Momentum Investing: The Quick and the Dead

Momentum has a long history of providing a positive premium above the market return. In the following analysis, we present evidence that a momentum strategy must rebalance the portfolio often to consistently capture the momentum premium. We further find that momentum's alpha signal experiences significant decay with the passage of time, placing the "freshness" of one's portfolio of paramount concern. Accordingly, we believe that when analyzing any momentum-based investment strategy, the frequency of rebalancing should be a relevant consideration.

"To improve is to change; to be perfect is to change often."
-Winston S. Churchill

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Momentum works, but it does experience signal decay

Empirical evidence demonstrates the momentum premium to be robust, persistent, and pervasive. In theory, momentum investing may seem simple – stocks that have performed well should continue to perform well. However, in practice, the momentum premium can be difficult to harvest consistently. One of the main challenges of successfully capturing the premium is that it exhibits significant signal decay through time.

Jegadeesh, Narasimhan, and Titman (1993) examined this phenomenon by looking at different holding periods for momentum strategies. One example cited in their research showed that a portfolio based on returns realized over the past 6 months generates an average cumulative return of 9.5% over the next 12 months but loses more than half of this return in the following 24 months. Arnott (2017) found similarly that a buy-and-hold momentum portfolio is profitable through month 8 but then loses all its gains after less than 24 months. Taken together, their research suggests that the rebalancing frequency associated with momentum strategies is of paramount concern.

Sample data and empirical analysis

To test the relationship between momentum's performance and rebalancing frequency, we form four sets of portfolios. Each portfolio starts with examining returns of the largest 3,000 U.S. stocks by market capitalization. These stocks are then ranked based on their trailing eleven-month return lagged by one month. We then buy the top decile of past performers and market cap weight the portfolio. Table 1 shows the performance and characteristics of the monthly, quarterly, semi-annually, and annually rebalanced versions. As shown in Table 1, all four of these sets of momentum portfolios outperform the Russell 3000 Index, with the best performer being the monthly rebalanced version at over 5% excess return per annum. On a risk-adjusted basis (Sharpe and Information Ratios), the monthly version again prevails and experiences an average excess return that is statistically significant at the 98% level. As for the annually rebalanced version, it also outperforms the Russell 3000 Index, but by a much lesser extent with a lower *t-stat* than the higher frequency versions.

In addition, in Table 1, we provide the turnover associated with each portfolio's rebalancing frequency. For example, the monthly rebalanced portfolio averaged 426% turnover per year, while the annually rebalanced portfolio averaged 94%. Obviously, due to the level of turnover required by each of these strategies, a suitable balance between expected alpha and implementation costs must be maintained.

Table 1: Rebalancing Effects on Momentum's Performance

January 1985 – June 2022

	Russell 3000 Index	Momentum (Monthly)	Momentum (Quarterly)	Momentum (Semi-Annually)	Momentum (Annually)
Annualized Return	10.49%	15.70%	13.06%	13.81%	11.97%
Turnover (Annualized)	3%	426%	225%	152%	94%
Sharpe Ratio	0.49	0.53	0.42	0.45	0.38
Information Ratio to R3000	--	0.32	0.16	0.21	0.10
T-Stat (Mean Excess Return)	--	2.37	1.56	1.85	1.22

See important disclosures on page 11. The Momentum Portfolios are calculated using data from the FactSet U.S. database. This analysis uses the top 3,000 stocks by market capitalization after excluding any stocks with a month-end price less than $2 as of the portfolio formation date. Turnover for the Russell 3000 Index is based on the annualized trailing five years. Turnover for the Momentum Portfolios is annualized for the period January 1985 through June 2022. Benchmark data is from FTSE Russell.

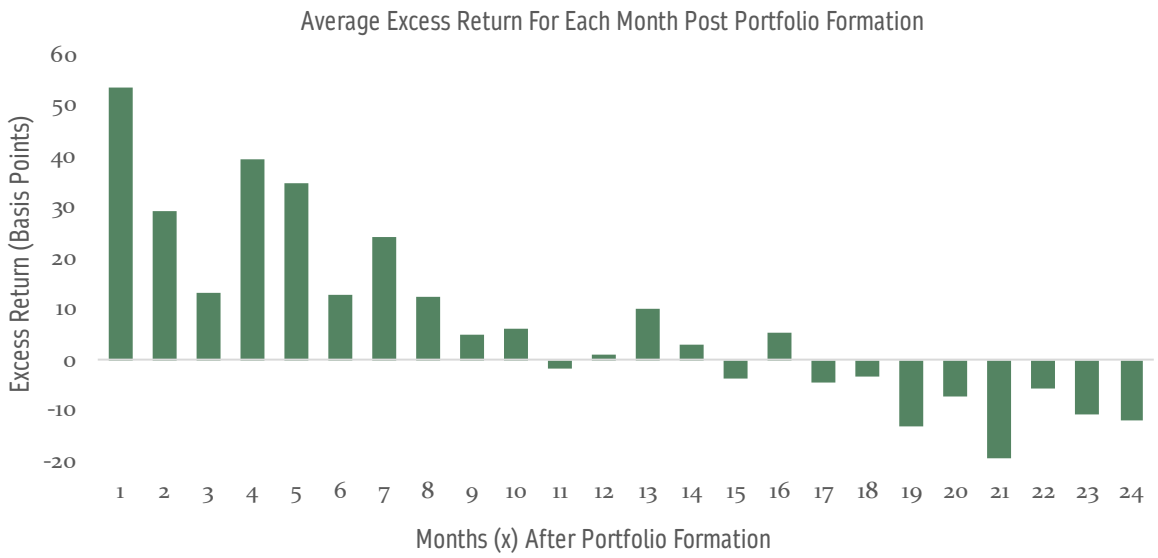
Measuring the signal decay

One way to understand why increased turnover improves the performance of a momentum strategy is to test the duration and amplitude of the alpha signal that relative strength provides. We do this by forming top decile momentum portfolios at the end of month *t*. We then fix the holding period (*x*) and compute the momentum portfolio's excess return (relative to the Russell 3000 Index) during month *t + x*. We then vary *x* for *x = 1, 2, …, 24* months. This computation provides us with non-cumulative momentum profits for each single month *t + x*. Then by varying the portfolio formation date (*t*) across the entire sample period (1985-2022), we can obtain time-series averages of excess returns *x* months into the future. In Figure 1, we plot these excess returns.

As can be seen in Figure 1, the highest monthly return comes in month 1 with an average return of 54 basis points. Further, while months 1 through 10 generate positive excess returns, they turn mostly negative after month 10. The strategy begins to trail the benchmark in month eleven and continues to do so throughout the second-year post portfolio formation[1]. Therefore, by rebalancing the portfolio often enough, one can hold stocks that form the return on the left side of the bar chart, while avoiding the right side.

Figure 1: Buy & Hold Momentum Signal Decay Through Time

January 1985 – June 2022



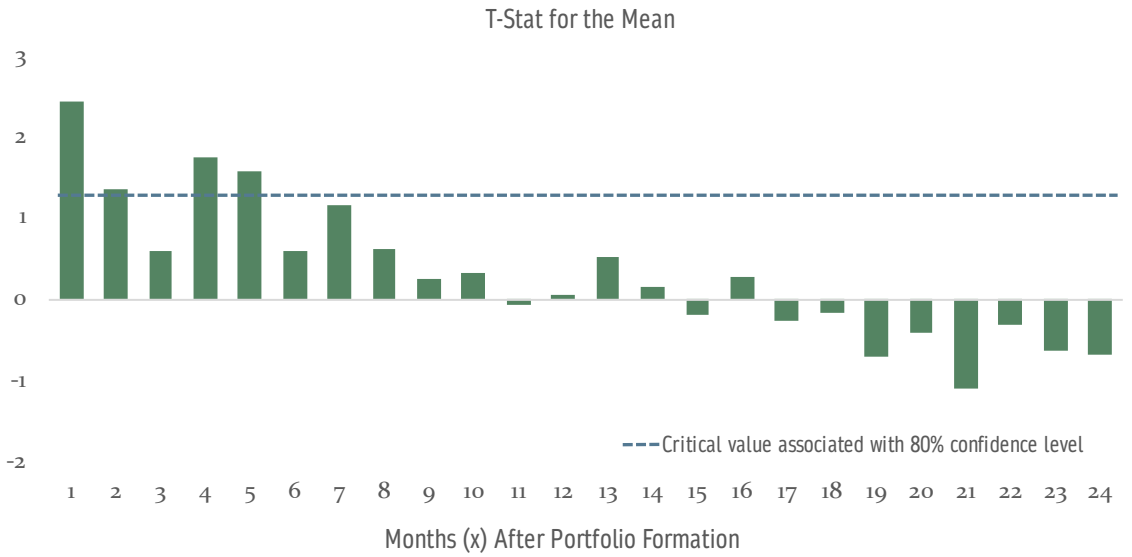
Information presented is calculated using data from the FactSet U.S. database. This analysis uses the top 3000 stocks by market capitalization after excluding any stocks with a month-end price less than $2 as of the portfolio formation date. Benchmark data used in the calculations is from FTSE Russell.

[1] We also find evidence of mean reversion during year three of the buy and hold period.

In addition, for each of these months we report the associated *t*-statistic and the critical value associated with a confidence level of 80% in Figure 2. Comparing Figure 1 with Figure 2, demonstrates that the signal decay appears to occur even earlier than month eleven, as during month eight (and onward through the second-year post portfolio formation), the statistical significance of each positive excess return month drops below 76%.

Figure 2: Buy & Hold Momentum Excess Return Significance

January 1985 – June 2022



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Conclusion

To harvest the momentum premium consistently through time, our research suggests that one needs to keep the portfolio "fresh" by turning over portfolio holdings frequently. Further, our research suggests that more frequent rebalancing generally results in better excess returns as momentum experiences a significant signal decay through time. Our analysis demonstrates that excess returns tend to decline through time and turn negative by month 11. Therefore, we believe a successful momentum strategy must strike a balance between expected alpha and the costs of implementation at higher turnover rates – placing the costs of trading and rebalancing frequencies as key ingredients in any successful momentum-based strategy.

Appendix 1: Risk-Adjusted Momentum Profits

Previously, we analyzed excess momentum portfolio returns relative to the Russell 3000 Index. As a robustness check, we consider momentum portfolio returns in excess of the Fama-French three-factor and five-factor models. The intercepts from the regressions referenced below represent risk-adjusted excess returns for momentum relative to each of the Fama-French models.

First, we form Fama-French risk adjusted returns in the following way: We form top decile momentum portfolios at the end of month *t*. We then compute twenty-four regression intercepts by fixing the holding period (*x*) and regressing the momentum portfolio profits during month *t + x*, onto the contemporaneous Fama-French (1993) three-factor model returns. We then vary *x* for *x = 1, 2, …, 24* months. The momentum returns are not cumulative and represent the return for each single month *t + x*, in which the holding period (*x*) is fixed. Then the portfolio formation date (*t*) is varied across the sample period (1985-2022) to form the time-series used in the regression. We also repeat this regression specification with respect to the Fama-French (2015) five-factor model. Equations (1) and (2) display the regressions used in order to plot the intercepts $\alpha^{(x)}$ and $\tilde{\alpha}^{(x)}$ of figures A1.1 and A1.3 respectively. We also note that *Rf* is used to denote the risk-free rate.

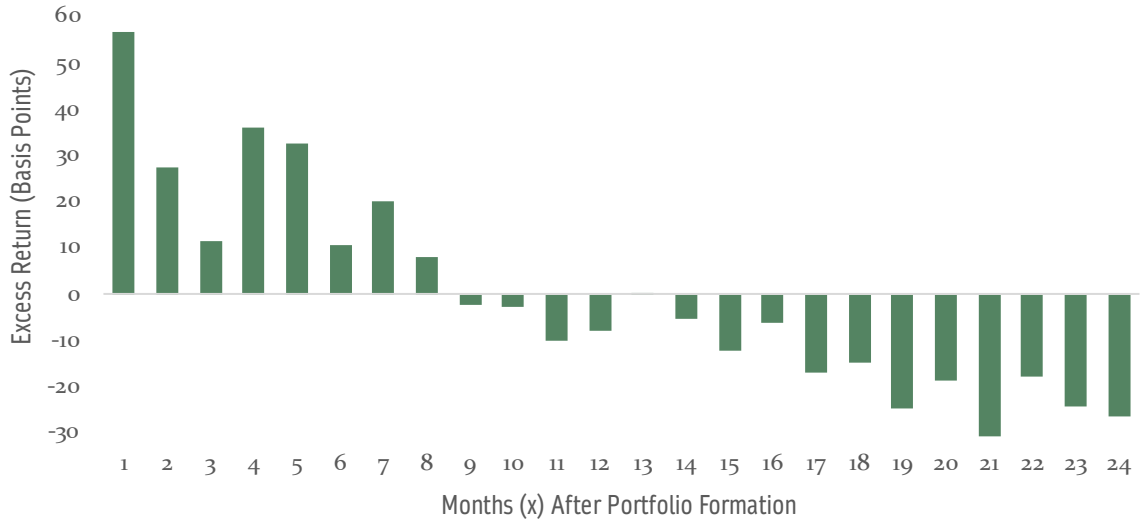
Figure A1.1 shows a similar result to that of Figure 1, with alpha vanishing in month nine. Figure A1.2 reports the *t*-statistics and the critical value associated with a confidence level of 80% for the three-factor model intercept.

$$MOM_t^{(x)} - Rf_t = \alpha^{(x)} + \beta^{(x)} \cdot \left(MKT_t - Rf_t\right) + \delta^{(x)} \cdot SMB_t + \lambda^{(x)} \cdot HML_t + \varepsilon_t^{(x)}, \;\; x = 1, 2, \ldots, 24. \quad (1)$$

Figure A1.1: Fama-French Three-Factor Intercept

January 1985 – June 2022

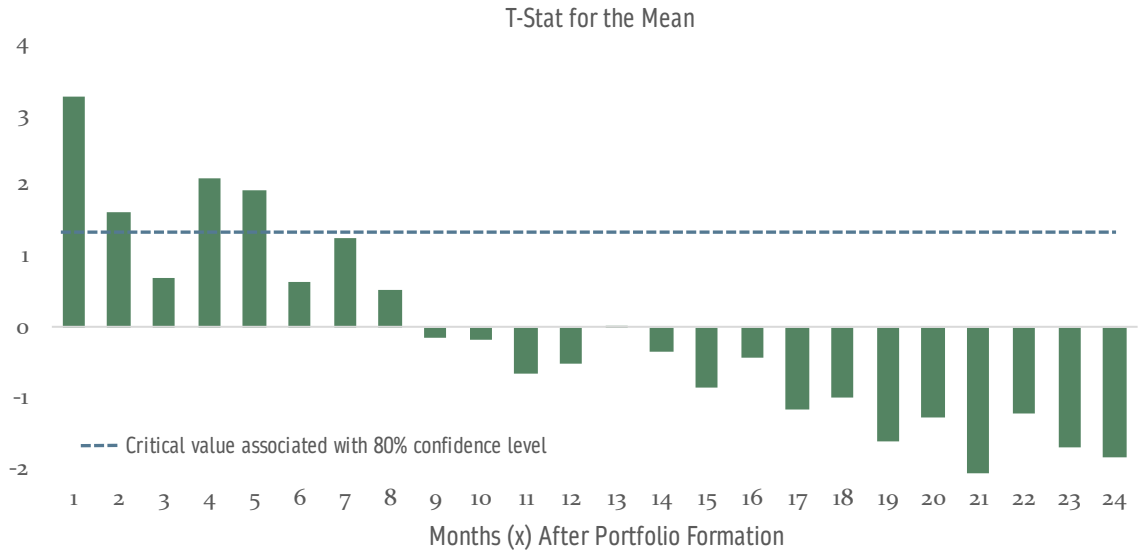
Average Excess Return For Each Month Post Portfolio Formation



The intercept shown is relative to the Fama-French 3-Factor Model risk adjustment. Momentum Portfolios are calculated using data from the FactSet U.S. database. The Fama-French factor returns data may be found at: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Figure A1.2: Fama-French Three-Factor Intercept Significance

January 1985 – June 2022



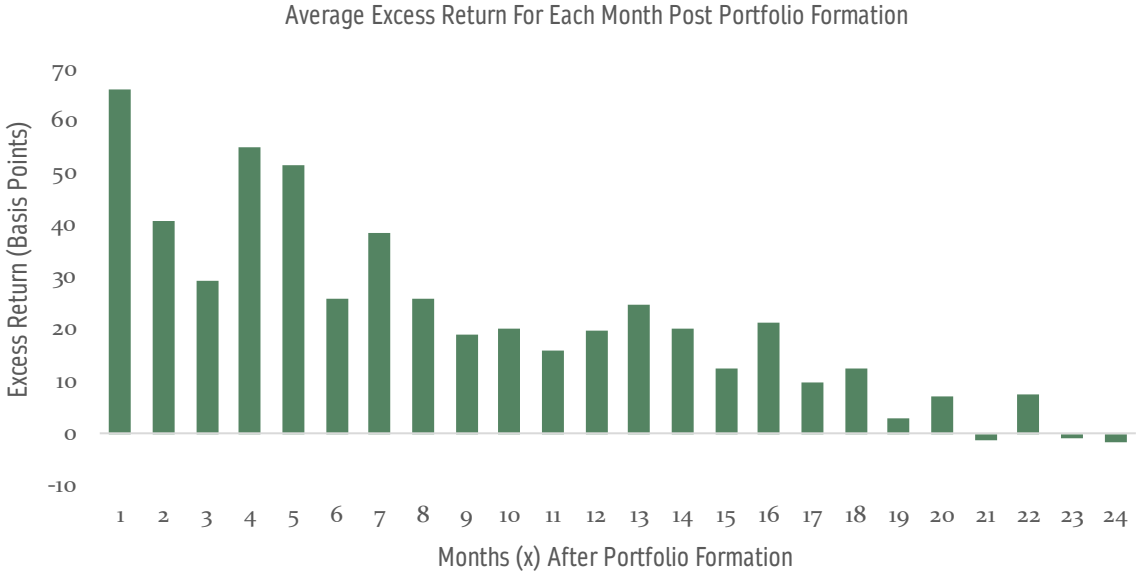
The intercept shown is relative to the Fama-French 3-Factor Model risk adjustment. Momentum Portfolios are calculated using data from the FactSet U.S. database. The Fama-French factor returns data may be found at: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Figure A1.3 shows the intercepts relative to the Fama-French five-factor model. The signal decay is again apparent. However, the intercept is positive further into the future due to the buy and hold momentum portfolio becoming negatively exposed to the two additional factors present in equation (2) which are not part of the regression specification of equation (1). Namely the operating profitability factor (RMW) and the investments factor (CMA). These two contributors cause the intercept to rise to offset the negative contributions to the momentum decomposition given by those two positive factor premiums. Figure A1.4 reports the *t*-statistics and the critical value associated with a confidence level of 80% for the five-factor model intercept.

$$MOM_t^{(x)} - Rf_t = \tilde{\alpha}^{(x)} + \tilde{\beta}^{(x)} \cdot \left(MKT_t - Rf_t\right) + \tilde{\delta}^{(x)} \cdot SMB_t + \tilde{\lambda}^{(x)} \cdot HML_t + \ldots$$
$$\eta^{(x)} \cdot RMW_t + \phi^{(x)} \cdot CMA_t + \tilde{\varepsilon}_t^{(x)},\ x = 1, 2, \ldots, 24. \qquad (2)$$

Figure A1.3: Fama-French Five-Factor Intercept

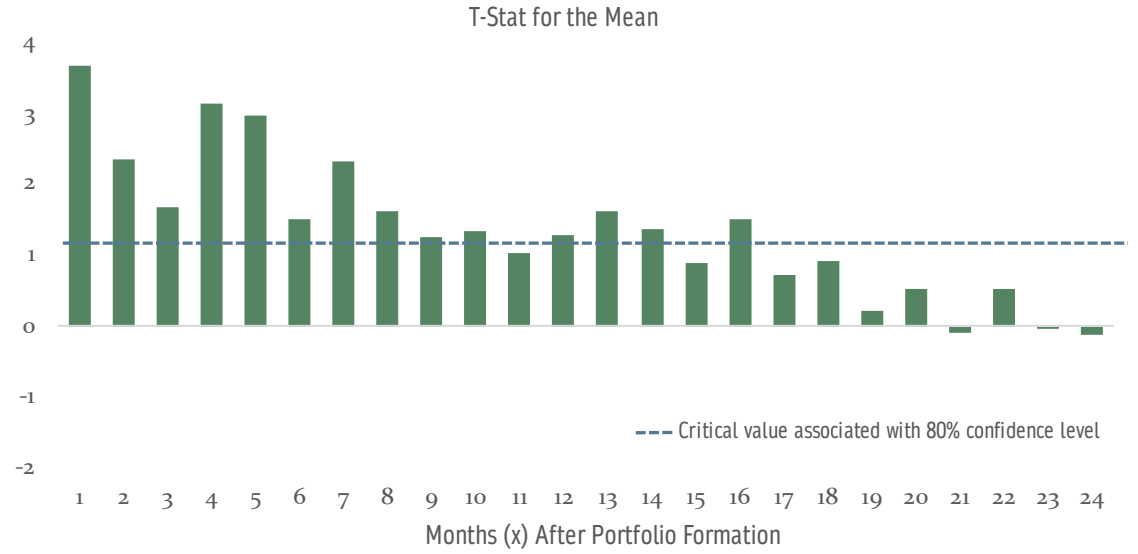
January 1985 – June 2022



The intercept shown is relative to the Fama-French 5-Factor Model risk adjustment. Momentum portfolios are calculated using data from the FactSet U.S. database. The Fama-French factor returns data may be found at: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Figure A1.4: Fama-French Five-Factor Intercept Significance

January 1985 – June 2022



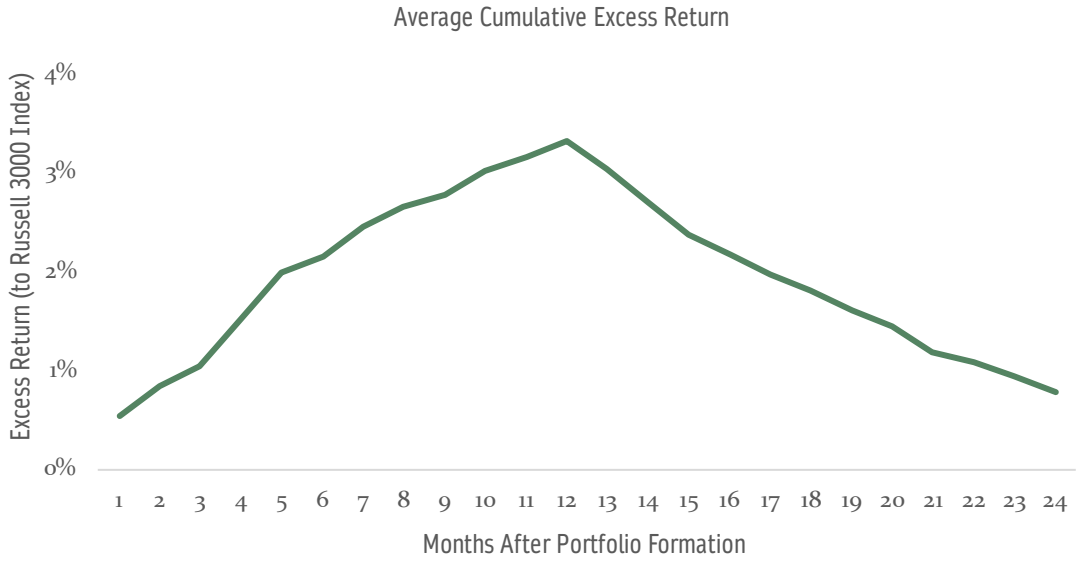
The intercept shown is relative to the Fama-French 5-Factor Model risk adjustment. Momentum portfolios are calculated using data from the FactSet U.S. database. The Fama-French factor returns data may be found at: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Appendix 2: Cumulative Performance

We show the average cumulative excess return (annualized excess return if the time horizon is one year or more) from portfolio formation through *x* months forward in Figure A2.1. The best time to own the momentum stocks is during the earlier time periods post portfolio formation. This figure shows that after month thirteen, the annualized performance drops off and begins to erode the prior gains. Again, evidence of the need to turn over the portfolio in order not to miss the opportunity costs associated with buying the "*fresh*" momentum stocks.

Figure A2.1: Momentum's Cumulative Performance Post Portfolio Formation

January 1985 – June 2022



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About EAM

EAM Investors is solely focused on delivering alpha for clients in global equity markets. Our Informed Momentum approach to investing combines stock selection, tailored risk management, and efficient implementation to effectively deliver the momentum premium. This investment process is the foundation of our firm and is applied consistently across all our strategies. For our clients, we deliver persistent risk exposures, resulting in more consistent and predictable alpha.

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The Russell 3000 Index is a market-capitalization-weighted equity index maintained by FTSE Russell that provides exposure to the entire U.S. stock market. The index tracks the performance of the 3,000 largest U.S.-traded stocks, which represent about 97% of all U.S.-incorporated equity securities. Stocks in the Russell 3000 Index are reconstituted once a year.

Fama-French returns referenced in this document are calculated using monthly and daily data from Ken French's website:
https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html