Does It Matter Who Owns the Stock?

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October 17, 2014

ABSTRACT

Different mutual fund managers hold different groups of stocks. Our empirical analysis shows that high-turnover (low-turnover) funds hold stocks likely to be held by other high-turnover (low-turnover) funds. Moreover, high-turnover funds prefer more relatively volatile stocks than low-turnover funds do. The different preferences also affect stock prices. In particular, stocks mostly held by high-turnover funds have a more negative relation between volatility and stock performance than stocks held by low-turnover funds do. This partly explains the volatility puzzle suggested by Ang, Hodrick, Xing, and Zhang (2006). Further tests show that newly appointed mutual fund managers and those with poor past performance are likely to trade frequently, possibly because they have strong incentives to create a good record in the short term.

Keywords: Mutual Fund, Portfolio Turnover Level, Volatility Preference
JEL classification: G10, G11, G12

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The traditional finance literature states that rational investors should hold a mean–variance-efficient portfolio and risk-free assets; they cater to their risk appetites by deciding the proportion of the two assets (Markowitz (1952)). As a result, rational investors should hold the same stock portfolios. On the other hand, Bodurtha, Kim, and Lee (1995) and Barberis, Shleifer, and Wurgler (2005) suggest models in which different investors restrict themselves to trading within different "habitats," or stock groups. The concept originates with the observation that many investors trade only a subset of all available stocks. According to the Barberis et al. (2005), such a phenomenon could be due to transaction costs, trading restrictions, or lack of information.

Consistent with the habitat view, Dorn and Huberman (2010) show that individual investors tend to select only stocks whose return volatilities are commensurate with their risk aversion. As a result, the stock returns within each individual's portfolio have remarkably similar volatilities. The authors state that narrow framing could be the reason. Individual investors tend to evaluate one stock at a time or compare the relative merits of one stock versus another rather than optimize their whole portfolios. In this paper, we investigate whether the behavior of institutional investors, especially mutual fund managers, is consistent with the habitat hypothesis.

We also investigate whether different investor groups have different stock preferences. The empirical finance literature often attributes each cross-sectional asset pricing anomaly to a single preference of a representative investor for a certain stock characteristic. For example, it is commonly believed that the size effect of Banz (1981) is attributed to investors' preference for large-cap stocks, at least during a certain period. Similarly, the value effect of Fama and French (1993) is attributed to investors' general preference for glamour stocks. However, some researchers claim that there different investor groups can have different preferences. For example, Barberis and Xiong (2012) and Ingersoll and Jin (2013) suggest realization utility models in which different investors have different stock return volatility preferences. In their models, investors with a high discount rate prefer high-volatility stocks, while investors with a low discount rate prefer low-volatility stocks.

If there are different preferences, it will be intriguing to investigate how they affect cross-sectional stock prices across different habitats. Kumar and Lee (2006) find that systematic retail trading could lead return comovement for stocks with high retail concentration. Barberis et al. (2005) also suggest that stocks preferred by a given clientele exhibit comovement beyond that attributable to fundamental news. Both groups of authors imply that the systematic trading of a certain group of investors could affect the prices of stocks they hold, even if it is not related to usual risk factors. The different preferences of different investors might affect stock prices differently, depending on the stock's habitat. Our research question is whether patterns of stock returns can differ across different habitats if different investors have different preferences for a certain stock characteristic and trade stocks within different habitats. We test for this possibility using data from the U.S. mutual fund industry.

The U.S. mutual fund industry has grown rapidly for decades. In 2012, it managed about \$13 trillion and the number of shareholder accounts surpassed 260 million.[1] It offers a variety of investment strategies in accordance with customers' risk appetites and investment horizons. Some mutual funds offer aggressive investment strategies for customers who can afford high risk and seek high returns in the short term. Other funds offer conservative investment strategies for customers who prefer receiving stable cash flows for a long time. The incentive plans of fund managers also influence the investment decisions of mutual funds. For example, newly appointed managers are more likely to trade aggressively because they are eager to attain high performance in the short term compared to older managers. Such different customer and managerial needs might result in different preferences for a certain stock characteristic across mutual funds.

In empirical analysis, we estimate Carhart's (1997) portfolio turnover measure using quarterly snapshots of the equity holdings of actively managed mutual funds. At the end of each quarter,

[1] See the 2013 Investment Company Fact Book, at http://www.icifactbook.org/fb_data.html.

beginning on December 31, 1983, and ending March 31, 2012, we rank mutual funds into deciles according to their portfolio turnover levels. Various characteristics are computed within each group.

The results show that different mutual fund managers trade different groups of stocks. Specifically, when we focus on the stocks on which the highest- and lowest-turnover fund groups place more weight than the aggregate average, only 20.8% of the stocks held by the highest-turnover fund group are shared by the lowest-fund group. This is less than half of the comparable percentage for the second-highest-turnover fund group, 47.9%. Other test results also indicate that high-turnover (low-turnover) funds hold stocks likely to be held by other high-turnover (low-turnover) funds. A simulation method by which held stocks are randomly replaced by stocks of similar investment opportunity confirms the robustness of the results. We also show that newly bought stocks by high-turnover (low-turnover) funds tend to be stocks already held by other high-turnover (low-turnover) funds.

We also find that there are different preferences for stock return volatility across high- and low-turnover mutual funds. The simulation results show that high-turnover funds prefer relatively volatile stocks while low-turnover funds prefer relatively stable stocks. The probability that such a difference is due to chance is only 2.9% according to the simulation results. High-turnover funds also buy relatively volatile stocks compared to low-turnover funds.

Interestingly, the different preferences among different mutual funds managers also affect stock prices. Our cross-sectional regression results suggest that stocks held by high-turnover funds tend to exhibit relatively low returns when their returns are volatile, while stocks held by low-turnover funds do not follow such a relation. The results are robust even when we consider stock return volatility and stock-level trading volume.

Traditional financial theory says that there should be a positive risk–return relation. Because investors are mostly risk averse and think stock return volatility is one of the most important sources of risk, there should be a positive relation between stock return volatility and investment return.

However, empirical studies such as that of Ang et al. (2006) show that there is actually a negative relation between volatility and investment return. This paper explains, in part, the reason for such a negative relation.

The portfolio turnover level depends on characteristics of the mutual fund. Managers with past poor performance and newly appointed managers tend to trade more frequently. A fund style also affects the portfolio turnover level. In particular, mid-cap and small-cap fund managers trade more actively than growth fund managers do, whereas income fund managers trade less actively. We assume that these results are due to the incentives of mutual fund managers and customer demands. Further analysis shows that the portfolio turnover level barely affects fund performance.

This paper contributes to the finance literature in two ways. First, it shows that who owns the stock can affect the stock price. Multiple frameworks that determine different stock prices can exist, which contradicts the traditional theory that rational investors or arbitrageurs eventually determine all stock prices with a single asset pricing framework. Second, this paper shows that even institutional investors, usually considered rational investors, can defy the predictions of the traditional literature such as a positive relation between volatility and investment return. Empirical analysis indicates that high-turnover funds prefer relatively volatile stocks, which results in a negative relation between volatility and investment return within their habitat.

This paper is organized as follow. Section I describes the data and shows evidence of the different habitats and trading behaviors of different mutual fund managers. Their influence on asset pricing is presented in Section II. Section III conducts further analysis on the portfolio turnover level of mutual funds. Section IV concludes the paper.

I. Different Trading Behaviors of Different Mutual Fund Managers

A. Data

Our quarterly snapshot data of the equity holdings of actively managed mutual funds are from the *Thompson Reuters Mutual Fund Common Stock Holdings Database* (S12); mutual fund characteristics, including net returns, expense ratio, and total net assets, are from the *Center for Research in Security Prices* (CRSP) *Mutual Fund Database;* and data to connect the two databases are from *Mutual Fund Links*.

Our empirical analysis focuses on U.S. domestic equity mutual funds and the stocks they held from December 1983 to March 2012. We exclude funds whose S12 investment objective code denote *international*, *municipal bonds*, *bond & preferred* or *balanced*; those that have CRSP objective codes not in the *domestic equity* category; and those whose code denotes *sector*, *large cap*, *hedged*, or *short*. If a fund has no CRSP objective code, then we use the most recent one. We also exclude funds whose CRSP or S12 names include *Index, S&P, DOW, Wilshire, Russell,* or *NASDAQ*; those whose proportion of common stock is less than 80%, and those whose previous quarter's assets are less than $5 million. The number of sample mutual funds was about 140 in 1984, increasing to about 1,200 in 2011. In particular, the number skyrockets during the late 1990s.

The *CRSP Security Files* and *Compustat* are used to obtain the market values, returns, and book-to-market ratios of stocks. The three Fama–French factors (excess market returns, SMB, and HML) and the momentum factor are obtained from *Wharton Research Data Services' Fama–French Portfolios and Factors*.

B. Construction of Measures

Our purpose is to investigate whether different mutual fund managers restrict themselves to trade within different groups of stocks. When Dorn and Huberman (2010) classify individual investors into different groups, they used the survey data in which individual investors report their risk attitudes.

Similarly, to classify fund managers into different groups, we need such a criterion that can represent the different characteristics of mutual fund managers or their clients. We consider the portfolio turnover level an obvious candidate. Barberis and Xiong (2012) and Ingersoll and Jin (2013) suggest that trading frequency is affected by the investor's discount rate. Since investors' discount rate is closely related to their risk aversion, the portfolio turnover level can represent risk aversion of mutual fund managers or their clients. In addition, fund managers are likely to trade frequently if they are confident of their stock-picking abilities. Similarly, if they are newly appointed or their customers are impatient investors, they have an incentive to trade frequently to obtain high profits in the short term. Therefore, we expect classification by the portfolio turnover level to reveal differences in characteristics across different mutual fund groups.

We calculate Carhart's (1997) portfolio turnover measure for each mutual fund at the end of each quarter. The measure of fund *i* at the end of the quarter *t* is

$$PTurn_{i,t} = \frac{Min\left(Tbuy_{i,t}, Tsell_{i,t}\right)}{\frac{1}{2}(Asset_{i,t-1} + Asset_{i,t})}$$

where *Tbuy* and *Tsell* are the total dollar amounts of stocks bought and sold during the quarter, respectively, and *Asset* is the sum of the dollar amount of stocks held at the end of the quarter. Because it uses the minimum of buys and sells, the measure has the advantage of being unrelated to fund inflows or redemptions. Because *PTurn* is highly skewed, we assign the cross-sectional percentile ranking of *PTurn* to each mutual fund, which we call *RTurn*.

Then we form a universe of stocks held by a mutual fund complex and construct the stock-level measure that indicates the portfolio turnover level of mutual funds that own the stock. Specifically, we calculate the share-weighted average *RTurn* of the mutual fund shareholders for each stock at the end of each quarter, which we call *STurn*. As a result, if *STurn* is high, the mutual fund shareholders of the stock have a high portfolio turnover level overall.

C. Basic Statistics and Correlations

Table I shows the basic statistics and correlations of variables for the U.S. domestic mutual fund sample. The variables *Log(Age)* and *Log(Tenure)* are the natural logarithms of the differences in months between the current date and the date the fund was first offered and between the current date and the date the current manager took control, respectively; *Expense* is the expense ratio; *Log(TNA)* is the natural logarithm of total net assets in millions; *Ret* is the net return of the fund during the next quarter; *PreAlpha* is the Fama and French (1993) and Carhart (1997) factor-adjusted return during the previous 24 months; and *PostAlpha* is the difference between *Ret* and the predicted return estimated by the 24-month regression coefficients. All measures are estimated at the end of each quarter. Panel A shows basic statistics, including the mean, median, standard deviation, skewness, kurtosis, and autocorrelation. Autocorrelation is estimated with intervals of one quarter. The fact that the autocorrelations of *PTurn* and *RTurn* are 0.67 and 0.73, respectively, shows that the portfolio turnover level persists.

Panel B shows the correlations of the variables. The variable *RTurn* is negatively correlated to *Log(Tenure)*. This implies that newly replaced managers tend to trade more actively than managers with long tenure. The variable *RTurn* is also negatively correlated to *PreAlpha*. This implies that a fund manager with poor past performance trades more frequently. We further investigate these issues later. On the other hand, the portfolio turnover level is positively related to the expense ratio. This seems natural because frequent trades are associated with a heavy workload.

D. Restricted Stock Holdings of Mutual Fund Portfolios

We rank mutual funds into deciles by their portfolio turnover levels. To find evidence of different habitats, first, we simply investigate how many stocks are shared by both the highest- and lowest-turnover groups. Because some shares are very minor relative to the total investment amount of each mutual fund group, we calculate each group’s aggregate percentage of market shares relative to the CRSP stock universe and only count stocks held by each group in larger quantities. Then we calculate the proportion of stocks held by both the highest- and lowest-turnover groups relative to the number of stocks held by the highest-turnover group. Figure 1 shows the results as eight-quarter moving averages. The average percentage of stocks shared by the highest- and lowest-turnover groups is only 20.8%. When we calculate the percentage of stocks shared by the highest- and second-highest-turnover groups relative to the number of stocks held by the highest-turnover group, the proportion increases to 47.9%. This is twice as high as the figure for the lowest-turnover group. The difference is statistically very significant, with a *t*-value of 25.6.

Next we calculate the portfolio-weighted $STurn_i^*$ for each fund *i*, where $STurn_i^*$ is the share-weighted average *RTurn* of the stock's mutual fund shareholders except for fund *i*. Table II shows the cross-sectional mean and standard deviation of $STurn_i^*$ across the 10 mutual fund portfolio groups. The values are time series averaged over the sample period. The highest-turnover group has a mean value of 0.509 and the lowest-turnover group has a mean value of 0.423. The difference between the two values is 0.086 and it significantly different from zero. The mean values are monotonically increasing in the portfolio turnover level and the Spearman rank correlation is 0.926. This implies that stocks owned by high-turnover (low-turnover) funds are likely to be owned by other high-turnover (low-turnover) funds.

Dorn and Huberman (2010) show that the stocks owned by each individual investor have remarkably similar volatilities. To demonstrate the robustness of their results, the authors compare actual portfolios to simulated ones consisting of randomly selected stocks. Motivated by their work, we conduct similar experiments to show the robustness of the above result.

First, we create a universe of stocks held by the entire mutual fund sample at the end of each quarter. For each portfolio, while keeping the same portfolio weights, we replace stocks with ones selected randomly from the universe to form simulated portfolios. At the end of each quarter, we compare the simulated cross-sectional mean and standard deviation to the actual ones. In Table II, the *no restriction* row shows the percentages of the case in which the actual values are higher than the simulated ones. We run the simulation 100 times with the sample period covering 114 quarters; therefore, there are 11,400 comparisons for each value. The results reveal that the lowest-turnover group has only a 2.4% probability of having such a low $STurn^*$ value by chance. Similarly, the highest-turnover group has a 5.8% probability of having such a high $STurn^*$ value by chance. The difference is so high that only 0.2% of the simulated cases beat it. The *no restriction* values are monotonically increasing in the portfolio turnover level.

Because the majority of stocks in the universe are relatively small and volatile, those used to randomly replace stocks tend to be small and volatile. Considering the fact that mutual funds tend to place large weights on big stocks, a simulated portfolio under no restrictions differs remarkably from the actual portfolio. Therefore, we next impose a restriction. We form 10 stock groups ranked by the investment amount of the entire mutual fund sample at the end of each quarter. Then we replace each stock randomly under the restriction that each replacing stock is in the same group as the original. The row *investment amount* in Table II shows the results. Similarly, we next replace stocks with stocks with similar market values and volatilities and in the same industries;[2] the results are revealed in the rows *Market value, Volatility,* and *Industry,* respectively. The actual investment opportunities for mutual funds are best reflected in *investment amount*, so we consider it a main result.

The *investment amount* results indicate that the lowest-turnover group has only a 7.0% probability of having such low $STurn^*$ values by chance and the highest-turnover group has a 2.1% probability of having such high $STurn^*$ values by chance. The difference is so great that only 0.4% of simulated cases beat it. The values are monotonically increasing in the portfolio turnover level. Other simulation results are qualitatively the same. We can conclude that stocks owned by high-turnover (low-turnover) funds are likely to be owned by other high-turnover (low-turnover) funds.

Comparisons between actual and simulated standard deviation values are also consistent with the finding. Actual standard deviation values are so low that only in a small percentage of cases are the simulated values lower than the actual values. Specifically, the row *investment amount* in Table II

[2] We use the 10 industry portfolios on Kenneth R. French's website; see http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_10_ind_port.html.

shows that only in 6.4% of simulated cases are the values lower than the actual values, on average. This implies that mutual fund managers restrict themselves to trading within small ranges of stocks, which is consistent with the habitat hypothesis.

Finally, we investigate the trades of mutual fund managers rather than their portfolio holdings. Chen, Jegadeesh, and Wermers (2000) claim that trades represent fund managers' opinions about stock values more strongly than the passive decisions of holding existing positions. To be specific, we estimate the value-weighted $STurn^*$ of stocks that each mutual fund buys in quarter t and then average the values cross-sectionally within each group. Table III shows the results. The variable $STurn^*$ estimated at both times $t-1$ and t are presented in the table. Panel A represents the results for all stocks, including the additional purchase of existing stocks. The results show that the $STurn^*$ values are almost monotonically increasing in the portfolio turnover level and the differences between the highest- and lowest-turnover funds are very statistically significant for both values at times $t-1$ and t. Panel B reports the results for only newly bought stocks. We may think that fund managers' opinions are more deeply reflected in newly bought stocks than in all of their stocks. The results also indicate that $STurn^*$ is almost monotonically increasing in the portfolio turnover level. The differences between the highest- and lowest-turnover funds are even larger and statistically more significant than those for all their stocks. This means that high-turnover (low-turnover) funds are likely to buy stocks held by other high-turnover (low-turnover) funds.

In conclusion, all the empirical findings in this subsection indicate that stocks owned or bought by high-turnover (low-turnover) funds are likely to be owned by other high-turnover (low-turnover) funds. They support the habitat model of Bodurtha et al. (1995) and Barberis et al. (2005), in which different investors restrict themselves to trading within different groups of stocks.

E. Different Preferences of Mutual Fund Managers

We assume that the different needs of customers and managers can result in different stock preferences. To be specific, high-turnover funds are likely to chase high profits in the short term because they are confident about their ability or eager to verify it.[3] Therefore, they are likely to trade volatile stocks, since these provide more opportunities to obtain high returns in the short run.

Following this assumption, we calculate the previous six-month daily volatility for each stock. Then we use the cross-sectional percentile ranking of volatility within the universe of stocks held by the mutual fund sample rather than raw volatility, since the latter is highly skewed. Then we calculate the portfolio-weighted stock volatility of each mutual fund portfolio and estimate the cross-sectional mean of each portfolio turnover group. Table IV reports the results. The actual volatilities increase monotonically in the portfolio turnover level. The value of the lowest-turnover group is 0.275, which is unlikely to be due to chance when compared to the simulated value under an investment amount restriction. Only 2.7% of simulated cases have lower values than the actual cases. This means that low-turnover funds prefer stable stocks. On the other hand, the value of the highest-turnover group is 0.390 and only 12.5% of simulated cases have higher values than the actual cases. This indicates that high-turnover funds prefer relatively volatile stocks more than low-turnover funds do. The difference is 0.115 and is statistically very significant. Only 2.9% of simulated cases have higher values. The standard deviation results also confirm this finding. Each group holds stocks within a tight range of volatilities. The simulation results for the standard deviation indicate that it is almost impossible to say that mutual fund managers randomly select stocks. In conclusion, mutual fund managers have different stock return volatility preferences. In particular, high-turnover funds prefer stocks with relatively high volatility compared to low-turnover funds.

One might think that some mutual funds happen to hold volatile stocks and because the stocks need to be actively managed, the funds have a high turnover level. That is, stock characteristics instead of mutual fund characteristics might lead the results. However, this is not likely, because we estimate stock return volatility at the end of each quarter, not at the beginning. When a mutual fund happens to hold volatile stocks at the beginning of each quarter, it might sell them and buy them back or buy other stocks during the quarter. If the fund buys back the same stocks, it does not increase Carhart's (1997) portfolio turnover level because the measure counts only the difference between

[3] Similarly, Barberis and Xiong (2012) and Ingersoll and Jin (2013) show that investors with a high discount rate chase high returns in the short run and trade actively.

portfolios at the beginning and at the end of the quarter. If the fund buys other randomly selected stocks, the stocks bought by the fund at the end of the quarter are not necessarily more volatile than those in a simulated portfolio. To be clearer, we also conduct an additional test in which we have a time lag between measuring the portfolio turnover level of a mutual fund and stock return volatility. We use a one-year time lag, that is, we form 10 mutual fund portfolio turnover groups one year before stock return volatility estimation. Because there is a sufficient time lag, if the issue significantly influences the previous results, then the new results will be changed or the monotonically increasing pattern will be considerably reduced. However, the results with the time lag in Panel B of Table V show almost no differences with the previous results.

Moreover, Table III presents the return volatilities of stocks bought by fund managers. In this analysis, the volatility estimation period is the previous three months; it is not in a cross-sectional percentile ranking form but, rather, in its raw form. The implication of this analysis is the same as the above analysis for portfolio holdings. For either all stocks or only new stocks, the volatilities of the stocks purchased by the highest-turnover funds are statistically higher than those of the stocks purchased by the lowest-turnover funds. The values are almost monotonically increasing in the portfolio turnover level.

Finally, the size of a mutual fund could critically affect the above analysis. Large funds are likely to hold large-capitalization stocks due to liquidity and transaction costs and those stocks tend to be more stable. To address this issue, we construct 10 *TNA*-controlled mutual fund portfolios using 10×10 double-sorting method. Panel A in Table VI shows the variations of the fund assets of the original groups and the *TNA*-controlled groups. The original groups exhibit an inverted U-shaped pattern, while the *TNA*-controlled groups exhibit a uniform pattern. In Panel C, we repeat the previous test for stock return volatility. We can see the mean values increase monotonically in the portfolio turnover level and the difference between the highest- and lowest-turnover portfolios is significantly different from zero. The difference is so great that only 5.0% of the simulated values are higher than the actual difference. This implies that high-turnover funds prefer relatively volatile stocks more than low-turnover funds do, even after adjusting for fund size.

In this subsection, we find that high-turnover funds prefer relatively volatile stocks more than low-turnover funds do. This result is robust even when we consider a time lag between the construction of the groups and stock return volatility estimation, consider trades rather than holdings, and use the *TNA*-adjusted groups instead of the original groups.

II. Influence on Asset Pricing

Kumar and Lee (2006) find that systematic retail trading could lead to return comovement for stocks with high retail concentration. Barberis et al. (2005) also suggest that stocks preferred by a given clientele exhibit comovement beyond that attributable to fundamental news. This is interesting because the systematic trading of a certain investor group could affect stock prices, even if it is not related to usual risk factors. In the previous section, we find that mutual funds with different portfolio turnover levels restrict themselves to trading different groups of stocks. We also know that high-turnover funds prefer relatively volatile stocks more than low-turnover funds do. Therefore, there is a possibility that the different preferences of mutual funds cause different stock pricing patterns. Specifically, stocks mostly held by high-turnover funds may exhibit a relatively negative volatility–return relation. In this section, we test for the possibility.

First, we form a universe of stocks held by the mutual fund sample. We exclude stocks with fewer than 10 shareholders in our mutual fund sample. The number of stocks in this analysis is about 200 in 1984, increasing to more than 2,300 in 2011. The number skyrockets during the late 1990s.

Table VII shows the basic statistics and correlations of the variables of the stock sample. We only present the estimates of stocks belonging to the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX) in this table. The estimates of NASDAQ stocks are also qualitatively similar. The variables *Vol* and *Skew* are the past six months' standard second and third moments of daily stock returns, respectively; *Ret* is the past six months' cumulative return; *Turn* is the past six months' daily average turnover rate, which is measured by trading volume divided by the number of outstanding shares; *Amihud* is the past six months' Amihud (2002) measure; *Log(ME)* is the natural logarithm of the market value of equity; and *BM* is the book-to-market ratio. All measures are estimated at the end of each quarter. Panel A shows basic statistics, including the mean, median, standard deviation, skewness, kurtosis, and autocorrelation. The autocorrelation is estimated with intervals of one quarter. The autocorrelation of *STurn* of 0.73 shows that the portfolio turnover level of mutual fund shareholders is persistent. Panel B shows the correlations of the variables.

We form three stock groups based on *STurn* and run Fama–MacBeth (1973) cross-sectional regressions within each group. The regression specification is

$$r_{i,t+1} = \alpha_t + \beta_t Vol_{i,t} + \gamma_t X_{i,t} + u_{i,t+1}$$

where $r_{i,t+1}$ is the cumulative stock return during quarter $t+1$ and X is a set of well-known control variables that predict stock returns, including the natural logarithms of firm size and the cumulative stock return of months $t-11$ to $t-1$ and the book-to-market ratio. We adopt the Newey–West (1987) adjustment, using four lags to calculate the *t*-statistics.

The traditional literature predicts a positive relation between volatility and investment return because investors are risk averse and consider stock return volatility a risk. Therefore, the coefficient β should be positive. On the other hand, empirical research papers, including that of Ang et al. (2006), find a negative relation between volatility and stock performance. If this is the case, the coefficient β will be negative.

Table VIII shows the results. The row *without restriction* implies that the coefficients α_t and γ_t can differ across all the stock groups, while the row *with restriction* implies that α_t and γ_t are constant across the stock groups to uniformly fix other effects of control variables. The results for *without restriction* in Panel A show that the low-*STurn* stock group exhibits a weakly positive relation between volatility and investment return, although it is statistically insignificant. The high-*STurn* group, however, has a statistically significant negative relation. The coefficient, -0.957, is also economically significant because it means that only a 1% difference in volatilities can make an almost 1% difference in investment returns. The *t*-statistic is -2.14. The difference between the two β values is -1.054 and statistically very significant. This is clear evidence showing that the different preferences of shareholders affect stock prices. Similarly, the results for *with restriction* also show different asset pricing patterns. The difference is still statistically significant, but the difference is smaller. This is due to the fact that effects other than the volatility effect can interact with shareholder characteristics. We conduct two sub-period tests in panels B and C. Interestingly, the economic significance weakens, but the statistically significance increases in the later period. The sub-period test reconfirms the significant difference between the low- and high-*STurn* stock groups' volatility preferences.

One might think that the low- and high-*STurn* stock groups have primarily different volatility distributions because mutual fund managers have different preferences for stock return volatility. Volatile stocks are likely to belong to the high-*STurn* group, while stable stocks are likely to belong to the low-*STurn* group. The relation between volatility and investment return might be related to how high the stock return volatility is rather than who owns the stock. To address the issue, we form three volatility-adjusted *STurn* stock groups using the 5×3 double-sorting method. After the adjustment, the three stock groups have almost identical volatility distributions. Panel D of Table VIII repeats the previous analysis using the alternative three stock groups. The results are qualitatively similar to the results in Panel A, even though the differences are somewhat weaker.

Chou, Huang, and Yang (2013) show that investment return is affected by interaction of the stock's trading volume with stock return volatility. To check the robustness of the results, we run Fama–MacBeth (1973) cross-sectional regressions with the alternative specification

$$r_{i,t+1} = \alpha_t + \beta_{1,t} Vol_{i,t} + \beta_{2,t} STurng_{i,t} \cdot Vol_{i,t} + \beta_{3,t} Turng1_{i,t} \cdot Vol_{i,t}$$
$$+ \beta_{4,t} Turng2_{i,t} \cdot Vol_{i,t} + \gamma_t X_{i,t} + u_{i,t+1}$$

where *STurng* is an index having a value of zero, one, or two to indicate which group the stock belongs to when grouped into terciles by *STurn*. The variable *Turng1* has a value of zero, one, or two according to the past six months' daily average turnover rate if the stock belongs to the NYSE or

AMEX and zero otherwise. Similarly, *Turng2* has a value of zero, one, or two according to the turnover rate if the stock belongs to NASDAQ and zero otherwise. We use the two distinct variables because the NASDAQ has a different trading system from that of the NYSE and the AMEX.[4] The control variable X is the same as in the previous regression equation. If different preferences for stock return volatility exist, the coefficient β_2 will be negative. Table IX shows the results. Consistent with the prediction, equations (2) and (4) show that the β_2 values are significantly negative before and after controlling for the interaction between the trading volume and stock return volatility.

The cross-sectional analysis in this section implies that there are different asset pricing patterns depending on who owns the stock. Specifically, stocks mostly held by high-turnover funds tend to exhibit a more negative relation between stock return volatility and investment return than stocks mostly held by low-turnover funds do. This evidence supports the notion that the different preferences of mutual funds produce cross-sectionally different patterns of stock returns; that is, who owns the stock affects the stock price.

III. Further Analysis on the Portfolio Turnover Level of a Mutual Fund

In this section, we investigate what determines the portfolio turnover level of a mutual fund and how it influences the fund's performance.

We run Fama–MacBeth (1973) cross-sectional regressions. The regression specification is

$$RTurn_{i,t} = \alpha_t + \beta_{1,t} PreAlpha_{i,t} + \beta_{2,t} Log(TNA)_{i,t} + \beta_{3,t} Log(TNA)^2{}_{i,t}$$

$$+\beta_{4,t} Log(Age)_{i,t} + \beta_{5,t} Log(Tenure)_{i,t} + \beta_{6,t} Style\_Dummies_{i,t} + u_{i,t+1}$$

where $Style\_Dummies$ includes the dummies *Mid-Cap*, *Small-Cap*, *Micro-Cap*, *Growth & Income*, and *Income*. They are all zero when the fund's CRSP objective is growth; otherwise, it has different

[4] While the NYSE and AMEX are primarily auction markets, NASDAQ is a dealer market where trades with dealers are included in the reported trading volume. Therefore, the reported trading volume of NASDAQ stocks is overestimated relative to NYSE and AMEX stocks (Atkins and Dyl (1997)).

values of either zero or one, depending on the objective's value. For example, if the fund's objective is income, then the *Income* dummy is one while the other dummies are zero. All the coefficient's estimates are standardized to compare their relative importance.

The results are shown in Table X. The size variables *Log(TNA)* and $Log(TNA)^2$ barely affect the portfolio turnover level. The sensitivity of *Log(Age)* is not significant either. On the other hand, the previous factor-adjusted return is an important determinant of the portfolio turnover level. The coefficient β_1 is -1.745 and its *t*-statistic is -5.10. This implies that fund managers with poor past performance trade stocks actively. This is plausible, because they are eager to recover from losing positions. The sensitivity of *Log(Tenure)* is very significantly negative, too. The coefficient β_5 is -2.231 and its *t*-statistic is -18.34. We assume that newly appointed managers trade more actively than managers with long tenure because they have strong incentives to prove their ability in a short period. Mutual fund styles are also relevant to portfolio turnover levels. Mid-cap and small-cap fund managers trade more actively than growth fund managers do, whereas growth & income and income funds trade less actively. This may be due to customer demands. Customers require long and stable cash flows from *growth & income* and *income* funds, while they require relatively short-term gains from *mid-cap* and *small-cap* funds. However, the strongest determinants of the portfolio turnover level are the past performance and tenure of the fund manager, with other variables less than half as strong. This result is plausible because past performance and tenure are most directly related to managerial incentives and, therefore, managerial trading behavior.

Second, we investigate how a mutual fund's portfolio turnover level affects its performance. To compare the stock selection abilities of high- and low-turnover funds, we calculate equal-weighted hypothetical three-month holding period returns for each mutual fund portfolio. If a fund holds the same portfolio for the next quarter, it will have a hypothetical return. Table XI shows the results. There are little differences between the hypothetical returns of high- and low-turnover funds. The difference between the highest- and lowest-turnover fund groups is almost zero. The simulation results are also around 50%, which means there is no remarkable difference in stock-picking ability. We also estimate hypothetical one-month holding returns, since high-turnover funds tend to hold stocks for the short run; however, the results are qualitatively the same as above. We do not present the results here to save space. The bottom row of Table XI also shows the hypothetical gains from recent three-month trades, calculated by adding the returns of stocks that were bought and subtracting the returns of stocks that were sold. The results also show little difference between the high- and low-turnover groups. This implies that fund managers do not have high returns, even though those who are eager to recover or seek high returns in the short run make many trades.

Table XII shows the Fama–MacBeth (1973) cross-sectional regression results of the next three month's actual net returns of mutual funds. The regression specification is

$$Net_{Return_{i,t+1}} = \alpha_t + \beta_{1,t} RTurn_{i,t} + \beta_{2,t} PreAlpha_{i,t} + \beta_{3,t} Expense_{i,t}$$

$$+\beta_{4,t} Log(TNA)_{i,t} + \beta_{5,t} Log(TNA)^2{}_{i,t} + \beta_{6,t} Log(Age)_{i,t}$$

$$+\beta_{7,t} Log(Tenure)_{i,t} + \beta_{8,t} Style_{Dummies_{i,t}} + u_{i,t+1}$$

The first row of Table XII reports the results in which the dependent variable is a raw return form and the second row shows the results for the Fama–French (1993) and Carhart (1997) four-factor adjusted returns. All the coefficient estimates are standardized and the *t*-statistics, in parentheses, are Newey–West (1987) adjusted using four lags. We control for the previous four-factor alpha following Brown and Goetzmann (1995) and Gruber (1996), who claim fund performance persistence. As predicted, the coefficients of the previous performance measure are significantly positive. The coefficient of *STurn* confirms that the portfolio turnover level barely affects the fund's performance, which is consistent with the similar regression results of Amihud and Goyenko (2013).

In this section, we conclude that managers with poor past performance and newly appointed managers tend to trade actively. Fund styles also affect the portfolio turnover level. In particular, mid-cap and small-cap fund managers trade more actively than growth fund managers do, whereas growth & income and income funds trade less actively. We assume the results are due to the incentives of mutual fund managers and customer expectations. However, despite the strong incentives and expectations, we cannot find any evidence of a significant relation between a mutual fund's portfolio turnover level and its performance.

IV. Conclusion

In this paper, we conduct several empirical analyses. We estimate Carhart’s (1997) portfolio turnover measure using quarterly snapshots of the equity holdings of actively managed equity mutual funds and show that different mutual fund managers trade and hold different groups of stocks. This finding is consistent with the habitat model suggested by Bodurtha et al. (1995) and Barberis et al. (2005). Specifically, high-turnover (low-turnover) funds hold stocks likely to be held by other high-turnover (low-turnover) funds. In addition, mutual fund managers have different preferences for a stock characteristic. High-turnover funds prefer relatively volatile stocks more than low-turnover funds do. The simulation method in which held stocks are randomly replaced by stocks of similar investment opportunity is adopted to show the robustness of our results.

Interestingly, the different preferences among different managers affect stock prices as well. Stocks mostly held by high-turnover funds tend to have low returns when their returns are volatile, compared to stocks held by low-turnover funds. This is not consistent with the traditional theory, but it is consistent with the different preferences of mutual fund managers. The results are robust even after we control for stock return volatility and stock-level turnover rates.

Portfolio turnover levels depend significantly on mutual fund characteristics. Managers with poor performance and newly appointed managers tend to trade more frequently. Fund style also affects the portfolio turnover level. In particular, mid-cap and small-cap fund managers trade more actively than growth fund managers do, whereas growth & income and income funds trade less actively. We assume these results are due to the incentives of mutual fund managers and customer expectations. Further analysis shows that the portfolio turnover level barely affects the fund’s performance.

This paper contributes to the finance literature in two ways. First, it shows that who owns the stock can actually affect the stock price. This implies there are multiple frameworks that determine stock prices at the same time, which deviates from the traditional theory that rational investors or arbitrageurs eventually determine stock prices, even if there are irrational investors in the stock market. Second, this paper shows that even institutional investors, which are usually considered rational investors, can defy the predictions of the traditional literature, such as a positive relation between volatility and investment return. We provide evidence that high-turnover funds prefer relatively volatile stocks, which results in a negative relation between volatility and investment return within a certain group of stocks.

Table I. Basic Statistics and Correlations of Mutual Fund Sample

This table shows the basic statistics and correlations of the variables for the U.S. domestic mutual fund sample. The sample period is from December 1983 to March 2012. The variable *PTurn* is Carhart's (1997) portfolio turnover measure; *RTurn* is the cross-sectional percentile ranking of *PTurn*; *Log(Age)* and *Log(Tenure)* are the natural logarithms of the differences in months between the current date and the date the fund was first offered and between the current date and the date the current manager took control, respectively; *Expense* is the expense ratio; *Log(TNA)* is the natural logarithm of total net assets in millions; *Ret* is the net return of the fund during the next quarter; *PreAlpha* is *the* Fama and French (1993) and Carhart (1997) factor-adjusted return during the previous 24 months; and *PostAlpha* is the difference between *Ret* and the predicted return estimated by the 24-month regression coefficients. All the measures are estimated at the end of each quarter. Panel A shows basic statistics, including the mean, median, standard deviation, skewness, kurtosis, and autocorrelation. Autocorrelation is estimated with intervals of one quarter. Panel B shows the correlations of the variables.

	PTurn	*RTurn*	Log(Age)	Log(Tenure)	Expense	Log(TNA)	Ret	PreAlpha	PostAlpha
Panel A: Basic Statistics									
Mean	0.15	0.50	4.77	4.07	-0.01	5.17	0.03	0.00	0.00
Median	0.12	0.50	4.86	4.12	0.00	5.12	0.03	0.00	0.00
Std	0.12	0.29	0.98	0.91	0.16	1.63	0.04	0.01	0.04
Skew	1.55	0.01	-0.31	-0.38	-1.72	0.16	0.09	-0.09	-0.01
Kurt	3.49	-1.21	-0.05	0.32	68.54	-0.13	2.76	3.65	3.92
AR	0.67	0.73	1.00	0.95	0.93	1.00	0.04	0.86	0.04
Panel B: Correlations									
PTurn	1	0.90	-0.06	-0.19	0.12	-0.08	0.02	-0.12	-0.02
RTurn		1	-0.05	-0.20	0.13	-0.06	0.02	-0.11	-0.02
Log(Age)			1	0.38	-0.14	0.47	-0.01	-0.05	0.00
Log(Tenure)				1	-0.04	0.24	-0.01	0.03	0.01
Expense					1	-0.28	-0.01	-0.05	-0.03
Log(TNA)						1	-0.01	0.09	0.00
Ret							1	0.04	0.67
PreAlpha								1	0.09
PostAlpha									1

Table II. Portfolio-Weighted *STurn** Values of Mutual Fund Groups Sorted by Their Portfolio Turnover Levels

This table shows the cross-sectional mean and standard deviation of the portfolio-weighted *STurn** values and a comparison between the actual and simulated values across the 10 mutual fund portfolio groups formed on the basis of their portfolio turnover levels. The values are time-series averaged from December 1983 to March 2012. We run the simulation 100 times.

		Low	2	3	4	5	6	7	8	9	High	High - Low (*t*-Value)	Rank Correlation
Mean		0.423	0.433	0.442	0.449	0.458	0.467	0.474	0.487	0.500	0.509	**0.086 (29.79)**	**0.926**
Simulation	**No restriction**	2.4%	5.1%	9.5%	11.1%	24.4%	39.3%	49.9%	79.5%	94.2%	94.2%	**99.8%**	**0.836**
	Investment amount	7.0%	10.7%	26.0%	48.9%	73.4%	84.1%	91.1%	96.7%	99.4%	97.9%	**99.6%**	**0.832**
	Market value	8.3%	8.1%	18.7%	38.0%	70.6%	85.1%	91.7%	96.9%	99.4%	98.3%	**99.1%**	**0.846**
	Volatility	5.7%	10.0%	17.3%	25.8%	40.8%	55.1%	67.5%	86.7%	96.6%	96.8%	**99.0%**	**0.830**
	Industry	1.9%	5.5%	8.8%	10.6%	20.5%	34.6%	43.9%	71.6%	89.2%	92.9%	**99.2%**	**0.806**
												Average	
Standard Deviation		0.101	0.104	0.105	0.107	0.108	0.109	0.111	0.112	0.114	0.116	**0.109**	
Simulation	**No restriction**	1.9%	2.4%	4.1%	4.5%	3.0%	2.7%	2.7%	1.2%	2.5%	2.9%	**2.8%**	
	Investment amount	4.7%	6.4%	6.8%	8.5%	6.8%	5.4%	6.5%	5.5%	5.4%	8.4%	**6.4%**	
	Market value	4.6%	5.3%	6.2%	7.2%	5.3%	4.4%	4.4%	4.0%	4.2%	6.8%	**5.2%**	
	Volatility	2.4%	3.3%	4.7%	5.8%	4.1%	3.4%	3.6%	1.5%	2.7%	2.5%	**3.4%**	
	Industry	2.1%	2.4%	4.0%	5.5%	3.8%	3.0%	3.1%	1.4%	2.3%	2.6%	**3.0%**	

Table III. Value-Weighted *STurn** Values and the Volatility of the Stocks Bought by Each Mutual Fund

This table shows the cross-sectional mean of the value-weighted *STurn** values and the volatility of the stocks bought by each mutual fund during quarter *t* across the 10 mutual fund portfolio groups formed on the basis of their portfolio turnover levels. The values are time-series averaged from December 1983 to March 2012.

	Low	2	3	4	5	6	7	8	9	High	High - Low (*t*-Value)	Rank Correlation
Panel A: All Stocks												
STurn* (*t-1*)	0.439	0.445	0.454	0.462	0.467	0.473	0.478	0.484	0.492	0.497	**0.057 (20.00)**	**0.780**
STurn* (*t*)	0.456	0.454	0.463	0.469	0.471	0.475	0.479	0.483	0.490	0.495	**0.039 (12.84)**	**0.600**
Volatility (*t-1*)	0.0231	0.0233	0.0235	0.0237	0.0244	0.0246	0.0248	0.0254	0.0260	0.0263	**0.0032 (9.83)**	**0.589**
Volatility (*t*)	0.0238	0.0237	0.0240	0.0241	0.0246	0.0250	0.0251	0.0255	0.0262	0.0264	**0.0026 (7.14)**	**0.518**
Panel B: New Stocks												
STurn* (*t-1*)	0.434	0.440	0.451	0.459	0.466	0.472	0.478	0.485	0.495	0.500	**0.067 (21.33)**	**0.829**
STurn* (*t*)	0.453	0.452	0.462	0.465	0.471	0.476	0.480	0.485	0.493	0.497	**0.045 (13.43)**	**0.658**
Volatility (*t-1*)	0.0240	0.0240	0.0242	0.0242	0.0250	0.0250	0.0252	0.0257	0.0262	0.0264	**0.0024 (6.92)**	**0.453**
Volatility (*t*)	0.0252	0.0246	0.0247	0.0246	0.0252	0.0254	0.0255	0.0259	0.0265	0.0266	**0.0014 (3.42)**	**0.365**

Table IV. Portfolio-Weighted Stock Return Volatilities of Mutual Fund Groups Sorted by Their Portfolio Turnover Levels

This table shows the cross-sectional mean and standard deviation of the portfolio-weighted percentile ranking of the previous six months' daily volatility and a comparison between the actual and simulated values across the 10 mutual fund portfolio groups formed on the basis of their portfolio turnover levels. The values are time-series averaged from December 1983 to March 2012. We run the simulation 100 times.

		Low	2	3	4	5	6	7	8	9	High	High - Low (*t*-Value)	Rank Correlation
Mean		0.275	0.286	0.297	0.306	0.320	0.332	0.340	0.358	0.375	0.390	**0.115 (22.51)**	**0.843**
Simulation	**No restriction**	0.0%	0.0%	0.0%	0.1%	0.1%	0.5%	0.8%	0.9%	2.0%	7.6%	**98.3%**	**0.418**
	Investment amount	2.7%	0.5%	2.2%	7.1%	15.3%	31.2%	40.6%	74.4%	85.5%	87.5%	**97.1%**	**0.789**
	Market value	16.7%	14.8%	21.0%	33.4%	43.3%	52.9%	71.4%	90.1%	93.7%	94.3%	**96.9%**	**0.799**
	Industry	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	**97.9%**	**0.375**
												Average	
Standard Deviation		0.170	0.177	0.178	0.182	0.186	0.189	0.191	0.194	0.197	0.198	**0.186**	
Simulation	**No restriction**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	
	Investment amount	0.0%	0.1%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.8%	0.0%	**0.1%**	
	Market value	0.5%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.4%	0.3%	**0.2%**	
	Industry	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	

Table V. Portfolio-Weighted Characteristics of Mutual Fund Groups Sorted by Their Portfolio Turnover Levels at Quarter *t* - 4

This table shows the cross-sectional mean and standard deviation of the portfolio-weighted percentile ranking of characteristics and a comparison between the actual and simulated values across the 10 mutual fund portfolio groups formed on the basis of their portfolio turnover levels at quarter *t* - 4. The values are time-series averaged from December 1984 to March 2012. We run the simulation 100 times.

	Low	2	3	4	5	6	7	8	9	High	High - Low (*t*-value)	Rank Correlation
Panel A: *STurn**												
Mean	0.421	0.433	0.440	0.449	0.458	0.466	0.473	0.485	0.495	0.508	**0.087 (31.77)**	**0.898**
Simulation	10.5%	15.2%	27.9%	57.3%	74.1%	81.3%	90.5%	94.8%	97.1%	99.0%	**99.6%**	**0.803**
Standard Deviation	0.102	0.104	0.106	0.107	0.108	0.109	0.112	0.112	0.114	0.117	**0.109**	
Simulation	3.5%	6.3%	6.2%	5.9%	8.1%	5.9%	7.5%	8.5%	6.5%	9.7%	**6.8%**	
Panel B: Volatility												
Mean	0.272	0.282	0.293	0.303	0.316	0.327	0.335	0.352	0.369	0.384	**0.112 (20.37)**	**0.791**
Simulation	3.1%	2.0%	4.1%	11.8%	18.2%	32.7%	41.3%	64.9%	84.7%	85.6%	**94.9%**	**0.769**
Standard Deviation	0.170	0.176	0.178	0.180	0.184	0.187	0.189	0.192	0.195	0.196	**0.185**	
Simulation	0.3%	1.0%	0.3%	0.0%	0.7%	0.0%	0.0%	0.1%	0.0%	0.2%	**0.3%**	

Table VI. Portfolio-Weighted Characteristics of *TNA*-Controlled Mutual Fund Groups Sorted by Their Portfolio Turnover Levels

This table shows the cross-sectional mean and standard deviation of the portfolio-weighted percentile ranking of characteristics and a comparison between the actual and simulated values across the 10 *TNA*-controlled mutual fund portfolio groups formed on the basis of their portfolio turnover levels. The values are time-series averaged from December 1983 to March 2012. We run the simulation 100 times.

	Low	2	3	4	5	6	7	8	9	High	High - Low (*t*-value)	Rank Correlation
Panel A: Fund Size ($M)												
No Control	108	167	181	174	166	165	157	150	132	97		
Size Control	141	139	140	140	140	139	140	140	139	137		
Panel B: *STurn**												
Mean	0.424	0.434	0.443	0.450	0.457	0.466	0.476	0.487	0.498	0.506	**0.082 (27.98)**	**0.925**
Simulation	4.2%	6.1%	18.2%	45.2%	66.2%	83.3%	91.1%	97.3%	98.6%	98.0%	**99.0%**	**0.844**
Standard Deviation	0.101	0.104	0.106	0.107	0.108	0.109	0.110	0.113	0.113	0.116	**0.109**	
Simulation	5.5%	7.0%	8.5%	6.6%	9.6%	6.3%	6.4%	8.0%	10.2%	16.2%	**8.4%**	
Panel C: Volatility												
Mean	0.278	0.286	0.300	0.308	0.317	0.329	0.344	0.360	0.373	0.382	**0.104 (18.79)**	**0.820**
Simulation	5.1%	1.0%	5.3%	14.3%	15.7%	24.7%	50.2%	76.8%	87.3%	83.8%	**95.0%**	**0.764**
Standard Deviation	0.171	0.176	0.180	0.181	0.185	0.188	0.190	0.194	0.196	0.198	**0.186**	
Simulation	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.7%	0.5%	0.1%	**0.1%**	

Table VII. Basic Statistics and Correlations of Stock Sample

This table shows basic statistics and correlations of the variables of the stock sample that belong to the NYSE or AMEX. The sample period is from December 1983 to March 2012. The variable *STurn* is described in Section II; *Vol* and *Skew* are the past six months' standard second and third moments of daily stock returns, respectively; *Ret* is the past six months' cumulative return; *Turn* is the past six months' daily average turnover rate, which is measured by trading volume divided by the number of outstanding shares; *Amihud* is the past six months' Amihud (2002) measure; *Log(ME)* is the natural logarithm of , which is measured by trading volume divided by the number of outstanding shares the market value of equity; and *BM* is the book-to-market ratio. All the measures are estimated at the end of each quarter. Panel A shows basic statistics, including the mean, median, standard deviation, skewness, kurtosis, and autocorrelation. Autocorrelation is estimated with intervals of one quarter. Panel B shows the correlations of the variables.

	STurn	**Vol**	**Skew**	**Ret**	**Turn**	**Amihud**	**Log(ME)**	**BM**
Mean	0.42	0.03	0.17	0.08	0.01	0.00	7.86	0.63
Median	0.41	0.02	0.16	0.05	0.01	0.00	7.71	0.52
Std	0.14	0.01	1.08	0.30	0.01	0.00	1.45	0.62
Skew	0.29	1.48	0.60	1.79	3.20	25.38	0.49	7.53
Kurt	-0.27	4.90	14.63	15.10	21.10	720.82	0.07	133.53
AR	0.73	0.89	0.46	0.49	0.93	0.97	0.99	0.95
STurn	1	0.20	0.01	0.15	0.27	-0.05	-0.10	-0.03
Vol		1	0.06	0.00	0.51	0.00	-0.37	0.07
Skew			1	0.32	-0.02	0.02	-0.02	0.04
Ret				1	0.00	0.00	0.08	0.05
Turn					1	-0.10	-0.06	0.00
Amihud						1	-0.06	0.07
Log(ME)							1	-0.20
BM								1

Table VIII. Sensitivity of Stock Performance to Volatility

This table shows the Fama–MacBeth (1973) cross-sectional regression results of three-month investment returns for three stock groups formed on the basis of their *STurn* values. The regression specification is

$$r_{i,t+1} = \alpha_t + \beta_t Vol_{i,t} + \gamma_t X_{i,t} + u_{i,t+1}$$

where $r_{i,t+1}$ is the three-month investment return, *Vol* is the past six months' standard second moment of daily stock returns, and $X_{i,t}$ is a set of well-known control variables that predict stock returns, including the natural logarithm of the market value of equity, the natural logarithm of the cumulative stock return of months $t-11$ to $t-1$, and the book-to-market ratio. This table only presents the coefficient β. The variables are constructed at the end of each quarter. The row *without restriction* implies that the three cross-sectional regressions run independently, allowing for different α_t and γ_t values for each group, while the row *with restriction* implies that the three cross-sectional regressions estimate the coefficient β under the restriction that α_t and γ_t are constant across the groups. All the *t*-statistics, in parentheses, are Newey–West (1987) adjusted using four lags. Panel A reveals the results for the entire period, panels B and C show the subperiod test results, and Panel D shows the results using volatility-adjusted groups.

	Low	Middle	High	High - Low
Panel A: Entire Period (Jan 1984–Jun 2012)				
Without Restriction	0.097	-0.568	-0.957	-1.054
	(0.25)	(-1.46)	(-2.14)	(-3.36)
With Restriction	-0.307	-0.483	-0.617	-0.310
	(-0.79)	(-1.24)	(-1.58)	(-3.46)
Panel B: Jan 1984–Sep 1997				
Without Restriction	-0.077	-1.004	-1.664	-1.587
	(-0.14)	(-1.85)	(-2.64)	(-2.70)
With Restriction	-0.544	-0.802	-0.892	-0.348
	(-1.04)	(-1.49)	(-1.69)	(-2.12)
Panel C: Oct 1997–Jun 2012				
Without Restriction	0.265	-0.148	-0.275	-0.540
	(0.48)	(-0.27)	(-0.47)	(-3.67)
With Restriction	-0.086	-0.186	-0.360	-0.274
	(-0.15)	(-0.33)	(-0.62)	(-3.26)
Panel D: Using Volatility-Adjusted Groups				
Without Restriction	-0.271	-0.697	-0.856	-0.585
	(-0.69)	(-1.52)	(-2.10)	(-2.25)
With Restriction	-0.426	-0.639	-0.658	-0.232
	(-1.10)	(-1.64)	(-1.72)	(-2.59)

Table IX. Sensitivity of Stock Performance to Volatility after Adjusting Trading Volume

This table shows the Fama–MacBeth (1973) cross-sectional regression results of three-month investment returns. The regression specification is

$$r_{i,t+1} = \alpha_t + \beta_{1,t} Vol_{i,t} + \beta_{2,t} STurng_{i,t} \cdot Vol_{i,t} + \beta_{3,t} Turng1_{i,t} \cdot Vol_{i,t} + \beta_{4,t} Turng2_{i,t} \cdot Vol_{i,t} + \gamma_t X_{i,t} + u_{i,t+1}$$

where $r_{i,t+1}$ is the three-month investment return, *Vol* is the past six months' standard second moment of daily stock returns, *STurng* is an index having a value of zero, one, or two to indicate which group the stock belongs to when stocks are grouped into terciles by *STurn*. The variable *Turng1* has a value of zero, one, or two according to the past six months' daily average turnover rate if the stock belongs to the NYSE or AMEX and zero otherwise. Similarly, the variable *Turng2* has a value of zero, one, or two according to the turnover rate if the stock belongs to NASDAQ and zero otherwise. The variable X is a set of well-known control variables that predict stock returns, including the natural logarithm of the market value of equity, the natural logarithm of the cumulative stock return of months $t-11$ to $t-1$, and the book-to-market ratio. The variables are constructed at the end of each quarter from December 1983 to March 2012. All the *t*-statistics, in parentheses, are Newey–West (1987) adjusted using four lags.

Equation	**Vol**	***STurng*·Vol**	**Turng1·Vol**	**Turng2·Vol**	**Log(ME)**	**Log(Ret)**	**BM**	**Adj-R^2**
(1)	-0.570				-0.002	0.022	-0.001	0.085
	(-1.48)				(-0.97)	(2.24)	(-0.24)	
(2)	-0.306	-0.158			-0.002	0.025	-0.002	0.087
	(-0.79)	(-3.50)			(-1.12)	(2.50)	(-0.37)	
(3)	-0.125		-0.149	-0.199	-0.001	0.021	-0.000	0.095
	(-0.38)		(-1.99)	(-1.83)	(-0.83)	(2.24)	(-0.11)	
(4)	0.052	-0.137	-0.128	-0.174	-0.002	0.023	-0.001	0.096
	(0.15)	(-3.01)	(-1.72)	(-1.64)	(-1.01)	(2.47)	(-0.26)	

Table X. Fama–MacBeth Cross-Sectional Regression of Portfolio Turnover Levels

This table shows the Fama–MacBeth (1973) cross-sectional regression results of portfolio turnover levels. The variables are constructed at the end of each quarter from December 1983 to March 2012. The regression specification is

$$RTurn_{i,t} = \alpha_t + \beta_{1,t}PreAlpha_{i,t} + \beta_{2,t}Log(TNA)_{i,t} + \beta_{3,t}Log(TNA)^2{}_{i,t} +$$

$$\beta_{4,t}Log(Age)_{i,t} + \beta_{5,t}Log(Tenure)_{i,t} + \beta_{6,t}Style\_Dummies_{i,t} + u_{i,t+1}$$

where *RTurn* is the cross-sectional percentile ranking of Carhart's (1997) portfolio turnover measure; *PreAlpha* is the Fama and French (1993) and Carhart (1997) factor-adjusted return during the previous 24 months; *Log(TNA)* is the natural logarithm of total net assets in millions; *Log(Age)* and *Log(Tenure)* are the natural logarithms of the differences in months between the current date and the date the fund was first offered and between the current date and the date when the current manager took control, respectively; and $Style\_Dummies_{i,t}$ are all zero when the fund's CRSP objective is growth; otherwise, it has values of either zero or one, depending on the objective's value. All the coefficient estimates are standardized and the *t*-statistics, in parentheses, are Newey–West (1987) adjusted using four lags.

PreAlpha	Log(TNA)	Log(TNA)^2	Log(Age)	Log(Tenure)	Fund Style (Default: Growth)					Adj-R^2
					Mid-Cap	Small-Cap	Micro-Cap	Growth & Income	Income	
Dependent Variable: *RTurn*										
-1.745	0.226	-0.265	0.114	-2.231	0.381	0.216	-0.023	-0.824	-0.272	0.089
(-5.10)	(0.29)	(-0.31)	(0.88)	(-18.34)	(4.40)	(2.69)	(-1.24)	(-7.01)	(-2.95)	

Table XI. Hypothetical Three-Month Returns of Mutual Fund Groups Sorted by Their Portfolio Turnover Levels

This table shows the cross-sectional mean of hypothetical three-month holding period returns and hypothetical gains from the trades during the previous quarter and a comparison of the actual and simulated values across the 10 mutual fund groups formed on the basis of portfolio turnover levels. The values are time-series averaged from December 1983 to March 2012. We run the simulation 100 times.

		Low	2	3	4	5	6	7	8	9	High	High - Low (*t*-Value)	Rank Correlation
Portfolio return		0.030	0.029	0.030	0.030	0.030	0.030	0.029	0.030	0.032	0.031	**0.001 (0.14)**	**0.031**
Simulation	**No restriction**	55.0%	53.6%	55.1%	55.9%	55.1%	55.8%	55.4%	58.3%	56.5%	54.5%	**51.0%**	**0.097**
	Investment amount	46.7%	44.1%	43.7%	46.3%	44.2%	41.0%	41.4%	45.2%	47.6%	50.4%	**51.6%**	**0.048**
	Market value	46.7%	44.1%	42.4%	45.6%	46.8%	44.1%	41.9%	44.5%	49.9%	50.9%	**51.9%**	**0.048**
	Industry	54.7%	54.0%	55.8%	55.4%	55.3%	54.6%	52.9%	55.2%	54.5%	53.6%	**49.3%**	**0.048**
Gains from recent trades		0.004	0.005	0.005	0.002	0.003	0.003	0.003	0.003	0.002	0.002	**-0.002 (-0.71)**	**-0.094**

Table XII. Fama–MacBeth Cross-Sectional Regression of Net Returns

This table shows the Fama–MacBeth (1973) cross-sectional regression results for the next three-month actual net returns of mutual funds. The variables are constructed at the end of each quarter from December 1983 to March 2012. The regression specification is

$$Net_{Return_{i,t+1}} = \alpha_t + \beta_{1,t} RTurn_{i,t} + \beta_{2,t} PreAlpha_{i,t} + \beta_{3,t} Expense_{i,t} + \beta_{4,t} Log(TNA)_{i,t} + \beta_{5,t} Log(TNA)^2{}_{i,t}$$

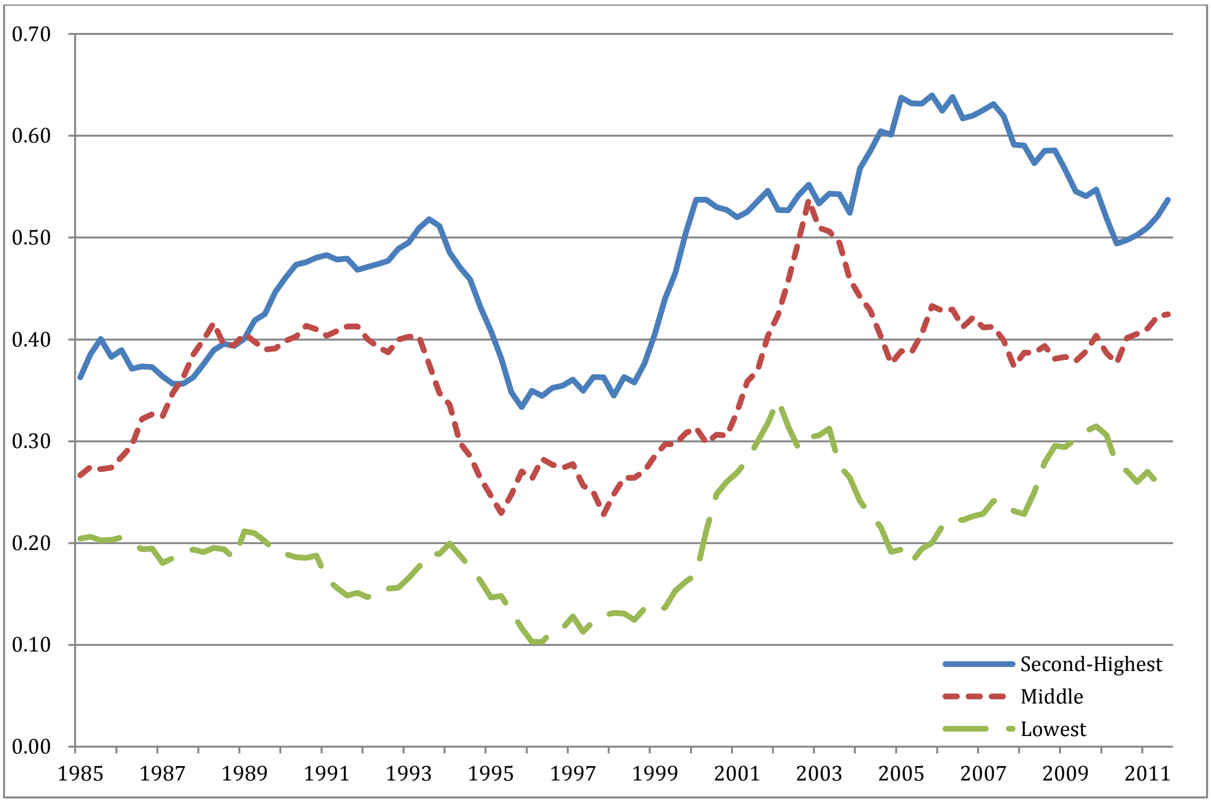
$$+\beta_{6,t} Log(Age)_{i,t} + \beta_{7,t} Log(Tenure)_{i,t} + \beta_{8,t} Style\_Dummies_{i,t} + u_{i,t+1}$$

where *Net_Return* is the actual three-month net return of mutual funds; *RTurn* is the cross-sectional percentile ranking of Carhart's (1997) portfolio turnover measure; *PreAlpha* is the Fama and French (1993) and Carhart (1997) factor-adjusted return during the previous 24 months; *Expense* is the expense ratio; *Log(TNA)* is the natural logarithm of total net assets in millions; *Log(Age)* and *Log(Tenure)* are the natural logarithms of the differences in months between the current date and the date the fund was first offered and between the current date and the date the current manager took control, respectively; and $Style\_Dummies_{i,t}$ are all zero when the fund's CRSP objective is growth; otherwise, it has values of either zero or one, depending on the objective's value. All the coefficient estimates are standardized and the *t*-statistics, in parentheses, are Newey–West (1987) adjusted using four lags.

	STurn	PreAlpha	Expense	Log(TNA)	Log(TNA)^2	Log(Age)	Log(Tenure)	Fund Style (Default: Growth)					Adj-R^2
								Mid-Cap	Small-Cap	Micro-Cap	Growth & Income	Income	
Dependent Variable: Monthly net returns													
Raw	0.075	0.184	-14.065	-0.435	0.348	-0.012	0.000	0.052	0.115	0.044	-0.050	-0.034	0.217
	(0.71)	(1.89)	(-2.21)	(-1.74)	(1.35)	(-0.21)	(0.00)	(1.59)	(1.37)	(1.64)	(-0.76)	(-0.85)	
FF4 Alpha	-0.024	0.285	-12.586	-0.331	0.245	-0.022	0.039	0.045	-0.002	0.003	-0.012	0.009	0.150
	(-0.35)	(2.88)	(-2.59)	(-1.77)	(1.28)	(-0.55)	(0.89)	(2.19)	(-0.11)	(0.31)	(-0.41)	(0.63)	

Figure 1: Proportion of Stocks Shared by the Highest-Turnover Group and Other Groups

This graph shows the percentage of stocks shared by the highest-turnover fund group and the lowest-, middle-, and second-highest-turnover fund groups, respectively, when we rank mutual funds into deciles according to their portfolio turnover levels. The estimation period is from December 1983 to March 2012. The values are calculated as eight-quarter moving averages.



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