



Chris Brightman, CFA

“A momentum strategy implemented through an index-based approach has serious limitations.”

## KEY POINTS

1. Implementation costs and front running make an index replication strategy inadvisable as a means to capture the momentum premium.
2. The pros (proven profitability and robustness) of momentum can swiftly be wiped out by the cons (crashes and crowded trades), making an active implementation dangerous for all but the most skilled managers.
3. Combining value and momentum in order to exploit their typically negative correlation in stock holdings and alpha can improve a portfolio's Sharpe ratio over those of either strategy alone.

## How NOT to Wipe Out with Momentum

Chris Brightman, CFA, Vitali Kalesnik, Ph.D., and Engin Kose, Ph.D.

Momentum investors are like the surfers we watch from beaches along the Pacific coast. Both must catch a wave. Both attempt to ride it as it breaks. But the ability to glide away smoothly before being caught inside the inevitable crash(ing wave) that follows is what determines success.

Momentum, one of a handful of equity factors that empirically displays robust equity returns, has recently become popular as investors explore factor investing. In the passive realm, investors are increasingly seeking to replicate cheap and transparent indices. But does index replication make sense in the case of momentum?

We believe a momentum strategy implemented through an index-based approach has serious limitations. And although some active managers are quite adept at riding the momentum wave, it does require significant experience and skill. Our view is that momentum as an index replication strategy can be very dangerous, but incorporating it into an active value strategy is an opportune way to exploit its insights.

### Catching the Wave

The investment industry borrowed the term “momentum” from the physical sciences. In physics, momentum is defined as mass (such as ocean water) in motion. When used in the sense of investing, momentum refers to movement in stock prices.

Several explanations exist for the energy that creates the prolonged movement of stock prices higher or lower. The most convincing explanation in our view is that investors initially underreact to earnings surprises. Chordia and Shivakumar (2006) and Novy-Marx (2015) have shown that earnings momentum explains most of the momentum effect. Investors are at first slow to react to an unexpected uptick or downtick in earnings. But when the next earnings data are reported and they confirm the prior report, investors register the potential importance of the change in trend. If earnings are higher than expected, the momentum in price is upward. Subsequent confirming earnings releases may even cause euphoria and over-extrapolation of future earnings forecasts, reinforcing the fast-moving upward trajectory. The momentum investor benefits as the price reacts to subsequent earnings announcements and moves higher. Price momentum can also move in the opposite direction—down—with correspondingly negative outcomes for investors. We will discuss this “fly in the sunscreen” in the next section.

Investors have good reason to want to catch the momentum wave. History shows that stocks with above-average performance in the prior year have tended to persist in producing short-term excess returns. This tendency is one of the strongest empirical regularities in finance and has been documented across geographies and asset classes.

**Table 1** reports the average performance of momentum equity portfolios constructed for different definitions of momentum<sup>1</sup> and in different geographical markets: the United States, Europe, Japan, Asia Pacific ex Japan, and Global. Momentum has consistently added value across markets, with the widely known exception of Japan, an outlier we would expect for any strategy with inherent randomness.

The data also show that the risk-return characteristics of momentum are robust across time periods. **Figure 1** plots the growth of one U.S. dollar invested in a long-short momentum strategy in January 1927. By the end of the 87-year period in June 2015, it had grown quite steadily to a formidable \$6,524, which compares to \$4,078 for the market portfolio.

## Wiping Out

Buying into positive price momentum—that is, purchasing a stock whose price subsequently and steadily rises—generates a capital gain for an investor. The catch is that, as in physics, what goes up must come down. The perfectly breaking 15-foot wave can quickly become dangerous and deadly.

*“Momentum has consistently added value across markets, with the widely known exception of Japan.”*

Predicting when that turning point will be, just as forecasting when the turning point in the price momentum of a particular stock or asset class will arrive, is no easy task. Missing that turning point can mean not only *not* locking in a gain, but more insidiously being “caught inside the wave,” unable to sell before the downside of a momentum trend takes hold in the market. Accordingly, two predominant risks characterize a momentum strategy: substantial drawdowns, or crashes, and a crowded momentum trade, which makes the trading costs high enough to obliterate the alpha of the strategy for the careless momentum surfer. Let’s take a closer look at both of these.

The crashes periodically experienced in a momentum strategy can be significant, as **Figure 2** shows. The relentless upward climb of prices depicted in Figure 1 disguises (thanks to the log-scale of the

chart) the sudden and abrupt drawdowns that a momentum investor must live with. These drawdowns usually occur following periods of heightened volatility, typically a function of a crisis event. Since 1927, drawdowns have generally been under 20%, but the granddaddy of all drawdowns was the 74% plunge in prices in the aftermath of the Great Depression. In the last 15 years, the U.S. equity market has been visited with two major negative momentum events: the first, a 31% drawdown after the tech bubble burst in 2000, and the second, a 57% drawdown, in the wake of the 2008 global financial crisis.

In a crash, the price momentum is typically concentrated in groups of stocks that the market particularly loathes and fears more than others, often distressed companies with high betas. These recent losers are sold as the negative momentum continues, until investors, satisfied with the new state of the world, view these stocks as cheap enough to be great investment opportunities. As the market shifts its perspective, the most-feared losers with high betas recover with a vengeance and momentum investors are off to catch another wave.

**Table 1. Pervasiveness of Momentum**

Region and Definition	Recent Winners		Recent Losers		t-stat of Long-Short
	Return	Volatility	Return	Volatility	
United States –2 to –12 months	15.6%	18.5%	6.3%	22.0%	3.74***
United States –2 to –12 months, 3-month hold	14.5%	18.7%	6.6%	21.6%	3.36***
United States –2 to –6 months	13.0%	18.3%	8.4%	21.9%	1.83*
Europe –2 to –12 months	14.8%	17.1%	2.0%	21.5%	3.89***
Japan –2 to –12 months	2.5%	20.8%	0.3%	24.4%	0.45
Asia Pacific ex Japan –2 to –12 months	16.1%	22.1%	3.4%	26.3%	3.41***
Global –2 to –12 months	13.0%	16.1%	4.2%	19.1%	2.77***

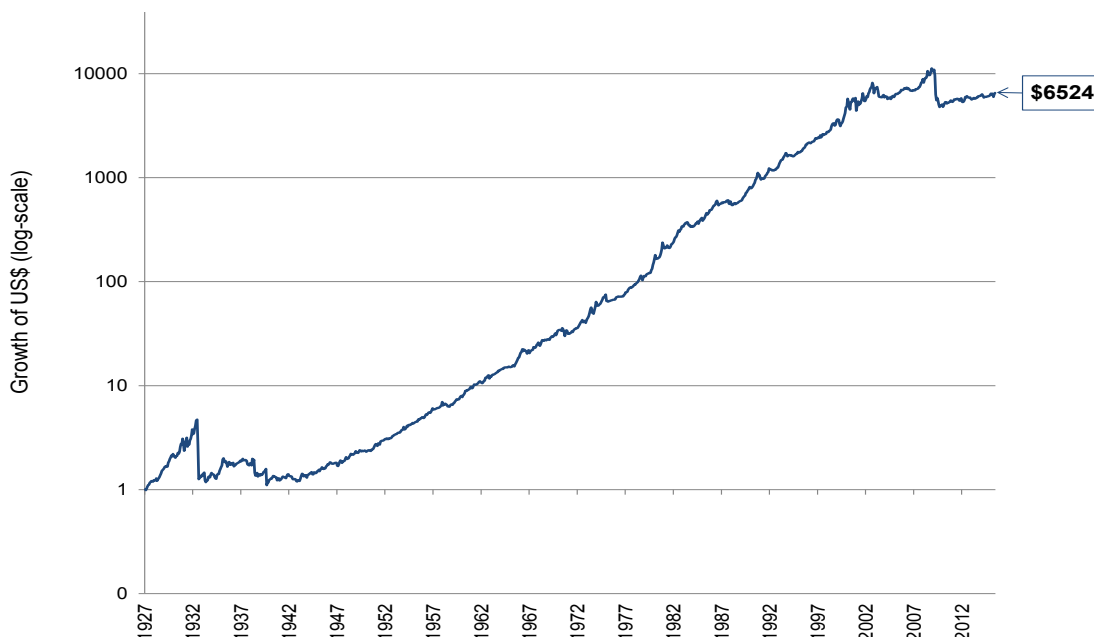
\* Significant at the 10% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 1% level.

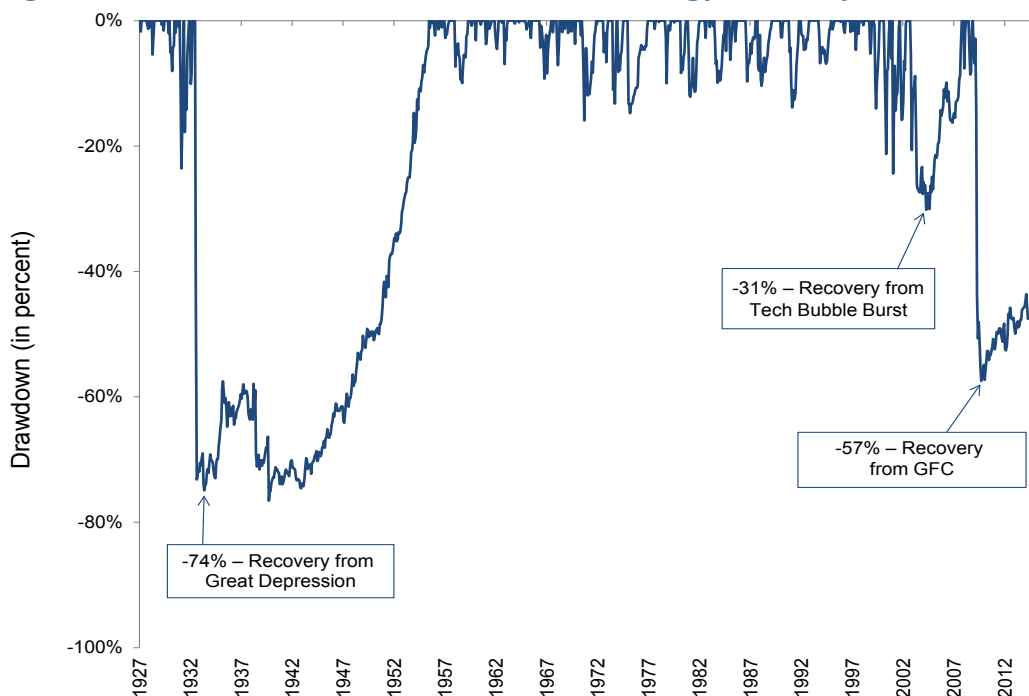
Source: Research Affiliates, LLC, using data from the website of Kenneth French. The performances are reported for the following periods: United States, 1967–2014; Europe, Japan, and Global, 1987–2014.

Figure 1. Growth of One U.S. Dollar Invested in a Long-Short Momentum Strategy, Including the Risk-Free Asset as Collateral, January 1927-June 2015



Source: Research Affiliates, LLC, using data from the website of Kenneth French.

Figure 2. Drawdowns of a Momentum Strategy, January 1927-June 2015



Source: Research Affiliates, LLC, using data from the website of Kenneth French.

Note: The strategy is a momentum long-short portfolio with the risk-free asset as collateral.

Crowded surf can create frustration as surfers compete for waves, leading to low wave counts and disappointing rides. The same experience looms for investors who chase the momentum trade. Momentum investors face the probability of a lower return as they “crowd in” to purchase a stock benefitting from positive momentum, which pushes the price up beyond fair value. When the momentum trend begins to reverse, momentum investors face the risk of not being able to sell at a reasonable price as large numbers “crowd out” to liquidate their positions. Essentially, the higher the price goes, the more investors are attracted to the trade, lowering its potential return except to the earliest adopters. Likewise, the lower the price goes, the faster investors seek to exit the trade, putting significant pressure on the price and the market’s ability to absorb the extent of the selling interest.

The substantial risk from these interrelated forces—drawdowns and the crowded trade—act as a very practical and meaningful deterrent to more widespread adoption of a momentum investing strategy, even though it has been proven to be robustly profitable. Being cognizant of these risks, how can an investor best exploit the insights of a momentum strategy?

## Navigating Dangerous Currents

A surfer knows to look for rip currents that can push her away from shore. In investing, particularly in passive strategies, dangerous currents lurk in the implementation process. One of these currents, the far from trivial price impact of rebalancing in popular indices, has been studied by a number of researchers: Shilfer (1986), Harris and Gurel (1986), Arnott and Vincent (1986), Goetzmann and Garry (1986), Jain (1987), Lamoureux and Wansley (1987), and Lynch and Mendenhall (1997), among others.

Other researchers, including Novy-Marx and Velikov (2014) and Hsu et al. (forthcoming), have estimated the trading costs associated with index-like implementation of a momentum strategy. Hsu and his co-authors calculate the value added by a momentum strategy before and after transaction costs, as reported in **Table 2**. The calculation shows that trading costs are higher than the potential benefits from the strategy. [A caveat: We do not believe this to be true in the case of an active manager with strong expertise in trading.<sup>2</sup>]

The practical implication of tracking an index, regardless of factor, is that when one investor places her rebalancing trades, all the other investors tracking

the same index are also placing their rebalancing trades. Consequently, these investors are competing for the same stocks at the same time, generating upward pressure on price. When the factor is momentum, this phenomenon is aggravated by the fact that, in order to squeeze the highest performance out of a momentum strategy, turnover of close to 100% a month is required. Thus, in the hands of inefficient implementers or automated indices, high turnover can mean high cost.

Other currents that plague the implementation of passive strategies are the required transparency and broad disclosure of index rules. With today’s state-of-the-art technology, modern-day front runners are able to reproduce index calculations and implement trades well before rebalancing announcements are made by the index calculator. Therefore, spreading trades over time cannot remedy the problem of prices pushed up significantly by front-running activity. As such, the front runners will enjoy the factor premium—in this case, the momentum premium—and the index investors will provide this premium to them.

## Riding the Curl

A pure momentum strategy, as we have just outlined, has both pros (demonstrated profitability and robustness) and cons

**Table 2. Value Add of Momentum Strategies Before and After Trading Costs**

Region and Definition	\$10B, Large-Cap Portfolio		\$1B, Small-Cap Portfolio	
	Value Add vs. Market, Before Transaction Costs	Value Add vs. Market, After Transaction Costs	Value Add vs. Market, Before Transaction Costs	Value Add vs. Market, After Transaction Costs
United States -2 to -12 months	2.7%	-3.4%	5.2%	0.4%
United States -2 to -12 months, 3-month hold	2.0%	-1.6%	3.7%	0.7%
United States -2 to -6 months	0.0%	-9.7%	2.7%	-5.2%
Average	1.6%	-4.9%	3.9%	-1.4%

Source: Research Affiliates, LLC, using CRSP/Compustat and Worldscope/Datastream data from Hsu et al. (forthcoming).

(crashes and crowded trades). One strong “pro” we have yet to mention is the contribution that momentum can make to a value strategy. Adding momentum to a value strategy is similar to a surfer riding “peaky” waves that will give him a lengthy and exciting ride, leaving others to surf “close-out” waves with short, dull rides.

In a value strategy, investors sometimes find themselves trading *against* momentum. As a stock becomes cheaper, a value strategy suggests buying more of it, the exact opposite of what a momentum strategy suggests. Not surprisingly, value and momentum strategies are usually negatively correlated both in terms of stock holdings and alpha. Exploiting this negative correlation is essentially riding the curl—a value strategy conditioned on momentum. The combined strategy generally trades like a value strategy, but with purchases and sales delayed to benefit from momentum’s impact on prices. The addition of momentum need not boost turnover relative to a value investing strategy, and therefore, need not incur the high trading costs of a momentum strategy.

“ Combining value and momentum in a single strategy leads to significant improvements in portfolio risk-return characteristics. ”

**Table 3** illustrates that combining value and momentum in a single strategy leads to significant improvements in portfolio risk-return characteristics. The improvements, largely attributable to consistent negative correlation that varies between -0.2 and -0.4, are robust. As shown in Table 3, the 50% value/50% momentum strategy’s Sharpe ratios are markedly higher than those for either strategy alone, indicating that a value strategy conditioned on momentum produces a significantly improved risk-return trade-off across regions, with the exception of Japan.

**Pipelining Momentum**

On paper, a momentum-based index against which active managers can benchmark makes sense—momentum is an important market driver that

cannot be ignored. But in our opinion, passive implementation of a momentum strategy is not advisable. Front runners and high transaction costs, a function of the strategy’s required high turnover, largely destroy the potential benefits of a momentum-based passive portfolio.

Certainly, an active implementation of a momentum strategy, which incorporates a careful study of liquidity, makes sense for some investors. The more sophisticated investors who are aware of the strategy’s risks of crashes and crowded trades can benefit, but only when carefully implemented. Thus, the implementation capabilities of an active manager of a momentum strategy should be reviewed just as rigorously as, if not more so, the manager’s trading expertise.

In our view, both passive and active standalone momentum-based strategies have the potential to wipe out the value add that the momentum premium can bring to a portfolio. But incorporating momentum into a value strategy can open a performance pipeline for the investor who can make a clean escape as the wave closes behind him, crashing on the investors who are not exploiting momentum’s insights in a similar way.

**Table 3. Sharpe Ratios and Correlation of Value and Momentum Strategies and 50/50 Mix**

		Average Return	Average Volatility	Sharpe Ratio	Correlations between Value and Momentum	Sharpe Ratio of the 50/50 Mix
United States	Momentum	6.79%	16.42%	0.41	-0.40	0.78
	Value	4.02%	12.25%	0.33		
Europe	Momentum	10.47%	14.07%	0.74	-0.28	1.08
	Value	4.15%	8.34%	0.50		
Japan	Momentum	0.17%	15.66%	0.01	-0.22	0.35
	Value	4.62%	9.60%	0.48		
Asia Pacific ex Japan	Momentum	9.94%	15.88%	0.63	-0.31	1.12
	Value	6.85%	10.66%	0.64		
Global	Momentum	6.68%	13.65%	0.50	-0.26	0.83
	Value	3.84%	8.00%	0.48		

Source: Research Affiliates, LLC, using data from the website of Kenneth French. The performances are reported for the following periods: United States: January 1927–June 2015; Europe, Japan, and Global: November 1990–June 2015.

## Endnotes

1. In Table 1 we report long-only strategies in the "Recent Winners" and "Recent Losers" columns. These portfolios comprise stocks with the highest and lowest past returns, respectively. The "t-Stat" column reports the t-stat of the long-short portfolio returns. The long-short portfolio holds recent winners and shorts recent losers. Three versions of the momentum strategy are reported for the United States because three different holding periods were used to measure recent returns.
2. For example, Frazzini, Israel, and Moskowitz (2012) analyze trading costs associated with an actual implementation of a momentum strategy by an active manager. Their main finding is that, with thoughtful implementation, transaction costs in a momentum strategy can be significantly reduced.

## References

- Arnott, Robert, and Stephen Vincent. 1986. "S&P Additions and Deletions: A Market Anomaly." *Journal of Portfolio Management*, vol. 13, no. 1 (Fall):29-33.
- Basu, Sanjoy. 1977. "Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis." *Journal of Finance*, vol. 32, no. 3 (June):663-682.
- Chordia, Tarun, and Lakshmanan Shivakumar. 2006. "Earnings and Price Momentum." *Journal of Financial Economics*, vol. 80, no. 3 (June):627-656.
- Frazzini, Andrea, Ronen Israel, and Tobias Moskowitz. 2012. "Trading Costs of Asset Pricing Anomalies." Fama-Miller Working Paper, Chicago Booth Research Paper No. 14-05 (December 5). [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2294498](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2294498)

Goetzmann, William, and Mark Garry. 1986. "Does Delisting from the S&P 500 Affect Stock Price?" *Financial Analysts Journal*, vol. 42, no. 2 (March/April):64-69.

Harris, Lawrence, and Eitan Gurel. 1986. "Price and Volume Effects Associated with Changes in the S&P 500 List: New Evidence for the Existence of Price Pressures." *Journal of Finance*, vol. 41, no. 4 (September):815-829.

Hsu, Jason, Vitali Kalesnik, Helge Kostka, and Noah Beck. Forthcoming. "Navigating the Factor Zoo." Research Affiliates Working Paper.

Jain, Prem. 1987. "The Effect on Stock Price from Inclusion In or Exclusion from the S&P 500." *Financial Analysts Journal*, vol. 43, no. 1 (January/February):58-65.

Lamoureux, Christopher, and James Wansley. 1987. "Market Effects of Changes in the Standard & Poor's 500 Index." *Financial Review*, vol. 22, no. 1 (February):53-69.

Lynch, Anthony, and Richard Mendenhall. 1997. "New Evidence on Stock Price Effects Associated with Changes in the S&P 500 Index." *Journal of Business*, vol. 70, no. 3:351-383.

Novy-Marx, Robert. 2015. "Fundamentally, Momentum Is Fundamental Momentum." NBER Working Paper No. 20984 (February). <http://www.nber.org/papers/w20984>.

Novy-Marx, Robert, and Mihail Velikov. 2014. "A Taxonomy of Anomalies and Their Trading Costs." NBER Working Paper No. 20721 (December). <http://www.nber.org/papers/w20721>

Shleifer, Andrei. 1986. "Do Demand Curves for Stocks Slope Down?" *Journal of Finance*, vol. 41, no. 3 (July):579-590.

## Disclosures

The material contained in this document is for general information purposes only. It is not intended as an offer or a solicitation for the purchase and/or sale of any security, derivative, commodity, or financial instrument, nor is it advice or a recommendation to enter into any transaction. Research results relate only to a hypothetical model of past performance (i.e., a simulation) and not to an asset management product. No allowance has been made for trading costs or management fees, which would reduce investment performance. Actual results may differ. Index returns represent back-tested performance based on rules used in the creation of the index, are not a guarantee of future performance, and are not indicative of any specific investment. Indexes are not managed investment products and cannot be invested in directly. This material is based on information that is considered to be reliable, but Research Affiliates™ and its related entities (collectively "Research Affiliates") make this information available on an "as is" basis without a duty to update, make warranties, express or implied, regarding the accuracy of the information contained herein. Research Affiliates is not responsible for any errors or omissions or for results obtained from the use of this information. Nothing contained in this material is intended to constitute legal, tax, securities, financial or investment advice, nor an opinion regarding the appropriateness of any investment. The information contained in this material should not be acted upon without obtaining advice from a licensed professional. Research Affiliates, LLC, is an investment adviser registered under the Investment Advisors Act of 1940 with the U.S. Securities and Exchange Commission (SEC). Our registration as an investment adviser does not imply a certain level of skill or training.

Investors should be aware of the risks associated with data sources and quantitative processes used in our investment management process. Errors may exist in data acquired from third party vendors, the construction of model portfolios, and in coding related to the index and portfolio construction process. While Research Affiliates takes steps to identify data and process errors so as to minimize the potential impact of such errors on index and portfolio performance, we cannot guarantee that such errors will not occur.

The trademarks Fundamental Index™, RAFI™, Research Affiliates Equity™, RAE™, and the Research Affiliates™ trademark and corporate name and all related logos are the exclusive intellectual property of Research Affiliates, LLC and in some cases are registered trademarks in the U.S. and other countries. Various features of the Fundamental Index™ methodology, including an accounting data-based non-capitalization data processing system and method for creating and weighting an index of securities, are protected by various patents, and patent-pending intellectual property of Research Affiliates, LLC. (See all applicable US Patents, Patent Publications, Patent Pending intellectual property and protected trademarks located at <http://www.researchaffiliates.com/Pages/legal.aspx#d>, which are fully incorporated herein.) Any use of these trademarks, logos, patented or patent pending methodologies without the prior written permission of Research Affiliates, LLC, is expressly prohibited. Research Affiliates, LLC, reserves the right to take any and all necessary action to preserve all of its rights, title, and interest in and to these marks, patents or pending patents.

The views and opinions expressed are those of the author and not necessarily those of Research Affiliates, LLC. The opinions are subject to change without notice.

©2015 Research Affiliates, LLC. All rights reserved.