Industry Momentum and Sector Mutual Funds

Edward S. O'Neal

Recent academic research has ascribed the intermediate-term (3-month to 12-month) momentum present in U.S. stock returns to an industry effect. In the intermediate term, strong (weak) industry performance is followed by continued strong (weak) industry performance. The industry-specific aspect of momentum gives rise to profitable trading strategies that use industry-sector mutual funds. In this study, strategies of buying previous intermediate-term top-performing sector funds outstripped the S&P 500 Index over the 10-year period from May 1989 through April 1999 on a total-return basis. These strategies entailed greater total and systematic risk, however, than the index.

Momentum in stock returns is the tendency for well-performing stocks to continue to perform well and for poor performers to continue to perform poorly. This positive serial correlation has been documented for U.S. common stock returns for holding periods in the 3- to 12-month range. The most recent academic evidence on momentum suggests that the bulk of the observed momentum in these intermediate-term individual stock returns is an industry effect. Could the industry aspect of momentum facilitate practitioner exploitation of this phenomenon? This article explores one mechanism for capturing industry momentum profits—trading strategies involving industry-sector mutual funds.

Various academic researchers have studied serial correlation in common stock returns. These studies uncovered both positive and negative serial correlation in returns, depending on the length of the horizon examined. De Bondt and Thaler (1985, 1987) found evidence of reversals in long-term U.S. stock returns. Using stock returns for 1926–1982, they found that portfolios of previous winners tend to significantly underperform previous losers over three-year to five-year periods following portfolio formation. This negative serial correlation in stock returns has also been observed for short holding periods. Jegadeesh (1990) uncovered significant negative serial correlation in monthly U.S. stock returns over the 1934–87 period.

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Jegadeesh and Titman (1993) explored intermediate-term correlations in the 1965–89 period and uncovered momentum for 3- to 12-month holding periods. The strategy of selecting U.S. stocks on the basis of their performance in the previous six months and holding the portfolio for six months realized abnormal returns on the order of 12 percent a year. Chan, Jegadeesh, and Lakonishok (1999) documented similar price momentum in the 1973–93 and 1994–98 periods. Most research in this area has concentrated on U.S. equities, but Schiereck, De Bondt, and Weber (1999) found that stocks on the Frankfurt Stock Exchange also exhibit intermediate-term momentum.

Moskowitz and Grinblatt (1999) attributed the bulk of the observed momentum in intermediate-term individual stock returns to industry momentum—the tendency for stock return patterns at the industry level to persist. They examined the 1963–95 time period and divided the U.S. stock universe into 20 industries by two-digit SIC codes. They formed two portfolios—winners and losers—on the basis of the returns to the industries over a particular period (called the "lag period"). The winners portfolio contained the top three industries from the lag period, and the losers portfolio contained the bottom three. The authors formed self-financing portfolios that went long on past winners and short on past losers for the subsequent study period (the "hold period"). At the end of the hold period, the portfolios were liquidated and rebalanced on the basis of the most recent lag-period ranking. This procedure was repeated for the entire 33-year sample period. The performance of such an investment strategy was the difference in returns between the winners and the losers.

Moskowitz and Grinblatt explored this self-financing strategy for lag and hold periods of various lengths but concentrated their analysis on six-month lag and six-month hold periods, which they denoted 6,6. Profits averaged 0.43 percent a month. The return to strategies with varying hold- and lag-period lengths was similar in magnitude: A 6,12 strategy yielded 0.40 percent a month, and a 12,6 strategy yielded 0.53 percent a month.

Of note is that these returns resulted from a combination of good performance by the previous winners and poor performance by the previous losers. Because shorting stocks can present problems for investors, Moskowitz and Grinblatt identified what portion of the return came from outperformance of the median industry by the winner portfolio and what portion came from underperformance of the median industry by the loser portfolio. Of the 0.43 percent a month for the 6,6 strategy, 0.37 percent came from winners outperforming and the remaining 0.06 percent came from losers underperforming.

The move from identifying return patterns in the market to profiting from those patterns is difficult at best and impossible in many cases. Academic studies such as those cited in this section use the universe of U.S. stock returns for 30 or more years to explore market anomalies. Unfortunately, implementing a strategy suggested by academic research is often impractical when making real-world, real-time investment decisions. In this study, I considered an alternative to trading in individual stocks to exploit industry momentum—namely, actively trading sector mutual funds.

Industry-Sector Mutual Funds

Using mutual funds to capture industry momentum has at least two advantages over direct equity investment. The first is that the transaction costs are fully known. Mutual funds require the direct payment of some combination of loads, annual expenses, and redemption fees. Trades in individual stocks incur quantifiable commissions but uncertain market-impact costs. The second advantage is that sector mutual funds allow the investor to follow a more manageable set of investment vehicles. The industries in Moskowitz and Grinblatt contained an average of 230 stocks per industry.

The primary disadvantage to using sector mutual funds to implement an industry momentum strategy is that sector funds are generally actively managed. They are not necessarily a pure play on a diversified industry portfolio. If a fund manager makes poor investment choices for the portfolio from the available set of industry stocks, the strategy may be rendered ineffective, even in the presence of significant industry momentum in stock returns. In addition, because of the active nature of sector mutual funds, significant management fees are assessed on fund holdings.

The analysis here concentrates on the Fidelity Select Portfolios sector funds because of their broad coverage of industries and the availability of more than 10 years of returns for the funds. Fidelity introduced 6 sector funds in 1981, 2 more in 1984, an additional 14 in 1985, and 9 in 1986. The total number of Fidelity Select funds as of April 1999 with at least 10 years of historical return data was 31.[1] These funds are listed in **Exhibit 1**.

Exhibit 1. Fidelity Select Industry Mutual Funds with Inception Date Prior to January 1989

Air Transportation	Industrial Equipment
Automotive	Industrial Materials
Biotechnology	Insurance
Brokerage and Investment	Leisure
Chemicals	Medical Delivery
Computers	Multimedia
Construction and Housing	Paper and Forest Products
Defense and Aerospace	Precious Metals and Minerals
Electronics	Regional Banks
Energy	Retailing
Energy Services	Software and Computers
Financial Services	Technology
Food and Agriculture	Telecommunications
Gold	Transportation
Healthcare	Utilities Growth
Home Finance	

During the sample period of this study (mid-1989 through mid-1999), Fidelity merged four Select funds into other Select funds. In October 1990, three funds were merged: Fidelity Select Automation and Machinery into Fidelity Select Industrial Equipment; Fidelity Select Property and Casualty into Fidelity Select Insurance; and Fidelity Select Restaurant Industry into Fidelity Select Leisure. In March 1994, Fidelity Select Electric Utilities merged into Fidelity Select Utilities Growth. The data used in this study came from Morningstar, which provided no return data for the funds that no longer existed. Therefore, these mergers may have introduced some small bias into the study; investors at the beginning of the sample period would have had a menu of feasible funds that is different from the one studied. Given that poor performance sometimes leads to a fund merger, the funds that were merged may have been poor performers.

Therefore, the evidence of momentum in these data may be weaker than it would have been without the mergers because some of the poorest performers may have been merged out of existence.[2]

Like all mutual funds, the Fidelity Select funds assess annual fees. The average annual expense ratio (expenses as a percentage of net assets) for the 31 sector funds in this study was 1.89 percent a year in the 1989–98 period. Annual expenses declined during the period as the sector funds introduced in the 1980s began to enjoy economies of scale as a result of increased assets under management. **Figure 1** graphs the average annual fees and the average net assets for the 31 Select funds over the 1989–98 period.

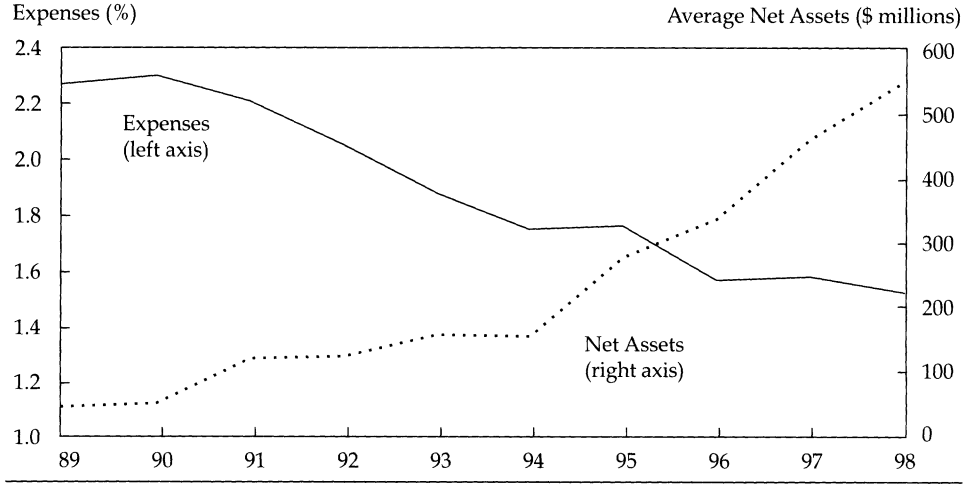
In addition to annual expenses, Fidelity charges a 3 percent front-end load for Select funds. This load is charged on the initial investment but is not assessed on an exchange from one Select fund to another. Fidelity also charges redemption fees of $7.50 or 0.75 percent of fund assets, whichever is less, as long as the shares have been held 30 days or more. To discourage short-term trading, the redemption fee is 0.75 percent of assets for shares held under 30 days. The redemption fee, unlike the load, is paid into the net assets of the fund to offset brokerage commissions and market-impact costs the fund might incur to honor the redemption. Fidelity also charges an exchange fee when moving assets from one fund into another of $7.50 *unless* the exchange is made through Fidelity's automated exchange service. Therefore, an exchange made via phone call to a Fidelity representative will incur both the redemption and the exchange fee. An investor can avoid the exchange fee (but not the redemption fee) by using the automated exchange service. Finally, Fidelity reserves the right to limit the number of exchanges an investor makes. The prospectus dated April 29, 2000, states that currently no limit is placed on investors.

Preliminary Analysis

The analysis was performed on monthly return data for the 31 Fidelity sector funds in Exhibit 1. Data were collected from the Morningstar Principia Plus database dated May 1999. Each momentum trading strategy consisted of a series of lag and hold periods. Funds were ranked on lag-period returns, and investment strategies were formulated that selected groups of funds in specific rank positions to hold for the hold period. Three lag-period and hold-period lengths were used—3 months, 6 months, and 12 months. For each strategy, the returns were examined for the 10-year period May 1989 through April 1999, so the first lag periods are the 3, 6, or 12 months ended April 1989.

As a simple first step to verify the industry momentum effect in this sample of sector funds, I examined the strategy of investing in a single rank position for the hold period. Given 31 funds, I had 31 potential strategies. In this simple initial analysis, to provide a clearer indication of whether the underlying industry momentum effect was present in the sector fund returns, I did not consider the front-end load and the redemption and exchange fees.

Figure 1. Average Net Assets and Average Annual Expense Ratios for 31 Fidelity Select Mutual Funds, 1989–98



The following procedure illustrates the analysis for a strategy with a six-month hold period and a six-month lag period that invested in the single fund with the best lag-period return:

- The first hold period was May 1989 through October 1989. Therefore, the first lag period was the prior six-month period (November 1988 through April 1989).
- For each of the 31 sector funds, the total return in the lag period was calculated by compounding the six monthly returns. The funds were ranked on this six-month return.
- The fund with the best performance over this period was the Fidelity Select Telecommunications fund with a 26.8 percent return.
- Over the ensuing six-month hold period, this fund provided a 15.4 percent return.
- The second hold period was November 1989 through April 1990, which made the second lag period May 1989 through October 1989.
- Over this second lag period, Fidelity Select Biotechnology had the best six-month return—20.8 percent.
- I assumed a fund share exchange was effected on the final trading day of the six-month hold period that liquidated the position in the Telecommunications fund and bought the Biotechnology fund. The Biotechnology fund returned 8.1 percent over the next six months.
- Compounding the first two six-month returns (15.4 percent and 8.1 percent) produced a return for the first year of the strategy of 24.7 percent.
- This procedure was repeated for the 20 six-month hold periods in the sample.
- The 10-year annualized geometric mean return was then calculated from the 20 hold-period returns, R_i:

$$\text{Annualized return} = \left[\prod_{i=1}^{20}(1+R_i)\right]^{1/10} - 1. \qquad (1)$$

- The annualized return in this example was 22.4 percent for the entire 10-year period.

For a given lag- and hold-period length, this procedure led to 31 different possible strategies. For each strategy, the procedure was the same except that instead of investing in the best performing fund, I invested in, say, the second-best performing fund, and so on. **Figure 2** details the annualized investment returns for each of the 31 ranks based on three lag- and hold-period lengths for the 10-year period.

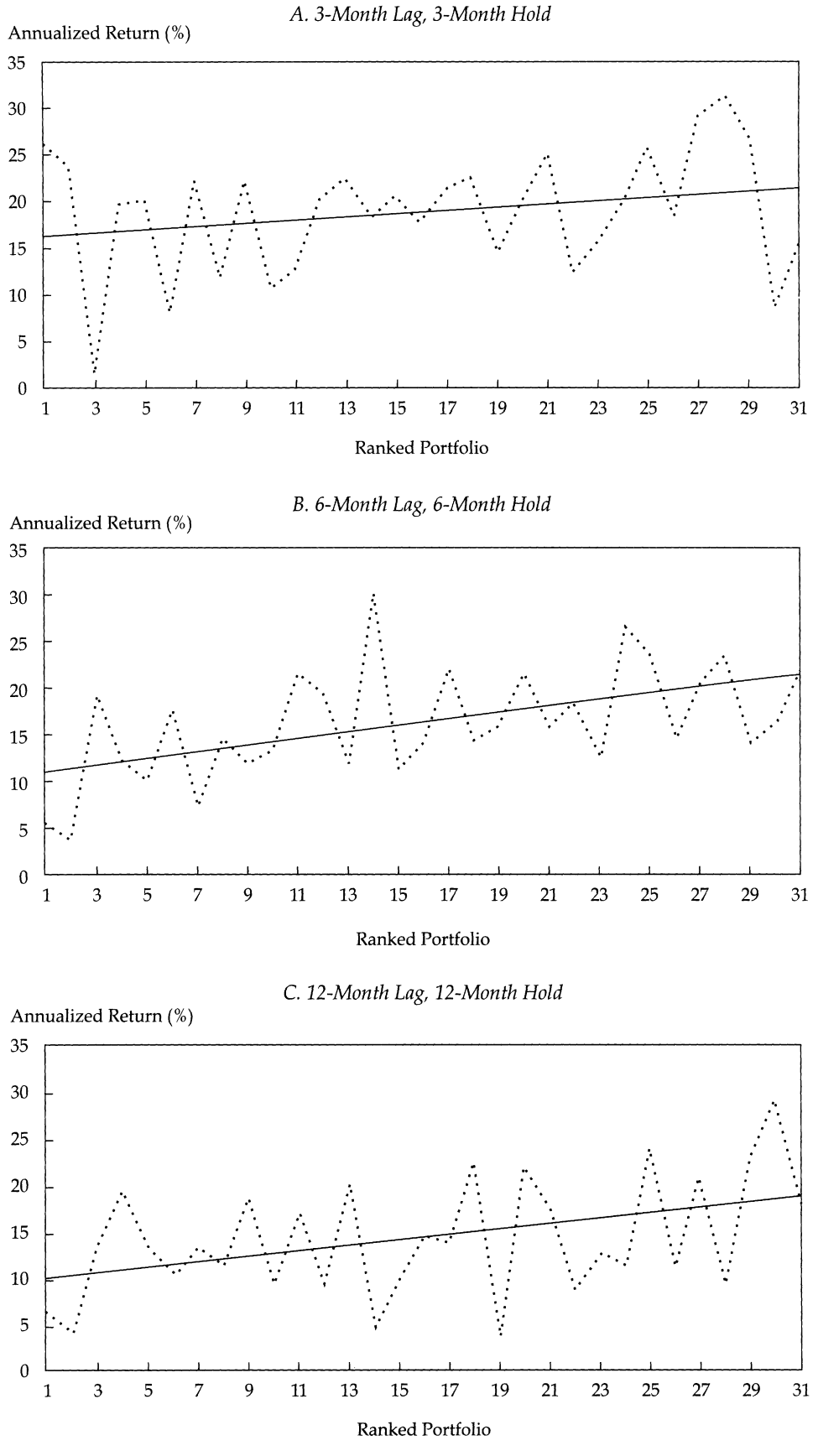
The overwhelming impression Figure 2 gives is the inconsistency of the industry rank and return correlations. For example, the returns from investing in the third-best lag-period performer in the 12,12 strategy (Panel C) led to an annual return of 26.1 percent. If, instead, I had invested in the fourth-best performer, the return would have been 12.3 percent. Notice, however, that the fitted regression lines confirm the existence of momentum in sector fund returns. For example, for the 6,6 strategy illustrated in Panel B, a simple regression of annualized returns against the rank for each portfolio strategy yields an adjusted R^2 of 21.6 percent, and the t-statistic on rank is 6.30. The 12,12 and 3,3 strategies yield adjusted R^2s of 13.3 percent and 1.2 percent, respectively, and the t-statistics on rank are 6.00 and 6.21. Despite the inconsistency, simple statistical analysis confirms momentum in these sector fund returns. The scatterplot in **Figure 3**, which shows annualized six-month hold-period returns against actual annualized six-month lag-period returns (not ranks) for each industry, reveals inconsistencies similar to those in Figure 2. I also found similar statistical significance, however, in the relationship—an adjusted R^2 of 20.8 percent for the 6,6 strategy (18.7 percent for the 12,12 strategy and 1.8 percent for the 3,3 strategy).

Momentum-Based Portfolios

Because of the inconsistencies illustrated in Figures 2 and 3, a strategy that attempts to profit from industry momentum should build portfolios of several ranked industries rather than concentrate on a single rank. As previously mentioned, Moskowitz and Grinblatt looked at the returns of the top three and bottom three ranked industries. This study examined portfolios of three industries and portfolios of six industries. The analysis also took into account loads and redemption fees. Recall that for the Fidelity Select funds, the initial load is 3 percent of the investment amount, while redemption fees are a flat $7.50 for redemption amounts greater than $1,000. The fact that redemption fees are flat dollar amounts means that the percentage returns to an active Fidelity Select fund trading strategy depend on the initial investment amount. The larger the initial investment, the smaller the drag redemption fees have on realized returns. In the analysis that follows, $100,000 was the initial investment. On the assumption that the automated exchange service was used for redemptions, the $7.50 exchange fee was ignored.

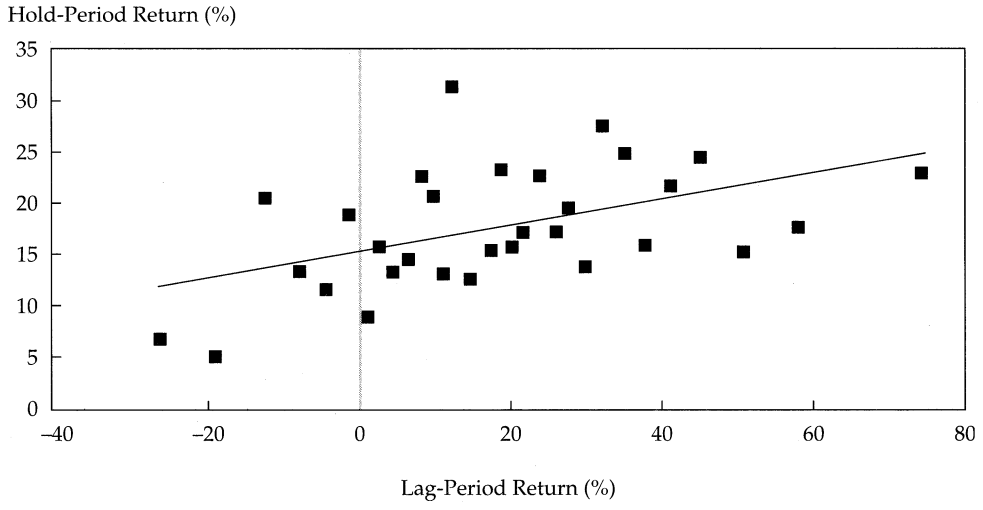
When pursuing an active strategy, the lag period and hold period do not have to be the same length. Therefore, the study examined a number of combinations of lag and hold periods, as well as portfolios of three industries and six industries. The

Figure 2. Annualized Returns to Ranked Industry-Sector Investment Strategies



Note: The straight line is the fitted regression line.

Figure 3. Annualized Six-Month Hold-Period Returns versus Six-Month Lag-Period Returns for 31 Industries



analysis was identical to that described in the previous section with the following three exceptions:

- Equally weighted portfolios of funds (rather than single funds) were formed for the hold periods. The High portfolio consisted of the top three or six sector funds; the Low portfolio consisted of the bottom three or six sector funds; and the Mid portfolio consisted of the middle three or six sector funds.[3]
- $97,000 was invested in the initial hold period ($100,000 minus the 3 percent load).
- Redemption fees were assessed when the portfolios were liquidated and reformed.
- Annualized returns were calculated from the ending value of the investment relative to the initial $100,000 investment:

$$\text{Annualized return} = \left(\frac{\text{Ending investment value}}{\$100{,}000}\right)^{1/10} - 1. \quad (2)$$

Table 1 summarizes the findings for each combination of lag period, hold period, and portfolio size.

Table 1. Momentum Strategy Returns Using Industry-Sector Funds, May 1989–April 1999
(annualized standard deviations, in percents, are in parentheses)

	Three Industries per Portfolio with Hold Periods of:			Six Industries per Portfolio with Hold Periods of:		
Ranked Portfolio	3 Months	6 Months	12 Months	3 Months	6 Months	12 Months
6-month lag period						
Low	12.1%	11.2%	10.2%	13.6%	13.2%	11.9%
	(29.7)	(28.8)	(29.9)	(20.7)	(21.7)	(21.6)
Mid	15.3	17.2	17.0	16.8	19.3	19.9
	(17.6)	(18.6)	(17.8)	(18.1)	(18.6)	(18.2)
High	15.7	18.7	20.2	19.0	20.0	22.7
	(24.5)	(25.7)	(25.5)	(20.7)	(21.2)	(22.1)
High – Low	3.6 pps	7.5 pps	10.0 pps	5.4 pps	6.8 pps	10.8 pps
12-month lag period						
Low	11.6%	9.6%	11.7%	11.5%	11.9%	15.1%
	(28.6)	(24.8)	(24.0)	(20.4)	(19.1)	(18.5)
Mid	18.9	18.4	15.9	18.5	17.6	14.8
	(18.8)	(18.8)	(17.4)	(17.9)	(17.5)	(17.0)
High	19.0	22.2	26.5	19.6	20.5	22.1
	(24.7)	(23.9)	(24.6)	(21.7)	(21.3)	(22.1)
High – Low	7.4 pps	12.6 pps	14.8 pps	8.1 pps	8.6 pps	7.0 pps

Note: High – Low is the return to the High portfolio minus the return to the Low portfolio.

Average Returns. Evidence of industry momentum is strong in the results shown in Table 1. The difference in annualized returns between the High and Low portfolios averaged across the 12 portfolio strategies is 8.6 percentage points (pps) and ranges from a low of 3.6 pps to a high of 14.8 pps. Momentum appears to have been especially strong for 12-month holding periods, regardless of whether the lag period was 6 or 12 months. The 12,12 strategy with three industries in the portfolio produced the greatest difference between High and Low portfolios.[4]

Although the annualized differences in returns to High and Low portfolios support the industry momentum findings of Moskowitz and Grinblatt, an important question for investors attempting to exploit this phenomenon is whether the differences are driven by the persistence of poor performance or the persistence of good performance. Chan et al. and Schiereck et al. (in addition to Moskowitz and Grinblatt) analyzed the performance of hedge portfolios that were long in past winners and short in past losers, but such portfolios are feasible only with individual stocks, not with mutual funds. Therefore, a profitable mutual fund momentum strategy is possible only if prior *high* performance persists. To find out whether High or Low performers contributed most to the return difference between the High and Low portfolios (and following Moskowitz and Grinblatt), I divided the differences in returns between the High and Low portfolios into two components—how much the High portfolios outperformed the Mid portfolios and how much the Low portfolios underperformed the Mid portfolios. The results here are not consistent with the findings of Moskowitz and Grinblatt.

Recall that the mean difference between the High and Low portfolios was 8.6 pps. The mean difference in annualized returns between the High and Mid portfolios was 3.1 pps, and the mean difference between the Low and Mid portfolios was 5.5 pps. Therefore, apparently, only about 36 percent (3.1/8.6) of the difference in performance between previous winners and previous losers is the outperformance of winners. The results of these 12 strategies are not independent, however, and these percentages are averages across all 12 portfolio strategies. Because no theory suggests that momentum should be consistent for different lag- and hold-period lengths, simply citing the averages may not be appropriate. For the 12,12 strategies for the three- and six-industry portfolios, the High portfolios outperformed the Mid portfolios by 10.6 pps and 7.3 pps, respectively. These results suggest that momentum measured over 12-month lag and 12-month hold periods is driven primarily by past winners.[5]

Perhaps even more germane to investors and analysts is how these strategies performed when measured against market indexes or the mutual fund universe. I measured returns against the S&P 500 Index (large stocks), the Russell 2000 Index (small stocks), and the Wilshire 5000 Index (total stock market). In addition, to gain some idea of how the strategies performed relative to the mutual fund universe, I derived several benchmarks from the returns of the 546 domestic equity funds that existed throughout the 10-year sample period. All index and fund data were drawn from the May 1999 Morningstar Principia Plus database. **Table 2** reports the return data for the indexes and several mutual fund universe benchmarks.

Of the 12 momentum strategies examined, for the sample period, the High portfolios failed to beat the S&P 500 realized annualized return (18.8 percent) in only two cases—the three-industry portfolio for three-month hold periods and (just barely)

Table 2. Index and Fund Return Data, May 1989–April 1999
(annualized standard deviations, in percent, in parentheses)

Benchmark	Return
Index	
Wilshire 5000	17.7%
	(15.8)
S&P 500	18.8
	(15.7)
Russell 2000	12.0
	(19.1)
Mutual fund universe[a]	
All domestic equity	14.9
	(17.3)
Top 10 percent domestic equity	20.3
	(20.2)
All S&P 500 index funds	18.2
	(15.6)
All growth style	15.6
	(21.2)
All value style	14.2
	(14.9)
All small-company index funds	13.0
	(18.6)

[a]Sample is all funds in existence the entire 10-year period. Of the 546 domestic equity funds, the top 55 based on total returns over the sample period composed the top 10 percent. S&P 500 index funds numbered 5. Growth style funds (numbering 176) and value style funds (numbering 171) were based on the Morningstar style classification as of May 1999. Small-company index funds numbered 3.

the three-industry portfolio for six-month hold periods. The High portfolios performed even better when compared with the Wilshire 5000 (outperforming in 11 of 12 cases) and the Russell 2000 (outperforming in all 12 cases). All 12 High portfolios following the momentum strategy outperformed the average domestic equity fund, the average growth fund, and the average value fund; 5 of the 12 High portfolios managed to beat the *ex post* grouping of the top 10 percent of domestic equity funds. All but 1 of the 12 High portfolios beat the average S&P 500 index fund (note that only five such funds existed throughout the period), and all 12 outperformed the average small-company index fund (only three funds existed).

Consistency of Returns. An additional concern for investors attempting to exploit a momentum strategy is the consistency of the strategy over time. Sequential periods of below-index performance may deter investors from such a strategy. An examination of the consistency of returns also addresses the problem of the individual strategies' lack of independence, which casts some doubt on conclusions drawn from citing average returns across strategies.

The results presented in Table 2 suggest that the momentum strategies with 12-month hold periods have the highest returns. For the four 12-month hold-period strategies, I found the number of periods (months, quarters, and years) in which the High portfolio and Low portfolio outperformed the S&P 500 or the average mutual fund. This number was divided by the total number of periods (120 months, 40 quarters, and 10 years) to find the percentage of periods in which the portfolios outperformed each benchmark. These percentages are presented in **Table 3**.

The various High portfolios outperformed the S&P 500 in more than 50 percent of all months, quarters, and years. As the length of the period increased, the frequency with which the High portfolios outperformed the index tended to increase. The Low portfolios exhibited the opposite result—generally underperforming the S&P 500 more than 50 percent of the time and underperforming more frequently as the period lengthened. The number of times the High portfolios outperformed the Low portfolios, shown as High – Low in Table 3, was 55–90 percent of the periods, depending on the length of the period. Again, the longer the period, the greater the frequency of outperformance by the High portfolios.

The results for High portfolios compared with the average mutual fund are generally similar to those for the comparison with the S&P 500 in Table 3, but the outperformance is more pronounced. Such increased outperformance would be expected because the average mutual fund underperformed the S&P 500 by almost 4 percent a year in this period. Interestingly, the Low portfolios outperformed the average mutual fund more than half the

Table 3. Percentage of Periods Momentum Portfolios Outperformed, May 1989–April 1999

Portfolio by Lag, Hold, Number of Industries	S&P 500			Average Domestic Equity Fund		
	Months	Quarters	Years	Months	Quarters	Years
6,12,3						
Low	50	45	30	51	50	70
High	53	53	60	58	55	70
High – Low	60	58	70			
6,12,6						
Low	46	43	20	51	53	60
High	58	55	80	61	70	80
High – Low	63	65	90			
12,12,3						
Low	46	40	30	53	55	60
High	61	60	70	63	68	80
High – Low	59	60	70			
12,12,6						
Low	48	43	30	53	58	70
High	53	60	60	62	58	80
High – Low	58	55	70			

time in almost all cases. A comparison of Tables 1 and 2 shows that three of the four Low portfolios underperformed the average fund over the entire 10-year period. Although not shown in Table 3, the magnitudes of underperformance by the Low portfolios were greater than the magnitudes of outperformance. This result emphasizes the importance of considering not only the frequency of outperformance but also the magnitude.

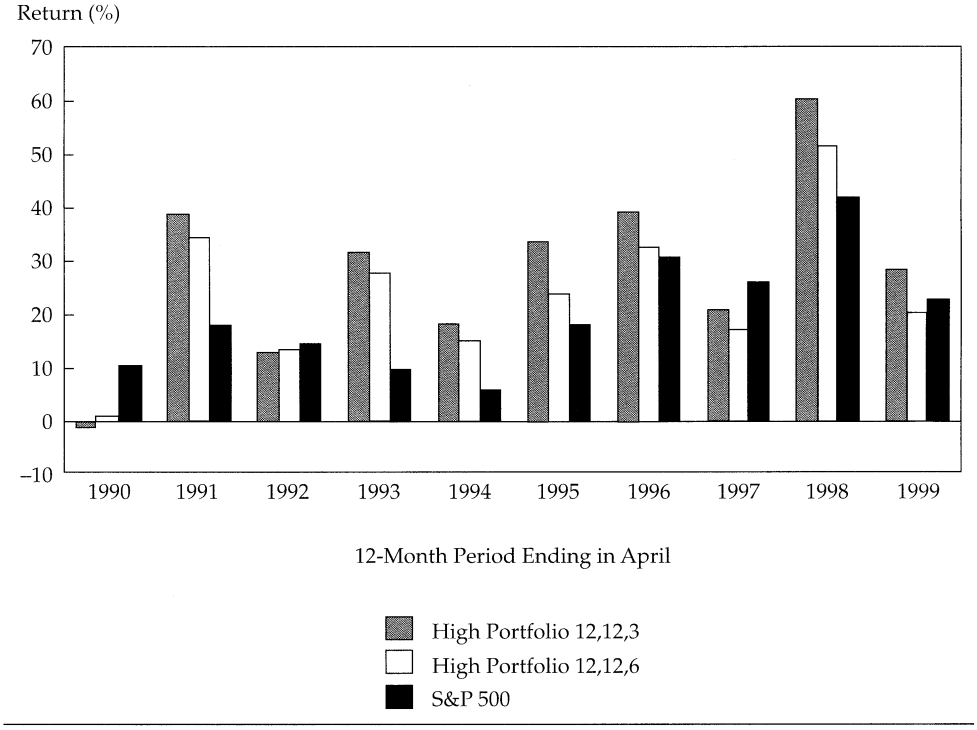
The annual performance of two High portfolios (12,12,3 and 12,12,6) relative to the performance of the S&P 500 for 1990 through 1999 is shown in **Figure 4**. This figure demonstrates not only how frequently these High strategies outperformed the index but also the magnitudes of the over- or underperformance each year. Both portfolios outperformed the S&P 500 in the majority of the 10 annual periods. The 12,12,3 strategy outperformed the index in 7 of 10 years, and the 12,12,6 strategy outperformed in 6 of 10 years. Figure 4 also shows the importance, however, of considering more than the number of periods of outperformance. The overall outperformance of the S&P 500 by the 12,12 portfolio with three industries was largely the result of infrequent large relative returns; in 1991, 1993, and 1998, the portfolio outperformed the S&P 500 by almost 20 pps. The worst underperformance was by approximately 12 pps in 1990. This pattern is also evident in the monthly returns. Over the 120 months of the sample, the 12,12,3 portfolio outperformed the S&P 500 by at least 5 pps in 11 months.

Risk-Adjusted Performance Measures. The four High portfolios with 12-month hold periods produced superior returns. This superiority was evident regardless of the lag-period length or the number of industries in the portfolio. Therefore, most of the subsequent analysis concentrates on the performance of these 12-month High portfolios.

To this point, risk has not been considered. For all 12-month High portfolios, the annualized standard deviations ranged between 20.7 percent and 25.7 percent. For the S&P 500, the standard deviation was 15.7 percent.

To measure reward to variability, I calculated Sharpe ratios for the strategies. The Sharpe ratio takes the difference between the portfolio return and the risk-free rate and divides it by the portfolio standard deviation. Using the average annual return to three-month U.S. T-bills over this period as the risk-free rate, I calculated the Sharpe ratio for

Figure 4. Annual Returns of Two High-Portfolio Strategies versus the S&P 500 Return, 1990–99



Note: The ending month of each year is April.

the four 12-month High portfolios, the S&P 500, and the mutual fund benchmarks as follows:

$$\text{Sharpe ratio}_i = \frac{AR_i - AR_{rf}}{\sigma_i}, \quad (3)$$

where

AR_i = average annualized return to portfolio i
AR_{rf} = average annualized return to three-month T-bill
σ_i = standard deviation of portfolio i calculated from monthly returns

The annualized returns, standard deviations, and various performance ratios are presented in **Table 4**. The High portfolio with the highest Sharpe ratio, 0.86, is the 12,12 with three industries. The S&P 500 Sharpe ratio is also 0.86. Of the remaining three High portfolios with 12-month hold periods, none beat the S&P 500 and only the 6,12 with six industries topped the Wilshire 5000. Therefore, although the High portfolios largely outperformed the indexes based on total returns, the excess performance of many of the High portfolios apparently failed to compensate for the risk as measured by standard deviation.

Standard deviation measures total risk, but *systematic* risk is arguably the more important risk measure for investors considering the addition of a sector-rotation strategy to a diversified portfolio. For each of the High portfolios, I calculated systematic risk for the 120 months of returns in the study. The excess returns on each High portfolio were regressed against the excess returns on the S&P 500 for the entire 10-year period to generate capital asset pricing model (CAPM) betas and Jensen's alphas:

$$R_{i,t} - R_{rf,t} = \alpha_i + \beta_i (R_{m,t} - R_{rf,t}) + \varepsilon_{i,t}, \quad (4)$$

where

$R_{i,t}$ = monthly return on portfolio i
$R_{rf,t}$ = monthly three-month T-bill return
$R_{m,t}$ = monthly S&P 500 return
α_i = Jensen's alpha for portfolio i
β_i = beta for portfolio i

Table 4. Risk and Performance Measures for Selected High Portfolios and Benchmarks, May 1989–April 1999

Portfolio	Annualized Return	Standard Deviation	Sharpe Ratio	CAPM Beta	Jensen's Alpha (t-statistic)	Treynor Measure
High portfolios						
6,12,3	20.5%	25.5%	0.58	1.19	0.40%	12.8
					(0.09)	
6,12,6	22.7	22.1	0.79	1.12	2.80	15.5
					(0.84)	
12,12,3	26.5	24.6	0.86	1.18	5.40	18.0
					(1.41)	
12,12,6	22.1	22.1	0.76	1.15	1.83	14.6
					(0.57)	
Index benchmarks						
S&P 500	18.8	15.7	0.86	1.00	0.00	13.5
					—	
Wilshire 5000	17.7	15.8	0.78	1.00	–0.91	12.4
					(–1.22)	
Russell 2000	12.0	19.1	0.35	1.01	–5.45	6.6
					(–1.62)	
Mutual fund universe benchmarks						
All domestic equity	14.9	17.3	0.55	0.96	–2.54	10.0
Top 10 percent domestic equity	20.3	20.2	0.66	1.09	0.78	13.8
All S&P 500 index funds	18.2	15.6	0.83	1.00	–0.51	12.9
All growth style equity	15.6	21.2	0.49	1.10	–2.24	9.4
All value style equity	14.2	14.9	0.60	0.85	–3.06	10.5
All small-company index funds	13.0	18.6	0.41	0.98	–4.23	7.9

Notes: Jensen's alphas are annualized. None of the Jensen's alphas are significant at the 10 percent level. The betas and alphas reported in the table are the averages over all funds in the category.

The betas and Jensen's alphas for each High portfolio and each benchmark are reported in Table 4. The systematic risk for the High momentum portfolios, as measured by the CAPM beta, is higher than for the S&P 500 or any other index or fund universe benchmark. But this greater risk did not lead to inferior risk-adjusted returns, as measured by Jensen's alpha. Although none of the alphas on the High portfolios is significant, all four are positive.

Treynor measures, shown in the final column of Table 4, were calculated as the excess return to the portfolio divided by beta:

$$\text{Treynor measure}_i = \frac{AR_i - AR_{rf}}{\beta_i}. \quad (5)$$

The Treynor measure, also called the reward-to-volatility ratio, is probably a more appropriate risk-adjusted measure for many investors to use than the Sharpe ratio.[6] In this study, three of the four High portfolios exhibited higher Treynor measures than all the indexes and the mutual fund benchmarks.

Whenever researchers purport to uncover stock market anomalies, the question of data mining arises. To examine the robustness of the intermediate-term industry momentum phenomenon, I looked at the results for the most recent half of the study period only—the five years from May 1994 through April 1999. This subsample overlaps the Moskowitz–Grinblatt study by 15 months (their sample period went through July 1995) and contains 45 months completely outside their sample. Only the results are described here.

I found that the momentum effect was at least as strong in this 5-year period as in the full 10-year period. Differences between the annualized returns to the High and Low portfolios averaged 11.4 pps a year for the 12 portfolio strategies. Again, the 12-month hold periods exhibited the strongest effect. For the four 12-month strategies, the average portfolio return difference was 15.8 pps. Two of the High portfolios outperformed the S&P 500. The reward-to-risk measures, however, were even less kind to these 5-year momentum portfolios than in the 10-year analysis. The highest Sharpe ratio for the High portfolios was 1.05 for the 12,12,3 portfolio, whereas the Sharpe ratio for the S&P 500 was 1.24. This same High portfolio had a positive but insignificant Jensen's alpha and a Treynor measure higher than the S&P 500. The other three High portfolios had negative but insignificant alphas and Treynor measures smaller than the S&P 500.

The percentage of periods (months, years, and quarters) that the High and Low portfolios outperformed the S&P 500 was lower in the most recent 5-year period than in the full 10-year period for all four portfolios. Interestingly, all the High and Low portfolios outperformed the average mutual fund *more frequently* in the 5-year period than in the full period.

In comparing the momentum strategy with the S&P 500, readers should remember the extremely strong performance of this index in this particular 60-month period. Only 13 periods (out of 768) since 1931 have shown a rolling 60-month performance higher than the 26.9 percent annualized return earned by the S&P 500 from May 1994 through April 1999: the 10 rolling periods ending September 1936 through August 1937 and the 3 rolling periods ending July 1987 through September 1987.

All four of the 12-month hold-period High portfolios outstripped the average domestic equity fund in total returns over the five-year period (1,308 funds had five-year records through April 1999), and all exhibited higher Sharpe ratios than the average domestic equity fund. One of the High momentum portfolios (the 12,12,3) outperformed the top 10 percent of equity funds in terms of total returns and the Treynor measure, whereas none displayed higher Sharpe ratios than this mutual fund benchmark.

Finally, a comparison of the best performing High portfolios with individual mutual funds on a total-return basis is interesting. For the entire 10-year sample period, the 12,12,3 High portfolio outperformed all 546 domestic equity funds. It outperformed 99.6 percent (1,303 out of 1,308) of the domestic equity funds with five-year track records for the period ended April 1999. The 12,12,6 High portfolio outperformed 98.4 percent of all funds over the 10-year period and 95.9 percent of all funds over the 5-year period.

Economic Determinants of Momentum

What causes industry momentum? Moskowitz and Grinblatt reviewed the theoretical literature on momentum and divided the potential explanations into two camps—behavioral and rational. The behavioral theories are beyond the scope of this article, but perhaps I can provide some insight into how industry momentum is rationally linked to changing economic conditions.

Using macroeconomic variables to characterize the state of the economy, Schiereck et al. found that momentum strategies with German stocks perform well regardless of the state of the economy. In the spirit of their analysis, I looked at four monthly series of macroeconomic variables to measure the relationship between industry momentum and the U.S. economy. The maturity premium in bond returns was proxied by the difference between the returns to holding the Lehman Brothers' long-term

T-bond index and three-month T-bills. A default risk premium was proxied by the difference in returns to Credit Suisse First Boston's high-yield index and the Lehman Brothers T-bond index. Changes in the U.S. index of leading economic indicators and changes in expected inflation came from the U.S. Federal Reserve Economic Data.[7] The excess returns of each of the four 12-month High portfolios over the S&P 500 were the dependent variables in the analyses. The regression equation was

$$R_{i,t} - R_{m,t} = \alpha_i + \beta_1(\text{MatPrem}_t) + \beta_2(\text{DefPrem}_t) + \beta_3(\Delta\text{Lead}_t) + \beta_4[\Delta E(I_t)] + \varepsilon_{i,t} \quad (6)$$

where

MatPrem_t = 30-year T-bond return premium over T-bill return in month t

DefPrem_t = high-yield bond index return premium over 30-year T-bond return in month t

ΔLead_t = change in level of leading economic indicators from month $t-1$ to month t

$\Delta[E(I_t)]$ = change in level of expected inflation from month $t-1$ to month t

Results of the regressions are in **Table 5**.

The only macroeconomic variable that proved to be consistently significant in the analysis was the default-risk-premium variable. DefPrem in Table 5 is positive and significant at the 1 percent level for all four High portfolios, which suggests that in an environment characterized by declining default risk, industry momentum is strongest. Perhaps the industries that compose the top performers are thought by market participants to be riskier than average investments. As default risk falls, these top performers continue to perform strongly as the market lowers the risk premium associated with such investments. Certainly, the standard deviations of returns to High portfolios detailed in Table 1 were higher than those of the S&P 500 and of Mid portfolios. The Low portfolios had standard deviations that were similar, however, to those of the High portfolios.

Declining default risk premiums are likely when the market perceives an upturn in the economy, which decreases the likelihood of corporate financial distress. Perhaps the performance of momentum strategies is tied to the market's perception of future economic strength. If market participants are able to effectively predict changes in economic strength, a relationship might be observable between current performance of momentum portfolios and future levels of GDP. Unfortunately, GDP is available only on a quarterly basis from the Federal Reserve and was thus not included in the previous regression of monthly momentum premiums. In unreported results, I calculated quarterly High momentum portfolio premiums over the S&P 500 in quarter t and regressed the results against GDP_{t+4}. For the 12,12 portfolio with three industries, one-year-ahead GDP was significant at the 5 percent level in a simple regression with an R^2 of 14 percent. If future economic strength and, therefore, GDP are partially predictable, this result is consistent with industry momentum being related to forecasted changes in economic strength.

Table 5. Results of Regressions of High-Portfolio Excess Return over S&P 500 Return on Economic Data
(*t*-statistics in parentheses)

Economic Variable	12,12,3	12,12,6	6,12,3	6,12,6
Intercept	0.005	0.002	0.001	0.002
	(1.63)	(0.92)	(0.02)	(0.87)
T-bond return premium over T-bill return	0.308	0.238	0.383*	0.243
	(1.64)	(1.52)	(1.76)	(1.56)
High-yield bond return premium over T-bond return	0.435***	0.418***	0.716***	0.544***
	(2.66)	(3.06)	(3.77)	(4.00)
Change in leading economic indicators	–0.221	–0.511	0.768	0.195
	(–0.16)	(–0.452)	(0.49)	(0.17)
Change in inflation expectation	0.060	0.043	0.020	0.005
	(1.52)	(1.31)	(0.43)	(0.16)
R^2	7.1	9.0	15.0	16.8

Notes: Ordinary least-squares regression coefficients are reported. Leading economic indicators and inflation expectation data are percentage monthly first differences calculated from the Federal Reserve Economic Data.

*Significant at the 10 percent level.
***Significant at the 1 percent level.

Conclusion

Industry momentum over intermediate time horizons is clearly evident in the performance of industry mutual funds in the 1989–99 period. Portfolios of previous top-performing industry funds far outstripped portfolios of previous poor performers regardless of the lag period for determining previous performance or the holding-period length. Results presented here suggest that this momentum phenomenon is strongest for portfolios that are held for 12 months. When pitted against the S&P 500 on total returns, the High momentum portfolios generally outperformed over the 10-year period but had some difficulty beating the index over the most recent 5-year period. The High momentum portfolios fared much better against benchmarks derived from the mutual fund universe.

The sector fund investment strategies entailed more total risk than investing in the S&P 500. When returns were adjusted for standard deviation by using the standard Sharpe ratio, only 1 out of 12 High momentum portfolios matched the index in the 10-year period. In the most recent 5-year period, none of the strategies displayed a higher Sharpe ratio than the S&P 500. The High momentum strategies also exhibited more systematic risk than the index. Performance measures that take into account systematic risk (Jensen's alpha and the Treynor measure) do not suggest superiority of the S&P 500, however, over the High portfolios. In fact, for the total 10-year study period, four of the High momentum portfolios exhibited positive, although insignificant, Jensen's alphas and three out of four exhibited Treynor measures larger than the S&P 500.

Notes

1. As of the time of writing this article, Fidelity offered 39 sector funds, but the analysis here uses the 31 for which an extended time series of data was available.
2. The industries of the merged funds are very similar to the industries of the funds into which they merged. Fidelity likely effected the mergers because it was unable to attract enough assets to economically manage two industry portfolios that were so similar or because the highly similar funds confused potential investors. In that case, no bias would be introduced by excluding the merged funds from the analysis.
3. I used the middle three or six funds to be consistent with the procedure of Moskowitz and Grinblatt. An alternative of using the middle 25 funds (31 minus the 3 top and the 3 bottom) or 19 funds (31 minus 6 minus 6) yielded qualitatively similar results.
4. It is worth noting that the results of these strategies are not independent. They are drawn from the same time period and use the same 31 sector funds to generate returns. Another way to measure the power of the momentum strategies is to examine the consistency in performance of the various portfolios against relevant benchmarks. This consistency is addressed in the next section of the paper.
5. The results reported are for an initial investment of $100,000. I also carried out the analysis for an initial investment of $30,000. The annualized holding-period returns with this smaller initial investment were lower because of the redemption fees. For strategies with three-month holding periods, the annualized returns were reduced by approximately 26 basis points. Six- and twelve-month holding periods saw reduced returns of 13 and 6 basis points, respectively.
6. Sharpe, Alexander, and Bailey (1999) pointed out that for investors holding diversified portfolios, beta is a more appropriate measure of risk than standard deviation. Furthermore, Sharpe et al. documented that for such investors, the Treynor measure is a superior risk-adjusted measure to the Sharpe ratio. Jones (1998) also provided a discussion of the relative superiority of the Treynor measure over the Sharpe ratio for an investment that constitutes a portion of a diversified portfolio.
7. The inflation expectation came from the Survey of Consumers, Survey Research Center, University of Michigan, and is the median expected price change over the next 12 months. The index of leading economic indicators came from The Conference Board's Business Cycle Indicators. Both of these series are available from the Federal Reserve Board of St. Louis. Levels of each of these macroeconomic variables used also in (unreported) regressions were insignificant, as were coincident economic indicators and investment-grade corporate bond premiums.

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