

Active Equity Managers in the U.S.: *Do the Best Follow Momentum Strategies?*

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There is an extensive literature on predicting stock returns on the basis of past performance. De Bondt and Thaler [1985, 1987] argue that portfolios of prior losers perform better than portfolios of winners over the next three to five years, in an analysis of New York Stock Exchange common stocks over 1926–1982. Lehmann [1990] illustrates short-term return reversals of winner and loser stocks even after taking bid-ask spreads and transaction costs into account.

Jegadeesh and Titman [1993] report the momentum of stock returns over an intermediate term (3 to 12 months). They construct *relative-strength* portfolios, or zero-investment portfolios formed by buying winners and selling losers defined in terms of their returns over the past one to four quarters and varying holding periods from one to four quarters. They show that these portfolios yield positive returns from 1965 to 1989. Jegadeesh [1990] also shows stock return reversion for relatively short periods. He demonstrates significantly negative first-order serial correlation in monthly stock return data over 1929–1982.

Many other authors document that money managers can take advantage of a momentum effect. For example, Grinblatt, Titman, and Wermers [1995] report that almost three-quarters of equity funds track momentum. Carhart [1997] argues that a one-year momentum effect explains the “hot hands” effect of mutual funds, while individual funds that follow momentum

strategies do not turn in superior performance. Badrinath and Wahal [2002] suggest that institutional money managers act as momentum traders when they buy stocks. Nofsinger and Sias [1999]; Sias, Starks, and Titman [2001]; Sapp and Tiwari [2004], and Sias [2004] document similar results.

Yet most previous research focuses on exploring the behavioral characteristics of active funds, rather than providing actual equity selection rules that can generate performance similar to the funds.

Our primary purpose is to reveal an investment strategy that can replicate the performance patterns of so-called good active funds, besides investigating the relation of the active funds and the momentum strategy.

We focus mainly on identifying trading strategies that institutional money managers adopt in selecting equities and that thus can be used as the hedging vehicle for active funds. Active managers consistently use momentum selection rules at the industry level, especially in growth and core domains. The similarity between an industry-level momentum strategy and actively managed funds strengthens as time passes, and funds that perform well tend to be more strongly similar. We also find that individual funds can benefit by following a momentum strategy.

To see this, we construct a variant of the relative-strength portfolio at the industry level and compare its return pattern to active fund

return patterns. We focus on industry-level data because they can capture fund managers' efforts with regard to diversification better than a stock-level momentum strategy, which tends to be volatile and thus represent a poor choice for managers. While an industry-level momentum strategy can take advantage of the profitability of the momentum effect, it is less volatile than stock-level strategies; a diversification effect embedded within each industry makes it a good candidate for portfolio construction rules for active funds.

An industry-level momentum strategy moreover yields more robust performance. While stock-level momentum is highly affected by idiosyncratic factors, industry-level momentum is driven mainly by common economic factors. This makes it robust to parameters such as evaluation periods or holding periods. For evaluation purposes, we use long-only momentum strategies.

DATA AND INDUSTRY-LEVEL MOMENTUM PORTFOLIOS

We collect for empirical analysis monthly returns of active managed funds from the eVestment database. The sample period is 20 years long, from 1987 through 2006. Each fund of the 2,546 in the data set is classified into one of 12 styles—large, mid, mid-small, or small-cap, with growth, and value breakouts. Fund managers in a specific style are asked to outperform the benchmark index while constructing their portfolio using only stocks within or similar to the index. Exhibit 1 shows the fund styles and the benchmark indexes.

EXHIBIT 1 Style Classification, Benchmark Indexes, and Number of Funds

Style	Benchmark Index	Number of Funds
Large Core (LC)	Russell 1000	374
Large Growth (LG)	Russell 1000 Growth	443
Large Value (LV)	Russell 1000 Value	450
Mid Core (MC)	Russell Mid Cap	81
Mid Growth (MG)	Russell Mid Cap Growth	161
Mid Value (MV)	Russell Mid Cap Value	123
Mid-Small Core (MSC)	Russell 2500	62
Mid-Small Growth (MSG)	Russell 2500 Growth	125
Mid-Small Value (MSV)	Russell 2500 Value	80
Small Core (SC)	Russell 2000	132
Small Growth (SG)	Russell 2000 Growth	260
Small Value (SV)	Russell 2000 Value	255

As the main source of investment in active funds in the database comes from long-term institutional investors, shorting is limited, if not prohibited altogether. To eliminate the survivorship bias that Malkiel [1995] argues to be a critical factor, the database is constructed to include all closed funds. And as we are interested more in the investment patterns of active funds than their performance, all tests are conducted using before-fees returns.¹

One advantage of analyzing a style- and size-segmented database is that we can effectively eliminate size effects at the data collecting stage. Active funds might achieve persistent investment performance simply by over- or underweighting smaller stocks in their portfolios. Size effects might result in biased estimates of funds' relative performance such as excess returns, tracking errors, and information ratios, so size should be taken into account in analysis of the results.

In our case, fund managers in a particular style class are limited to constructing portfolios only with equities corresponding to their benchmark index, so sizes of the constituent stocks should remain relatively similar to that of the benchmark over time. For instance, a large-cap value fund manager is asked to outperform the Russell 1000 Value index by constructing the portfolio using large-cap and value-oriented stocks, and a small-cap growth fund should be constructed with stocks whose positions on the style map are similar to the Russell 2000 Growth index.

Because funds in the database are long-only investors, industry-level momentum portfolios are constructed as a long-only version of the zero-cost relative-strength portfolio in Jegadeesh and Titman [1993]. That is, only past winner industries are included in the portfolios. We adopt monthly returns of level-4 industries defined by Datastream services (38 industries + Datastream U.S. market index). Note that each industry represents a cap-weighted index of firms within a classification.

The recipe for the momentum portfolios can be described as follows:

1. Choose winner industries (top 10%: 4 industries) with equal weights based on their past 3-, 6-, 9-, and 12-month return—possibly up to 16 industries.
2. If an industry is seen more than once, put more weight on it accordingly.
3. Hold the chosen industries for the predetermined holding period.
4. To reduce the timing bias, we form the portfolio using overlapping time windows.

5. Holding periods are 3, 6, 9, and 12 months.
6. Repeat the five steps.

In Mulvey and Kim [2007] we study strategies of this type. They have been implemented in mutual funds such as the “Rydex Sector Rotation Fund” [2006] and in exchange-traded funds such as Merrill Lynch’s Elements Spectrum Large-Cap U.S. Sector Momentum Index.

Exhibit 2 describes the performance of the momentum portfolios and the benchmark index (the Datastream U.S. market index).

EMPIRICAL ANALYSIS

Our empirical tests examine several issues regarding similarities of active funds and momentum strategies:

1. To see the relation of active funds and momentum strategies, we compare performance patterns of “average” active funds and momentum portfolios.
2. Funds are divided according to performance, and the average funds that represent funds within each performance group are also compared to momentum portfolios in order to evaluate whether the best funds are more likely to exploit momentum effects.
3. To test whether following momentum rules can yield better performance at the individual fund level, we compare the investment performance of active fund groups based on similarities with the momentum portfolios. We also measure the relative performance of the momentum portfolio to rank it among the active funds.

Comparing Average Funds to Momentum Portfolios

The “average” fund is an imaginary fund that performs the same as an investment in the whole universe or all funds of a specific style. For instance, the return of the average fund of the whole universe for a specific month is simply the average return across all funds.

In order to extract the market-free relation between active funds and momentum, we compare *excess return series*, instead of using a total return series. Excess returns are calculated by subtracting returns of the corresponding benchmark index from fund or strategy returns.

For example, the excess returns of a large-cap core fund are obtained by subtracting the returns of the Russell 1000 index from the returns of the corresponding average fund. For momentum strategies, we use the equation, Strategy Return–Datastream Index Return.

Exhibit 3 presents the results of analyzing correlation between the excess returns of momentum and average funds for the entire 20-year sample period (1987–2006, Panel A) and five-year subperiods (Panels B–E). A three-month holding period is used for the momentum strategy.² In other words, the industries with the best 3-, 6-, 9-, and 12 month performance are chosen and held for three months. Then, new industries are selected according to their past performance, and the process is repeated again. Each panel has 20 entries corresponding to correlations for specific fund styles.

We can relate several meaningful observations. First, the excess return series of the average fund for the whole universe has a correlation of 0.345 with the industry-level momentum strategy. Considering that correlations are

EXHIBIT 2

Performance of Momentum Strategies 1987–2006

Holding Period	Industry-Level Momentum Strategy				Market Index
	3M	6M	9M	12M	
Annualized Geometric Return	17.17%	17.65%	17.41%	16.57%	12.35%
Volatility	18.00%	18.06%	18.40%	18.03%	14.64%
Annualized Excess Return	4.82%	5.30%	5.06%	4.22%	N/A
Information Ratio	0.44	0.52	0.52	0.47	N/A
Monthly Risk-Adjusted Return	0.42%	0.43%	0.38%	0.31%	N/A
Annualized Risk-Adjusted Return	5.11%	5.26%	4.70%	3.76%	N/A

EXHIBIT 3

Excess Return Correlations of Active Funds and Momentum Strategy

Panel A. Entire Sample Period (1987–2006)

	Core	Growth	Value	All Style
Large-Cap	0.317	0.468	0.152	0.468
Mid-Cap	0.158	0.331	0.074	0.314
Mid-Small-Cap	-0.008	0.133	-0.099	0.042
Small-Cap	-0.030	0.101	-0.139	-0.013
All-Cap	0.194	0.400	0.029	0.345

Panel B. 1987–1991

	Core	Growth	Value	All Style
Large-Cap	-0.073	0.041	0.118	0.061
Mid-Cap	0.051	0.061	0.134	0.109
Mid-Small-Cap	-0.093	-0.281	-0.100	-0.262
Small-Cap	-0.139	-0.146	-0.131	-0.165
All-Cap	-0.117	-0.094	0.061	-0.050

Panel C. 1992–1996

	Core	Growth	Value	All Style
Large-Cap	0.302	0.534	-0.117	0.320
Mid-Cap	0.176	0.342	0.054	0.289
Mid-Small-Cap	0.065	0.172	-0.310	0.049
Small-Cap	-0.245	-0.151	-0.265	-0.260
All-Cap	0.205	0.396	-0.175	0.191

Panel D. 1997–2001

	Core	Growth	Value	All Style
Large-Cap	0.455	0.628	0.302	0.702
Mid-Cap	0.112	0.447	0.081	0.458
Mid-Small-Cap	-0.140	0.309	-0.101	0.189
Small-Cap	-0.086	0.268	-0.209	0.031
All-Cap	0.190	0.589	0.054	0.552

Panel E. 2002–2006

	Core	Growth	Value	All Style
Large-Cap	0.522	0.562	0.106	0.563
Mid-Cap	0.461	0.463	-0.037	0.453
Mid-Small-Cap	0.444	0.522	-0.102	0.450
Small-Cap	0.284	0.317	0.015	0.226
All-Cap	0.499	0.590	0.041	0.545

Average fund is constructed to perform the same as the investment in the whole universe or all funds in a specific style. A three-month holding period is employed for the momentum strategy.

free of the market fluctuation, active funds indeed share similar return patterns with momentum.

Second, growth-oriented funds are more strongly similar ($\rho = 0.400$ for all growth-oriented funds) than value-oriented ones ($\rho = 0.029$ for all value-oriented funds). Also, core-oriented funds are meaningfully correlated ($\rho = 0.194$ for all core-oriented funds), although not as strongly as growth-oriented funds. This may be because of differences in risk aversion among different styles. The more risk-averse value-oriented funds may be more likely to follow conservative strategies. Growth-oriented funds may take more risks, so they might be more likely to exploit momentum effects. Also, core-oriented funds lie between value and

growth funds in terms of risk aversion, so their intermediate correlations may be explainable in that context.

Next, large-cap funds are more strongly correlated with the momentum strategy ($\rho = 0.468$ for all large-cap funds) than smaller-cap ones ($\rho = -0.013 \sim 0.314$). This does not necessarily mean that large-cap funds are more strongly related to a momentum strategy, however. As Datastream industry indexes are cap-weighted and cover the whole U.S. stock market, the industry-level momentum strategies used for the tests are inevitably skewed toward large-cap funds. Thus, there may be a size bias within strategy settings, so we might find stronger results among smaller-cap funds, if momentum strategies were constructed using industries corresponding with the managers' universe such as mid-cap, small cap, and so on. Further analysis is warranted in this respect.

Finally, all these observations are valid for all five-year subsample periods except the first one (1987–1991). Correlations moreover tend to strengthen as time passes. In the first five-year period (1987–1991), there is little evidence that active funds could use a momentum strategy as a hedging vehicle; the correlation is merely -0.05 . As time passes, though, correlations rise up to 0.545 for 2002–2006. The excess return series of the average large-cap fund in particular has a correlation of 0.702 in 1997–2001. After 1992, correlations range between 0.534 and 0.628 , compared to only 0.041 in the first period. Consider that the key research on the momentum strategy (Jegadeesh and Titman) was published in 1993.

Are the “Best” More Likely to Follow a Momentum Strategy?

Our empirical tests results indicate that average funds have strong similarities with momentum portfolios, especially large-cap growth and core funds. The goal is to find a strategy that active fund managers use or a strategy that can mimic those funds' performance patterns. When we see that the momentum strategy can play such a role, it is natural to ask whether correlations vary depending the performance of the funds. We thus explore how similar the representative funds in core and growth groups are to momentum strategies.

To this end, we construct another set of fund groups with different investment performance. In other words, funds in each of the large core and the large growth domains are divided into four groups according to performance, and average funds are constructed as

equal-weighted portfolios of the particular fund groups. We use excess returns, information ratios, and risk-adjusted returns as performance measures. For instance, the return series of the representative fund among the best large growth funds in terms of risk-adjusted returns is the average of fund return series whose risk-adjusted returns fall in the first quartile during the given sample period.

Now a tricky problem arises. Because the dataset includes all closed funds to eliminate survivorship bias, sample periods differ by funds. That is, some funds begin reporting in 1987, say, and disappear from the database after 1996, while some others are introduced to the database after 1997. Under these circumstances, it is inappropriate

simply to compare funds' performance, for their time windows may differ.

To overcome this complication, we divide the 20-year sample period into ten two-year subsample periods, and comparisons are carried out only with funds whose return data are available for 20 months or more for each of 24-month long subperiods. In this manner, we can reduce the bias from the difference in the timing as well as from ignoring too many funds.³

Exhibit 4 presents the results, divided into correlations between the excess returns of momentum strategies and average funds representing performance groups in large-cap growth and large-cap core. Results are shown

EXHIBIT 4 Correlation Analysis for Ranked Active Fund Groups

Panel A. Large-Cap Growth												
Sample Period	Performance Based on Excess Returns				Performance Based on Information Ratios				Performance Based on Risk-Adjusted Returns			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
1987~1988	0.069	0.139	0.054	0.236	-0.202	0.239	0.230	0.236	0.176	0.039	-0.009	0.236
1989~1990	0.258	-0.057	0.086	-0.203	0.271	-0.092	0.040	-0.128	0.271	0.055	-0.090	-0.119
1991~1992	0.122	0.122	-0.093	-0.225	0.104	0.150	-0.198	-0.186	0.042	0.185	-0.202	-0.032
1993~1994	0.457**	0.532***	0.484**	0.338	0.434**	0.533***	0.491**	0.338	0.477**	0.535***	0.433**	0.338
1995~1996	0.601***	0.344*	0.412**	0.325	0.576***	0.465**	0.460**	0.142	0.443**	0.433**	0.374*	0.369*
1997~1998	0.510**	0.499**	0.165	0.224	0.503**	0.565***	0.203	0.184	0.407**	0.411**	0.369*	0.321
1999~2000	0.730***	0.235	-0.022	-0.258	0.642***	0.662***	0.179	-0.292	0.737***	0.284	-0.093	-0.285
2001~2002	0.879***	0.832***	0.803***	0.429**	0.869***	0.848***	0.788***	0.443**	0.712***	0.850***	0.838***	0.825***
2003~2004	0.371*	0.405**	0.195	0.230	0.378*	0.413**	0.271	0.152	0.428**	0.385*	0.190	0.297
2005~2006	0.765***	0.690***	0.521**	0.301	0.738***	0.754***	0.547***	0.158	0.743***	0.678***	0.563***	0.341

Panel B. Large-Cap Core												
Sample Period	Performance Based on Excess Returns				Performance Based on Information Ratios				Performance Based on Risk-Adjusted Returns			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
1987~1988	-0.072	0.252	-0.291	-0.030	-0.258	0.329	-0.242	0.193	-0.072	0.252	-0.291	-0.030
1989~1990	0.135	-0.011	-0.133	0.060	0.155	-0.002	-0.079	0.045	0.164	-0.053	-0.100	0.069
1991~1992	0.450**	0.178	0.199	-0.295	0.481**	0.146	0.411**	-0.421**	0.445**	0.136	-0.293	0.107
1993~1994	0.419**	0.265	0.002	0.031	0.400*	0.214	0.136	0.037	0.413**	0.298	0.007	0.018
1995~1996	0.192	0.225	0.203	0.184	0.224	0.198	0.223	0.172	0.077	0.301	0.174	0.223
1997~1998	0.129	0.254	0.114	0.104	0.058	0.228	0.191	0.101	-0.168	0.170	0.436**	0.109
1999~2000	0.609***	0.351*	0.087	-0.218	0.615***	0.557***	0.001	-0.227	0.613***	0.414**	-0.067	-0.171
2001~2002	0.864***	0.778***	0.726***	-0.229	0.846***	0.863***	0.739***	-0.317	0.609***	0.706***	0.761***	0.686***
2003~2004	0.436**	0.260	0.145	-0.195	0.417**	0.272	0.148	-0.219	0.393*	0.224	0.265	-0.276
2005~2006	0.811***	0.521**	0.237	-0.177	0.783***	0.618***	0.481**	-0.513**	0.757***	0.514**	0.254	0.169

Average fund in a specific performance group performs the same as investment in the equal-weighted portfolio of all funds in the corresponding performance group. 1st quartile performs best. A three-month holding period is employed for the momentum strategy.

*Significant at 90% confidence level.

**Significant at 95% confidence level.

***Significant at 99% confidence level.

EXHIBIT 5

Comparison of Investment Performance for Funds with Different Correlation Levels with Momentum Portfolio

Panel A. Large Growth

Average Annualized Excess Returns					
Correlation Level	Highest	Second	Third	Lowest	p-value
1987~1988	-0.41%	-1.78%	1.60%	1.22%	0.364
1989~1990	-0.54%	1.02%	-2.27%	-3.24%	0.001
1991~1992	5.23%	3.99%	0.84%	0.54%	0.098
1993~1994	2.72%	2.36%	2.82%	0.55%	0.166
1995~1996	0.45%	-0.33%	-2.08%	-1.98%	0.104
1997~1998	-0.13%	-2.26%	-3.12%	-2.38%	0.178
1999~2000	15.69%	11.58%	7.61%	5.00%	0.000
2001~2002	7.45%	3.58%	1.24%	-2.63%	0.000
2003~2004	2.92%	1.97%	0.92%	-0.46%	0.000
2005~2006	2.19%	1.07%	-0.53%	-1.27%	0.000

Average Information Ratios					
Correlation Level	Highest	Second	Third	Lowest	p-value
1987~1988	-0.19	-0.63	0.35	0.13	0.136
1989~1990	-0.13	0.31	-0.38	-0.61	0.004
1991~1992	0.60	0.60	0.12	-0.24	0.010
1993~1994	0.45	0.34	0.55	-0.02	0.029
1995~1996	0.01	-0.16	-0.47	-0.40	0.093
1997~1998	0.04	-0.35	-0.28	-0.44	0.145
1999~2000	1.15	0.98	0.81	0.39	0.000
2001~2002	0.53	0.37	0.14	-0.30	0.000
2003~2004	0.52	0.24	0.09	-0.28	0.000
2005~2006	0.40	0.20	-0.15	-0.36	0.000

Monthly Risk-Adjusted Returns					
Correlation Level	Highest	Second	Third	Lowest	p-value
1987~1988	-0.01%	-0.10%	0.13%	0.09%	0.513
1989~1990	-0.02%	0.10%	-0.17%	-0.23%	0.000
1991~1992	0.23%	0.22%	0.14%	0.19%	0.917
1993~1994	0.23%	0.20%	0.23%	0.04%	0.115
1995~1996	-0.03%	0.11%	0.00%	0.12%	0.287
1997~1998	-0.14%	-0.13%	-0.11%	0.01%	0.224
1999~2000	1.35%	0.88%	0.51%	0.27%	0.000
2001~2002	-0.43%	-0.36%	-0.25%	-0.02%	0.000
2003~2004	0.22%	0.13%	0.09%	0.00%	0.000
2005~2006	0.17%	0.07%	-0.04%	-0.07%	0.000

Panel B. Large Core

Average Annualized Excess Returns					
Correlation Level	Highest	Second	Third	Lowest	p-value
1987~1988	2.73%	1.30%	-0.18%	0.29%	0.397
1989~1990	0.73%	1.37%	1.03%	-0.40%	0.724
1991~1992	4.41%	0.29%	0.74%	-3.45%	0.000
1993~1994	1.48%	0.95%	0.27%	-0.39%	0.159
1995~1996	-0.75%	-1.09%	-0.64%	0.25%	0.655
1997~1998	-0.49%	-1.52%	-1.88%	-0.68%	0.532
1999~2000	6.03%	3.44%	2.73%	-0.11%	0.000
2001~2002	4.80%	2.41%	0.68%	-1.29%	0.000
2003~2004	0.76%	-0.19%	-1.20%	-2.73%	0.000
2005~2006	1.37%	-0.65%	-0.82%	-2.12%	0.000

Average Information Ratios					
Correlation Level	Highest	Second	Third	Lowest	p-value
1987~1988	0.64	0.41	-0.12	0.10	0.314
1989~1990	0.35	0.55	0.32	0.17	0.880
1991~1992	0.74	-0.05	0.03	-0.89	0.000
1993~1994	0.39	0.12	0.19	0.06	0.412
1995~1996	-0.21	-0.19	-0.32	-0.25	0.959
1997~1998	-0.07	-0.23	-0.27	0.00	0.501
1999~2000	0.70	0.47	0.35	-0.05	0.000
2001~2002	0.66	0.38	0.05	-0.28	0.000
2003~2004	0.00	-0.33	-0.48	-0.94	0.000
2005~2006	0.26	-0.22	-0.31	-0.82	0.000

Monthly Risk-Adjusted Returns					
Correlation Level	Highest	Second	Third	Lowest	p-value
1987~1988	0.21%	0.11%	-0.01%	0.05%	0.393
1989~1990	0.06%	0.11%	0.11%	-0.03%	0.620
1991~1992	0.18%	0.02%	0.07%	-0.10%	0.019
1993~1994	0.12%	0.08%	0.03%	-0.02%	0.203
1995~1996	0.05%	-0.05%	0.04%	0.08%	0.559
1997~1998	-0.09%	-0.10%	-0.10%	0.04%	0.166
1999~2000	0.49%	0.27%	0.22%	0.00%	0.000
2001~2002	-0.01%	-0.04%	0.04%	0.03%	0.618
2003~2004	0.08%	0.00%	-0.02%	-0.09%	0.002
2005~2006	0.05%	-0.05%	-0.05%	-0.12%	0.000

Results of ANOVA tests on investment performance in fund groups divided by similarity with the momentum strategy. All tests conducted for 10 two-year subsample periods in the 20-year long sample period (1987~2006).

for excess returns, information ratios, and risk-adjusted returns in descending order from left to right. A three-month holding period is used.⁴

The most intriguing finding in Exhibit 4 is that correlations tend to rise as performance improves. For instance, after 1993, correlations of the best large growth funds and the momentum portfolio range from 0.37 to 0.88 (with statistical significance), while values for the poorest are much lower and without statistical significance except in 2001–2002. Similar patterns are seen for large growth funds in Panel B.⁵

As Menkhoff and Schmidt [2005] state in their survey, “aggressive” funds are more likely to adopt momentum strategies. Thus, it is intuitive to expect less agreement with a conclusion that the better the performance, the stronger the similarity, when performance is adjusted for risk. In fact, results for two risk-adjusted performance measures (the IR and risk-adjusted returns) indicate that such a relation still strongly holds, which would indicate that momentum rules can improve investment performance even after taking risk into account.

Can Individual Funds Benefit from Following Momentum Rules?

So far we have examined the relation of active funds to momentum at the portfolio, not individual level. Such approaches can provide insights for investment in funds, but they do not directly show whether each individual fund can benefit from following a momentum rule. To see whether a momentum rule produces better performance, we first rank funds on the basis of their similarities to momentum strategies. Correlations between excess returns of each individual fund and the momentum portfolio are estimated, and the results are sorted by correlation. Then, three performance measures are calculated for each fund.

We conduct one-way analysis of variance tests of fund groups divided by correlation level to see whether different levels of similarities yield different performance. To effectively eliminate timing bias, we divide the 20-year sample period into ten two-year subsample periods, and run tests only for funds with data available for 20-months or more for each subperiod.⁶

Exhibit 5 illustrates results of the ANOVA tests. Exhibit 6 shows results of the correlation analysis between fund performance and similarities to momentum in order to depict the direction of the relation. These results show that funds whose return patterns are similar to momentum tend to perform better than funds with lower correlation. Most of the test results indicate that funds highly correlated

with momentum outperform funds with lower correlation with 99% statistical significance for the last eight years (1999–2006), which implies that an individual fund in growth and core domains can improve its performance by following industry-level momentum selection rules.

It would be interesting to see what might have happened with investment performance if a fund manager had adopted an industry-level momentum strategy for the entire sample period. The problem is that the benchmark for the momentum strategy covers the whole U.S. stock market, while actual funds are restricted to choosing stocks in their target benchmark indexes.

Thus, we consider only funds within the large-cap core domain for a comparison, because the Russell 1000 index, the benchmark for the large core universe, has an almost identical return pattern to the Datastream index. The reason is that both indexes are market value weighted, so they are skewed toward large stocks, which will make the difference from smaller stocks almost negligible. Furthermore, the momentum strategy portfolio is composed of market value-weighted industry indexes, which naturally makes it skewed toward large-cap stocks. Also, we use risk-adjusted returns as the performance measure for evaluation purposes in order to reduce the bias of the different benchmarks.

The test results in Exhibit 7 indicate that the risk-adjusted return of the industry-level momentum strategy (5.1% per year) is in between the return of the top 10% (6.7% per year) and top 25% funds (4.2% per

EXHIBIT 6 Comparison of Investment Performance and Momentum Similarity

Panel A. Large-Cap Growth				Panel B. Large-Cap Core			
Sample Period	Performance Measure			Sample Period	Performance Measure		
	ER	IR	Alpha		ER	IR	Alpha
1987~1988	-0.278	-0.350*	-0.227	1987~1988	0.02	0.11	0.004
1989~1990	0.478***	0.420***	0.505***	1989~1990	0.09	0.045	0.089
1991~1992	0.277**	0.333***	0.013	1991~1992	0.513***	0.539***	0.309***
1993~1994	0.193**	0.218**	0.209**	1993~1994	0.171*	0.098	0.162*
1995~1996	0.228***	0.235***	-0.051	1995~1996	-0.068	0.021	-0.041
1997~1998	0.148**	0.146**	-0.091	1997~1998	-0.055	-0.072	-0.177**
1999~2000	0.493***	0.439***	0.578***	1999~2000	0.373***	0.355***	0.386***
2001~2002	0.550***	0.546***	-0.302***	2001~2002	0.500***	0.485***	-0.058
2003~2004	0.263***	0.293***	0.254***	2003~2004	0.336***	0.329***	0.284***
2005~2006	0.455***	0.430***	0.395***	2005~2006	0.476***	0.462***	0.288***

Test statistics represent (correlation of a fund with the momentum strategy in terms of excess returns, information ratio, and alpha).

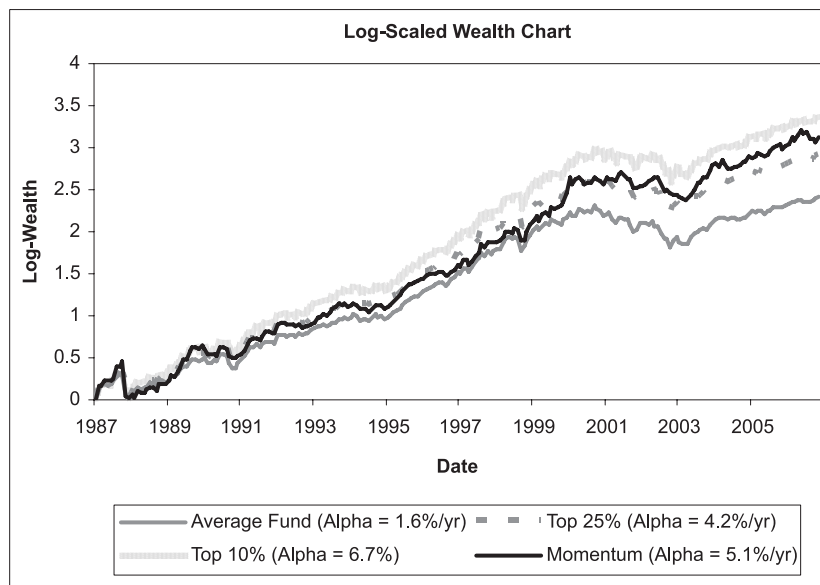
*Significant at 90% confidence level.

**Significant at 95% confidence level.

***Significant at 99% confidence level.

EXHIBIT 7

Comparison of Performance of Momentum Portfolio and Representative Funds



year).⁷ Note that the top funds are chosen every two years as in the previous subsections. In order to beat the momentum strategy by duplicating the performance of the top 10% funds in Exhibit 7, one would have to be lucky enough to pick two-year subperiod winners ten consecutive times.

CONCLUSION

Institutional money managers, especially in large growth and the large core domains, are momentum traders. When we compare a long-only industry-level momentum strategy to these active funds, we find that performance patterns have been very similar, especially since 1993. The similarity becomes stronger as time passes, and as funds perform better. The evidence is that active managers can improve their performance by adopting momentum rules.

ENDNOTES

The authors thank Randy Cusick and Jon Mossman for their assistance. They generously provided the active fund data as well as helpful comments.

¹Results using net-of-fees data produce almost identical results.

²Tests with 6-, 9-, and 12-month holding periods yield that similar results.

³Tests conducted with funds with 50% (12-month) and

full data availability (24-month) for each of the subsample periods yield similar conclusions. Analysis of the entire sample period as well as four five-year-long subsample periods yields results similar to those in Exhibit 4.

⁴Results are similar for different holding periods (6, 9, and 12 months).

⁵Surprisingly, even large-cap value funds show a significant similarity with the momentum strategy after 1997.

⁶Results of tests for funds with 50% (12 months) and full data availability (24 months) yield similar conclusions.

⁷The top funds in Exhibit 7 are chosen on the basis of risk-adjusted returns. Similar results are obtained when we use other performance measures.

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