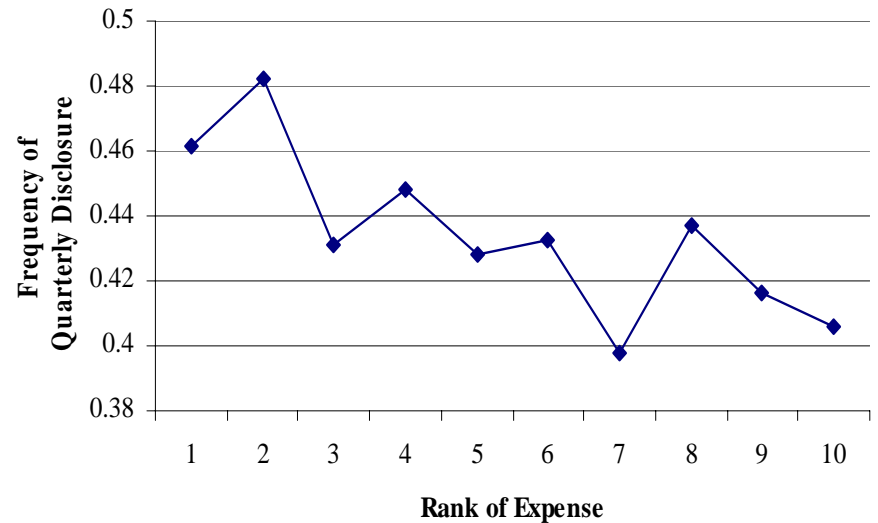
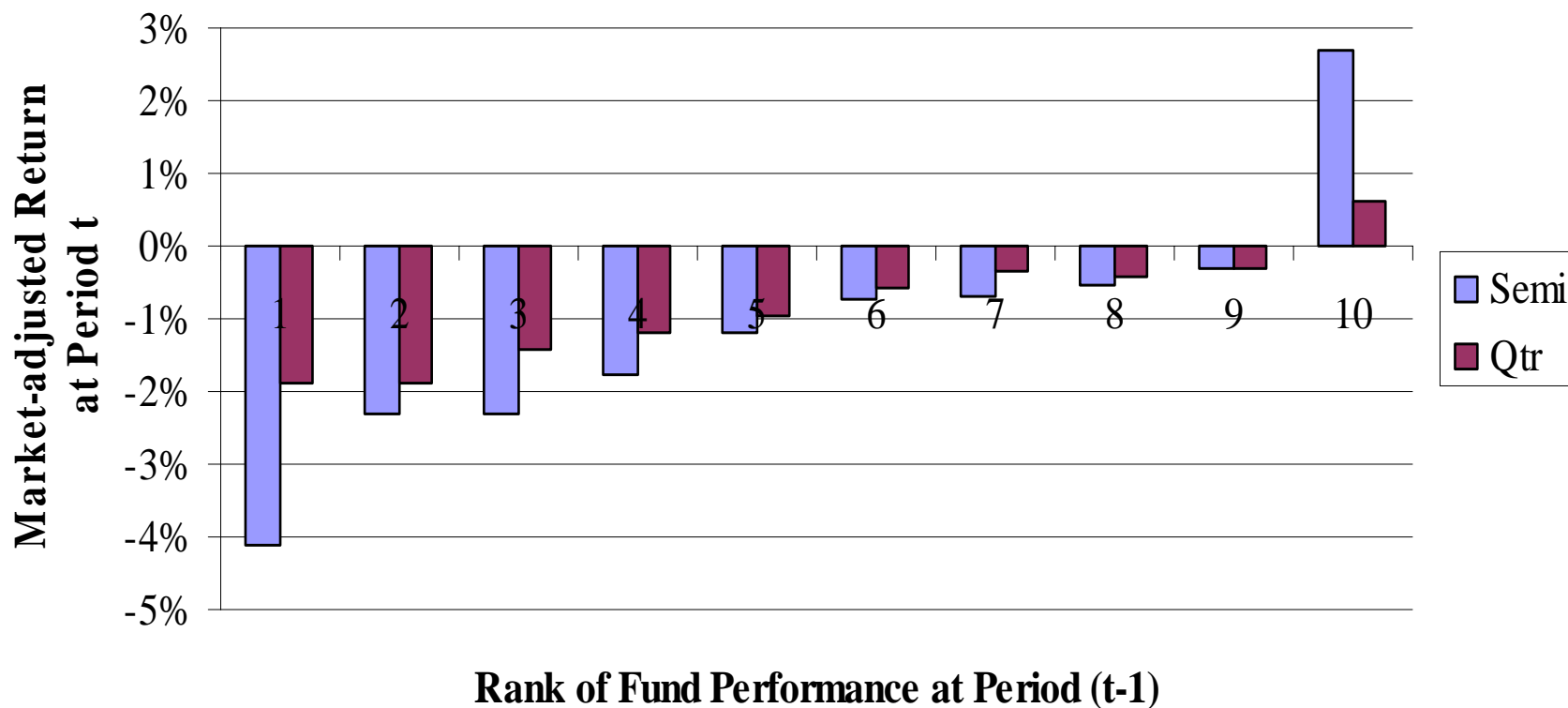


Figure 1b. Frequency of Quarterly Disclosure based on Operating Expense



**Figure 2. Future Market-adjusted Returns Conditioned upon Fund Performance and Disclosure**

The sample includes equity mutual funds and spans the period of 1985-1999. There are a total of 17,886 observations. We plot the average market-adjusted returns for partitions of funds based on disclosure frequency and past fund performance. For each semiannual time period, the mutual funds are ranked based on their market-adjusted returns during the previous period. Semi represents semiannual reporting funds, and Qtr represents quarterly reporting funds.



**Figure 3. Future Market-adjusted Returns Normalized by the Excess Return Standard Deviations Conditioned upon Fund Performance and Disclosure**

The sample includes equity mutual funds and spans the period of 1985-1999. There are a total of 17,233 observations. We plot the average market-adjusted returns normalized by the standard deviation of the excess returns in the previous 12 months for partitions of funds based on disclosure frequency and past fund performance. For each semiannual period, the mutual funds are ranked based on their market-adjusted returns during the previous period. Semi represents semiannual reporting funds, and Qtr represents quarterly reporting funds.

