On the Industry Concentration of

Actively Managed Equity Mutual Funds

Marcin Kacperczyk

Clemens Sialm

Lu Zheng*

March 15, 2004

*All authors are at the University of Michigan Business School, Ann Arbor, MI 48109-1234. We thank Sreedhar Bharath, Sugato Bhattacharyya, Fang Cai, Joel Dickson, William Goetzmann, Rick Green, Gautam Kaul, Lutz Kilian, Zbigniew Kominek, Francine Lafontaine, Luboš Pástor, Tyler Shumway, Steve Todd, Zhi Wang, Toni Whited, an anonymous referee, and seminar participants at Michigan State University, the University of Colorado at Boulder, the University of Michigan, the 2003 European Financial Management Association Meeting in Helsinki, the 2003 Summer Meeting of the Econometric Society, and the CIRANO seminar in Montreal for helpful comments. We are grateful to Paul Michaud for his support with the CDA/Spectrum database. We especially thank Russ Wermers for providing us with the characteristic-adjusted stock returns reported in DGTW (1997). We acknowledge the financial support from Mitsui Life Center in acquiring the CDA/Spectrum data. All errors are our own responsibility.

On the Industry Concentration of
Actively Managed Equity Mutual Funds

ABSTRACT

The value of active fund management recently has become a central debate among researchers and practitioners. Mutual fund managers can deviate from the passive market portfolio by concentrating their holdings in specific industries. We investigate whether mutual fund managers are motivated to hold concentrated portfolios because they have investment skills that are linked to specific industries or whether they are motivated by agency problems that induce them to hold poorly diversified portfolios.

Using U.S. mutual fund data from 1984-1999, we study the relationship between the industry concentration of mutual funds and their performance. Our analysis indicates that mutual funds differ substantially in their industry concentration, and that concentrated funds tend to follow distinct investment styles. Managers of more concentrated funds overweigh growth and small stocks, whereas managers of more diversified funds hold portfolios that closely resemble the total market portfolio.

We find that more concentrated funds perform better after adjusting for risk and style differences using various performance measures. Mutual funds with an above median concentration yield an average abnormal return of 0.33 percent per year after deducting expenses, whereas mutual funds with below median concentration yield an average abnormal return of -0.77 percent. We establish that the superior performance of concentrated funds is not due to their greater responsiveness to macro-economic conditions. We also measure the performance of mutual funds based on their portfolio holdings using characteristic-based benchmarks. The results indicate that the superior performance of concentrated mutual funds is primarily due to their superior stock selection ability.

To test the robustness of our results, we also examine the trades of mutual funds. We find that the stocks purchased by mutual funds tend to outperform the stocks sold. Moreover, we show that the return difference between the buys and the sells of mutual funds increases significantly with the industry concentration. This finding indicates that concentrated mutual funds are more successful in selecting securities than more diversified funds.

Our results show that the industry concentration of a mutual fund, a specific measure of active management, is positively related to fund performance. This finding lends support to the hypothesis that investment ability is linked to specific industries.

Introduction

The rapid increase in the number and total assets of actively managed equity mutual funds in the U.S. is one of the most intriguing phenomena in the financial markets. Investors allocate their assets into actively managed funds despite widely documented empirical evidence that these funds, on average, under-perform market indexes and passively managed portfolios. This constitutes a puzzle, as pointed out by Gruber (1996) in his presidential address.

In this paper, we examine the industry concentration of equity mutual funds, one specific aspect of active fund management. The industry concentration measures how the holdings of mutual funds in various industries deviate from the market portfolio. Our paper focuses on the impact of industry concentration on fund performance.

Conventional wisdom suggests that mutual fund managers should widely diversify their holdings across industries to reduce their portfolios' idiosyncratic risk. However, the adversaries of "over-diversification" argue that a wide dispersion of holdings among many industries might not allow money managers to fully exploit their informational advantages. Fund managers might want to hold concentrated portfolios if they believe some industries will outperform the overall market or if they have superior information to select profitable stocks in specific industries. Consistent with this hypothesis, we would expect funds with skilled managers to hold more concentrated portfolios and to perform better. As a result, we should observe a positive relation between fund performance and its industry concentration.

Mutual fund managers may also hold concentrated portfolios as a consequence of a potential conflict of interest between funds and investors. Though investors would like the fund to maximize its risk-adjusted expected returns, mutual funds want to maximize their profits, which depend mainly on the value of total assets under management. Several studies indicate that investors reward stellar performance with disproportionately high money inflows but do not penalize poor performance equivalently.[1] This behavior results in a convex option-like payoff profile for mutual funds. Consequently, some funds, especially those with lower ability, may have an incentive to adopt volatile investment strategies to increase their chances of having extreme performance. Consistent with this hypothesis, funds pursuing such gaming strategies would hold more concentrated portfolios. In this case, we would expect a negative relation or at least a lack of relation between fund concentration and its performance.

The majority of the literature on mutual fund performance analyzing the net returns of mutual fund shares documents that mutual funds, on average, under-perform passive benchmarks by a statistically and economically significant margin.[2] However, several studies based on the portfolio holdings of mutual funds conclude that managers

---

[1] Numerous studies have demonstrated that mutual fund investors chase fund performance. Spritz (1970) reports a contemporaneous positive linear relation between performance and cash flows. Similar results, exploiting different samples and approaches, are reported in Smith (1978), Ippolito (1992), and Patel, Zeckhauser, and Hendricks (1994). Several papers have called attention to the nonlinearity in the performance-flow relation. Ippolito (1992) shows that the performance-flow relation is stronger for funds with positive rather than negative market-adjusted returns. Gruber (1996), Chevalier and Ellison (1997), Goetzmann and Peles (1997), Sirri and Tufano (1998), Del Guercio and Tkac (2002), and Nanda, Wang, and Zheng (2004) document a similar nonlinear performance-flow relation.

[2] For evidence on fund performance, see, for example, Jensen (1968), Grinblatt and Titman (1989), Elton et al. (1993), Hendricks, Patel, and Zeckhauser (1993), Malkiel (1995), Brown and Goetzmann (1995), Ferson and Schadt (1996), Ferson and Warther (1996), Baks, Metrick, and Wachter (2001), Elton, Gruber, and Blake (2001), Kothari and Warner (2001), and Cohen, Coval, and Pastor (2002).

who follow active investment strategies have stock-picking talents. For example, Grinblatt and Titman (1989, 1993), Grinblatt, Titman, and Wermers (1995), Daniel, Grinblatt, Titman, and Wermers (DGTW 1997), and Wermers (1997) find evidence that mutual fund managers have the ability to choose stocks that outperform their benchmarks before deducting expenses. Chen, Jegadeesh, and Wermers (2000) further document that the stocks purchased by funds have significantly higher returns than the stocks sold. Meanwhile, Wermers (2000) and Kosowski, Timmermann, White, and Wermers (2001) find that funds pick stocks well enough to cover their costs. The support for active management is also reported by Myers, Poterba, Shackelford, and Shoven (2001) who show that actively managed mutual funds generate higher returns before expenses than "copycat" funds that mechanically replicate the portfolios of their active counterparts after the portfolio disclosure dates.

Coval and Moskowitz (1999, 2001) show that mutual funds exhibit a strong preference for investing in locally headquartered firms and that these investors earn substantial abnormal returns on their local holdings. Their results suggest that local investors have an informational advantage. In our paper, we analyze whether mutual fund managers have an expertise in specific industries and whether they can create value by holding portfolios concentrated in specific industries.

Recent studies suggest the size of a fund affects its ability to outperform the benchmark. In a theoretical paper, Berk and Green (2002) explain many stylized facts related to fund performance using a model with rational agents. In their model, skilled active managers do not outperform passive benchmarks after deducting expenses because of a competitive market for capital provision combined with decreasing returns to scale in active management. In a related empirical study, Chen, Hong, Huang, and Kubik (2002) find that smaller funds tend to outperform larger funds due to diseconomies of scale. While the size of the fund negatively affects its performance, it is possible that a wide dispersion of holdings across many industries also may erode its performance. Our paper investigates whether such diseconomies of scope affect the performance of mutual funds.

This paper evaluates a fund's performance conditioned upon its industry concentration. The rationale for selecting industry concentration as the conditioning variable is that skilled fund managers may exhibit superior performance by holding more concentrated portfolios to exploit the informational advantage of focusing on particular sectors. To date, there has been no research on whether portfolio concentration, a specific measure of active management, is related to fund performance.

Using U.S. mutual fund data from 1984-1999, we construct portfolios of funds with different industry concentration levels. We develop our measure, the Divergence Index, to quantify the extent of portfolio concentration in ten broadly defined industries. This index is based on the difference between the industry weights of a mutual fund and the industry weights of the total market portfolio. Our analysis indicates that mutual funds differ substantially in their industry concentration, and that concentrated funds tend to follow distinct investment styles. Managers of more concentrated funds overweigh growth and small stocks, whereas managers of more diversified funds hold portfolios that closely resemble the total market portfolio.

We find that more concentrated funds perform better after adjusting for risk and style differences using the four-factor model of Carhart (1997). Mutual funds with an above median concentration yield an average abnormal return of 1.58 percent per year before deducting expenses and 0.33 percent per year after deducting expenses, whereas mutual funds with below median concentration yield an average abnormal return of 0.36 percent before and -0.77 percent after expenses. We confirm the relation between fund concentration and performance using panel regressions controlling for other fund characteristics. Using the conditional measures of Ferson and Schadt (1996), we establish that the superior performance of concentrated funds is not due to their greater responsiveness to macro-economic conditions.

To investigate the causes of the superior performance of concentrated portfolios, we follow DGTW (1997) and measure the performance of mutual funds based on their portfolio holdings using characteristic-based benchmarks. The results indicate that the superior performance of concentrated mutual funds is primarily due to their superior stock selection ability. Moreover, concentrated funds tend to have better style-timing ability than more diversified funds. We find that concentrated funds are able to select superior stocks even after adjusting for the average industry performance.

Kothari and Warner (2001) show that examining the trades of mutual funds can be a more powerful method to find value in active fund management than examining the holdings. Consistent with Chen, Jegadeesh and Wermers (2000), we find that the stocks purchased by mutual funds tend to significantly outperform the stocks sold. Moreover, we show that the return difference between the buys and the sells of mutual funds increases significantly with the industry concentration. This finding indicates that concentrated mutual funds are more successful in selecting securities than more diversified funds.

The remainder of the paper proceeds as follows. We describe the data in Section I. Sections II and III define the concentration and performance measures, respectively. Section IV documents the empirical results and reports several robustness tests. Section V concludes.

I. Data

The main data set has been created by merging the CRSP Survivorship Bias Free Mutual Fund Database with the CDA/Spectrum holdings database and the CRSP stock price data. The CRSP Mutual Fund Database provides information about fund returns, total net assets, different types of fees, investment objectives, and other fund characteristics. One major constraint imposed on researchers using CRSP is that it does not provide detailed information about fund holdings. We follow Wermers (2000) and merge this data set with the stockholdings database published by CDA Investments Technologies. The CDA database provides stockholdings of virtually all U.S. mutual funds, with no minimum survival requirement for a fund to be included in the database. The data are collected both from reports filed by mutual funds with the SEC and from voluntary reports generated by the funds. We link each reported stock holding to the CRSP stock database in order to find its price and industry classification code. The vast majority of funds have holdings of companies listed on the NYSE, NASDAQ or AMEX stock exchanges. However, there also are funds for which we are not able to identify the price and the industry code of certain holdings. The missing data, however, constitute less than one percent of all holdings. The Appendix provides further details pertaining to the merging process.

Our final sample spans the period of January 1984 to December 1999. We eliminate balanced, bond, index, international, and sector funds, and focus our analysis on actively managed diversified equity funds. In addition, we include funds with multiple share classes only once. We also eliminate all observations where fewer than 11 stock holdings could be identified. Finally, we exclude all fund observations where the size of the fund in the previous quarter does not exceed $1 million. With all the exclusions, our final sample includes 1,771 actively managed diversified equity funds with a minimum of 235 funds in the first quarter of 1984 and a maximum of 1,426 funds in the third quarter of 1998. Panel A of Table I presents summary statistics of the data.

II. Industry Concentration

We define our measure of industry concentration, the Divergence Index, based on the fund holdings. Specifically, we assign every stock held by a mutual fund to one of ten industries. In the Appendix, we present the detailed composition of the industries. The Divergence Index (*DI*) at time t for mutual fund F is defined as the sum of the squared deviations of the value weights for each of the ten different industries held by the mutual fund, $w_{i,t}^{F}$, relative to the industry weights of the total stock market, $w_{i,t}^{M}$.

$$DI_t^F = \sum_{i=1}^{10} \left(w_{i,t}^F - w_{i,t}^M \right)^2 \tag{1}$$

The Divergence Index indicates how much the mutual fund portfolio deviates from the market portfolio. This index is equal to zero if the mutual fund has exactly the same industry composition as the market and increases as the mutual fund becomes more concentrated in a few industries.

This concentration measure is related to the Herfindahl Index, which is commonly used in Industrial Organization (cf. Tirole (1988)) to measure the concentration of companies in an industry.[3] The Divergence Index can be thought of as a market-adjusted Herfindahl Index. In our sample, it has a correlation coefficient of 0.93 with the Herfindahl Index.[4] We choose the Divergence Index for two reasons. First, the industry weights of the total market vary over time. The Divergence Index takes this variation into account by adjusting for the time-varying industry weights in the market portfolio. Second, a mutual fund can have a lower Herfindahl Index than the entire market portfolio if it is more equally invested in the different industries. The Divergence Index is not subject to this problem, because the market portfolio has the lowest possible Divergence Index of zero.

Panel A of Table I documents summary statistics of the Divergence Index and other fund characteristics. The average actively managed mutual fund has a Divergence Index of 5.98 percent. The Divergence Index ranges between 0.01 and 83.42 percent,

---

[3] The Herfindahl Index is defined as $HI_t^F = \sum_{i=1}^{N} \left(w_{i,t}^F \right)^2$.

which demonstrates a significant cross-sectional variation of mutual funds with respect to their concentration level. Concentrated funds may differ substantially from diversified funds in numerous characteristics such as size, age, managerial fees, loads, and turnover. In Panel B of Table I, we examine the correlation between the Divergence Index and funds' attributes. In general, we observe statistically significant correlations between the different characteristics. On average, concentrated funds have higher turnover and higher expenses than diversified funds. On the other hand, concentrated funds are younger and manage fewer assets.

III. Performance Measures

To examine the relation between industry concentration and fund performance, we use both factor-based and holding-based performance measures. In this section, we describe the different measures.

A. Carhart Four-Factor Measure

One of our measures is the Carhart (1997) four-factor model, which adjusts for risk and style. It is especially important to adjust for momentum in stock returns (Jagadeesh and Titman 1993) of our industry concentration portfolios since momentum is stronger at an industry level (Moskowitz and Grinblatt 1999).[5] We estimate the following regression:

---

[4] Using the Herfindahl Index instead of the Divergence Index does not change the qualitative aspects of our results.

[5] Carhart (1997) indicates that performance persistence mainly can be explained by including a momentum factor. Zheng (1999) suggests that the "smart-money" effect is closely related to momentum in stock returns. Nevertheless, our findings remain similar when we use the Fama and French (1993) three-factor model.

$$R_{i,t} - R_{F,t} = \alpha_i + \beta_{i,M}(R_{M,t} - R_{F,t}) + \beta_{i,S}\,SMB_t + \beta_{i,V}\,HML_t + \beta_{i,m}\,MOM_t + e_{i,t}, \qquad (2)$$

where the dependent variable is the quarterly return on portfolio *i* in quarter *t* minus the risk-free rate, and the independent variables are given by the returns of the four zero-investment factor portfolios. $R_{Mt} - R_{Ft}$ is the excess return of the market portfolio over the risk-free rate.[6] *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.[7] The intercept of the model, α_i, is the Carhart measure of abnormal performance.

We also compute the appraisal ratio of Treynor and Black (1973), defined as a ratio of the intercept from the regression equation (2) and the standard deviation of the residuals from the same regression.

B. Ferson-Schadt Conditional Measure

Ferson and Schadt (1996) and Ferson and Warther (1996) argue that the traditional unconditional measures of abnormal performance might be unreliable, because common variation in risk levels and risk premia will be confounded with average performance. They argue that a managed portfolio strategy that can be replicated using readily available public information should not be judged as having superior performance. They advocate a model based on conditional performance, which uses predetermined

[6] 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.
[7] The size, the value, and the momentum factor returns were taken from Kenneth French's Web site: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library

instruments to capture the time-varying factor loadings. Our specification of the conditional model follows Wermers (2003) and includes interaction terms between the excess market returns and various macroeconomic variables:

$$R_{i,t}-R_{F,t}=\alpha_i+\beta_{i,M}(R_{M,t}-R_{F,t})+\beta_{i,S}SMB_t+\beta_{i,V}HML_t+\beta_{i,M}MOM_t+\sum_{j=1}^{4}\beta_{i,j}[z_{j,t-1}(R_{M,t}-R_{F,t})]+e_{i,t} \quad (3)$$

where $z_{j,t-1}$ is the demeaned value of the lagged macro-economic variable j. We consider the following four macro-economic variables: the one-month Treasury bill yield, the dividend yield of the S&P 500 index, the Treasury yield spread (long- minus short-term bonds), and the quality spread in the corporate bond market (low- minus high-grade bonds).[8] The intercept of the model, α_i, is the conditional measure of performance.

C. Grinblatt-Titman Measure (*GT*)

To mitigate a possible model misspecification in the factor regressions, we use an alternative set of measures based on the fund holdings rather than the time-series of fund returns. Grinblatt and Titman (1989) suggest a measure of the overall fund performance that does not rely on traditional benchmarks, such as the Fama-French factors. The *GT* measure compares the current performance of the current portfolio to the current performance of the portfolio held by the fund one year ago and is defined as follows:

$$GT = \sum(w_{j,t-1} - w_{j,t-5})R_{j,t}, \quad (4)$$

[8] Ferson and Schadt (1996) also include an indicator variable for January. We exclude this indicator variable because our data are at a quarterly frequency and because the coefficient on the interaction term between the excess market return and an indicator variable for the first quarter is usually not statistically significantly different from zero.

where $R_{j,t}$ is the return on stock j during period t, and $w_{j,t}$ is the relative weight of stock j in a mutual fund at the end of quarter t.

D. DGTW Measures (*CS*, *CT*, *AS*)

DGTW (1997) decompose the overall return of a fund into a 'Characteristic Selectivity' measure *CS*, a 'Characteristic Timing' measure *CT*, and an 'Average Style' measure *AS*.

To form the benchmark portfolios, we follow DGTW (1997) and group the universe of common stocks listed on the NYSE, AMEX, and NASDAQ into quintiles along the dimensions of size (market value of equity), book-to-market ratio, and momentum (the return of a stock in the previous year). This sorting results in a total of 125 passive portfolios. The returns on each benchmark portfolio are calculated by value-weighting the stocks in the portfolios. DGTW (1997) describe the computation of these benchmarks in more detail.[9]

CS is a measure of stock selection ability and uses as a benchmark the return of a portfolio of stocks that is matched to each of the fund's holdings every quarter along the dimensions of size, book-to-market ratio, and momentum:

$$CS_t = \sum_j w_{j,t-1}[R_{j,t} - BR_t(j, t-1)], \tag{5}$$

where $R_{j,t}$ is the return on stock j during period t, $BR_t(j, t-1)$ is the return on a benchmark portfolio during period t to which stock j was allocated during period $t-1$ according to its size, value, and momentum characteristics, and $w_{j,t-1}$ is the relative weight of stock j at the end of period t–1 in the mutual fund.

CT is a measure of style timing ability and examines whether fund managers can generate additional performance by exploiting time-varying expected returns of the size, book-to-market, or momentum benchmark portfolios:

$$CT_t = \sum_j [w_{j,t-1} BR_t(j, t-1) - w_{j,t-5} BR_t(j, t-5)] \quad (6)$$

where $BR_t(j, t-k)$ is the return on a benchmark portfolio during period t to which stock j was allocated during period $t - k$ according to its size, value, and momentum characteristics, and $w_{j,t}$ is the relative weight of stock j at the end of period t in the mutual fund.

As in DGTW (1997), we use the *AS* measure to capture the returns earned by a fund due to a fund's tendency to hold stocks with certain characteristics. The *AS* measure is defined as:

$$AS_t = \sum [w_{j,t-5} BR_t(j, t-5)]. \quad (7)$$

E. Industry-Adjusted Measures (*IS*, *IT*)

To adjust a fund's performance for industry returns, we develop the industry stock selectivity *IS* and the industry timing *IT* measures. *IS* is a measure of a manager's ability to select superior stocks within industries, while *IT* is a measure of a manager's ability to

---

[9] We benefited from the authors of DGTW (1997) when constructing the holding-based measures. They provided us benchmark-adjusted returns for each stock in their sample (1975-1994), which allow us to validate the accuracy of the DGTW measures for our sample (1984-1999).

select superior industries. *IS* and *IT* are defined in two steps. In the first step, we compute the industry-adjusted performance using the returns of the 48 industries:

$$IS_t = \sum_j w_{j,t\text{-}1}[R_{j,t} - IR_t(j, t-1)] \quad (8)$$

$$IT_t = \sum_j [w_{j,t\text{-}1}\, IR_t(j, t-1) - w_{j,t\text{-}5}\, IR_t(j, t-5)], \quad (9)$$

where $IR_t(j, t-k)$ is the return on an industry portfolio during period t, to which stock j was allocated during period $t-k$. R and w are the same as defined previously. In the second step, we regress the *IS* and *IT* measures on the Carhart four-factor model to obtain industry-adjusted abnormal returns.

IV. Empirical Evidence

In this section, we investigate the relation between industry concentration and fund performance using a portfolio and a regression approach.

A. Portfolio Evidence

At the end of each quarter, we sort all mutual funds into ten portfolios according to their Divergence Index. For each decile portfolio, we compute the equally weighted average return for each quarter. For this estimation, we use the performance information from all funds, even from funds with short return histories, thus mitigating a potential selection bias.

Factor-Based Performance Measures

Table II summarizes the results of the unconditional and conditional four-factor models, as in equations (2) and (3). We examine the factor-adjusted returns before and after subtracting expenses. Looking at the returns before expenses enables us to better evaluate the investment ability of mutual fund managers, since managers with better skills may charge higher expenses to extract rents, as discussed in Berk and Green (2002). On the other hand, the returns after expenses are important for mutual fund investors.

The unconditional abnormal returns before expenses are summarized in the first column. The results indicate that the most diversified fund portfolio generates an abnormal return of 0.09 percent per quarter, which is not significantly different from zero. On the other hand, the most concentrated fund portfolio generates the highest abnormal return of 0.53 percent per quarter, which is significantly different from zero at the ten percent level. The abnormal returns of the five most concentrated portfolios are all positive and significant at the ten percent level while the abnormal returns of the five most diversified portfolios are all not significantly different from zero. The difference in the quarterly abnormal returns between the five most and the five least concentrated deciles equals 0.30 percentage points per quarter. This difference is statistically significant at the five percent level. The magnitude of the performance difference increases further if we compare the top and the bottom quintiles or deciles. The Spearman rank correlation between fund concentration and performance equals 0.87 and is significant at the one percent level.

The second column summarizes the abnormal performance using the conditional four-factor model. The results of the conditional model are generally stronger and more statistically significant than the results using the unconditional model.

The pattern of the returns after expenses is very similar to the one before expenses. The most concentrated fund portfolios tend to have positive abnormal net returns, while the least concentrated portfolios tend to have negative abnormal net returns. The difference in the performance between concentrated and diversified funds declines slightly if we study after-expense returns, because highly concentrated funds charge higher expenses than diversified funds. In particular, the average quarterly expenses range from 0.38 percent for the most concentrated funds to 0.26 percent for the most diversified funds. The after-expense abnormal return of the five most concentrated deciles exceeds that of the five least concentrated deciles by 0.24 percentage points per quarter. A trading strategy going long in the most concentrated portfolios and going short in the most diversified portfolios would have generated these risk-adjusted returns.

The last four columns of Table II summarize the factor loadings of an unconditional four-factor model for our decile portfolios using before-expense returns. In our sample, the coefficient on the market factor does not differ much among the ten portfolios; it varies between 0.93 and 0.99.[10] We observe that diversified funds tend to hold large and value companies, whereas concentrated funds tend to hold small and

[10] The coefficient estimates on the market factor differ substantially if we run a one-factor CAPM regression as opposed to the three- or four-factor Fama-French regression. The market coefficients range between 1.22 for the first decile to 0.92 for the tenth decile for the CAPM. Including the three additional factors completely eliminates the higher market factor loading for the concentrated funds. The concentrated funds have a high market-factor coefficient in the CAPM model because this factor captures the effect from overweighing growth and small stocks, which tend to have more systematic market risk.

growth companies. Concentrated funds exhibit more momentum in their returns than diversified funds.

Holding-Based Performance Measures

The unconditional and conditional four-factor performance measures rely heavily on the regression specification. To mitigate this problem, we use the measures based on the characteristics of stocks held by the mutual funds (equations 4 to 7). This approach, introduced by Grinblatt and Titman (1989) and extended by DGTW (1997), provides a different way to evaluate the performance of mutual funds and sheds light on the causes of their over- or under-performance. Specifically, the DGTW performance measures detect whether mutual fund managers successfully select stocks that outperform the average stock with the same characteristics and whether fund managers successfully time these characteristics.

Table III summarizes the four performance measures according to DGTW (1997) for the divergence decile portfolios. Overall, the average performance during our sample period, 1984-1999, is similar to that reported by DGTW (1997) using data from 1975-1994.[11]

Concentrated mutual funds have significantly higher *GT* measures than diversified funds. The difference in the *GT* measures between the five most concentrated

[11] DGTW compute an annualized average GT measure of 1.91 percent, while our results give an annualized average GT measure of 2.68 percent. Both averages are statistically significantly different from zero at the one percent confidence level. DGTW compute an annualized average CS measure of 0.77 percent, while our results produce an annualized average CS measure of 0.96 percent. Their results are statistically significant at the five percent level, while our results are significant at the ten percent level. The CT measure is neither statistically significant in their paper nor in our paper.

and the five least concentrated deciles equals 0.41 percentage points per quarter and is very similar to the difference of the quarterly before-expense four-factor abnormal returns, which amounts to 0.45 percentage points per quarter. The differences in the *GT* measures increase substantially if we compare more extreme portfolios of mutual funds.

Concentrated mutual funds tend to have higher selectivity measures *CS* and higher timing measures *CT* than diversified mutual funds. The difference in the *CS* measures between the five most and the five least concentrated deciles equals 0.20 percentage points per quarter, while the respective difference in the *CT* measures equals 0.06 percentage points per quarter. These differences are not statistically significant. However, the *CS* and the *CT* measures of the decile portfolios increase almost monotonically with the Divergence Index, which results in highly statistically significant Spearman rank correlations. In summary, the results using the portfolio approach indicate that concentrated funds outperform diversified funds. This finding is consistent with the hypothesis that managers who hold concentrated portfolios are skilled or have informational advantages.[12]

B. Multivariate Regression Evidence

In this section, we further extend our analysis using multivariate regressions. This approach differs from the portfolio approach in three major respects. First, the decile portfolio analysis does not control for mutual fund characteristics that are related to fund

[12] This finding corroborates the evidence in Nanda, Wang and Zheng (2004) that fund families following focused investment strategies across funds perform better than fund families following dispersed investment strategies across funds.

performance. For example, well-diversified mutual funds are, on average, larger than concentrated funds. It might be that smaller funds perform better than larger funds, and that the concentration level matters only because it is correlated with size. A multivariate regression framework controls for these different factors simultaneously. Second, the portfolio approach aggregates mutual funds of similar concentration levels into different groups. Here, we take advantage of the rich panel of individual mutual funds. Third, the previous section determines the abnormal returns in the four-factor model simultaneously with the factor loadings. To take into account possible time variations in the factor loadings of individual funds, we use past data to estimate the four-factor model and determine the abnormal returns during a subsequent period.

We analyze the concentration-performance relation using the unconditional and conditional four-factor and the holding-based performance measures.

Factor-Based Performance Measures

The factor-based measures are calculated in two steps. In the first step, we use three years of past monthly returns to estimate the coefficients of the unconditional and conditional factor models. One limitation of using this approach is that we have to exclude young mutual funds that do not have a sufficiently long history. In the second step, to determine the abnormal return of fund i in quarter t, we subtract the estimated benchmark return from the realized fund return. These two steps are repeated for each period in the sample.[13]

Next, we regress the performance measures of each mutual fund in each quarter on the Divergence Index and other fund characteristics. We lag all explanatory variables by one quarter, except for expenses and turnover, which are lagged by one year due to data availability. Using the lagged explanatory variables mitigates potential endogeneity problems. Moreover, we take the natural logarithms of the age and the size variables, because both variables are skewed to the right. Wermers (2003) shows that flows by mutual fund investors can have an impact on asset prices. To control for the effect of lagged inflows we include the lagged-quarter flows into each mutual fund as an additional explanatory variable.[14] Each regression additionally includes time dummies to capture time effects.

We estimate the regressions with panel-corrected standard errors (PCSE). The PCSE specification adjusts for the contemporaneous correlation and heteroskedasticity among fund returns as well as for the autocorrelation within each fund's returns (Beck and Katz, 1995). We analyze the unbalanced panel, since most mutual funds do not exist over the whole sample period.[15] Table IV summarizes the regression results.

The first column shows the coefficients from the panel regression using the abnormal return based on the unconditional four-factor model as the dependent variable.

[13] Notice that our rolling window for the estimation shifts by three months each quarter. We require three years of return data on mutual funds to estimate the factor loadings. This reduces the sample size by approximately 30 percent.
[14] We calculate quarter flows following Gruber (1996) and Zheng (1999).

The sign and magnitude of the coefficient on the Divergence Index are consistent with our previous analysis using the concentration decile portfolios. Specifically, an increase in the Divergence Index by 5 percentage points (corresponding approximately to the standard deviation of the Divergence Index) increases the quarterly abnormal return of a mutual fund by 13 basis points (= 2.57*5 = 12.85bp), or by approximately 0.52 percentage points on an annual basis. This effect is economically and statistically significant. On average, expenses have a statistically significant negative effect on the abnormal return of the mutual fund. Fund age is negatively related to fund performance, and lagged cash flow is positively related to fund performance.

In the second column of Table IV, we use the conditional abnormal return as a dependent variable. The coefficient on the Divergence Index remains similar and is statistically significant at the one percent level. This result indicates the superior performance of concentrated funds cannot be attributed to their greater responsiveness to macro-economic conditions.

Holding-Based Performance Measures

Columns three through five of Table IV summarize estimation results using holding-based performance measures as dependent variables. The third column indicates that mutual funds with higher concentration tend to have significantly higher *GT* measures even after controlling for other fund characteristics. A one standard deviation increase in

---

[15] We also checked the robustness of our results using the cross-sectional, two-stage approach as in Fama and MacBeth (1973). We do not report the results, because they do not differ qualitatively from the panel regressions.

the Divergence Index increases the quarterly *GT* return of the mutual fund by 25 basis points. This effect is economically and statistically significant.

The fourth and the fifth columns report the relation between the *CS* and *CT* measures and mutual fund characteristics. These results show that mutual funds with a high Divergence Index have better stock selection and better style timing ability. Specifically, a one standard deviation increase in the Divergence Index increases the quarterly *CS* measure by 14.3 basis points, and the *CT* measure by 4.6 basis points. Compared to the previous portfolio results, taking advantage of the rich panel structure of our data set and controlling for other mutual fund characteristics results in a significant relation between mutual fund divergence and characteristic-based performance measures.

Overall, the regression results confirm our earlier evidence using decile portfolios that concentrated funds outperform diversified funds by an economically significant margin during our sample period.

Industry-Adjusted Abnormal Performance

One explanation for the superior performance of concentrated funds is that they select industries with high returns. We test this hypothesis using the previously defined *IS* and *IT* measures (equations 8 and 9). *IS* evaluates the stock-picking ability of the fund within the industries, while *IT* captures the ability of the fund to time superior industries. The first two columns of Table V summarize the results of adjusting the portfolio returns by industry, risk, and style. A one standard deviation increase in the Divergence Index increases the quarterly *IS* measure by 9.1 basis points. Likewise, a one standard deviation increase in the Divergence Index increases the quarterly *IT* measure by 7.2 basis points. Both effects are significant at the one percent level.

The results indicate that concentrated funds outperform diversified funds even after adjusting for the industry performance. Concentrated funds have the ability to select better performing stocks within industries, as indicated by the *IS* measure. Also, concentrated funds are able to select better performing industries, as indicated by the *IT* measure.

Appraisal Ratio

As a portfolio deviates more from the market portfolio, it will be exposed to more idiosyncratic risk. To take into account the different amount of unique risk across our sample of funds, we use as a performance measure a modified appraisal ratio of Treynor and Black (1973). The appraisal ratio is calculated by dividing the abnormal return by the standard deviation of the residuals from a four-factor model. Brown, Goetzmann, and Ross (1995) show that survivorship bias is positively related to fund return variance. Thus, the higher the return volatility, the greater the difference between the ex-post observed mean and the ex-ante expected return. Using the alpha scaled by the idiosyncratic risk as our performance measure mitigates such survivor problems.

The regression results using the appraisal ratio are presented in the third column of Table V. Consistent with our earlier findings, we observe a positive relation between portfolio concentration and fund performance, which is statistically significant at the one percent level. The coefficients on the other variables are similar to those using the alternative dependent variables. Thus, the empirical results suggest the superior performance of concentrated funds is not driven by the amount of idiosyncratic risk, which is related to survival conditions.

Sub-Period Performance

We examine the relation between portfolio concentration and fund performance for two sample periods: 1987-1993 and 1994-1999. There are significant differences in fund characteristics for the two time periods; for example, many new funds were introduced and the average TNA per fund increased substantially during the latter period. The two periods differ also in the overall stock market performance. The average quarterly market return equals 3.4 percent in the first sub-sample and 5.3 percent in the second sub-sample. Thus, it is possible that the concentration-performance relation may differ across the two sub-periods.

The results of this analysis, presented in Table VI, suggest that a similar positive relation between portfolio concentration and fund performance exists in both sample periods. The robustness of the concentration-performance relation to sample periods indicates that this relation is unlikely to be driven by the extraordinarily strong stock market during the late 1990s.

C. Size Portfolios

To further analyze whether the effect of the Divergence Index depends on the size of the mutual funds, we segregate the mutual funds into different size portfolios and compare the performance of concentrated and diversified funds for these various size portfolios.

The distribution of the assets under management by mutual funds is highly skewed to the right. For example, the median mutual fund in our sample has a TNA of \$104 million, while the largest mutual fund (Fidelity Magellan) reached a TNA of \$97,594 million in 1999. According to Berk and Green (2002) there are important diseconomies of scale in money management, which make it difficult for very large funds to outperform passive benchmarks even if fund managers are skilled.

We first sort our funds into size quintiles based on the TNAs at the end of the previous quarter. Subsequently, we sort the mutual funds within each size quintile into two equally-sized groups according to the Divergence Index. Mutual funds in the first quintile manage on average \$10.19 million, while funds in the fifth quintile manage on average \$2,604 million.

Our findings, reported in Table VII, confirm the results in Chen, Hong, Huang, and Kubik (2002) that small mutual funds outperform large funds. Mutual funds in the small size quintile have an abnormal return before expenses of 0.48 percent per quarter using the unconditional four-factor model, while funds in the large size quintile have an abnormal return of 0.16 percent per quarter. This difference in the abnormal performance is statistically significantly different from zero at the five percent level.

Table VII focuses primarily on the effects of the Divergence Index on abnormal performance for the different size quintiles. We observe a positive performance difference between the high and low concentration funds in all size quintiles using the various performance measures. The concentration effect does not differ significantly between the different size quintiles. This indicates that our results are not primarily driven by the smallest mutual funds.

D. Style Portfolios

Funds frequently concentrate their holdings in specific investment styles (value vs. growth, small vs. large capitalization stocks). In this section, we investigate to what extent our concentration results are related to funds' investment styles. We sort our sample of mutual funds into four investment styles based on the characteristics of their stock holdings.

Each stock traded on the major U.S. exchanges is grouped into respective quintiles according to its market value and its book-to-market ratio. Using the quintile information, we compute the value-weighted size score and value score for each mutual fund in each period. For example, a mutual fund that invests only in stocks in the smallest size quintile would have a size score of 1, while a mutual fund that invests only in the largest size quintile would have a size score of 5. We group all mutual funds according to their size scores and value scores into four portfolios. The small-growth portfolio includes mutual funds with below median size scores and below median value scores. Similarly, we define the large-growth, small-value, and large-value portfolios. Subsequently, we subdivide each of these four portfolios according to the Divergence Index. As a result, we obtain eight portfolios of mutual funds according to their style and divergence characteristics.

Table VIII summarizes the different performance measures of these portfolios of mutual funds. The first two columns report the four-factor abnormal returns before subtracting expenses; the other columns report the holding-based DGTW performance measures. Consistent with the findings in DGTW (1997) and Chen, Jegadeesh, and Wermers (2000), we observe that mutual funds investing primarily in small or growth stocks outperform the other mutual funds with respect to all performance measures we use. Mutual funds specializing in large-value stocks tend to perform the worst according to all measures. Mutual funds specializing in small-growth stocks outperform mutual funds specializing in large-value stocks by 0.39 percent per quarter using the unconditional four-factor model. This performance difference is statistically significant at the ten percent level.

Mutual funds with a higher industry concentration tend to generate higher abnormal returns before expenses within style categories, unless they specialize in large-value stocks. The least concentrated 50 percent of small-growth mutual funds have an abnormal return before expenses of 0.18 percent per quarter, while the most concentrated 50 percent have an abnormal return of 0.59 percent per quarter using the unconditional four-factor model. On the other hand, the least concentrated 50 percent of large-value mutual funds have an abnormal return before expenses of 0.06 percent per quarter, while the most concentrated 50 percent have an abnormal return of -0.08 percent per quarter. The effect of the Divergence Index on the abnormal returns and the statistical significance of the return differences increase if we compute conditional instead of unconditional abnormal returns. The results using the holding-based performance measures are consistent with the results using the abnormal four-factor performance.

E. Trade Portfolios

Chen, Jagadeesh, and Wermers (2000) and Kothari and Warner (2001) show that examining trades can be a more powerful method to find value in active fund management than examining holdings. We compute for each mutual fund the average quarterly returns of the stocks purchased and sold during the previous six months. The average returns of the buys and sells of mutual fund *j* at time *t* are computed as follows:

$$R_{j,t}^{Buys} = \frac{\sum_{w_{i,t}^{j} > \tilde{w}_{i,t-1}^{j}} \left(w_{i,t}^{j} - \tilde{w}_{i,t-1}^{j} \right) R_{i,t}}{\sum_{w_{i,t}^{j} > \tilde{w}_{i,t-1}^{j}} \left(w_{i,t}^{j} - \tilde{w}_{i,t-1}^{j} \right)} \tag{10}$$

$$R_{j,t}^{Sells} = \frac{\sum_{w_{i,t}^{j} < \tilde{w}_{i,t-1}^{j}} \left(w_{i,t}^{j} - \tilde{w}_{i,t-1}^{j} \right) R_{i,t}}{\sum_{w_{i,t}^{j} < \tilde{w}_{i,t-1}^{j}} \left(w_{i,t}^{j} - \tilde{w}_{i,t-1}^{j} \right)} \tag{11}$$

The current weight of stock i in mutual fund j is denoted by $w_{i,t}^{j}$ and the return of stock i at time t is denoted by $R_{i,t}$. We adjust for the weight changes that occur due to price changes in buy-and-hold portfolios. Thus, the lagged weight $\tilde{w}_{i,t-1}^{j}$ is defined as follows:

$$\tilde{w}_{i,t-1}^{j} = \frac{w_{i,t-1}^{j}\left(1 + R_{i,t-1}\right)}{\sum_{i} w_{i,t-1}^{j}\left(1 + R_{i,t-1}\right)} \tag{12}$$

We also compute the return difference between stock purchases and liquidations during the previous six months.

$$R_{j,t}^{Buys-Sells} = R_{j,t}^{Buys} - R_{j,t}^{Sells} \tag{13}$$

We use two measures of performance for the trades. The first measure is the raw return and the second measure is the stock selection ability measure *CS* from DGTW (1997), defined as in Section III. For the second measure, we replace the raw returns *R* in equations (10), (11), and (13) with the style-adjusted returns *CS*.

We sort the mutual funds according to their Divergence Index and group them into ten portfolios as in Tables II and III. Table IX summarizes the two performance measures for the portfolios based on stock trades by mutual funds in different divergence deciles. The stocks purchased by mutual funds tend to perform significantly better than the stocks sold by mutual funds. Overall, the stocks purchased have a raw return that exceeds the return of the stocks sold by 1.35 percent per quarter. The difference between the buy and the sell portfolio tends to increase with the Divergence Index. The return difference equals 0.95 percent for the most diversified decile and 2.11 percent for the most concentrated decile. The difference in the differences is both statistically and economically highly significant. The superior performance of the trades of the concentrated funds is due to higher returns of the stocks purchased and lower returns of the stocks sold.

The last three columns of Table IX summarize the return differences for the style-adjusted *CS* measure. These results confirm the results using the raw returns. The trades of concentrated funds create significantly more value than the trades of the diversified funds.

V. Conclusions

Actively managed funds are an important constituent of the financial sector despite the well-documented evidence that, on average, they underperform passive benchmarks. With thousands of funds in the market, one should expect a significant heterogeneity in investment skills across fund managers. In this paper, we examine whether some fund managers create value by concentrating their holdings in certain industries. By deviating from the market portfolio fund managers might signal their informational advantage.

We find that funds with concentrated portfolios perform better than funds with diversified portfolios. This finding is robust to various risk-adjusted performance measures, including the four-factor model of Carhart, the conditional factor model of Ferson and Schadt, and the characteristic-adjusted performance measures of Daniel, Grinblatt, Titman, and Wermers that are based on fund holdings. Analyzing the buy and sell decisions of mutual funds, we find additional evidence that the trades of concentrated portfolios add more value than the trades of diversified portfolios.

In summary, we find some support for the value of active fund management. The empirical evidence suggests that managers of concentrated portfolios tend to be skilled despite the lack of superior performance of mutual funds as a group.

Appendix

A. Matching of the CRSP and the CDA Data Sets

In order to analyze the relation between industry concentration of mutual funds and their style characteristics, one of our main tasks includes the matching of the CDA mutual fund holdings database and the CRSP mutual fund database. We match funds in the CRSP database to the CDA holdings database. Specifically, given that both data sets have different identifying numbers, we need to use different characteristics to perform the merge. A natural common characteristic to be used as a merging variable is the name of the fund. This operation is done manually and very often, to avoid any spurious matches, supported by additional information obtained from the Web sites of particular funds. In cases where matching by name is not conclusive (less than ten percent of the sample), we support our matching with additional information about the TNA and the investment objective of the fund.

At the outset, our matched data set includes 4,253 different funds identified both in the CRSP and the CDA databases, which existed at any time between January 1984 and December 1999.[16] For this sample, we apply another filter, in which we exclude all bond, balanced, money market, index, international, and sector funds. We also eliminate fund observations where the TNA of a fund in the previous quarter is less than $1 million or where fewer than 11 stock holdings are identified. In summary, our final sample includes 1,771 distinct equity funds with complete characteristics of returns, total net

[16] For funds with multiple share classes, we include the dominant class of shares in CRSP.

assets, age, expenses, loads, turnover, portfolio holdings, style objective, and full name in at least one quarter between 1984 and 1999.

B. Industry Composition

Kenneth French lists on his Web page the SIC codes for a 48-industry classification (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library) used in Fama and French (1997). Our analysis aggregates these 48 industries into 10 main industry groups as described in Table AI.

References

Baks, Klaas, Andrew Metrick, and Jessica Wachter, 2001, Should investors avoid all actively managed mutual funds? A study in Bayesian performance evaluation, Journal of Finance 56, 45-85.

Beck, Nathaniel, and Jonathan N. Katz, 1995, What to do (and not to do) with time-series cross-section data, The American Political Science Review 89(3), 634-647.

Berk, Jonathan, and Richard C. Green, 2002, Mutual fund flows and performance in rational markets, NBER Working paper W9275.

Brown, Stephen J. and William N. Goetzmann, 1995, Performance persistence, Journal of Finance 50, 679-698.

Brown, Stephen J., William N. Goetzmann, and Stephen Ross, 1995, Survival, Journal of Finance 50, 853-873.

Carhart, Mark M., 1997, On persistence in mutual fund performance, Journal of Finance 52, 57-82.

Chevalier, Judith, and Glenn Ellison, 1997, Risk taking by mutual funds as a response to incentives, Journal of Political Economy 105, 1167-1200.

Chen, Hsiu-Lang, Narasimhan Jegadeesh, and Russ Wermers, 2000, An examination of the stockholdings and trades of fund managers, Journal of Financial and Quantitative Analysis 35, 343-368.

Chen, Joseph, Harrison Hong, Ming Huang, and Jeffrey Kubik, 2002, Does fund size erode performance? Liquidity, organizational diseconomies and active money management, Working paper.

Cohen, Randolph B., Joshua D. Coval, and Lubos Pastor, 2002, Judging fund managers by the company they keep, NBER Working Paper 9301.

Coval, Joshua D., and Tobias J. Moskowitz, 1999, Home bias at home: Local equity preference in domestic portfolios, Journal of Finance 54, 2045-2074.

Coval, Joshua D., and Tobias J. Moskowitz, 2001, The Geography of Investment: Informed Trading and Asset Prices, Journal of Political Economy 109 (4), 811-841.

Daniel, Kent, Mark Grinblatt, Sheridan Titman, and Russ Wermers, 1997, Measuring mutual fund performance with characteristic-based benchmarks, Journal of Finance 52, 1035-1058.

Del Guercio, Diane, and Paula A. Tkac, 2002, The determinants of the flow of funds of managed portfolios: Mutual funds versus pension funds, Journal of Financial and Quantitative Analysis 37, 523-557.

Elton, Edwin J., Martin J. Gruber, Sanjiv Das, and Matthew Hlavka, 1993, Efficiency with costly information: A reinterpretation of evidence for managed portfolios, Review of Financial Studies 6, 1-22.

Elton, Edwin J., Martin J. Gruber, and Christopher R. Blake, 2001, Incentive fees and mutual funds, Journal of Finance, forthcoming.

Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the return on bonds and stocks, Journal of Financial Economics 33, 3-53.

Fama, Eugene F., and Kenneth R. French, 1997, Industry costs of equity, Journal of Financial Economics 43, 153-193.

Fama, Eugene F., and J. MacBeth, 1973, Risk, return, and equilibrium: Empirical tests, Journal of Political Economy 71, 607-636.

Ferson, Wayne, and Rudi Schadt, 1996, Measuring fund strategy and performance in changing economic conditions, Journal of Finance 51, 425-462.

Ferson, Wayne, and Vincent A. Warther, 1996, Evaluating fund performance in a dynamic market, Financial Analysts Journal 52, 20-28.

Goetzmann, William N., and Nadev Peles, 1997, Cognitive dissonance and mutual fund investors, The Journal of Financial Research 20, 145-158.

Grinblatt, Mark, and Sheridan Titman, 1989, Mutual fund performance: An analysis of quarterly portfolio holdings, Journal of Business 62, 393-416.

Grinblatt, Mark, and Sheridan Titman, 1993, Performance measurement without benchmarks: An examination of mutual fund returns, Journal of Business 66, 47-68.

Grinblatt, Mark, Sheridan Titman, and Russ Wermers, 1995, Momentum investment strategies, portfolio performance, and herding: A study of mutual fund behavior, American Economic Review 85, 1088-1105.

Gruber, Martin J., 1996, Another puzzle: The growth in actively managed mutual funds, Journal of Finance 51, 783-810.

Hendricks, Darryll, Jayendu Patel, and Richard Zeckhauser, 1993, Hot hands in mutual funds: The persistence of performance 1974-1988, Journal of Finance 48, 93-130.

Ippolito, Richard A., 1992, Consumer reaction to measures of poor quality: Evidence from the mutual fund industry, Journal of Law and Economics 35, 45-70.

Jegadeesh, Narasimhan, and Sheridan Titman, 1993, Returns to buying winners and selling losers: Implication for stock market efficiency, Journal of Finance 48, 65-91.

Jensen, Michael C., 1968, The performance of mutual funds in the period 1945-1964, Journal of Finance 23, 389-416.

Kosowski, Robert, Allan Timmermann, Hal White, and Russ Wermers, 2001, Can mutual fund "stars" really pick stocks? New evidence from a bootstrap analysis, Working paper.

Kothari, S.P. and Jerold B. Warner, 2001, Evaluating mutual fund performance, Journal of Finance 56, 1985-2010.

Malkiel, Burton G., 1995, Returns from investing in equity mutual funds 1971-1991, Journal of Finance 50, 549-572.

Moskowitz, Tobias J. and Mark Grinblatt, 1999, Do Industries Explain Momentum? Journal of Finance 54, 1249-1290.

Myers, Mary M., James M. Poterba, Douglas A. Shackelford, and John B. Shoven, 2001, Copycat funds: Information disclosure regulation and the returns to active management in the mutual fund industry, Working paper.

Nanda, Vikram, Zhi Wang, and Lu Zheng, 2004, Family values and the star phenomenon, Review of Financial Studies, forthcoming.

Patel, Jayendu, Richard J. Zeckhauser, and Darryll Hendricks, 1994, Investment flows and performance: Evidence from mutual funds, cross-border investments, and new issues, in Richard Satl, Robert Levitch, and Rama Ramachandran, eds.: Japan, Europe and the International Financial Markets: Analytical and Empirical Perspectives (Cambridge University Press, New York.).

Sirri, Erik, and Peter Tufano, 1998, Costly search and mutual fund flows, Journal of Finance 53, 1589-1622.

Smith, Keith V., 1978, Is fund growth related to fund performance?, Journal of Portfolio Management 4, 49-54.

Spritz, A. E., 1970, Mutual fund performance and cash inflow, Applied Economics 2, 141-145.

Tirole, Jean, 1988. The Theory of Industrial Organization (MIT Press, Cambridge, Mass.).

Treynor, Jack L., and Fisher Black, 1973, How to use security analysis to improve portfolio selection, Journal of Business 46, 66-86.

Wermers, Russ, 1997, Momentum investment strategies of mutual funds, performance persistence, and survivorship bias, Working paper.

Wermers, Russ, 2000, Mutual fund performance: an empirical decomposition into stock-picking talent, style, transaction costs, and expenses, Journal of Finance 55, 1655-1703.

Wermers, Russ, 2003, Is Money Really “Smart”? New Evidence on the Relation Between Mutual Fund Flows, Manager Behavior, and Performance Persistence, Working paper.

Zheng, Lu, 1999, Is money smart? A study of mutual fund investors’ fund selection ability, Journal of Finance 54, 901-933.

Table I: Summary Statistics

Panel A presents the summary statistics of the actively managed equity mutual funds included in the paper. Panel B reports the contemporaneous correlations between the main independent variables used in the paper. The Divergence Index is defined as $DI = \sum(w_{F,i} - w_{M,i})^2$, where $w_{F,i}$ is the weight of the mutual fund holdings in industry *i* and $w_{M,i}$ is the weight of the market in industry *i*.

Panel A: Fund Characteristics

	Mean	Median	Minimum	Maximum
Total Number of Funds	1,771			
Mean Number of Funds per Quarter	689.57	543	235	1,426
Number of Stocks Held by Fund	97.12	65	11	3,439
TNA (Total Net Assets) (in Millions)	623.44	107.18	1.001	97,594
Age (in Years)	14.58	8	1	77
Expenses (in %)	1.26	1.17	0.01	14.54
Turnover (in %)	88.28	64.0	0.04	4263
Total Load (in %)	2.55	0	0	8.98
Quarterly Raw Return (in %)	4.44	4.29	-49.32	130.62
Divergence Index (in %)	5.98	4.36	0.01	83.42

Panel B: Correlation Structure

Variables	Divergence Index	Expenses	Turnover	Age	TNA	Loads
Divergence Index	1.00					
Expenses	0.21***	1.00				
Turnover	0.15***	0.14***	1.00			
Age	-0.08***	-0.19***	-0.07***	1.00		
TNA	-0.06***	-0.15***	-0.03***	0.20***	1.00	
Loads	-0.05***	0.01***	-0.04***	0.17***	0.02***	1.00

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

Table II: Decile Portfolios

This table summarizes abnormal returns and the factor loadings using the Carhart (1997) four-factor model for different portfolios of mutual funds for the period of 1984-1999. Panel A shows the abnormal returns before and after expenses. The first and third columns show the unconditional abnormal returns. The second and fourth columns show the conditional abnormal returns according to Ferson and Schadt (1996), using the lagged level of the one-month Treasury bill yield, the lagged dividend yield of the S&P 500 index, the lagged measure of the slope of the term structure, and the lagged quality spread in the bond market. Panel B shows the factor loadings for the unconditional model using returns before expenses. We divide the sample into deciles based on the lagged Divergence Index, which is defined as $DI = \sum(w_{F,i} - w_{M,i})^2$, where $w_{F,i}$ is the weight of the mutual fund holdings in industry i and $w_{M,i}$ is the weight of the market in industry i. The returns are expressed at a quarterly frequency and the portfolios are rebalanced quarterly. The standard errors of the regressions are given in parentheses. The table includes the differences in the abnormal returns along with their standard errors before and after expenses between the top and the bottom deciles, the top and the bottom quintiles, and the top and the bottom halves of the non-sector mutual funds. Spearman rank correlations have been included together with their respective p-values.

	Abnormal Return (in % per quarter)				Factor Loadings			
	Before Expenses		After Expenses		Before Expenses Unconditional Model			
	Unconditional	Conditional	Unconditional	Conditional	Market	Size	Value	Momentum
All Funds	0.24***	0.21**	-0.07	-0.11	0.96***	0.28***	-0.09***	0.03**
	(0.09)	(0.09)	(0.09)	(0.09)	(0.01)	(0.02)	(0.02)	(0.01)
1	0.09	0.01	-0.17*	-0.25**	0.97***	-0.07***	0.01	0.00
Diversified	(0.10)	(0.10)	(0.10)	(0.10)	(0.01)	(0.02)	(0.02)	(0.02)
2	0.08	0.03	-0.19*	-0.24**	0.96***	0.03	0.01	-0.01
	(0.11)	(0.12)	(0.11)	(0.12)	(0.01)	(0.02)	(0.02)	(0.02)
3	0.10	0.07	-0.18	-0.22*	0.96***	0.13***	0.01	0.00
	(0.11)	(0.12)	(0.11)	(0.12)	(0.01)	(0.02)	(0.02)	(0.02)
4	0.08	-0.03	-0.21	-0.32*	0.97***	0.21***	0.02	0.02
	(0.17)	(0.17)	(0.17)	(0.17)	(0.02)	(0.03)	(0.03)	(0.03)
5	0.10	0.02	-0.21	-0.30*	0.97***	0.24***	-0.00	-0.01
	(0.17)	(0.17)	(0.17)	(0.17)	(0.02)	(0.03)	(0.03)	(0.02)
6	0.33*	0.29	0.16	-0.03	0.97***	0.31***	-0.02	0.02
	(0.18)	(0.19)	(0.18)	(0.19)	(0.02)	(0.03)	(0.03)	(0.03)
7	0.44**	0.37*	0.11	0.04	0.96***	0.38***	-0.07**	0.03
	(0.19)	(0.20)	(0.19)	(0.20)	(0.02)	(0.04)	(0.04)	(0.03)
8	0.26*	0.30*	-0.08	-0.04	0.97***	0.49***	-0.16***	0.05**
	(0.16)	(0.16)	(0.16)	(0.16)	(0.02)	(0.03)	(0.03)	(0.02)
9	0.42**	0.41**	0.07	0.07	0.99***	0.49***	-0.25***	0.07**
	(0.18)	(0.20)	(0.18)	(0.20)	(0.02)	(0.04)	(0.03)	(0.03)
10	0.53*	0.59**	0.15	0.22	0.93***	0.64***	-0.47***	0.12***
Concentrated	(0.29)	(0.30)	(0.29)	(0.30)	(0.04)	(0.05)	(0.05)	(0.04)
2nd Half –	0.30**	0.37***	0.24*	0.32**	-0.00	0.35***	-0.20***	0.06***
1st Half	(0.14)	(0.14)	(0.14)	(0.14)	(0.02)	(0.03)	(0.03)	(0.02)
5th Quintile –	0.39**	0.48**	0.29	0.39*	-0.01	0.58***	-0.37***	0.10***
1st Quintile	(0.20)	(0.21)	(0.20)	(0.21)	(0.03)	(0.04)	(0.04)	(0.03)
10th Decile –	0.44	0.58*	0.32	0.47	-0.04	0.70***	-0.48***	0.12**
1st Decile	(0.30)	(0.32)	(0.30)	(0.32)	(0.04)	(0.06)	(0.06)	(0.05)
Spearman	0.87***	0.85***	0.71**	0.78***	-0.04	0.99***	-0.92***	0.82***
Rank Correl.	(0.00)	(0.00)	(0.02)	(0.01)	(0.91)	(0.00)	(0.00)	(0.00)

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

Table III: Holding-Based Performance

This table summarizes holding-based performance measures according to DGTW (1997) for different portfolios of mutual funds for the period of 1984-1999. We divide the sample into deciles based on the lagged Divergence Index, which is defined as $DI = \sum(w_{F,i} - w_{M,i})^2$, where $w_{F,i}$ is the weight of the mutual fund holdings in industry i and $w_{M,i}$ is the weight of the market in industry i. The returns are expressed at a quarterly frequency and the portfolios are rebalanced quarterly. *GT* is the benchmark-free performance measure suggested by Grinblatt and Titman (1989) and is defined as $GT = \sum(w_{j,t-1} - w_{j,t-5})R_{j,t}$, where $w_{j,t-1}$ is the weight of the mutual fund in stock j at the end of the quarter $t-1$ and $R_{j,t}$ is the return of stock j during quarter t. *CS*, *CT*, and *AS* are characteristic-based performance measures. *CS* is a measure of stock selection ability and is defined as $CS = \sum w_{j,t-1}[R_{j,t} - BR_t(j, t-1)]$, where $BR_t(j, t-1)$ is the return of a benchmark portfolio during period t to which stock j was allocated during period $t-1$ according to its size, value, and momentum characteristics. *CT* is a measure of the style-timing ability and is defined as $CT = \sum[w_{j,t-1} BR_t(j, t-1) - w_{j,t-5}BR_t(j, t-5)]$ and *AS* is a measure of the style-selection ability and is defined as $AS = \sum[w_{j,t-5}BR_t(j, t-5)]$. The standard errors of the regressions are given in parentheses. The table includes the differences in the abnormal returns along with their standard errors between the top and the bottom deciles, the top and the bottom quintiles, and the top and the bottom halves of the mutual funds. Spearman rank correlations have been included together with their respective p-values.

Deciles	Holding-Based Performance (in % per quarter)			
	GT	*CS*	*CT*	*AS*
All Funds	0.67***	0.24*	0.08	4.26***
	(0.24)	(0.13)	(0.06)	(1.12)
1 Diversified	0.39**	0.13	0.03	4.48***
	(0.15)	(0.12)	(0.08)	(1.03)
2	0.46**	0.14	0.04	4.36***
	(0.18)	(0.11)	(0.07)	(1.04)
3	0.40**	0.13	0.04	4.31***
	(0.18)	(0.11)	(0.06)	(1.07)
4	0.59***	0.16	0.08	4.23***
	(0.19)	(0.12)	(0.06)	(1.08)
5	0.47**	0.14	0.06	4.20***
	(0.21)	(0.12)	(0.06)	(1.09)
6	0.55***	0.24*	0.05	4.26***
	(0.21)	(0.13)	(0.06)	(1.12)
7	0.70***	0.33**	0.09	4.17***
	(0.23)	(0.17)	(0.06)	(1.14)
8	0.95***	0.21	0.11	4.17***
	(0.34)	(0.20)	(0.08)	(1.18)
9	1.00***	0.40*	0.15*	4.17***
	(0.35)	(0.24)	(0.09)	(1.20)
10 Concentrated	1.15**	0.53	0.13	4.22***
	(0.45)	(0.33)	(0.10)	(1.27)
2nd Half –	0.41***	0.20	0.06	-0.12
1st Half	(0.15)	(0.15)	(0.05)	(0.20)
5th Quintile –	0.64**	0.33	0.11	-0.23
1st Quintile	(0.27)	(0.28)	(0.08)	(0.34)
10th Decile –	0.75**	0.40	0.11	-0.26
1st Decile	(0.33)	(0.34)	(0.11)	(0.41)
Spearman Rank	0.95***	0.88***	0.93***	-0.82***
Correlation	(0.00)	(0.00)	(0.00)	(0.00)

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

Table IV: Regression Evidence

This table reports the coefficients of the quarterly panel and cross-sectional regression of the general form: $PERF_{i,t} = \beta_0 + \beta_1*DI_{i,t-1} + \beta_2*LTNA_{i,t-1} + \beta_3*EXP_{i,t-1} + \beta_4*LAGE_{i,t-1} + \beta_5*TU_{i,t-1} + \beta_6*NMG_{i,t-1} + \varepsilon_{i,t}$. The sample includes actively managed equity mutual funds and spans the period of 1984-1999 (including the data used for calculating the abnormal returns). *PERF* measures the quarterly performance using the four-factor model of Carhart (1997) based on 36 months of lagged data, the conditional performance according to Ferson and Schadt (1996), the holding-based performance using the DGTW (1997) measures. *GT* is the Grinblatt-Titman (1989) measure, *CS* is the stock selectivity measure, and *CT* is the characteristic timing measure. The style-adjusted performance uses the returns of 125 benchmark portfolios, which were created according to the market capitalization, book-to-market, and momentum characteristics of a stock. *DI*, lagged one quarter, denotes the Divergence Index and is defined as $DI = \sum(w_{F,i} - w_{M,i})^2$, where $w_{F,i}$ is the weight of the mutual fund holdings in industry *i* and $w_{M,i}$ is the weight of the market in industry *i*; *EXP* denotes expenses lagged one year; *TU* is the turnover lagged one year; *LAGE* is the natural logarithm of age lagged one quarter; and *LTNA* is the natural logarithm of total net assets lagged one quarter; and *NMG* is the new money growth lagged one quarter. All regressions include time dummies. Panel-corrected standard errors for panel regressions have been provided in parentheses.

	Dependent Variable: Quarterly Performance (in bp)				
	Four-Factor Abnormal Return		Benchmark-Free Performance	Style-Adjusted Performance	
	Unconditional	Conditional	*GT*	*CS*	*CT*
DI	2.57***	2.82***	5.46***	2.94***	0.94***
(in %)	(0.62)	(0.77)	(0.66)	(0.56)	(0.23)
EXP	-40.16***	-46.07***	-6.03	-2.15	2.61
(in %)	(6.84)	(10.26)	(7.20)	(5.70)	(2.48)
TU	0.04	0.07	0.35***	0.18***	0.06***
(in %)	(0.05)	(0.06)	(0.06)	(0.04)	(0.02)
LAGE	-12.37***	-20.10***	-8.38**	1.71	-1.66
	(3.21)	(4.18)	(3.44)	(2.70)	(1.34)
LTNA	-1.16	-1.65	3.73*	2.15	0.16
	(1.64)	(2.09)	(1.97)	(1.53)	(0.74)
NMG	0.16	0.16	0.34*	0.28**	0.20***
	(0.18)	(0.23)	(0.18)	(0.13)	(0.07)
No. of obs.	30,645	30,645	36,325	42,659	36,325

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

Table V: Alternative Risk Adjustments

This table reports the coefficients of the quarterly panel and cross-sectional regression of the general form: $PERF_{i,t} = \beta_0 + \beta_1*DI_{i,t-1} + \beta_2*LTNA_{i,t-1} + \beta_3*EXP_{i,t-1} + \beta_4*LAGE_{i,t-1} + \beta_5*TU_{i,t-1} + \beta_6*NMG_{i,t-1} + \varepsilon_{i,t}$. The sample includes actively managed equity mutual funds and spans the period of 1984-1999 (including the data used for calculating the abnormal returns). *PERF* equals the industry-adjusted stock selectivity measure (*IS*), the industry-adjusted timing measure (*IT*), of the appraisal ratio of Treynor and Black (1973) based on the four-factor model. *DI*, lagged one quarter, denotes the Divergence Index and is defined as $DI = \sum(w_{F,i} - w_{M,i})^2$, where $w_{F,i}$ is the weight of the mutual fund holdings in industry *i* and $w_{M,i}$ is the weight of the market in industry *i*; *EXP* denotes expenses lagged one year; *TU* is the turnover lagged one year; *LAGE* is the natural logarithm of age lagged one quarter; *LTNA* is the natural logarithm of total net assets lagged one quarter; and *NMG* is the new money growth lagged one quarter. All regressions include time dummies. Panel-corrected standard errors for panel regressions have been provided in parentheses.

	Dependent Variable: Quarterly Performance (in bp)		
	Industry-Adjusted Abnormal Performance		Appraisal Ratio
	IS	IT	Four-factor
DI	1.89***	1.46***	0.65***
(in %)	(0.47)	(0.19)	(0.09)
EXP	7.32	3.24	-6.58***
(in %)	(5.98)	(2.78)	(0.95)
TU	0.10***	0.12***	0.01**
(in %)	(0.03)	(0.02)	(0.01)
LAGE	-1.51	-8.72***	-2.54***
	(2.32)	(1.15)	(0.72)
LTNA	9.91***	2.00***	-0.43
	(1.38)	(0.62)	(0.35)
NMG	0.23**	0.13**	0.91
	(0.11)	(0.06)	(3.49)
Obs.	37,177	33,025	30,645

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

Table VI: Sub-Period Evidence

This table reports the coefficients of the quarterly panel regression of the general form: $PERF_{i,t} = \beta_0 + \beta_1{*}DI_{i,t\text{-}1} + \beta_2{*}LTNA_{i,t\text{-}1} + \beta_3{*}EXP_{i,t\text{-}1} + \beta_4{*}LAGE_{i,t\text{-}1} + \beta_5{*}TU_{i,t\text{-}1} + \beta_6{*}NMG_{i,t\text{-}1} + \varepsilon_{i,t}$. The sample includes actively managed equity mutual funds and spans the period of 1987-1993 (left panel) and 1994-1999 (right panel). *PERF* measures the quarterly abnormal performance using the four-factor model of Carhart (1997) based on 36 months of lagged data; *DI*, lagged one quarter, denotes the Divergence Index and is defined as $DI = \sum(w_{F,i} - w_{M,i})^2$, where $w_{F,i}$ is the weight of the mutual fund holdings in industry *i* and $w_{M,i}$ is the weight of the market in industry *i*; *EXP* denotes expenses lagged one year; *TU* is the turnover lagged one year; *LAGE* is the natural logarithm of age lagged one quarter; *LTNA* is the natural logarithm of total net assets lagged one quarter; and *NMG* is the new money growth lagged one quarter. Panel-corrected standard errors have been provided in parentheses.

	Dependent Variable: Quarterly Abnormal Returns (in bp) Four-Factor Model	
	1987-1993	1994-1999
DI	2.44***	2.85***
(in %)	(0.85)	(0.88)
EXP	-30.61***	-45.59***
(in %)	(8.03)	(11.18)
TU	-0.01	0.08
(in %)	(0.05)	(0.07)
LAGE	-12.40***	-11.74***
	(4.43)	(4.40)
LTNA	4.39*	-3.44
	(2.61)	(2.12)
NMG	0.04	0.21
	(0.32)	(0.23)
Observations	10,948	19,697

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

Table VII: Mutual Fund Size Portfolios

Mutual funds are sorted at the beginning of each period into five equally-sized portfolios according to the lagged TNA of the mutual funds. The mutual funds in each of these four portfolios are further divided into two groups according to the lagged Divergence Index. The Divergence Index is defined as $DI = \sum(w_{F,i} - w_{M,i})^2$, where $w_{F,i}$ is the weight of the mutual fund holdings in industry *i* and $w_{M,i}$ is the weight of the market in industry *i*. The returns are expressed at a quarterly frequency and the portfolios are rebalanced quarterly. The abnormal returns before expenses using the Carhart (1997) four-factor model are summarized for different portfolios of mutual funds for the period of 1984-1999. *GT* is the benchmark-free performance measure suggested by Grinblatt and Titman (1989) and is defined as $GT = \sum(w_{j,t-1} - w_{j,t-5})R_{j,t}$, where $w_{j,t-1}$ is the weight of the mutual fund in stock *j* at the end of the quarter $t - 1$ and $R_{j,t}$ is the return of stock *j* during quarter *t*. *CS* and *CT* are characteristic-based performance measures according to DGTW (1997). *CS* is a measure of stock selection ability and is defined as $CS = \sum w_{j,t-1}[R_{j,t} - BR_t(j, t - 1)]$, where $BR_t(j, t - 1)$ is the return of a benchmark portfolio during period *t* to which stock *j* was allocated during period $t - 1$ according to its size, value, and momentum characteristics. *CT* is a measure of the style-timing ability and is defined as $CT = \sum[w_{j,t-1} BR_t(j, t - 1) - w_{j,t-5}BR_t(j, t - 5)]$. The standard errors of the regressions are given in parentheses.

Size Quintiles	*DI*	Four Factor Abnormal Return: Unconditional	Four Factor Abnormal Return: Conditional	Holding-Based Performance Measures: *GT*	Holding-Based Performance Measures: *CS*	Holding-Based Performance Measures: *CT*
Quintile 1	Low	0.36**	0.28*	0.31*	0.19*	0.08
		(0.15)	(0.15)	(0.19)	(0.11)	(0.07)
	High	0.60***	0.56***	0.74**	0.26	0.12
		(0.19)	(0.20)	(0.31)	(0.20)	(0.10)
Mean TNA:	*High –*	*0.24*	*0.28*	*0.42***	*0.07*	*0.04*
$10.19 M	*Low*	*(0.20)*	*(0.20)*	*(0.18)*	*(0.15)*	*(0.08)*
Quintile 2	Low	0.08	0.00	0.53***	0.13	0.08
		(0.16)	(0.17)	(0.18)	(0.11)	(0.07)
	High	0.38**	0.41***	0.93***	0.43**	0.14*
		(0.15)	(0.15)	(0.32)	(0.17)	(0.08)
Mean TNA:	*High –*	*0.30***	*0.40****	*0.41***	*0.30***	*0.05*
$42.03 M	*Low*	*(0.15)*	*(0.15)*	*(0.17)*	*(0.15)*	*(0.06)*
Quintile 3	Low	0.07	-0.04	0.46**	0.10	0.01
		(0.14)	(0.14)	(0.17)	(0.11)	(0.06)
	High	0.27	0.27	1.06***	0.28	0.09
		(0.19)	(0.20)	(0.33)	(0.23)	(0.06)
Mean TNA:	*High –*	*0.20*	*0.31**	*0.60****	*0.18*	*0.07*
$109.11 M	*Low*	*(0.19)*	*(0.20)*	*(0.18)*	*(0.20)*	*(0.05)*
Quintile 4	Low	0.02	-0.05	0.55***	0.14	0.03
		(0.14)	(0.10)	(0.18)	(0.11)	(0.08)
	High	0.34*	0.31	0.95***	0.38*	0.08
		(0.20)	(0.21)	(0.30)	(0.20)	(0.07)
Mean TNA:	*High –*	*0.33**	*0.35**	*0.39***	*0.24*	*0.05*
$302.37 M	*Low*	*(0.17)*	*(0.18)*	*(0.15)*	*(0.17)*	*(0.06)*
Quintile 5	Low	0.07	0.05	0.42**	0.16	0.05
		(0.10)	(0.10)	(0.18)	(0.12)	(0.07)
	High	0.24	0.28	0.70**	0.27	0.10
		(0.18)	(0.19)	(0.30)	(0.21)	(0.07)
Mean TNA:	*High –*	*0.18*	*0.23*	*0.28***	*0.11*	*0.05*
$2,604.22 M	*Low*	*(0.15)*	*(0.15)*	*(0.14)*	*(0.16)*	*(0.06)*

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

Table VIII: Style Portfolios

Mutual funds are sorted at the beginning of each period into four portfolios according to the lagged market values (small vs. large cap) and the lagged book-to-market ratios (growth vs. value) of their holdings. The mutual funds in each of these four portfolios are further divided into two groups according to the lagged Divergence Index. The Divergence Index is defined as $DI = \sum(w_{F,i} - w_{M,i})^2$, where $w_{F,i}$ is the weight of the mutual fund holdings in industry i and $w_{M,i}$ is the weight of the market in industry i. The returns are expressed at a quarterly frequency and the portfolios are rebalanced quarterly. The abnormal returns before expenses using the Carhart (1997) four-factor model are summarized for different portfolios of mutual funds for the period of 1984-1999. *GT* is the benchmark-free performance measure suggested by Grinblatt and Titman (1989) and is defined as $GT = \sum(w_{j,t-1} - w_{j,t-5})R_{j,t}$, where $w_{j,t-1}$ is the weight of the mutual fund in stock j at the end of the quarter $t - 1$ and $R_{j,t}$ is the return of stock j during quarter t. *CS* and *CT* are characteristic-based performance measures according to DGTW (1997). *CS* is a measure of stock selection ability and is defined as $CS = \sum w_{j,t-1}[R_{j,t} - BR_t(j, t-1)]$, where $BR_t(j, t-1)$ is the return of a benchmark portfolio during period t to which stock j was allocated during period $t - 1$ according to its size, value, and momentum characteristics. *CT* is a measure of the style-timing ability and is defined as $CT = \sum[w_{j,t-1} BR_t(j, t-1) - w_{j,t-5} BR_t(j, t-5)]$. The standard errors of the regressions are given in parentheses.

Style	Divergence Index	Four Factor Abnormal Return: Unconditional	Four Factor Abnormal Return: Conditional	Holding-Based Performance Measures: *GT*	*CS*	*CT*
Small Growth	Low	0.18	0.02	0.79***	0.21	0.08
		(0.21)	(0.20)	(0.28)	(0.16)	(0.08)
	High	0.59**	0.72**	1.43***	0.62*	0.19
		(0.28)	(0.29)	(0.54)	(0.37)	(0.14)
	High – Low	*0.40*	*0.70***	*0.64***	*0.41*	*0.11*
		(0.33)	*(0.31)*	*(0.32)*	*(0.28)*	*(0.11)*
Small Value	Low	0.06	0.04	0.50***	0.09	0.03
		(0.20)	(0.22)	(0.17)	(0.13)	(0.05)
	High	0.41**	0.41*	0.55***	0.14	0.08
		(0.20)	(0.21)	(0.20)	(0.17)	(0.05)
	High – Low	*0.35***	*0.37***	*0.05*	*0.05*	*0.05*
		(0.15)	*(0.15)*	*(0.10)*	*(0.11)*	*(0.04)*
Large Growth	Low	0.12	-0.01	0.56***	0.18	0.08
		(0.14)	(0.13)	(0.21)	(0.13)	(0.09)
	High	0.41**	0.39*	0.87**	0.41*	0.16
		(0.20)	(0.20)	(0.38)	(0.24)	(0.10)
	High – Low	*0.29*	*0.41***	*0.32*	*0.24*	*0.07*
		(0.21)	*(0.20)*	*(0.20)*	*(0.20)*	*(0.06)*
Large Value	Low	0.06	0.01	0.21*	0.09	0.01
		(0.17)	(0.18)	(0.12)	(0.13)	(0.09)
	High	-0.08	-0.14	0.24	0.06	-0.02
		(0.20)	(0.21)	(0.16)	(0.16)	(0.09)
	High – Low	*-0.14*	*-0.15*	*0.03*	*-0.03*	*-0.03*
		(0.12)	*(0.12)*	*(0.10)*	*(0.09)*	*(0.05)*

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

Table IX: Trade Portfolios

This table summarizes the returns of the stocks purchased and sold by different portfolios of mutual funds for the period of 1984-1999. We divide the sample into deciles based on the lagged Divergence Index, which is defined as $DI = \sum(w_{F,i} - w_{M,i})^2$, where $w_{F,i}$ is the weight of the mutual fund holdings in industry i and $w_{M,i}$ is the weight of the market in industry i. The returns are expressed at a quarterly frequency and the portfolios are rebalanced quarterly. For each mutual fund we compute the raw returns and style-adjusted returns of their stock purchases and sells. The style adjusted return is a measure of stock selection ability and is defined as $CS = \sum w_{j,t\text{-}1}[R_{j,t} - BR_t(j, t-1)]$, where $BR_t(j, t-1)$ is the return of a benchmark portfolio during period t to which stock j was allocated during period $t-1$ according to its size, value, and momentum characteristics. The table includes the differences in the returns along with their standard errors between the top and the bottom deciles, the top and the bottom quintiles, and the top and the bottom halves of the mutual funds. Spearman rank correlations have been included together with their respective p-values.

	Raw Returns			CS-Measure		
	Buys	Sells	Buys - Sells	Buys	Sells	Buys - Sells
All	5.01***	3.66***	*1.35****	0.57***	-0.50*	*1.06****
Funds	(1.31)	(1.22)	*(0.42)*	(0.22)	(0.29)	*(0.31)*
1	4.96***	4.01***	*0.95***	0.33**	-0.28	*0.61***
Diversified	(1.12)	(1.09)	*(0.40)*	(0.16)	(0.26)	*(0.28)*
2	4.99***	3.91***	*1.08****	0.45***	-0.26	*0.71***
	(1.18)	(1.09)	*(0.41)*	(0.16)	(0.25)	*(0.28)*
3	4.81***	3.68***	*1.13****	0.39**	-0.52*	*0.92****
	(1.19)	(1.16)	*(0.37)*	(0.16)	(0.27)	*(0.28)*
4	4.93***	3.70***	*1.24****	0.50***	-0.46	*0.97****
	(1.24)	(1.19)	*(0.39)*	(0.18)	(0.29)	*(0.30)*
5	4.79***	3.61***	*1.17****	0.41**	-0.52	*0.93****
	(1.26)	(1.20)	*(0.41)*	(0.19)	(0.31)	*(0.35)*
6	4.86***	3.73***	*1.13***	0.45**	-0.43	*0.88****
	(1.30)	(1.24)	*(0.36)*	(0.20)	(0.32)	*(0.29)*
7	4.91***	3.50***	*1.40****	0.54**	-0.62*	*1.16****
	(1.34)	(1.25)	*(0.41)*	(0.23)	(0.33)	*(0.33)*
8	5.00***	3.36**	*1.64****	0.61*	-0.72*	*1.32****
	(1.46)	(1.32)	*(0.50)*	(0.34)	(0.38)	*(0.39)*
9	5.20***	3.53***	*1.66****	0.76**	-0.60	*1.35****
	(1.51)	(1.33)	*(0.52)*	(0.37)	(0.39)	*(0.38)*
10	5.69***	3.57**	*2.11****	1.28**	-0.55	*1.82****
Concentrated	(1.68)	(1.47)	*(0.62)*	(0.52)	(0.48)	*(0.49)*
2nd Half –	0.23	-0.24	*0.48****	0.31	-0.17	*0.48****
1st Half	(0.37)	(0.30)	*(0.17)*	(0.22)	(0.23)	*(0.17)*
5th Quintile –	0.46	-0.41	*0.87****	0.62	-0.31	*0.93****
1st Quintile	(0.64)	(0.52)	*(0.30)*	(0.40)	(0.39)	*(0.29)*
10th Decile –	0.72	-0.44	*1.16****	0.94*	-0.27	*1.21****
1st Decile	(0.81)	(0.64)	*(0.40)*	(0.52)	(0.48)	*(0.39)*
Spearman Rank	0.48	-0.81***	*0.94****	0.89***	-0.78***	*0.95****
Correlation	(0.16)	(0.00)	*(0.00)*	(0.00)	(0.01)	*(0.00)*

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

Table AI: Industry Classification

10-Industry Classification	Weight (in %)	48-Industry French Classification	Weight (in %)
1. Consumer Non-Durables	10.08	1. Agriculture	0.10
		2. Food Products	2.48
		3. Candy and Soda	1.93
		4. Beer and Liquor	0.46
		5. Tobacco Products	1.75
		7. Entertainment	0.81
		8. Printing and Publishing	1.57
		10. Apparel	0.48
		16. Textiles	0.20
		33. Personal Services	0.30
2. Consumer Durables	8.74	6. Toys	0.55
		9. Consumer Goods	5.46
		23. Automobiles and Trucks	2.73
3. Healthcare	7.81	11. Healthcare	0.90
		12. Medical Equipment	1.39
		13. Pharmaceutical Products	5.52
4. Manufacturing	15.24	14. Chemicals	2.99
		15. Rubber and Plastic Products	0.25
		17. Construction Materials	1.75
		18. Construction	0.27
		19. Steel Works	1.03
		20. Fabricated Products	0.10
		21. Machinery	1.62
		22. Electrical Equipment	1.23
		24. Aircraft	1.07
		25. Shipbuilding and Railroad Equip.	0.12
		26. Defense	0.27
		38. Business Supplies	1.45
		39. Shipping Containers	0.89
		40. Transportation	1.40
		48. Miscellaneous	0.78
5. Energy	7.78	27. Precious Metals	0.25
		28. Mining	0.32
		29. Coal	0.06
		30. Oil	7.15
6. Utilities	6.67	31. Utilities	6.67
7. Telecom	5.42	32. Communications	5.42
8. Business Equipment and Services	11.92	34. Business Services	4.09
		35. Computers	4.48
		36. Electronic Equipment	2.47
		37. Measuring and Control Equip.	0.88
9. Wholesale and Retail	8.30	41. Wholesale	1.61
		42. Retail	5.40
		43. Restaurants, Hotels, and Motels	1.28
10. Finance	18.04	44. Banking	3.66
		45. Insurance	3.09
		46. Real Estate	0.23
		47. Trading	11.05