



# An evaluation of smart beta and other rules-based active strategies

Vanguard Research

August 2015

*Christopher B. Philips, CFA; Donald G. Bennyhoff, CFA; Francis M. Kinniry Jr., CFA; Todd Schlanger, CFA; and Paul Chin*

- Following significant losses by large-cap and growth stocks during the 2000–2002 bear market, investor interest has increased in non-market-capitalization index-weighting strategies that intentionally divorce a security’s index weighting from its price. Such rules-based alternatives to market-cap-weighted indexes are strategies labeled alternative indexing, fundamental indexing, or, the more commonly used, smart beta.
- Vanguard believes strongly that, by definition, smart-beta indexes should be considered rules-based active strategies because their methodologies tend to generate meaningful security-level deviations, or tracking error, versus a broad market-cap index. This paper’s analysis shows that the “excess return” of such strategies can be partly (and in some cases largely) explained by time-varying exposures to various risk factors, such as size and style.
- Consequently, the relative performance of smart-beta strategies versus the broad market has deviated meaningfully over time, and should be expected to do so, given (1) the relative performance of various equity market factors versus the broad market and (2) the inconsistent or dynamic exposure to such risk factors based on certain rules-based strategies.
- For investors seeking to outperform the broad market, we discuss viable alternatives to non-market-cap index-weighting strategies.

What is “smart beta”? The answer to this question depends on whom you ask. Much of the interest in the moniker seems to stem from the 2000–2002 global bear market—the so-called TMT (“tech, media, and telecom”) bubble. This global equity market decline featured significant equity losses by large companies the world over, leading many investors to assert that traditional market-cap indexes could be improved by divorcing a security’s weight in an index from its capitalization weight in a market (Arnott, Hsu, and Moore, 2005). It was not long before alternatively weighted indexes and then products (mainly ETFs) were introduced.

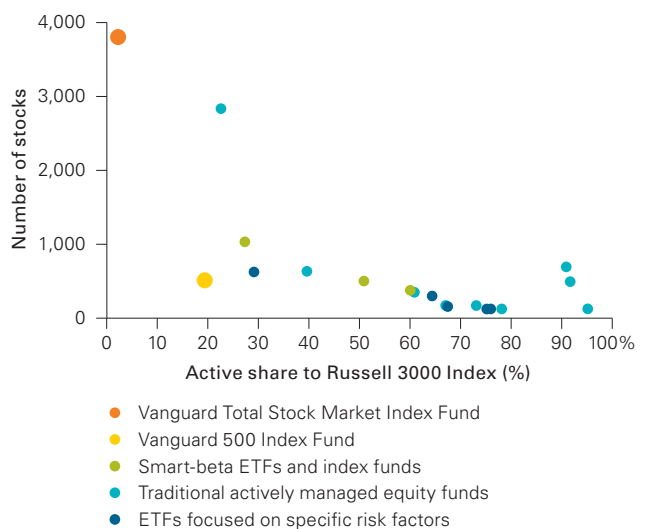
Despite the proliferation of products and growing investor interest in alternative strategies, no consensus definition of these strategies exists. As a case in point, in 2014, Vanguard commissioned a survey of institutional plan sponsors and consultants on the topic of smart beta. When asked “Which statement best reflects your firm’s view of [smart-beta] investing?” the responses varied from “it is low-cost alpha” to “it’s a version of indexing, part of the evolution of indexing” to “it is higher-cost indexing.” Despite a lack of consensus on what smart beta is, surveys (conducted by Spence Johnson [2014] in Europe and the United Kingdom; Bank of Montreal [BMO, 2014] in Canada; Pensions & Investments [2013] in Asia; AXA Investment Managers [2013] in Australia; and Cogent Research (now Market Strategies International) (2014) in the United States) of institutional consultants and investors across the world have confirmed the growing global interest in exploring smart-beta strategies.

Adding to the confusion is that, similar to “alternative investing,” smart-beta mandates do not fit neatly into a homogeneous category. For example, some strategies focus on a single criterion when constructing portfolios—such as dividends, gross domestic product, or volatility. Other rules-based strategies use multiple criteria. The common denominator, however, is that each strategy

deviates in some respect from a market-cap-weighted benchmark (see the box on page 3, “A refresher on beta and indexing”).

Whatever their makeup, alternative weighting schemes display characteristics that should lead to performance that differs from the market’s risk–return characteristics (or market beta). **Figure 1** provides a visualization of the  
(Continued on page 4)

**Figure 1. How active is smart beta?**



**Notes:** Data as of December 31, 2014. Funds/ETFs referred to in the figure include: **Smart-beta ETFs and index funds**—First Trust Large Cap Core AlphaDEX ETF, Guggenheim S&P 500 Equal Weight ETF, and PowerShares FTSE RAFI US 1000 ETF; **Traditional actively managed equity funds**—Vanguard Equity Income Fund, Vanguard Explorer™ Fund, Vanguard Growth and Income Fund, Vanguard Morgan™ Growth Fund, Vanguard PRIMECAP Fund, Vanguard Selected Value Fund, Vanguard Strategic Equity Fund, Vanguard U.S. Growth Fund, and DFA U.S. Core Equity 1 Fund; **ETFs focused on specific risk factors**—iShares MSCI USA Minimum Volatility ETF, iShares MSCI USA Momentum Factor ETF, iShares MSCI USA Quality Factor ETF, iShares MSCI USA Value Factor Fund, and WisdomTree U.S. Dividend Growth Fund. **Sources:** Vanguard, based on data from Morningstar, Inc.

*Notes on risk: All investing is subject to risk, including the possible loss of the money you invest. Bond funds are subject to interest rate risk, which is the chance that bond prices overall will decline because of rising interest rates, and credit risk, which is the chance that a bond issuer will fail to pay interest and principal in a timely manner or that negative perceptions of the issuer’s ability to make such payments will cause the price of that bond to decline. In a diversified portfolio, gains from some investments may help offset losses from others. However, diversification does not ensure a profit or protect against a loss. Past performance is no guarantee of future results.*

*Investments in stocks issued by non-U.S. companies are subject to risks that include country/regional risk, which is the chance that political upheaval, financial troubles, or natural disasters will adversely affect the value of securities issued by companies in foreign countries or regions; and currency risk, which is the chance that the value of a foreign investment, measured in U.S. dollars, will decrease because of unfavorable changes in currency exchange rates. Stocks of companies based in emerging markets are subject to national and regional political and economic risks and to the risk of currency fluctuations. These risks are especially high in emerging markets.*

## A refresher on beta and indexing

Traditionally, the term *beta* has been used to describe the risk-and-return attributes of a particular asset class. Accordingly, beta in the conventional sense is synonymous with “the market,” such as the equity or fixed income market.<sup>1</sup> Beta, however, as a theoretical concept, is not something that can be directly invested in. As a result, index providers have created indexes to represent their respective interpretation of asset-class beta (often taking investability and access into consideration). To capture all the characteristics, or beta, of a market, the index should be weighted relative to all the available securities in that market. This is otherwise known as market capitalization (Sharpe, 1991), a well-established capital-market concept easily explained by the following formula:

$$\text{Market capitalization} = \text{Shares outstanding} \times \text{Price per share}$$

Although a company controls the number of shares outstanding, the other critical factor in market cap is the price per share, which is influenced solely by market participants. Price is a powerful mechanism used collectively to establish and change views about a company’s worth and future performance (including the issuance or retirement of shares). Information is continuously incorporated into equity prices through investor trading and is therefore reflected in market capitalization. Market-cap-weighted indexes thus reflect the consensus-investor estimate not only of each company’s relative value at any moment but of how the average investor has performed for a specific beta.

Vanguard believes that if the purpose of an index is to reflect the total market exposure to an asset class or sub-asset class, then the index should represent the market-cap-weighted portfolio (Perold, 2007). For investors seeking to represent market beta, a market-cap index is the only index that measures the collective asset-weighted capital invested within the market it is intended to track, not necessarily the one that provides the highest return or lowest risk.

A deviation from market-cap weighting presumes there is a better criterion by which to judge a security’s value than the collective valuation processes of all investors. Indeed, this is the basis for active management. This truism is based on the fact that investment performance can be deconstructed into three parts: the portions of return attributable to beta, to market-timing, and to security selection (Brinson, Hood, and Beebower, 1986; 1991). The latter two are specific to active management. As such, an investment strategy that produces returns that differ from the market beta would be a strategy based on an active decision to deviate from the market portfolio, a choice that commonly involves different risks as well.

### The all-factor strategy

Because current price reflects every factor used by any investor to estimate a company’s value, a market-cap-weighted index also represents a true multifactor approach—that is, an all-factor approach (see **Figure 2**)—to investing and an *ex ante* (forward-looking), theoretically mean-variance-efficient portfolio. One could argue that the only “smart-beta” index available to investors is one that tracks the aggregate capital in the market, since it reflects the aggregate wisdom embedded in prices.

**Figure 2. A cap-weighted index is *the* ‘smart-beta’ strategy**

**Should investors focus only on some factors?**

Dividends  
Assets  
Cash flow  
Book value  
Sales  
Volatility

**Or do other factors matter as well?**

Profits	Regulatory environment	Counterparty exposure
Competitive landscape	Accounting irregularities	Supply chains
Management effectiveness	Off-balance-sheet items	Industry outlook
Corporate-governance controls	Share repurchases	Business model
Expected growth	International operations	Hedging activity
New products/lines/business	Expectations	Input prices
	Leverage	Natural disasters
	Liquidity	Market share

Market capitalization captures *all* potential factors that all investors collectively use to determine a stock’s price.

Source: Vanguard.

<sup>1</sup> In a statistical framework, beta describes the relationship between the movement of an asset or portfolio of assets and movements in the broad market. The degree of the relationship can be quantified by the regression coefficient of the co-movement over time. When the asset(s) and the broad market move in lockstep, the beta is assigned a value of 1, and the portfolio may be commonly referred to as “beta.”

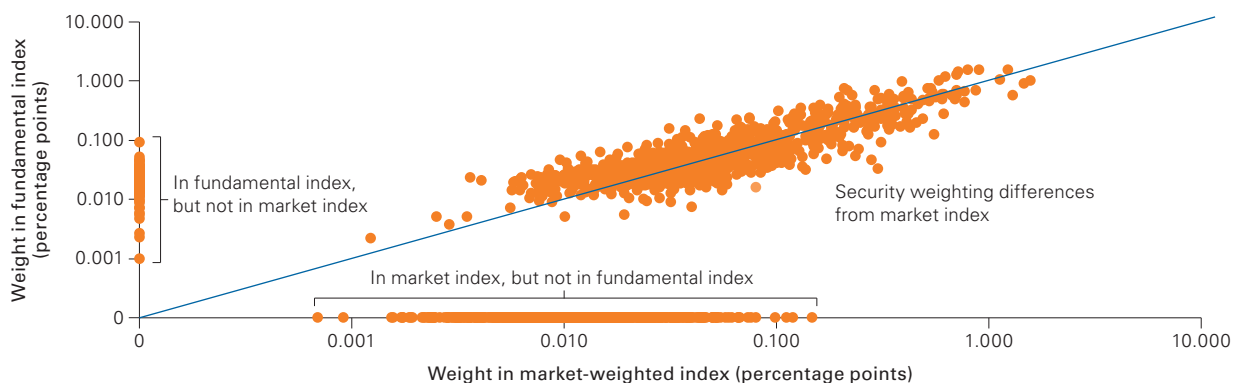
active management risk of these strategies through a review of their active-share statistics, a metric developed by Cremers and Petajisto (2009) to measure how active a given investment strategy is. Smart-beta strategies (shown as green in the figure) are seen throughout the spectrum. This demonstrates not only their variety but, more important, that they are *not* substitutes for achieving the U.S. stock market beta, represented by one investable total U.S. stock market fund (Vanguard Total Stock Market Index Fund—the orange dot in the figure). For comparison, Vanguard 500 Index Fund (yellow dot), which tracks the Standard & Poor’s 500 Index, was also provided. Also represented in Figure 1 are various Vanguard actively managed funds (light blue) as well as three exchange-traded funds (ETFs, in dark blue) that focus on providing exposure to securities with specific equity-risk factors such as value, quality, or momentum.

In non-market-cap weighted indexes, the decision to deviate from market weights occurs before, rather than during, the portfolio implementation process. This means that although not active in the traditional sense, the index *provider’s* decision to select and assign weights to securities reflects a primary component of active risk.

As an example, **Figure 3** illustrates the security weightings of the PowerShares FTSE RAFI Developed Markets ex-U.S. Portfolio versus the FTSE All-World Developed ex-U.S. Index. When the deviations from the figure’s blue line are summed, the security overweights by the RAFI portfolio versus the market benchmark are shown to have amounted to 23.2%, whereas security underweights accumulated to –16.6% versus the market benchmark. Further deviations from the benchmark can result from the intentional exclusion or addition of securities versus the index: 1.8% of the RAFI portfolio is allocated to securities outside of the market benchmark, whereas 8.4% of the market benchmark is excluded from the RAFI portfolio.

Smart-beta strategies should thus not be considered beta, because these strategies’ weights differ meaningfully from the market capitalization and therefore do not represent an asset class. Instead we believe that smart-beta strategies are best thought of as active investment strategies. This is because they reflect the specific views of index providers who proactively design indexes to differ from the market-cap weights as determined by

**Figure 3. Alternately weighted strategy’s security-level weight deviations from the market**



**Notes:** Figure displays security-level weight differences of PowerShares FTSE RAFI Developed Markets ex-U.S. Portfolio (based on FTSE RAFI Developed Markets ex-U.S. Index—the fundamental index) relative to its market-weighted universe of securities, represented by FTSE All-World Developed ex-U.S. Index. For a product with little or no active risk (no security selection) relative to the aggregate market, comparison-weight deviations would fall exactly on the blue line. Data as of December 31, 2014.

**Sources:** Vanguard, based on data from Morningstar, Inc.

market participants. Like traditional active managers, these providers choose a set of securities based on their belief in the securities' potential to outperform.<sup>2</sup>

The "smart" label stems from the suggestion that market-cap weighting inherently overweights overvalued equities and underweights undervalued equities, exposing investors to potentially lower returns with increased risk. If true that a stock's price reflects pricing inefficiency (discussed later), it follows that overvalued equities would represent a greater weight in a market-cap-weighted index relative to undervalued equities. By focusing on market cap, traditional indexes are said to necessarily underperform strategies that focus on metrics other than price and shares outstanding (Siegel, 2006; Hsu, 2006).

As **Figure 4** shows, the alternative indexes listed have significantly outperformed their market-cap-weighted counterparts (shown in boldface) since January 2000. In another example, researchers from the Cass Business School (City University London) demonstrated that randomly constructed portfolios of equal-weighted

securities produced higher risk-adjusted returns than market-cap-weighted indexes over a 40-year period (Clare, Motson, and Thomas, 2013a, b).<sup>3</sup> But as we demonstrate in subsequent sections of this paper, instead of capturing market inefficiencies, the security-selection process of non-market-cap-weighted indexes has led to systematic tilts toward specific risk exposures of existing benchmarks, capturing the effects of size and style that outperformed over the analysis period.

### Relevance of risk-factor exposures

The meaning of beta has evolved to include factors that have been shown to systematically influence return differences across individual securities *at any moment in time*, and thus the patterns of certain groups of securities *over time*. This is most apparent in fixed income, where maturity and credit are widely acknowledged as the primary factor risks (or drivers) of relative performance between two fixed income instruments. Thus, a U.S. corporate issue would, on average, be expected to outperform an AAA-rated sovereign issue (assuming the

**Figure 4. Historical performance of alternatively weighted strategies has been compelling**

Performance statistics of selected indexes: December 31, 1999–December 31, 2014

Alternative index	Annualized return	Annualized volatility	Return per unit of risk
FTSE RAFI Developed 1000 Index	7.2%	17.00%	0.42
<b>FTSE Developed Index</b>	<b>4.2%</b>	<b>15.95%</b>	<b>0.26</b>
MSCI World Equal Weighted Index	7.9%	17.23%	0.46
MSCI World Risk Weighted Index	9.4%	14.36%	0.65
MSCI World Minimum Volatility Index	7.0%	11.24%	0.62
<b>MSCI World Index</b>	<b>3.9%</b>	<b>15.87%</b>	<b>0.25</b>
STOXX Global Select Dividend 100 Index	10.9%	15.73%	0.69
<b>STOXX Global 1800 Index</b>	<b>3.6%</b>	<b>15.90%</b>	<b>0.23</b>

Note: Table data are based on total returns measured in U.S. dollars.

Sources: Vanguard, based on data from FTSE, MSCI, Dow Jones, and Thomson Reuters Datastream.

<sup>2</sup> This concept is further outlined by Asness (2006).

<sup>3</sup> Edwards and Lazzara (2014), from S&P Dow Jones, have directly addressed the implications from the Cass study, demonstrating that the published results are a direct and expected outcome from an equal-weighting methodology, and not the result of a flaw in market-cap-weighted indexes.

issues have matching durations). Indeed, investors should be compensated for the greater risk of corporates through higher expected returns. This comparison holds both for issues of longer maturity and those of shorter maturity. Greater risks should be expected to be compensated by higher returns, but not necessarily by higher *risk-adjusted* returns.

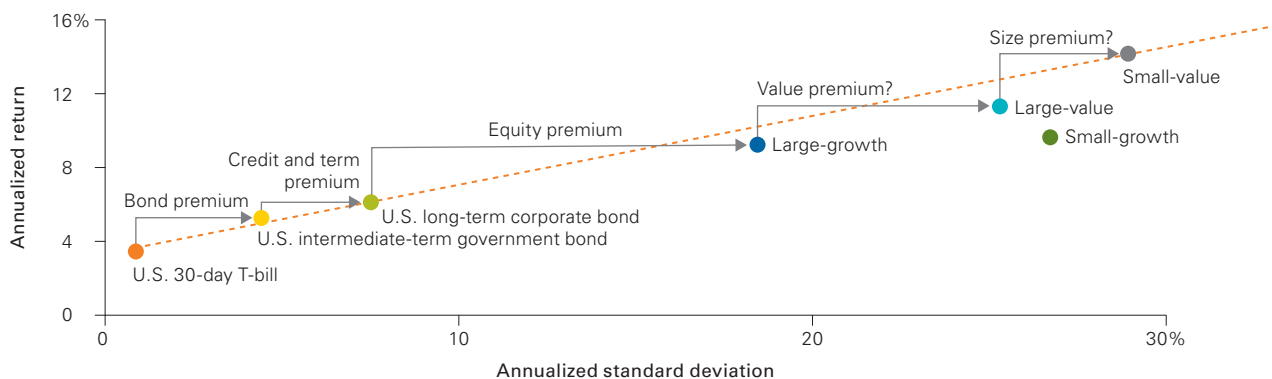
Over time, the study of risk factors has been extended within the equity markets, where “factor betas” associated with small-cap and value equities have demonstrated unique return characteristics over the very long run (Fama and French, 1992; 1993).<sup>4</sup> Using U.S. data, we plotted both the volatility and returns of a series of investments that serve as proxies for these various risk factors (Figure 5).<sup>5</sup> From the generally linear trend shown in the figure, the relationship between risk and return

seemed to hold, as might be expected. In other words, small-cap stocks and value stocks may have outperformed as a result of being riskier, or more volatile.

It’s not surprising, then, that over the past decade investors have increasingly sought methods for capturing these equity-based risk factors, just as they have done within fixed income. And, as with the attempts to provide investable exposure to market beta, index and investment providers have offered a variety of choices for investors to obtain exposure to these specific sub-asset-class factor betas, including both market-cap-weighted options and factor-weighted options targeting these segments.<sup>6</sup> That said, each index and investment provider may define these equity risk factors differently, and each may differ in the methods used to assign securities to these factors.

**Figure 5. Long-term risk-adjusted returns have been more similar than different**

Average annualized total returns and volatility for selected U.S benchmarks: August 31, 1927–December 31, 2014



**Notes:** Dotted line indicates trend of risk and return for selected U.S. benchmarks. Benchmarks are as follows: U.S. 30-day T-bill represented by IA SBBI US 30 Day T-Bill TR Index; U.S. intermediate-term government bond represented by IA SBBI US IT Govt TR Index; U.S. long-term corporate bond represented by IA SBBI US LT Corp TR Index; “Large-growth” represented by Fama-French Large Growth TR Index; “Large-value” represented by Fama-French Large Value TR Index; “Small-growth” represented by Fama-French Small Growth TR Index; “Small-value” represented by Fama-French Small Value TR Index. Index names as reported by Morningstar; all are total-return indexes.

**Sources:** Vanguard and Morningstar, Inc.

<sup>4</sup> See also Vanguard’s latest research on factor-based investing (Pappas and Dickson, 2015).

<sup>5</sup> These relationships can be time-period-dependent, and results may differ meaningfully over time.

<sup>6</sup> Here again, we must differentiate between statistical properties of beta and the shorthand for a sub-asset class such as small-cap equities. Using the statistical definition of *beta*, one might argue that to truly reflect the risk factor, one should not weight the portfolio according to market capitalization, but, instead, according to the risk factor’s influence on the constituent securities. We address this aspect in appendix Figure A-1 by evaluating smart-beta strategies against the Fama-French (1992; 1993) risk factors.

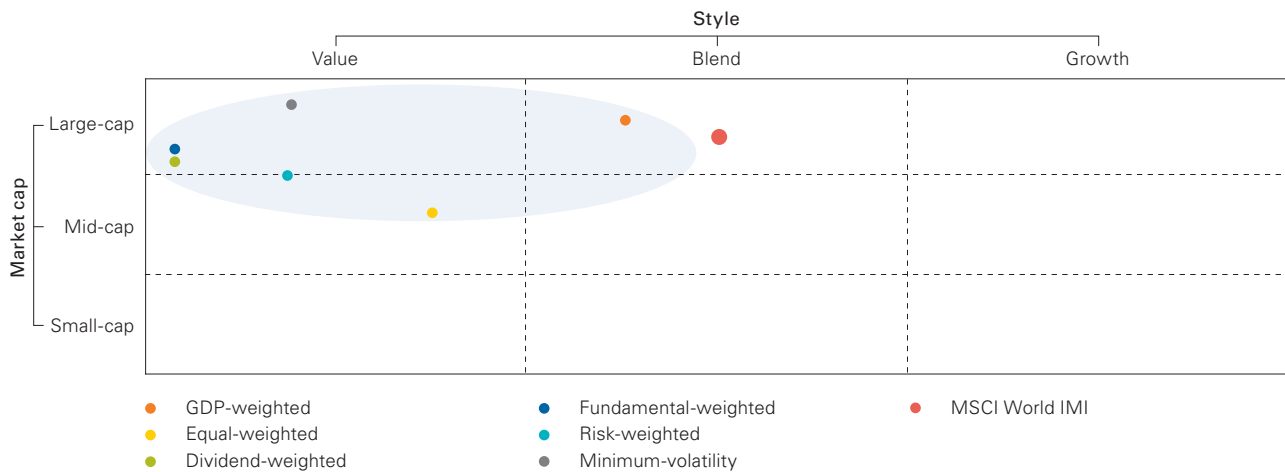
## Adjusting for risk exposures sheds light on past results

When evaluating these strategies, the next logical step is to perform an attribution analysis to see what exactly has driven the returns over time—capturing inefficiencies that might indicate either security-selection skill or exposure to specific risk factors that may also be obtained elsewhere in the market at lower cost. Although the portfolio-construction process of smart-beta strategies focuses on security selection (as outlined in Figure 3) and not on providing explicit exposure to market-risk factors, using such proxies in a style analysis can shed light on the tilts or biases of a portfolio over time. **Figure 6** uses a returns-based style analysis of both alternatively weighted and market-cap-weighted indexes to show their respective exposures across a suite of market-cap-weighted MSCI size and style benchmarks (growth or value).<sup>7</sup> Such an analysis can illuminate the degree of influence that specific risk factors (as defined by MSCI) have had on a strategy’s return stream over time.<sup>8</sup>

We found that alternative weighting methodologies generally showed tilts toward value companies and relatively smaller companies within their source-market index. These findings indicate that the performance of these weighting strategies has been driven by their size and style tilts. Intuitively, this means that when value equities and smaller equities outperform a broad stock market index, alternatively weighted strategies should generally outperform cap-weighted indexes. Accordingly, market-cap-weighted indexes generally outperformed these alternatively weighted strategies during the 1990s, when large-cap growth equities outperformed. In this respect, relative performance appears to be a conundrum: If the weighting choice alone were able to capitalize on the market’s pricing inefficiencies, and assuming that mispriced securities exist across time and investment style, then wouldn’t these strategies be expected to outperform their market-cap-weighted counterparts regardless of the size or style currently in favor?

**Figure 6. Alternatively weighted strategies have tended to tilt toward value and size factors**

Style and size exposure of alternative index versus broad developed-equity market: 1999–2014



**Notes:** Figure displays inferred benchmark weights resulting from tracking-error minimization for each alternative index across several size and style indexes. Factors and benchmarks are as follows: “Fundamental-weighted” represented by FTSE RAFI Developed 1000 Index; “Equal-weighted” represented by MSCI World Equal Weighted Index; “GDP-weighted” represented by MSCI World GDP Weighted Index; “Minimum-volatility” represented by MSCI World Minimum Volatility Index; “Risk-weighted” represented by MSCI World Risk Weighted Index; “Dividend-weighted” represented by STOXX Global Select Dividend 100 Index. Broad developed market represented by MSCI World Investable Index (IMI).

**Sources:** Vanguard, based on data from MSCI, FTSE, Dow Jones, and Thomson Reuters Datastream.

<sup>7</sup> Reflecting the fact that size and value have long been appreciated as systematic risk factors that can explain performance differences across market segments, Morningstar first introduced its nine-box framework in 1992. For details, see: [http://news.morningstar.com/pdfs/FactSheet\\_StyleBox\\_Final.pdf](http://news.morningstar.com/pdfs/FactSheet_StyleBox_Final.pdf)

<sup>8</sup> Note that we elected to use commonly available size and style indexes for this analysis because they best provide a framework for an investable index. A common criticism of using other sources for these regressions—such as the Fama-French data (Fama and French, 1992, 1993)—is that although instructive from an academic standpoint, no investable options exist (to date) to capture those factors. We show a factor attribution and alpha analysis using the Fama-French risk factors in appendix Figure A-1. We also acknowledge that not every investor may be familiar with or have the ability to invest in regional or global style indexes. However, given the growth of ETFs globally, this gap is likely to be filled.



Because the exposures to documented risk factors appear meaningful, a natural test is whether the declared market inefficiencies remain after correcting for those systematic exposures. **Figure 7** uses the exposures identified in Figure 6 to display the average excess return after accounting for each strategy’s size and value risk-factor tilts. In contrast to the excess returns shown in Figure 4, these results show that in most cases these strategies have produced *negative* excess returns after accounting for their risk-factor exposure.<sup>9</sup> Strategies that recorded positive excess returns produced returns that were notably lower than the outperformance displayed relative to a standard benchmark. Furthermore, it would seem reasonable for these excess returns to be lower still, or perhaps cease to exist, once implementation costs are accounted for (Li, Sullivan, and Feijóo 2014).

**Figure 8** takes the risk adjustment one step further and implements the three-risk-factor model from Fama and French (1993) and Carhart (1997). The figure shows the *t*-statistics for the style-adjusted alphas on a 36-month rolling basis. These values can be interpreted as the significance, either positive or negative, of the true risk-adjusted return remaining after accounting for the portfolio’s exposure to market, size, and value risk factors. None of the alternatively weighted indexes showed results that were consistently outside of the 0.05% confidence interval and therefore were not statistically different from zero.

The results in Figures 7 and 8 suggest that historical “smart-beta” performance is *not* produced by capturing market inefficiency related to security-level mispricings, which would be the case if such strategies better tracked a security’s intrinsic value. Rather, these figures suggest that the historical outperformance relative to cap-weighted benchmarks can be traced to systematic size and value exposures that have demonstrated identifiable historical performance characteristics.<sup>10</sup>

### The rebalancing component to smart beta

As emphasized earlier in this study, the primary focus of the methodology of many alternatively weighted index strategies is to decouple the security weights within the portfolio from their prices as reflected in their market caps. A secondary process is to “rebalance” a security’s relative weighting to a level that reflects the security’s intrinsic value as identified by the alternatively weighted index methodology. Some argue that this rebalancing enhances a portfolio’s returns by systematically selling overvalued, and buying undervalued, securities in a process that exploits perceived mean reversion in pricing errors across different market segments.<sup>11</sup>

**Figure 7. Exposure-adjusted excess returns suggest that performance is driven by active tilts**

Comparison of alternative index strategies to custom risk-factor-adjusted benchmark: 1999–2014

Alternative index	Annualized excess return	R-squared	Tracking error	Factor-adjusted annualized excess return
FTSE RAFI Developed 1000 Index	2.98%	98.38%	2.46%	–0.01%
MSCI World Equal Weighted Index	3.97%	98.50%	2.10%	0.42%
MSCI World Minimum Volatility Index	3.07%	85.28%	6.56%	–0.57%
MSCI World Risk Weighted Index	5.45%	97.46%	2.78%	0.41%
STOXX Global Select Dividend 100 Index	7.29%	88.78%	5.52%	–0.73%

**Notes:** Figure displays performance statistics resulting from 36-month rolling tracking-error minimization for each alternative index across five size and style indexes, as indicated.

**Sources:** Vanguard, based on data from MSCI, FTSE, Dow Jones, and Thomson Reuters Datastream.

<sup>9</sup> See Vanguard research by Joel Dickson, 2013, Solid, Liquid, or Gas? Vanguard Blog for Advisors, July 8; available at <http://vanguardadvisorsblog.com/2013/07/08/solid-liquid-or-gas/>.

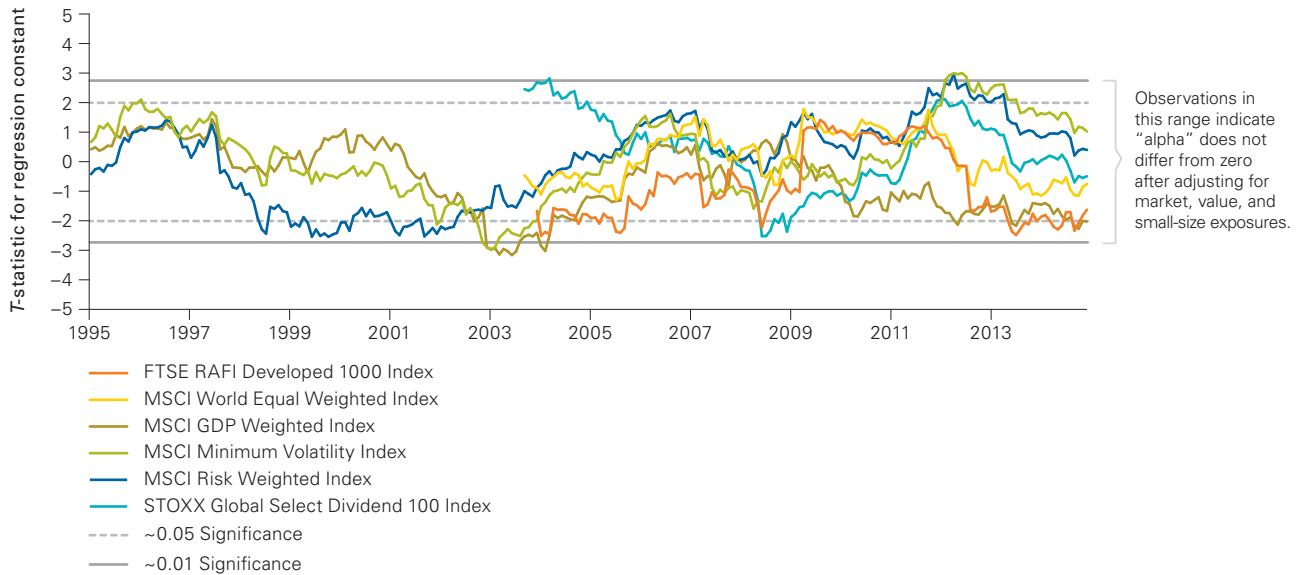
<sup>10</sup> For example, see (Fama and French 1993), documenting the existence of size and value as systematic factors that, along with broad-market beta, are successful in explaining the cross-section of equity security returns.

<sup>11</sup> For example, see Hsu (2013a–c; 2014).



**Figure 8. After accounting for size and value tilts, alpha disappears**

Rolling 36-month statistical tests for existence of alpha after accounting for market, value, and size exposures within global developed-market equity universe: 1994–2013



**Notes:** Chart displays *t*-statistics for constants (style-adjusted alphas) from 36-month rolling regression of returns of each alternative index on the three Fama-French risk factors (Fama and French, 1993; Carhart, 1997). A value outside of the significance bands would indicate a regression constant (alpha) that is statistically different from 0 at that given significance level. Factors are represented by the following benchmarks: Fundamental-weighted—FTSE RAFI Developed 1000 Index; Equal-weighted—MSCI World Equal Weighted Index; GDP-weighted—MSCI World GDP Weighted Index; Minimum-volatility—MSCI World Minimum Volatility Index; Risk-weighted—MSCI World Risk-Weighted Index; Dividend-weighted—STOXX Global Select Dividend 100 Index.

**Sources:** Vanguard, based on data from MSCI, FTSE, Dow Jones, Thomson Reuters Datastream, and Kenneth French’s website (the latter available at [mba.tuck.dartmouth.edu/pages/faculty/ken.french/](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/)).

A direct way to test the effectiveness of a mechanical approach to rebalancing is to evaluate an equal-weighted index to see if any excess return is left over after accounting for the differing risk exposures versus the market-cap-weighted approach. In such an approach, appreciating stocks are systematically sold to achieve a fixed weight, while depreciating stocks are systematically bought. Throughout this paper we have referred to the MSCI World Equal Weighted Index as a potential smart-beta approach that investors may be considering. As was shown in Figures 7 and 8, the residual excess return values, after accounting for exposure to differing risk

factors, have been neither consistent nor significant. In fact, by regressing the returns of the MSCI World Equal Weighted Index on the MSCI World Large Cap Index, the MSCI World Mid Cap Index, and the MSCI World Small Cap Index (since January 31, 2001, the start date of the small-cap index), we found average exposures of 24%, 49%, and 27%, respectively.

The result of our regression raises doubts about the existence of any rebalancing premium. Specifically, our estimated combination portfolio resulted in an average R-squared of 0.98 versus the equal-weighted index. The

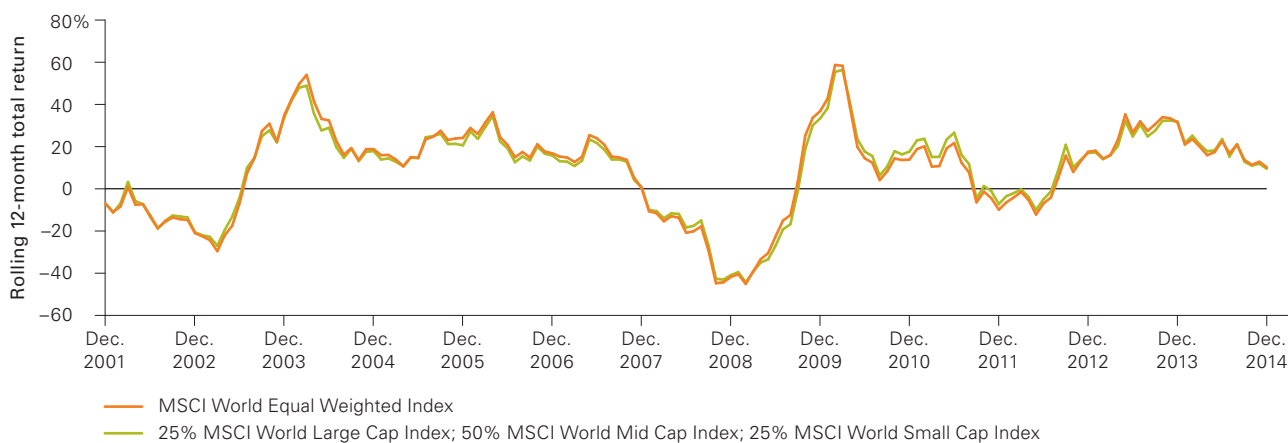
alpha of the equal-weighted index was statistically and economically insignificant, at 0.009% per month. In other words, a portfolio that combined the three component indexes in their respective weights effectively approximated the equally weighted version (see Figure 9), implying that the simple act of rebalancing at the security level does not systemically add to the returns of the portfolio over time.

For strategies that do not use a fixed-weight methodology, a critical factor in the rebalancing discussion is the security selection process used to establish the benchmark weights. For these strategies, rebalancing would likely occur as stock weights deviate from the intrinsic value identified in the strategy’s methodology. It is this process of returning a stock to its intrinsic value that has been touted as a return enhancer benefiting these strategies relative to cap-weighted indexes.

Although compelling, several assumptions are needed to justify the idea that breaking the link between price and weight and then periodically rebalancing to those weights within a pool of individual securities can add reliable excess returns to a portfolio.

- First, one must assume that securities are indeed subject to systematic mispricing; implicit in many of these strategies is the further assumption that mispricings are more significant in stocks of larger companies than smaller companies.
- Second, to be effective, one must assume that stocks that are rising in price are more likely overvalued, while stocks that are falling in price are more likely undervalued.
- Third, one must presume that the process used to determine a security’s “appropriate” weighting in the portfolio is more likely to reflect the security’s true or intrinsic value than the weighting that is determined by all market participants—using whatever valuation process they deem appropriate—as reflected in a stock’s market-cap.
- Finally, one must assume that, even if an investor knows a security’s true, fair value, a price-agnostic weighting strategy would allow the investor to benefit from any mispricing.

Figure 9. Rebalancing not a source of excess returns for an equal-weighted strategy: 2001–2014



Note: Data as of December 31, 2014.

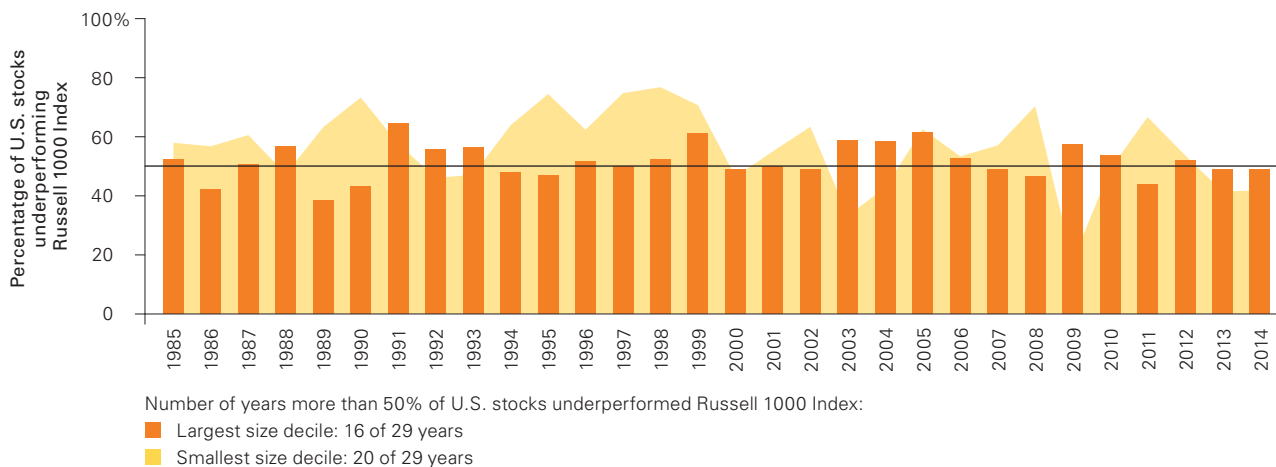
Sources: Vanguard and Thomson Reuters Datastream.

Although the first of these assumptions (of systematic mispricing) seems reasonable (history and markets tell us with the benefit of hindsight that price can divorce from value), the remaining assumptions are questionable. Blitz, Van der Grient, and Van Vliet (2010) demonstrated that the effect of rebalancing is time-period dependent and is influenced by the month chosen to rebalance. Such time-period dependence challenges the assertion that a rebalancing premium exists simply because the portfolio is rebalanced away from market-cap weights. In particular, the final assumption (favoring a price-agnostic weighting strategy) was addressed by Perold (2007) and Kaplan (2008), who pointed out that the noise in prices would cancel out across equities and over time.

One important challenge facing such a rebalancing strategy is that stocks that have risen in price may or may not be overvalued, while those that have fallen in price may or may not be undervalued. For example, if rising prices lead to an overvaluing of securities, then we might expect to see a majority of larger stocks underperform their index, and a majority of smaller stocks outperform. Intuitively, this makes sense, since stocks typically increase in size through price appreciation. **Figure 10** shows the one-year forward excess returns for each U.S. stock in the Russell 1000 Index since 1984. We then compare the performance across time of the largest and smallest deciles. By using forward returns, we addressed the assumption that larger stocks that have appreciated more over time are more likely to depreciate in the future. Clearly, no systematic pattern of large-cap stock underperformance has been evident. In fact, as the figure shows, a majority of the smallest stocks were more likely to underperform the index in a given year.

**Figure 10. Large-cap stocks have not demonstrated a proclivity to underperform**

Percentage of largest 100 and smallest 100 stocks that underperformed Russell 1000 Index: 1985–2014



Sources: Vanguard and FactSet.

### Is smart beta a way to strategically capture factor risks?

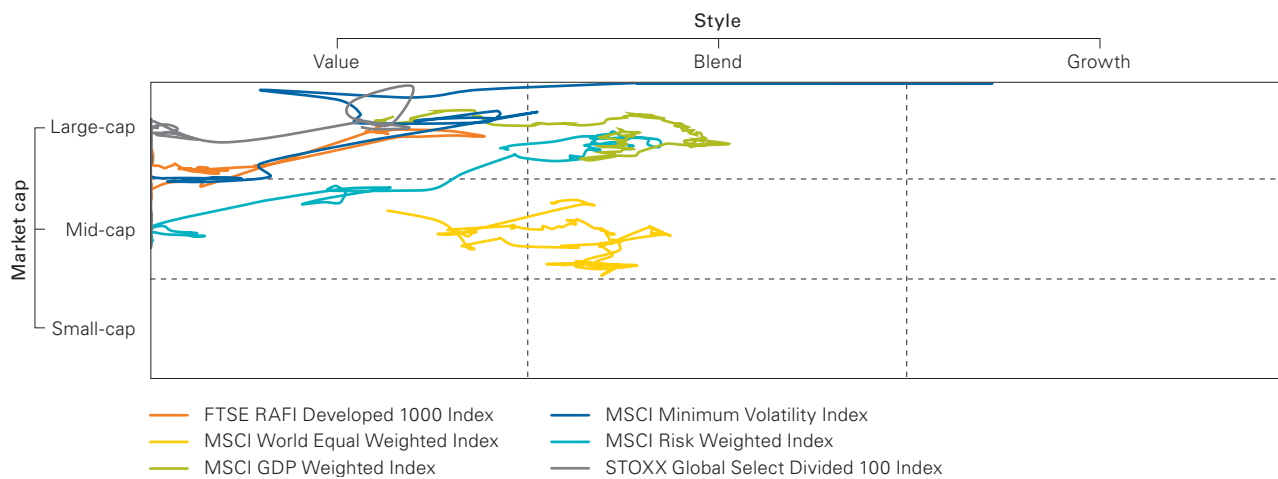
Some investors might view these non-market-cap-weighted indexes as effective ways to gain exposure to various market risk factors as mentioned here. However, as demonstrated earlier in Figure 6, the challenge with this approach is that the average risk exposures are anything but static. In fact, they are highly dynamic, as shown in Figure 11. This means that at any point in time, an investor's exposure to, for example, value equities or small equities may be greater than or less than that assumed by the strategy, and is subject to change over time. For more on the implications of this variability, see Rowley, Bennyhoff, and Choa (2014). This time-varying exposure is a direct outcome of the security selection process used by these strategies.

An additional challenge facing investors seeking to implement non-market-cap-weighted strategies to gain exposure to market risk factors is that such factors are dynamic in their performance relative to the broad market. For example, Figure 12 shows that both

smaller-cap and value equities within a targeted broad-market benchmark have undergone long periods of *underperformance* relative to the broad market. This demonstrates the potential for alternative strategies' embedded biases to work to the detriment of investors. We are not suggesting that market deviations are unacceptable, but, rather, that one should carefully consider the size of those deviations, given markets' cyclical and investor behavior.<sup>12</sup> That is, when a given segment of the equity market exhibits consistent and long-term underperformance, will investors remain committed to that strategy, or will they invest only after smaller-cap and value equities have outperformed? As Figure 12 shows, there is a significant performance differential between allocating 50% of a broad-market equity portfolio to a strategy focused on mid-cap value versus allocating 10%. As expected, the smaller the deviation from the broad market, the tighter the tracking error and performance differential versus the market. With this in mind, it may be worthwhile to consider allocating a significant portion of beta-seeking equity assets to broad-market, cap-weighted index funds while limiting the deviations to a modest amount.

Figure 11. Non-market-cap-weighted strategies' exposures to risk factors are time varying

60-month rolling style and size exposure of alternative index versus broad developed-equity market: 1999 to 2014



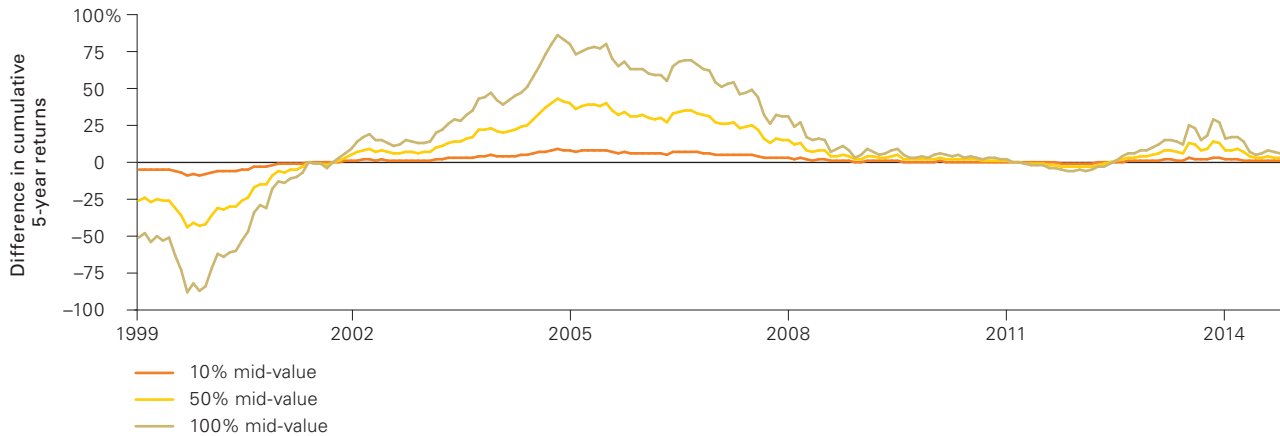
Notes: Figure displays 60-month rolling inferred benchmark weights resulting from tracking-error minimization for each index across size and style indexes. Factors are represented by the following benchmarks: Fundamental-weighted—FTSE RAFI Developed 1000 Index; Equal-weighted—MSCI World Equal Weighted Index; GDP-weighted—MSCI World GDP Weighted Index; Minimum-volatility—MSCI World Minimum Volatility Index; Risk-weighted—MSCI World Risk Weighted Index; Dividend-weighted—STOXX Global Select Dividend 100 Index.

Sources: Vanguard, based on data from MSCI, FTSE, Dow Jones, and Thomson Reuters Datastream.

<sup>12</sup> Previous Vanguard research (Bennyhoff and Kinniry, 2010) has shown investors' propensity to chase returns. First, returns captured by investors (also known as an internal rate of return, or IRR) have been shown to lag the returns of the funds in which they invest (also known as a fund's time-weighted return). Second, cash flows into and out of broad asset classes have tended to follow periods of large differences in relative performance in which one asset class significantly out- or underperforms another asset class.

**Figure 12. Divergent short-term performance has occurred regularly**

Relative performance of various combinations of MSCI World Mid Cap Value Index Versus MSCI World Index: 1995–2014



Sources: Vanguard, based on data from MSCI and Thomson Reuters Datastream.

## Conclusion

To the extent that an index is a group of securities chosen to represent an unbiased view of the risk-and-reward attributes of a market or a portion of a market, Vanguard believes that indexes should be constructed according to the market cap of the underlying constituents, as determined by all the available market information. By definition, alternatives to market-cap-weighted indexes, such as smart-beta strategies, should be considered active strategies, because their rules-based methodologies tend to generate meaningful security-level deviations, or *tracking error*, versus a broad market-cap index.

This paper’s analysis has shown that the “excess return” of such strategies can be partly (and in some cases largely) explained by time-varying exposures to certain risk factors, such as size and style. Consequently, the relative performance of smart-beta strategies versus

the broad market has deviated meaningfully over time (and can be expected to continue to do so), given (1) the relative performance of certain equity market factors versus the broad market, and (2) the inconsistent or dynamic exposures to such risk factors based on certain rules-based strategies. We found little evidence that such smart-beta strategies have been able to capture any security-level mispricings in a systematic or meaningful way.

The debate regarding the long-term performance of active versus indexed strategies continues, but Vanguard believes that reweighting traditional market-cap-based indexes represents neither a “new paradigm” of index investing nor a “smarter” way to invest.

For those investors seeking to outperform the broad market-cap portfolio, we encourage readers to see Appendix I (on page 15), which provides decision criteria for selecting viable alternatives to non-market-cap index-weighting strategies.

## References

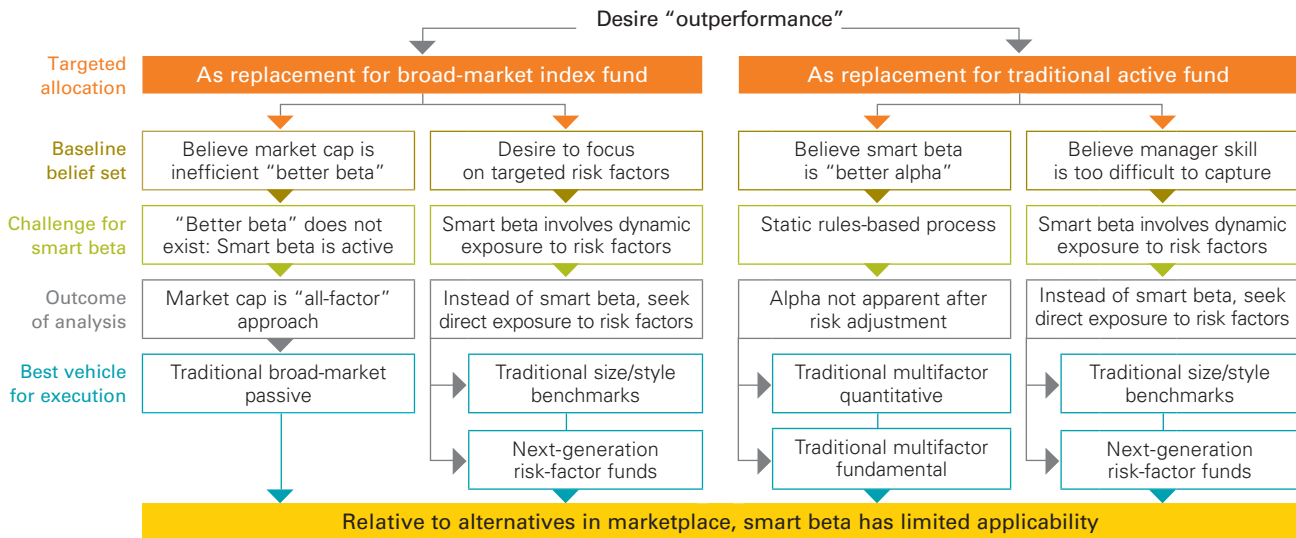
- Arnott, Robert, Jason Hsu, and Philip Moore, 2005. Fundamental Indexation. *Financial Analysts Journal* 61(2): 83–99.
- Asness, Clifford, 2006. The Value of Fundamental Indexing. *Institutional Investor*: 94–99.
- AXA Investment Managers, 2013. Australian Investors Embrace Smart Beta Strategies. From The Source, April 11; available at <http://www.advisorvoice.com.au/2013/04/australian-investors-embrace-smart-beta-strategies/>.
- Bennyhoff, Donald G., and Francis M. Kinniry Jr., 2010. *Advisor's Alpha*. Valley Forge, Pa.: The Vanguard Group.
- Blitz, David, Bart van der Grient, and Pim van Vliet, 2010. Fundamental Indexation: Rebalancing Assumptions and Performance. *Journal of Index Investing* 1(2): 82–88; available at <http://ssrn.com/abstract=1574150>.
- BMO Global Asset Management, 2014. *Canadian ETF Outlook Mid-Year 2014*. Montreal: Bank of Montreal, July.
- Brinson, Gary P., L. Randolph Hood, Jr., and Gilbert L. Beebower, 1986. Determinants of Portfolio Performance. *Financial Analysts Journal* 42(4): 39–44 (reprint, 1995, *Financial Analysts Journal* 51(1): 133–38, 50th Anniversary Issue).
- \_\_\_\_\_, 1991. Determinants of Portfolio Performance II: An Update. *Financial Analysts Journal* 47(3): 40–48.
- Carhart, Mark M., 1997. On Persistence in Mutual Fund Performance. *Journal of Finance* 52(1): 57–82.
- Clare, Andrew, Nick Motson, and Steve Thomas, 2013a. *An Evaluation of Alternative Equity Indices, Part 1: Heuristic and Optimised Weighting Schemes*. Cass Business School, City University London; available at <http://ssrn.com/abstract=2242028> or <http://dx.doi.org/10.2139/ssrn.2242028>.
- \_\_\_\_\_, 2013b. *An Evaluation of Alternative Equity Indices, Part 2: Fundamental Weighting Schemes*. Cass Business School, City University London; available at <http://ssrn.com/abstract=2242034> or <http://dx.doi.org/10.2139/ssrn.2242034>.
- Cogent Research, 2014. *The Evolution of Smart Beta ETFs: Smart Beta ETFs Poised for Growth Among Institutions*. Livonia, Mich.: Market Strategies International, January.
- Cremers, K.J. Martijn, and Antti Petajisto, 2009. How Active Is Your Fund Manager? A new measure that predicts performance. *Review of Financial Studies* 22(9): 3331–65.
- De Groot, Wilma, and Joop Huij, 2011. *Are the Fama-French Factors Really Compensations for Distress Risk?* Available at <http://ssrn.com/abstract=1840551> or <http://dx.doi.org/10.2139/ssrn.1840551>.
- Edness, Michael, 2011. The Small Cap Falsehood. Advisor Perspectives; available at [http://www.advisorperspectives.com/newsletters11/pdfs/The\\_Small\\_Cap\\_Falsehood.pdf](http://www.advisorperspectives.com/newsletters11/pdfs/The_Small_Cap_Falsehood.pdf).
- Edwards, Tim, and Craig J. Lazzara, 2014. Equal-Weight Benchmarking: Raising the Monkey Bars, S&P Dow Jones; available at <http://www.spindices.com/documents/research/research-equal-weight-benchmarking-raising-the-monkey-bars.pdf>.
- Fama, Eugene, and Kenneth French, 1992. The Cross-Section of Expected Equity Returns. *Journal of Finance* 47(2): 427–65.
- \_\_\_\_\_, 1993. Common Risk Factors in the Returns on Equities and Bonds. *Journal of Financial Economics* 33(1): 3–56.
- \_\_\_\_\_, 1996. Multifactor Explanations of Asset Pricing Anomalies. *Journal of Finance* 51(1): 55–84.
- Hsu, Jason, 2006. Cap-Weighted Portfolios Are Sub-Optimal Portfolios. *Journal of Investment Management* 4(3): 44–53.
- \_\_\_\_\_, 2013a. Smart Beta, MPT, and Diversification. Research Affiliates, October 10; available at <http://www.researchaffiliates.com/Our%20Ideas/Insights/Fundamentals/Pages/SBS/3-Smart-Beta-MPT-Diversification.aspx>.
- \_\_\_\_\_, 2013b. Smart Beta Versus Traditional Value Style Indices. Research Affiliates, November 12; available at <http://www.researchaffiliates.com/Our%20Ideas/Insights/Fundamentals/Pages/SBS/5-SmartBeta-vs-Traditional-Value.aspx>.
- \_\_\_\_\_, 2013c. Who Is on the Other Side of the Trade? Research Affiliates, December 18; available at <http://www.researchaffiliates.com/Our%20Ideas/Insights/Fundamentals/Pages/SBS/6-Who-is-on-Other-Side.aspx>.
- \_\_\_\_\_, 2014. The Value Premium Is Mean-Reverting? Research Affiliates, January 28; available at <http://www.researchaffiliates.com/Our%20Ideas/Insights/Fundamentals/Pages/SBS/7-the-Value-Premium-is-Mean-Reverting.aspx>.
- Kaplan, Paul, 2008. Why Fundamental Indexation Might—Or Might Not—Work. *Financial Analysts Journal* 64(1): 32–39.
- Li, Xi, R.N. Sullivan, and L. Garcia-Feijóo, 2014. The Limits to Arbitrage and the Low-Volatility Anomaly. *Financial Analysts Journal* 70 (1, Jan./Feb.): 52–63.
- Pappas, Scott N., and Joel M. Dickson, 2015. *Factor-Based Investing*. Valley Forge, Pa.: The Vanguard Group.
- Perold, André, 2007. Fundamentally Flawed Indexing. *Financial Analysts Journal* 63(6): 31–37.
- Pensions & Investments, 2013. Low-Volatility Strategies Are Gaining Speed in Asia, by Douglas Appell. *Pensions & Investments* 41(1, June 24):1.
- Rowley, James J., Donald G. Bennyhoff, and Samantha S. Choa, 2014. *Active Indexing: Being 'Passive-Aggressive' with ETFs*. Valley Forge, Pa.: The Vanguard Group.
- Sharpe, William F., 1991. The Arithmetic of Active Management. *Financial Analysts Journal* 47(1): 7–9.
- Siegel, Jeremy, 2006. The 'Noisy Market' Hypothesis. *Wall Street Journal* (June 14): A14.
- Spence Johnson, 2014. *Smart Beta Funds: A Growing Alternative to Active Approaches*. Investment Product Market Intelligence, 2014. London: Spence Johnson, April.
- Wang, Huijun, and Jianfeng Yu, 2013. An Empirical Assessment of Models of the Value Premium. Paper presented at 2013 American Finance Association Annual Meeting, San Diego, January 4–6; available at <http://ssrn.com/abstract=1866397> or <http://dx.doi.org/10.2139/ssrn.1866397>.

## Appendix I. Evaluating the rationale for smart beta in the marketplace

As a result of the myriad options for alternative strategies and the potentially disparate results of selecting one option over another, it is critical for investors to understand the rationale for smart beta, as well as the alternatives available in the marketplace to help investors achieve their

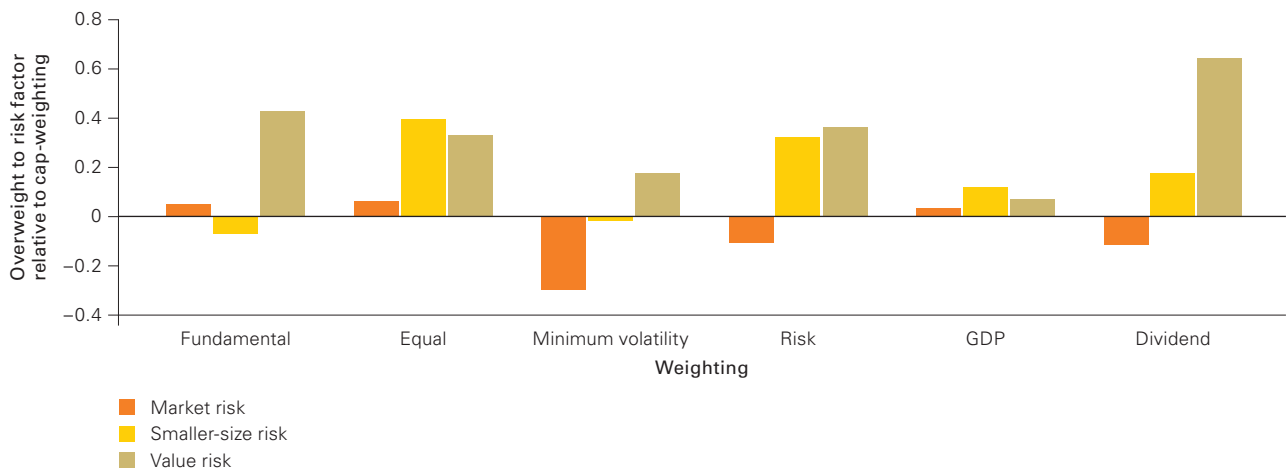
investment objectives. Appendix Figure A-1 provides such a decision framework, whereas Figure A-2 outlines risk-factor exposures of selected alternative strategies. Given that the sole reason for interest in smart-beta strategies is the pursuit of “better” investment performance, the nuanced question each investor needs to address is that of “better relative to what”?

Figure A-1. Decision tree when considering smart-beta funds



Source: Vanguard.

Figure A-2. Average risk-factor exposures of selected alternatively weighted strategies: 1999–2014



Notes: Figure displays three-factor Fama-French model for market, value, and smaller-size risk (Fama and French, 1993; Carhart, 1997); risk-factor exposure of each alternative index is shown relative to its cap-weighted counterpart index (i.e., the difference in the regression coefficients). Factors are represented by the following benchmarks: Fundamental-weighted—FTSE RAFI Developed 1000 Index; Equal-weighted—MSCI World Equal Weighted Index; GDP-weighted—MSCI World GDP Weighted Index; Minimum-volatility—MSCI World Minimum Volatility Index; Risk-weighted—MSCI World Risk Weighted Index; Dividend-weighted—STOXX Global Select Dividend 100 Index.

Sources: Vanguard, based on data from MSCI, FTSE, Dow Jones, Thomson Reuters Datastream, and Kenneth French's website (the latter available at [mba.tuck.dartmouth.edu/pages/faculty/ken.french/](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/)).



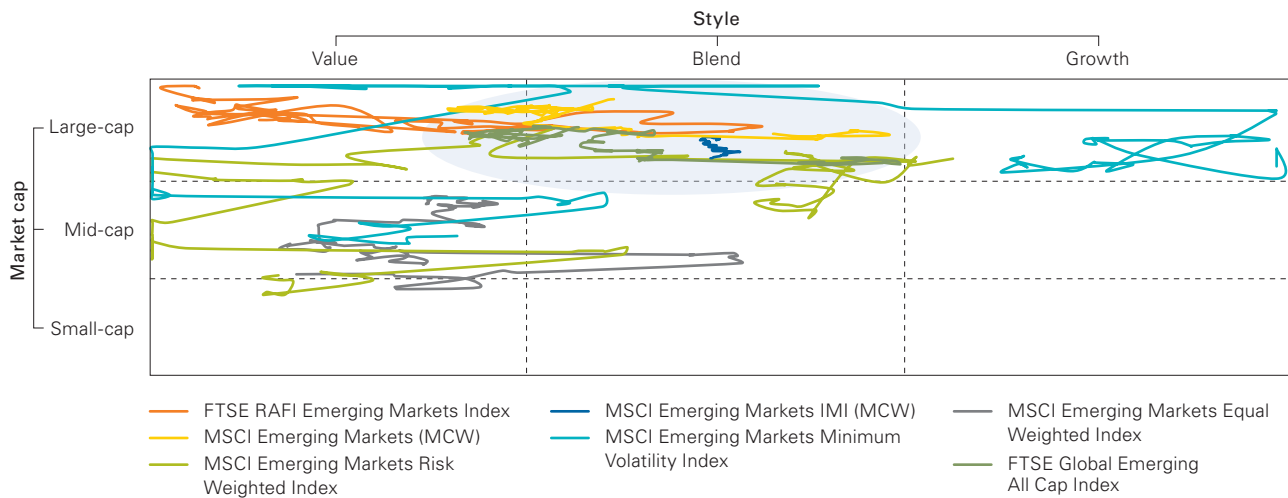
## Appendix II. Smart beta in emerging markets

This paper's analysis has focused mainly on non-market-cap-weighted benchmarks implemented within a global developed-market equity universe. Appendix Figure A-3 replicates the approach of Figure 6 (in the text), but using an emerging-market allocation. Our study's overall conclusions apply also to emerging markets, just as we

would expect them to apply to any particular regional equity mandate. To reiterate: Alternative weighting schemes represent an active decision to depart from market weights, resulting in active risk. This active risk tends to persistently overweight the value and smaller-size segments of the market, leading to performance that will be highly dependent on the relative returns of those market segments.

Figure A-3. Alternatively weighted strategies have tended to tilt toward value and smaller-size segments of the broad global emerging equity market

Style exposure of alternative indexes versus broad emerging equity market 1999–2014



Notes: Figure displays inferred benchmark weights resulting from 36-month rolling tracking-error minimization for each index across six MSCI emerging-markets size and style indexes (results were also not materially different using FTSE benchmarks).

Sources: Vanguard, based on data from MSCI, FTSE, Dow Jones, and Thomson Reuters Datastream.

Connect with Vanguard® > [vanguard.com](http://vanguard.com)

**For more information about Vanguard funds, visit [vanguard.com](http://vanguard.com) or call 800-662-2739 to obtain a prospectus. Investment objectives, risks, charges, expenses, and other important information about a fund are contained in the prospectus; read and consider it carefully before investing.**

The index is a product of S&P Dow Jones Indices LLC ("SPDJI") and has been licensed for use by Vanguard. Standard & Poor's® and S&P® are registered trademarks of Standard & Poor's Financial Services LLC ("S&P"); Dow Jones® is a registered trademark of Dow Jones Trademark Holdings LLC ("Dow Jones"); S&P® and S&P 500® are trademarks of S&P; and these trademarks have been licensed for use by SPDJI and sublicensed for certain purposes by Vanguard. Vanguard product(s) are not sponsored, endorsed, sold or promoted by SPDJI, Dow Jones, S&P, or their respective affiliates and none of such parties make any representation regarding the advisability of investing in such product(s) nor do they have any liability for any errors, omissions, or interruptions of the index.

CFA® is a registered trademark owned by CFA Institute.



Vanguard Research

P.O. Box 2600  
Valley Forge, PA 19482-2600

© 2015 The Vanguard Group, Inc.  
All rights reserved.  
Vanguard Marketing Corporation, Distributor.

ISGSA 082015