

RESEARCH

Smart β

January 2015

Bhanu Singh
Vice President
PORTFOLIO
MANAGEMENT

Marlena Lee, PhD
Vice President
RESEARCH

Smart beta strategies have grown in popularity across the investment industry. This is part of a broader trend toward systematic strategies attempting to deliver market premiums. Investors are drawn to benefits such as transparency and low management fees. While some assert that such strategies may reduce volatility without sacrificing expected returns, others claim to deliver increased expected returns using stock selection or weighting schemes that presume mispricing. As with any other investment approach, it is important to understand the objectives of these strategies, drivers of their returns, and crucially, their implementation.

DEFINING SMART BETA

Smart beta is a broad term encompassing strategies attempting to capture premiums among securities. Some examples include fundamental-weighted strategies, low volatility strategies, and factor-based indices. The lack of a universal definition has led to confusion among individual investors and professionals while increasing the challenge of evaluating the merits and limitations of a specific strategy.

For the purposes of this discussion, we define smart beta as rules-based index strategies that deviate from market capitalization weights, often through weighting schemes that break the connection between a security's price and its weight in a portfolio. The growing number of

systematic approaches may be good news for investors seeking low-cost, diversified alternatives to conventional stock picking or traditional market-cap weighted index funds. Caution is still warranted because not all applications of a systematic approach are created equal. Examining several smart beta approaches through the lens of decades-old research into empirical asset pricing, we show that these strategies may offer little more than exposure to the well-documented market, size, and value premiums, with exposure achieved indirectly and in varying degrees.

PERILS OF IGNORING PRICES

We believe securities have differences in expected returns. These differences can be systematically identified by using market data, i.e., the price at which the security is trading, and other relevant company information, i.e., data reported by the company in its financials. Thus, a common motivation for deviating from market cap weights is to improve the chances of beating a benchmark by emphasizing securities with higher expected returns. Designing and implementing strategies that adjust the investable universe and weighting scheme to improve expected outperformance may be a goal worth pursuing. But to successfully design and implement, it is important to understand what drives differences in expected returns among securities. Rigorous testing and a strong rationale are necessary to confirm that what you see in the historical data is not a chance result. With solid empirical research on your side, it is also important to consider implementation, which can be the difference between what is simulated on paper and what can actually be captured in competitive markets.

While there may be valid reasons to deviate from market cap weights, it is harder to see the rationale for breaking the link between a security’s price and portfolio weight. Market cap indices only consider prices. Some smart beta approaches consider only characteristics and point to it as a benefit. It is important to consider both. Valuation models and intuition suggest that expected returns depend on the profits investors expect to receive and the price they pay.

Company characteristics, such as data reported in financial statements, can be useful in assessing expected returns. However, changes in company characteristics are typically infrequent. In well-functioning markets, prices reflect the

constantly updated aggregate expectations of participants. Therefore, prices contain important, real-time information about company-specific and market-wide events, which affect expected returns of securities. Given the information available in prices, it is hard to imagine a scenario in which we can target securities with higher expected returns without taking into account the prices we pay for those securities.

ROUNDBOUT VALUE

Case Study 1: Fundamental Weighting

Fundamental-weighted strategies seek to weight securities by a company’s “economic footprint,” measured through variables such as book equity, sales, cash flows, and dividends. The hypothesis that securities are mispriced and that using market cap weights results in overweighting overpriced securities often motivates the fundamental weighting approach. According to the logic, a portfolio that ignores market prices and uses fundamental variables to weight securities will have higher average returns than market cap-weighted portfolios.

Exhibit 1 FUNDAMENTAL-WEIGHTED STRATEGY: HISTORICAL RETURNS AND VOLATILITIES
January 1963–December 2013

	S&P 500 Index	Fundamental Weighting
Annualized Return	10.20%	12.04%
Annualized Standard Deviation	14.91%	15.07%

See Appendix for strategy description and data sources. Past performance is no guarantee of future results. An index is not available for direct investment; therefore, its performance does not reflect the expenses associated with the management of an actual strategy. For fundamental-weighted strategy returns, filters were applied to data retroactively and with the benefit of hindsight.

Indeed, Exhibit 1 shows that fundamental weighting tends to produce higher average returns than a market cap-weighted portfolio.

Does fundamental weighting outperform because it capitalizes on mispricing? Even if mispricing occurs, there is no reason to believe that a simple rules-based weighting scheme will enable a portfolio to profit. This would require one to successfully identify a mispriced security and then have some reason to believe that the security will be

correctly priced in the future. The fact that most mutual fund managers fail to outperform their benchmarks suggests that it is difficult to generate consistent profits by identifying mispricing.

If not mispricing, what is the driver for the simulated outperformance of fundamental-weighted strategies? As shown in Exhibit 2, the regression results from a Fama/French three-factor model help identify the drivers of performance. Fundamental-weighted strategies have a tilt toward value, as indicated by the 0.44 coefficient on the value factor exposure. Market cap-weighted portfolios tend to be style-neutral and have value coefficients close to zero.

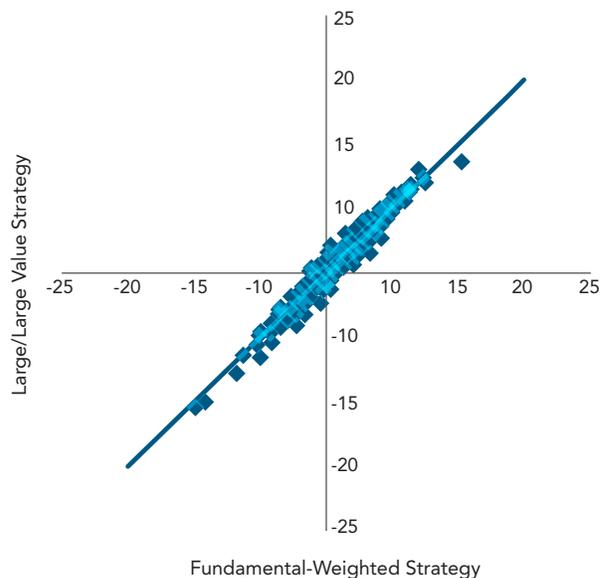
Exhibit 2 FUNDAMENTAL-WEIGHTED STRATEGY EXPOSURE TO MARKET, SIZE, AND VALUE FACTORS
January 1963–December 2013

	S&P 500 Index	Fundamental Weighting
Alpha (%)	0.02	-0.04
t-Stat	(1.49)	(-1.09)
Factor Exposures		
Market Beta	1.00	1.01
Size	-0.18	-0.05
Value	0.03	0.44
R-Squared	0.99	0.96

See Appendix for strategy description and data sources. Past performance is no guarantee of future results. An index is not available for direct investment; therefore, its performance does not reflect the expenses associated with the management of an actual strategy. For fundamental-weighted strategy characteristics, filters were applied to data retroactively and with the benefit of hindsight.

Fundamental-weighted strategies are value strategies: A security with a high relative price is underweighted relative to its market cap weight, and a security with a lower relative price is overweighted relative to its market cap weight. Exhibit 3 shows that a fundamental-weighted strategy performs like a portfolio comprising 25% US large cap and 75% US large cap value, both of which are market cap-weighted. Not only does the fundamental-weighted strategy have average returns similar to those of the large/large value strategy (1.04% vs. 1.07% per month, respectively), but the monthly returns are also highly correlated (0.98), as evidenced by the points being close to the 45-degree line.

Exhibit 3 MONTHLY RETURNS OF A FUNDAMENTAL-WEIGHTED STRATEGY AND A LARGE/LARGE VALUE STRATEGY January 1963–December 2013



See Appendix for strategy descriptions and data sources. Past performance is no guarantee of future results. Indices are not available for direct investment; therefore, their performance does not reflect the expenses associated with the management of an actual strategy. For fundamental-weighted strategy, filters were applied to data retroactively and with the benefit of hindsight.

The returns of the fundamental-weighted strategy can be closely replicated using simple market cap-weighted strategies, offering evidence that the alternative weighting scheme did not add value over the value tilt. That known factors drive the results of fundamental weighting can also be inferred from the lack of positive alpha in Exhibit 2. Thus, the relevant question for investors is whether fundamental weighting offers a better way to capture the value premium.

There are disadvantages associated with ignoring a security's price. Fundamental data can become stale, but market prices continuously incorporate the aggregate expectations of market participants. By ignoring price, fundamental-weighted strategies do not continuously incorporate relevant information contained in market prices.

INCONSISTENT VALUE

Case Study 2: Low Volatility

Understanding the drivers of returns is important for evaluating past performance and informing future

expectations. Strategies that do not intentionally and continuously target securities with higher expected returns may experience style drift, and exposures to premiums that have shaped past returns may not be captured reliably going forward.

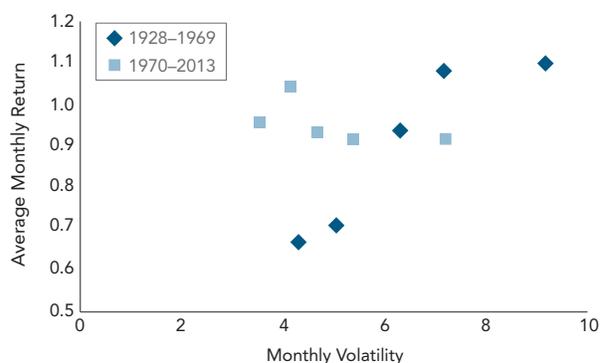
Low volatility strategies provide a cautionary example of time-varying factor exposure. These strategies use various methods that emphasize securities with low volatility in an effort to reduce risk in equity portfolios.¹ What seems to attract investors, however, is that this lower volatility did not come at the cost of lower returns, at least from 1970 to 2013. However, from 1929 to 1969, returns and volatility were positively related, as illustrated in Exhibit 4. Given that the results are not persistent through time, what should investors expect from low beta strategies?

Inconsistent value exposure helps explain the unreliable relation between returns and volatility. Exhibit 5 shows how low volatility stacks up against the Fama/French three-factor model. In both periods, low volatility had low market betas by construction, which allowed the strategy to have lower volatility than the market portfolio. Without help from other premiums, a low volatility portfolio should also have lower returns than the market. This is what we observed from 1928 to 1969, a period when the low volatility portfolio did not have meaningful exposure to the size and value factors.

In the recent period (1970–2013), the low volatility strategy behaved like value, as indicated by the sizable 0.28 loading on the value factor. The value premium provided a return boost that allowed the strategy to achieve market-like returns despite a low market beta. For investors to expect the recent historical performance to repeat in the future, low volatility strategies would need to benefit from additional sources of return over the market premium.

The historical record shows that low volatility strategies sometimes emphasize value and sometimes do not. This style drift should not be surprising, given that the low volatility strategy was not designed with valuation in mind. Investors should not expect strategies with incidental exposure to the drivers of expected returns to be continuously positioned to capture these premiums.

Exhibit 4 PORTFOLIOS SORTED ON MARKET BETA
January 1928–December 2013



See Appendix for portfolio descriptions and data sources. Past performance is no guarantee of future results. Filters were applied to data retroactively and with the benefit of hindsight.

Exhibit 5 LOW VOLATILITY EXPOSURE TO MARKET, SIZE, AND VALUE FACTORS

	1928–1969	1970–2013
Alpha (%)	0.07	0.08
t-Stat	0.94	1.02
Factor Exposures		
Market Beta	0.66	0.72
Size	-0.01	-0.13
Value	-0.10	0.28
R-Squared	0.84	0.77

See Appendix for portfolio description and data sources. Past performance is no guarantee of future results. Filters were applied to data retroactively and with the benefit of hindsight.

IMPLEMENTATION MATTERS

The smart beta term tends to be associated with an index implementation to buy securities that, at the reconstitution date, have prices and/or characteristics that indicate higher expected returns. However, these securities are held for a predefined period of time during which prices and characteristics may change, and as a consequence, the securities might no longer indicate higher expected returns. The common motivation behind an index implementation is to control turnover, but such an approach might result in lower expected returns due to style drift.

1. Some examples of low volatility strategies include inverse volatility, minimum variance, and low beta. In this paper, we focus on low beta strategies.

We believe the best implementation of a systematic approach uses price and characteristics to assess expected returns of securities every day and controls turnover by comparing the benefits of selling and buying securities with the costs of those trades. This implementation of a systematic approach can capture high expected returns with low turnover and be delivered at a competitive fee. And by closely tying weights to price, investors can efficiently target market premiums—considering up-to-date information—while limiting excessive turnover and mitigating the risk of uncontrolled overweighting in any security.

CONCLUSION

With the plethora of smart beta strategies available today, investors should carefully consider what may explain their expected returns, whether the driver is new or something old in disguise, and whether it is reliable. We find that well-understood drivers of expected returns easily explain the historical performance of fundamental-weighted and low volatility strategies. These strategies might obtain inadvertent exposure to securities with higher expected returns while not directly targeting them, which may limit their results to back-tested environments and may not prove reliable going forward. Investors should be cautious of simulated historical returns and question the robustness of the findings, especially if the strategy invites high implementation costs that can drive a wedge between simulated and actual results.

Investors seeking higher expected returns than what the market offers may deviate from market capitalization weights to focus on securities with higher expected returns. But instead of ignoring price, investors should use the information in prices to identify differences in expected returns across securities. When structured and managed properly, strategies based on a systematic approach that uses information in both prices and fundamental data are well positioned to have higher expected returns than regular indices or the market.

DATA APPENDIX

We use stock data from the Center for Research and Security Prices, University of Chicago (CRSP) and Compustat. Stocks must trade on NYSE, NYSE MKT, or NASDAQ and have shares codes 10 or 11. Fama/French

factors data is from Kenneth French's data library (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). The S&P data are provided by Standard & Poor's Index Services Group.

The fundamental-weighted strategy in Exhibits 1–3 consists of the largest 1,000 securities, weighted proportional to their current book equity and the five-year average dividends, book equity, sales, and cash flows. The large/large value blend in Exhibit 3 comprises 75% large value, represented by the Dimensional US Large Cap Value Index, and 25% large, represented by the Dimensional US Large Cap Equity Index.

The volatility sorted portfolios in Exhibits 4–5 each contain 20% of market capitalization and are formed by sorting stocks on market beta. Securities are weighted by market capitalization, and portfolios are rebalanced annually. Market beta is estimated using daily returns for one year. Returns are regressed on the daily market portfolio's return with five lags, and the market beta is the sum of the current and lagged slope coefficients.

INDEX DESCRIPTIONS:

Dimensional US Large Cap Value Index:

June 1927–December 1974: Dimensional US Large Cap Value Index Composition: A subset of the US Large Cap Index. The subset is defined as companies whose relative price is in the bottom 20% of the US Large Cap Index after the exclusion of utilities, companies lacking financial data, and companies with negative relative price. The eligible market is composed of securities of US companies traded on the NYSE, NYSE MKT (formerly AMEX), and NASDAQ Global Market. Exclusions: Non-US companies, REITs, UITs, and Investment Companies. Source: CRSP and Compustat.

January 1975–Present: Dimensional US Large Cap Value Index Composition: Consists of companies with market capitalizations above the 1,000th-largest company of the eligible market whose relative price is in the bottom 30% of large companies after the exclusion of utilities, companies lacking financial data, and companies with negative relative price. The index emphasizes securities with higher profitability, lower relative price, and lower market capitalization. Profitability is measured as operating income before depreciation and amortization minus interest expense scaled by book. The eligible

market is composed of securities of US companies traded on the NYSE, NYSE MKT (formerly AMEX), and NASDAQ Global Market. Exclusions: Non-US companies, REITs, UITs, and Investment Companies. Source: CRSP and Compustat.

The Dimensional US Large Cap Value Index has been retrospectively calculated by Dimensional Fund Advisors and did not exist prior to March 1, 2007. Accordingly, the results shown during the periods prior to March 1, 2007, do not represent actual returns of the index. Other periods selected may have different results, including losses. Back-tested index performance is hypothetical and provided for informational purposes only to indicate historical performance had the index been calculated over the relevant time periods. Back-tested performance results assume the reinvestment of dividends and capital gains. The index monthly returns are computed as the simple average of the monthly returns of 12 sub-indices, each one reconstituted once a year at the end of each month of the year. The index is unmanaged and is not subject to fees and expenses typically associated with managed accounts or investment funds. Investments cannot be made directly in an index. Past performance is no guarantee of future results. The calculation methodology for the Dimensional US Large Cap Value Index was amended on January 1, 2014, to include direct profitability as a factor in selecting securities for inclusion in the index.

Dimensional US Large Cap Equity Index:

June 1927–Present: Dimensional US Large Cap Index
Composition: Market capitalization-weighted index of securities of the largest US companies whose market capitalization falls in the highest 90% of the total market capitalization of the eligible market. The eligible market is composed of securities of US companies traded on the NYSE, NYSE MKT (formerly AMEX), and NASDAQ Global Market. Exclusions: Non-US companies, REITs, UITs, and Investment Companies. Source: CRSP and Compustat.

The Dimensional US Large Cap Index has been retrospectively calculated by Dimensional Fund Advisors and did not exist prior to March 1, 2007. Accordingly, the results shown during the periods prior to March 1, 2007, do not represent actual returns of the index. Other periods selected may have different results, including losses. Back-tested index performance is hypothetical and is provided for informational purposes only to indicate historical performance had the index been calculated over the relevant time periods. Back-tested performance results assume the reinvestment of dividends and capital gains. The index monthly returns are computed as the simple average of the monthly returns of 12 sub-indices, each one reconstituted once a year at the end of each month of the year. The index is unmanaged and is not subject to fees and expenses typically associated with managed accounts or investment funds. Investments cannot be made directly in an index. Past performance is no guarantee of future results.

All returns in US dollars.

REFERENCES

Crill, Wes. 2014. "Low Volatility Strategies."

Dimensional White Paper.

Crill, Wes, and James L. Davis. 2012. "Inverse Volatility Portfolio Weights." *Dimensional White Paper.*

Crill, Wes, and Ronnie R. Shah. 2012. "Residual Volatility and Average Returns." *Dimensional White Paper.*

Crill, Wes, and James L. Davis. 2012. "Beta and Expected Return." *Dimensional White Paper.*

Fama, Eugene F. and Kenneth R. French. 2014. "Dissecting Anomalies with a Five-factor Model." *Working Paper*, University of Chicago.

Novy-Marx, Robert. 2014. "Understanding Defensive Equity." *Working Paper*, University of Rochester.

Shah, Ronnie R. 2011. "Understanding Low Volatility Strategies: Minimum Variance." *Dimensional White Paper.*

Dimensional Fund Advisors LP is an investment advisor registered with the Securities and Exchange Commission. All expressions of opinion are subject to change. This information is intended for educational purposes, and it is not to be construed as an offer, solicitation, recommendation, or endorsement of any particular security, products, or services.

Eugene Fama and Ken French are members of the Board of Directors for and provide consulting services to Dimensional Fund Advisors LP.

Past performance is no guarantee of future results. Diversification does not protect against loss in declining markets. There is no guarantee strategies will be successful.

www.dimensionalfundadvisors.com