

The background of the page is a dark, teal-tinted photograph of a bridge structure. Overlaid on this are large, stylized, concentric circular and rectangular shapes in white, green, and yellow. These shapes are interconnected, creating a complex, geometric pattern that resembles a stylized 'A' or a series of nested loops. The colors transition from white to green to yellow, giving a sense of depth and movement.

Exploring
**SMART
BETA**

INTRODUCTION

Smart beta strategies are increasingly recognized as a key element in investors' portfolios. Nearly \$360 billion is already invested in U.S. exchange-traded products tracking what Morningstar calls "strategic beta" indices,¹ and industry observers expect to see continuing growth in assets under management.

In this environment, many investors want to learn more about smart beta investing—what it means, how it differs from traditional active and passive management, and why it merits an allocation in their portfolios.

In late 2013 and early 2014, Jason Hsu, Ph.D., wrote a series of short essays about selected topics in smart beta investing, ranging from how it differs from traditional capitalization-weighted indexing to the dollar cost averaging that naturally results from periodic rebalancing. These concise pieces provide a solid introduction to important dimensions of smart beta strategies.

Research Affiliates is pleased to make the content of Dr. Hsu's series of articles accessible in a new format that makes it easy for investors to understand key features of smart beta indexing. Because we are always engaged in research, the online version of this tutorial contains many in-context hyperlinks to other Research Affiliates publications. Readers who wish to explore selected topics in greater depth will find these links helpful.

We hope the insights you gain from the ideas and research findings presented here will help you refine your own thinking about smart beta investing. The full range of writings by our firm's investment professionals—addressing macro-economic issues, asset allocation, and target-date funds, among many other topics—is publicly available on our [website](#).



MIKE BOWERS
Senior Vice President, Marketing

¹"Morningstar Launches Smart Beta Ratings System," *ThinkAdvisor*, September 22, 2014.

#1

The Genesis of Smart Beta Investing

Traditional cap-weighted indices rely on a single source of excess return. In contrast, smart beta indices incorporate diversified exposures to various sources of equity returns.

> [PAGE 1](#)

#2

Strategy Indices and Smart Beta

In the due diligence process, investors should ask active quantitative managers and smart beta managers different questions.

> [PAGE 5](#)

#3

Smart Beta, MPT, and Diversification

Smart beta's efficiency comes, not from optimization, but from a more balanced distribution across equity premium sources.

> [PAGE 7](#)

#4

Smart Beta and Benchmark Risk

When it comes to smart beta investing, the conventional ex post risk measures of tracking error and the information ratio have to be reinterpreted.

> [PAGE 10](#)

#5

Smart Beta vs. Traditional Value Style Indices

Fundamentally weighted index investing extracts the value premium more effectively through contrarian rebalancing in a diversified core portfolio.

> [PAGE 14](#)

#6

Who Is On the Other Side of the Trade?

Value investing is uncomfortable because it goes against our genetic programming: On our evolutionary path, fear and greed probably served to keep us safe.

> [PAGE 18](#)

#7

The Value Premium is Mean-Reverting

Because, like stock prices, the value premium tends to revert toward the long-term mean, rebalancing smart beta portfolios naturally results in dollar cost averaging.

> [PAGE 20](#)

THE GENESIS OF SMART BETA INVESTING

SMART BETA STRATEGIES ARE A RADICAL DEPARTURE, BUT THEY DIDN'T SUDDENLY APPEAR FROM NOWHERE. THEY ARE ROOTED IN THE HISTORY OF FINANCIAL THEORY AND THE EVOLUTION OF INDEX INVESTING. A GLANCE BACK AT THE ORIGINS IS A FIRST STEP TOWARD UNDERSTANDING HOW SMART BETA STRATEGIES HAVE REDEFINED THE CHOICES AVAILABLE TO INVESTORS.



WEIGHT AS A PERCENT OF
TOTAL INDEX



PRICE OF COMMON STOCK

CAPITALIZATION WEIGHTING

HOW DOES TRADITIONAL INDEX INVESTING WORK?

Conventional capital market indices are:

- › Capitalization-weighted
 - › With cap weighting, a company's share of the index depends in part on the price of its common stock
 - › If the market price of a stock rises, so does its weight as a percent of the total index, and vice versa
- › Based on the Capital Asset Pricing Model (CAPM)
 - › All investors are exposed to market risk
 - › If the market rises, individual stocks will rise to some extent, and vice versa
 - › Market beta is an estimate of *how much* a particular stock will rise or fall for a given rise or fall in the overall market

BUT over the past 40 years the CAPM has been rejected on both theoretical and empirical grounds.²

²CAPM is still taught in business schools as a valuable conceptual tool.

A NOTE ABOUT CAP WEIGHTING

Many well known indices assign weights to stocks on the basis of the issuing companies' market capitalization—the price of the stock multiplied by the number of shares outstanding—as a percentage of the total market capitalization of all the stocks in the index.

For example, as of June 30, 2014, General Electric Company was 1.4% of the S&S 500 Index.

VALUES AS OF JUNE 30, 2014				
	A	B	A x B	
	Market Price per Common Share	Shares of Common Stock Outstanding (Millions)	Market Capitalization (Millions)	Percent of Total
General Electric Co.	\$25.27	10,042.19	\$253,766	1.4%
S&P 500 Index			\$18,245,163	100%

Source: Research Affiliates using data from FactSet.

General Electric's weight in the index depends partially upon the market price of its common stock. If the price rose to \$30 per share, the index allocation to General Electric would rise to 1.7%; if the price fell to \$20, General Electric's weight in the index would drop to 1.2%.

WHAT MAKES SMART BETA DIFFERENT?

The state of the art in return modeling is the multi-factor framework based on the Arbitrage Pricing Model (APT).

- › There are multiple sources of equity return premia
 - › Some premium returns compensate investors for taking risk
 - › Some can be gained by taking advantage of other investors' patterns of behavior
- › The equity premium sources that appear to be most robust over time and across countries are associated with these factors:
 - › Market
 - › Value
 - › Momentum
 - › Low Volatility

FOR MORE INFORMATION, SEE **"SMART BETA: THE SECOND GENERATION OF INDEX INVESTING"** AND **"THE PROMISE OF SMART BETA."**

THE FACTOR ZOO

Academic researchers have claimed to find many other risk factors that generate return premia. We find, however, that these are the only ones that matter: market beta, of course, and the value, momentum, and low volatility effects.

FOR MORE INFORMATION, SEE ["FINDING SMART BETA IN THE FACTOR ZOO."](#)

SMART BETA IS AN EVOLUTIONARY
ADVANCE IN BETA INVESTMENT
STRATEGY JUST AS MULTI-FACTOR
APT IS AN IMPROVEMENT IN FINANCIAL
THEORY.

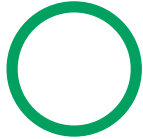
AN UPDATE ON THE SIZE EFFECT

In the early 1990s, Eugene Fama and Kenneth French developed a hugely influential return model with three factors: **market, value, and size**. The size factor reflected a finding that, on average, small-cap stocks generated higher returns than large-cap stocks. In other words, there was a small-cap premium. However, the small-cap anomaly has not been observed in the United States since the 1980s and does not exist outside the U.S. dataset.

FOR MORE INFORMATION, SEE ["BUSTING THE MYTH ABOUT SIZE."](#)

Traditional passive investing offers exposure to a single source of return—market beta. Smart beta strategies access multiple equity return sources, especially the value and low volatility factors.

NONETHELESS, SMART BETAS HAVE MANY CHARACTERISTICS IN COMMON WITH TRADITIONAL INDEXING. SMART BETA INDICES:



ARE TRANSPARENT



ARE BASED ON SIMPLE
MECHANICAL RULES



HAVE RELATIVELY
LOW TURNOVER



HAVE HIGH
INVESTMENT CAPACITY



HAVE LOW
IMPLEMENTATION COSTS



ARE BROADLY
REPRESENTATIVE OF THE
MACRO-ECONOMY

FOR MORE INFORMATION, SEE ["WHAT SMART BETA MEANS TO US."](#)



HOW CAN I USE THIS KNOWLEDGE?

TIP Focus on how to combine cap-weighted indices with smart beta strategies to create the desired mix of equity premium exposures

	Business Cycle	Risk Measure
Market Beta	Highly positively correlated	Low tracking error
Value and Low Volatility	More negatively correlated	High Sharpe ratio
Momentum	Positively correlated*	High Sharpe ratio

FOR MORE INFORMATION, SEE ["AN INVESTOR'S GUIDE TO SMART BETA STRATEGIES"](#) AND ["BUILDING A BETTER BETA: COMBINING FUNDAMENTALS WEIGHTING, LOW VOLATILITY, AND MOMENTUM STRATEGIES."](#)

STRATEGY INDICES AND SMART BETAS

IT IS CONVENIENT TO DIVIDE STRATEGY INDEXING (BROADLY UNDERSTOOD AS INVESTING IN ACCORDANCE WITH ACTIVE BUT RULES-BASED STRATEGIES) INTO AN ALPHA AND A BETA CAMP. ACTIVE QUANTITATIVE STRATEGIES BELONG TO THE ALPHA CAMP; SMART BETA INDICES FALL ON THE BETA SIDE. INVESTORS SHOULD ASK ACTIVE QUANTS AND SMART BETA MANAGERS DIFFERENT QUESTIONS.

ARE ACTIVE QUANT STRATEGIES SUITABLE CORE INVESTMENTS?

Active quants primarily emphasize generating alpha in excess of the standard equity premium by exploiting temporary mispricing driven by investors' behavioral quirks. Quantitative alpha signals can decay quickly as hedge funds and high-frequency traders compete to take advantage of transitory price anomalies.

ACTIVE QUANTITATIVE STRATEGIES DELIVERED ON AN INDEX CHASSIS ARE OFTEN CHARACTERIZED BY:

LIMITED CAPACITY

HIGH TURNOVER

BLACK-BOX OPACITY

CONCENTRATED EXPOSURES

These traits, along with the focus on alpha, may make active quant strategies less than ideal for an investor's equity core.³

HOW DO SMART BETA STRATEGIES STACK UP?

COMPARED TO ACTIVE QUANT STRATEGIES, EQUITY SMART BETA STRATEGIES OFFER:

HIGH CAPACITY

RELATIVELY LOW TURNOVER

TRANSPARENCY

BROAD EXPOSURE TO ECONOMIC SECTORS

If investors embrace modern finance theory, then smart beta is a natural progression from a world with a single source of equity premium to a world with multiple wellsprings of equity premia.

³For more information, see *"The Lure of Hedge Funds"*.

HOW DO THE DIFFERENCES AFFECT THE MANAGER SELECTION PROCESS?

Investors should subject active quant indices to the same analysis they have traditionally used in selecting active managers.

- › Is the back-test believable?
- › What is the theoretical explanation of the anomaly being captured?
- › Is there robust out-of-sample evidence for the anomaly?
- › Is the anomaly sufficiently persistent to generate long-term alpha?
- › Can the anomaly be exploited at size?

Smart beta strategies tap into well-established sources of long-term equity premia: market beta, value beta, and low volatility beta. Investors can give more thought to:

- › Formulating a view on the prospective equity premia
- › Thinking about the appropriate mix of factor exposures for their equity core

SMART BETA IMPLEMENTATION MATTERS!

When selecting a smart beta index, it's good to consider not only the factors it purports to capture but also how it is constructed. Ask prospective providers about these issues:

- › How often is the index rebalanced?
- › How much turnover is normally expected, and what are the related transaction costs?
- › Are the securities in the index selected, as well as weighted, without regard to prices?

FOR MORE INFORMATION, SEE [**"WHAT MAKES ALTERNATIVE BETA SMART?"**](#)

HOW CAN I USE THIS KNOWLEDGE?

Smart betas and active quant strategies are not mutually exclusive; there may be room for both in a comprehensive investment program. But when conducting searches it makes sense to ask different questions about alpha-seeking and beta indices.



SMART BETA, MPT, AND DIVERSIFICATION

MEAN-VARIANCE OPTIMIZATION IS A DOUBTFUL FINANCIAL OBJECTIVE FOR MOST INVESTORS. NONETHELESS, SMART BETA INDICES ARE GENERALLY MORE MEAN-VARIANCE EFFICIENT THAN CAP-WEIGHTED INDICES BECAUSE THEY PARTIALLY REALLOCATE RISK FROM MARKET BETA TO OTHER FACTORS.

IS MEAN-VARIANCE OPTIMIZATION MISGUIDED?

Some providers of financial products have constructed smart beta equity indices on the basis of mean-variance optimization, a method pioneered in 1952 by Nobel Laureate Harry Markowitz. But is this a wise approach?

Consider:

- › Investors' financial objectives are typically more complex than achieving respectable Sharpe ratios
- › Pension fund sponsors seek an investment policy that stands to fund retirement benefits cost effectively
- › Most investors desire the excess returns associated with non-market beta exposures as well as the potential for alpha

In our view, a mean-variance optimized equity portfolio does not adequately address the needs of pension fund sponsors and other investors.

WHAT ABOUT OPTIMAL DIVERSIFICATION?

In ordinary language, the notion of diversification is ill defined. Some investors use the inverse Herfindahl score, known as effective N , as a measure of diversification—but it may not be an appropriate metric.



A NOTE ABOUT MEAN-VARIANCE EFFICIENCY

Harry Markowitz, a vital figure in the development of modern portfolio theory (MPT), discovered that the stocks in a portfolio can be weighted so as to maximize the portfolio's expected return for a given level of forecasted risk.⁴ (Seen the other way around, an optimized or mean-variance efficient portfolio is one that minimizes ex

- › In the modern multi-factor framework, there are only a few true economic exposures
- › Raising a portfolio's effective N does not necessarily improve its diversification
- › One can never really have more exposures than there are industrial sectors

In the investment literature, diversification is defined as reducing risk without reducing expected return. Investors cannot set out to improve diversification without having strong views on expected returns for stocks.

HOW CAN SMART BETAS OUTPERFORM CAP-WEIGHTED INDICES?

Smart beta strategies have outperformed cap-weighted indices in long-term simulations. The outperformance does *not* result from optimization but rather from mean reversion⁵ in stock prices and the contrarian rebalancing effect. In fact, just about any hypothetical portfolio weighting scheme that is not price-based handily outperforms cap weighting.

ante risk for a given level of expected return.) Markowitz's method takes into account the signs and magnitudes of the correlations among all the stocks in the portfolio—how much their prices move together. Together, the stock weights and correlations determine the portfolio's expected return and volatility. Markowitz's concept of mean-variance efficiency is widely applied in asset allocation and active equity portfolio management.

All the same, despite its theoretical appeal, portfolio optimization is not easy to achieve in practice. Standard optimization techniques tend to concentrate into assets with large positive estimation errors unless the optimizer is subjected to numerous *ad hoc* constraints—and in that case the resulting portfolio is dominated by the constraints rather than the inputs or the optimizing algorithm.

⁴Harry Markowitz, "Portfolio Selection," *Journal of Finance*, 7/1 (March 1952), 77-91.

THE INVERSE HERFINDAHL SCORE

Effective N is a simple, straightforward measure of concentration; the larger the value, the less concentrated the portfolio along the measured dimension. Mathematically, the Herfindahl Index is defined as the sum of squared weights. Its inverse ranges from 1 for a portfolio that holds only one stock to N for a portfolio of N equally weighted stocks. Higher effective N s indicate less concentration. However, effective N ignores the fact that different stocks have different correlations with one another, and, therefore, it doesn't serve very well as an indicator of diversification across portfolio holdings. A more appropriate use of the inverse Herfindahl score is to assess a portfolio's concentration in industries or countries.

⁵Mean reversion, in this context, means that stocks whose prices have been trending upward or downward will, at some point, reverse direction and head back toward their average values. For more information about mean reversion and rebalancing, see "[*Smart Beta and the Pendulum of Mispricing.*](#)"

SO... ARE SMART BETA INDICES MEAN-VARIANCE EFFICIENT?

In fact, smart beta indices *are* generally more mean-variance efficient than cap-weighted indices insofar as they reduce volatility risk without diminishing expected returns or boost expected returns without increasing volatility risk. But...

- › The improvement in mean-variance efficiency does not come from optimization
- › Any equity portfolio which allocates risk from 100% market beta to market beta plus other factors is likely to improve its long-term risk-adjusted performance!



HOW CAN I USE THIS KNOWLEDGE?

TIP We caution investors against pursuing the elusive dream of optimality. Complex optimization generally underperforms strategies as simple as equal-weighting. In the land of smart beta, the old adage is true: Avoid letting perfection stand in the way of good enough.

SMART BETA AND BENCHMARK RISK

TRACKING ERROR (TE) AND THE INFORMATION RATIO (IR) HAVE DIFFERENT INTERPRETATIONS IN TRADITIONAL ACTIVE MANAGEMENT AND SMART BETA INVESTING. THE IR OF A SMART BETA STRATEGY PROVIDES INFORMATION ABOUT THE AMOUNT OF MARKET BETA IN ITS STOCKS, WHILE THE TE REFLECTS NON-MARKET-BETA SOURCES OF RETURN. IN THE SMART BETA WORLD, TE MAY BE A BETTER MEASURE OF CAREER RISK THAN INVESTMENT RISK.

WHAT IS TRACKING ERROR?

Tracking error is a statistical measure that indicates how closely a portfolio's returns correspond to the benchmark returns over a series of measurement periods such as months. In active portfolio management, a high TE indicates that the manager has taken significant positions against the market consensus. Right or wrong, the manager with a high TE against a capitalization-weighted index has strong convictions. Managers who have low TEs may be engaging in "closet indexing"; that is, keeping portfolio holdings closely aligned with the stocks held in the benchmark index to mitigate the risk of substantial underperformance.

THE PERFORMANCE OF BROAD MARKET INDICES

Some capitalization-weighted indices, such as the S&P 500 Index and the Russell 1000® Index, are considered representative of the U.S. stock market as a whole. These broad market indices are treated as proxies for the market portfolio, and their returns are considered the market return. However, it would be a mistake to think that broad market indices perform as well as the average stock or, said differently, as well as a portfolio of stocks chosen by an uninformed investor. FOR MORE INFORMATION, SEE [**"MEASURING THE 'SKILL' OF INDEX PORTFOLIOS."**](#) H

WHAT IS THE INFORMATION RATIO?

The IR is a measure of risk-adjusted return relative to the benchmark. It quantifies the value-added return (the portfolio's return in excess of the benchmark return) per unit of tracking error. A high IR usually means a high signal-to-noise ratio in the manager's "proprietary information" about securities—the information the manager gleans from applying a unique methodology or excelling in the use of standard approaches to security analysis. A low IR on a meaningful TE usually indicates that the manager is unskilled.

FOR THE MATHEMATICALLY INCLINED: TRACKING ERROR AND THE INFORMATION RATIO

Tracking error is the standard deviation of the difference between the portfolio return and the benchmark return.

The information ratio is the excess return of the account over the benchmark relative to the variability of that excess return.

$$TE = \hat{\sigma}_{A-B}$$

$$IR_A = \frac{\bar{R}_A - \bar{R}_B}{\hat{\sigma}_{A-B}}$$

Source: Jeffery V. Bailey, Thomas M. Richards, and David E. Tierney, "Evaluating Portfolio Performance," in John L. Maginn et al., eds., *Managing Investment Portfolios: A Dynamic Process* (John Wiley & Sons, 2007), 717-782.

WHAT DO SMART BETA TE'S AND IR'S REVEAL?

Smart beta strategies also have tracking errors against the cap-weighted benchmark. Unless we're speaking metaphorically, the TE of a smart beta strategy cannot be said to indicate "conviction." Rather, it measures the amount of non-market-beta sources of equity premium which have been injected into the portfolio. For example:

- › The TE of a fundamentally weighted index is generated by the allocation to low price stocks.
- › The TE of a low volatility index is driven by the allocation to low beta stocks.

Information ratios also have a different meaning for smart beta strategies. The IR of a smart beta strategy informs us about the amount of equity market premium contained alongside other factor premia in the portfolio's stocks.

Taking the two measures together:

- › Value, momentum,⁶ and size-oriented smart beta strategies tend to have active TEs and high IRs
- › Low-volatility smart beta strategies tend to have very large TEs and low IRs

⁶For more information about momentum, see "[*Hot Potato: Momentum as an Investment Strategy*](#)."

SO IS LOW VOLATILITY A SUB-PAR STRATEGY?

In active equity management, a portfolio's IR indicates how well it has performed on a risk-adjusted basis relative to the benchmark. A portfolio with a low IR has not produced particularly solid returns over the benchmark for the risk it took in deviating from the benchmark—and, when costs (notably including advisory fees) are taken into account, it seems likely to underperform in the future.

But the IR may not be an appropriate measure for analyzing and evaluating the performance of smart beta strategies. In the case of low volatility investing, it does not recognize that the strategy is designed to maximize exposure to the low-beta premium.

In our view, the Sharpe ratio (which is entirely unrelated to the cap-weighted benchmark) is a better measure of risk-adjusted return for smart beta strategies. A simulated low volatility portfolio has a Sharpe ratio of 0.7 compared to the market portfolio's 0.4.

FOR MORE INFORMATION ON LOW-VOLATILITY INVESTING, SEE [**"MAKING SENSE OF LOW VOLATILITY INVESTING."**](#)

Figure 1 displays the relationship between IR and the Sharpe ratio for fundamentally weighted and low volatility smart beta strategies.

FOR THE MATHEMATICALLY INCLINED: THE INFORMATION RATIO VERSUS THE SHARPE RATIO

The IR is the excess return of the account over the benchmark relative to the variability of the excess return. Thus it is a measure of the value-added return per unit of benchmark risk, the risk that arises from deviating from the benchmark.

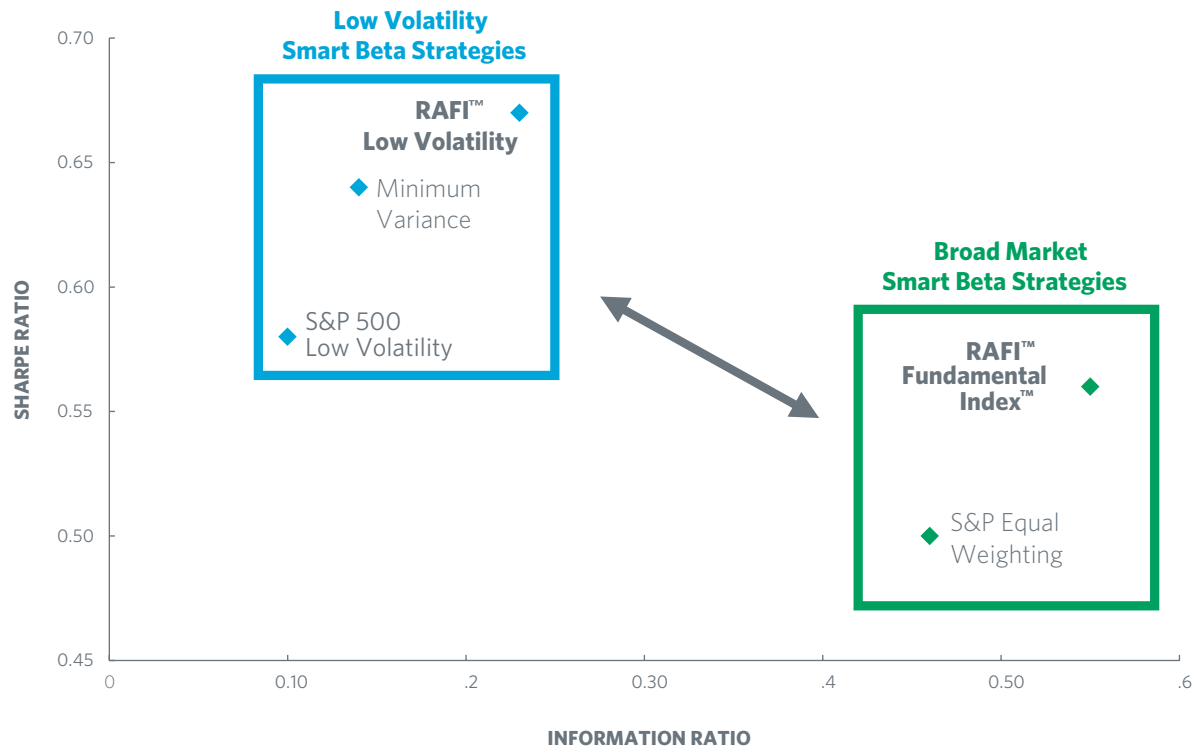
$$IR_A = \frac{\bar{R}_A - \bar{R}_B}{\hat{\sigma}_{A-B}}$$

The Sharpe ratio is the return of the portfolio in excess of the risk-free or default-free rate of return, relative to the total risk of the portfolio. (In the United States, the risk-free rate is usually represented by the 90-day T-bill rate.) The Sharpe ratio expresses total risk as the portfolio's standard deviation of returns.

$$SR_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\sigma}_A}$$

Source: Jeffery V. Bailey, Thomas M. Richards, and David E. Tierney, "Evaluating Portfolio Performance," in John L. Maginn et al., eds., *Managing Investment Portfolios: A Dynamic Process* (John Wiley & Sons, 2007), 717-782.

FIGURE 1: INFORMATION RATIO VS. SHARPE RATIO



INVESTMENT RISK OR CAREER RISK?

TE to the cap-weighted benchmark can be an unsatisfactory measure of investment risk, especially when analyzing smart beta strategies. But it is arguably an excellent indicator of career risk in organizations where the performance of core equity investments is evaluated against market returns. In such organizations, high TEs can signal a high risk of investment officers losing their jobs. With a market beta close to unity, smart beta strategies like a fundamentals-weighted index might be viable choices here.

For more progressive organizations that are attuned to the equity core's risk-adjusted contribution to the overall investment program, a more diversified allocation to the various sources of equity premium—including the low volatility effect—might be a sound policy choice.



HOW CAN I USE THIS KNOWLEDGE?

TIP Comparing the Sharpe ratio of the portfolio with that of the cap-weighted benchmark allows you to evaluate the portfolio's return, adjusted for total risk, relative to the risk-adjusted return you would have earned with the traditional passive alternative.

SMART BETA VS. TRADITIONAL VALUE STYLE INDICES

TRADITIONAL CAP-WEIGHTED VALUE STYLE INDICES HAVE TWO DRAWBACKS: THEIR ACTIVE SHARES ARE DOMINATED BY BETS ON INDUSTRIES WITH CHARACTERISTICALLY LOW VALUATION RATIOS, AND THEIR CAP WEIGHTING CONSTRUCTION LEADS TO LARGE POSITIONS IN VALUE STOCKS WHOSE PRICES HAVE RISEN. SMART BETA INDICES ARE BROADLY REPRESENTATIVE OF THE ECONOMY AND CAN CAPTURE THE VALUE PREMIUM MORE EFFICIENTLY.

WHAT IS A VALUE STYLE INDEX?

Value investing is most simply described as buying stocks with low market valuations in the expectation that their prices will rise over time. Value style indices became available in the late 1980s and early 1990s.

- › First-generation value indices were generally constructed by selecting stocks with low price-to-book (P/B) ratios and then cap weighting them.
- › Over time, the methodologies evolved to include other measures of value and to situate stocks on a value-growth continuum.

THE NINE-BOX STYLE MATRIX

Institutional investors increasingly recognized value investing as a distinctive investment strategy after consultants started using a nine-box style matrix that Morningstar introduced in 1992.

VALUE	BLEND	GROWTH	SIZE
			LARGE
			MID
			SMALL

Source: *The Morningstar Style Box™ Fact Sheet.*

In Morningstar's methodology, the size categories on the vertical axis are defined by market capitalization ranges. The value, blend or core, and growth categories are a little more complicated. Stocks are given value scores on the basis of five fundamental measures, such as price-to-book and dividend yield, and growth scores based on five growth rates such as growth in earnings and growth in cash flow. If a stock's net score (growth minus value) is very negative, the stock's style is value.

The nine-box style matrix has been widely adopted in the investment industry, but other consultancies have their own methods of classifying stocks as value- or growth-oriented.

SECTOR WEIGHTS IN VALUE STYLE INDICES

In conventional value indices, growth-oriented industries are represented only to the extent value stocks have growth characteristics. Because of the index construction methodology, value indices are unrepresentative of the underlying economy because they are poorly diversified across industries.

Compared with broad market indices like the Russell 1000 Index and the S&P 500 Index, traditional value indices tend to have...

- › Large overweights in financial and energy stocks
- › Underweights in technology stocks

These active weights, illustrated in the table below, result from the value style indices' favoring stocks from industries which typically have lower valuation measures such as P/B and price-to-earnings (P/E) ratios.

TABLE 1: INDEX SECTOR WEIGHTS AS OF OCTOBER 31, 2014

Index	Sector Weight (% of Total Index Capitalization)		
	Financial	Energy	Technology
Russell 1000 Value	27.41	10.99	9.10
Russell 1000	17.54	7.69	16.43
S&P 500 Value	21.72	13.99	6.25
S&P 500	16.40	8.32	17.18

Source: Research Affiliates based on data from FactSet. S&P 500 Index is represented by iShares S&P 500 Index ETF(IVV). S&P 500 Value Index is represented by iShares S&P 500 Value Index ETF(IVE)

This means that, relative to a broad market benchmark, value style indices unintentionally make significant bets on the financial and energy industries and against the technology industry. But it is known that, as value signals, P/B and (P/E) ratios are more meaningful for comparing stocks within an industry than across different industries. The value style indices' active industry weights are a suboptimal approach to exploiting the value effect.

VALUE STYLE INDICES ARE CAPITALIZATION-WEIGHTED

In the process of constructing or reconstituting a value style index, the selected stocks are weighted according to their market capitalization. Consequently, the stocks' weights fluctuate with prices.

Here is an example. Prior to the Global Financial Crisis, many large bank stocks became expensive relative to their historical valuation ratios. The cap weighting method meant that they took on heavier weights in value indices before the banking sector crisis. Later, at the low point in the crisis, banks were trading at historically low valuation multiples, and, as a result, their weights were substantially reduced before financial stocks recovered.

Table 2 compares major bank weights in a value index and a broad market index before the crisis and before the recovery.

TABLE 2: PRE-CRISIS AND PRE-RECOVERY WEIGHTS

Index	Major Banks (% of Total Index Capitalization)	
	May 31, 2007	February 27, 2009
Russell 1000 Value	8.5	4.6
Russell 1000	4.4	2.1

Holding a large position in bank stocks before they fell, and a small position in bank stocks before they recovered, can only be described as unfortunate timing. But it is to be expected; cap-weighted indices systematically buy high and sell low.

THE SMART BETA APPROACH TO VALUE INVESTING

Today many academics and practitioners interpret the value investment strategy as capturing mean reversion in stock valuation ratios. But rebalancing against price is the critical step in profiting from long-term mean reversion. Because cap-weighted indices do not rebalance against price, they substantially eliminate the opportunity to exploit mean reversion.

Some of the better constructed smart beta value indices offer more modern approaches to capturing the value premium. We will use a Fundamental Index™ strategy to illustrate these concepts.

First, the Fundamental Index strategy generally contains industry exposures that are reasonably similar to those of the broad market index.

For example, as of December 31, 2014, the FTSE RAFI® US 1000 Index* held 20.2% in the financial sector and 10.4% in energy stocks, compared to 27.4% and 11.0%, respectively, in the Russell 1000® Value Index.

- › The Fundamental Index approach weights stocks by measures of size such as book value and total cash flows
- › These size-related fundamentals roughly track a company's capitalization over time

It follows that the active shares of fundamentally weighted indices are dominated by intra-industry bets—for instance, overweighting Ford and underweighting Tesla. Industry-based active shares grow large only if an industry as a whole becomes significantly more expensive relative to its own historical valuation level.

Second, the Fundamental Index strategy rebalances annually against valuation ratio movements, buying what has become cheaper over the course of the year and selling what has become more expensive. The rebalancing is effected over hundreds of stocks across all industries.

SIMULATED SMART BETA RESULTS

The Fundamental Index approach to value investing results in approximately 200 bps of outperformance, substantially higher than the traditional value indices' value-added returns.

⁷For more information about the Fundamental Index approach, see the white paper entitled *"FTSE RAFI Index Series."*

TABLE 3: ANNUALIZED RETURNS FROM DECEMBER 31, 1978 TO SEPTEMBER 30, 2013

INDEX	ANNUALIZED RETURN%
FTSE RAFI US 1000	14.09
S&P 500 Value	11.98
S&P 500	12.01
Russell 1000 Value	12.52
Russell 1000	12.05

FOR MORE INFORMATION ABOUT THE DIFFERENCES BETWEEN TRADITIONAL STYLE INVESTING AND SMART BETA STRATEGIES, SEE **"VALUE INVESTING: SMART BETA VS. STYLE INDICES."**



HOW CAN I USE THIS KNOWLEDGE?

- › Smart beta equity strategies capture the value premium more effectively than traditional value style indices.
- › Within the smart beta index universe, various methodologies demonstrate different degrees of effectiveness in harvesting return premia.
- › Even if the advantages of moving away from traditional bulk beta⁸ seem obvious, investors need to be smart about analyzing smart beta strategies.

⁸The consulting firm of Towers Watson is credited with coining the phrases "smart beta" to describe non-price-weighted indices and "bulk beta" to describe traditional cap-weighted indices. Towers Watson used the word "smart" to suggest that investors need to use their heads when selecting a smart beta strategy.

WHO IS ON THE OTHER SIDE OF THE TRADE?

IF REGULARLY REBALANCING INTO VALUE AND LOW-BETA STOCKS ARE SUCH GOOD INVESTMENT PROPOSITIONS, WHO IS INVESTING IN EXPENSIVE AND HIGH-BETA STOCKS? WHO IS ON THE OTHER SIDE OF THE TRADE? ON OUR EVOLUTIONARY PATH, FEAR AND GREED PROBABLY SERVED TO KEEP US SAFE; BUT TODAY THESE EMOTIONS MAKE VALUE INVESTING VERY UNCOMFORTABLE.

FOCUS ON VALUE INVESTING

At its core, value investing means selling what has become expensive and rebalancing by reinvesting the sale proceeds into what has become cheap. Described in those terms, value investing seems obviously right.

However:

- › Often the cheap stocks have been oversold because they have suffered a series of negative shocks
 - › Botched product launches
 - › Declining profit margins due to aggressive new competitors
 - › Spectacular mismanagement...
- › Often the stocks that have rallied have had tremendous recent growth and wildly celebrated successes
 - › A golden-boy CEO
 - › A world-changing new product
 - › A stunning acquisition...

TWO BASIC TENETS OF INVESTING

The first chapter in any investment textbook should warn against:

1 CONFUSING A GOOD COMPANY FOR A GOOD INVESTMENT

2 MISCONSTRUING ONE'S PERSONAL OPINION, BASED ON PERUSING THE FINANCIAL PRESS, AS VALUABLE PRIVATE INFORMATION

Yet anyone who has participated in investment committees' performance reviews would acknowledge that these two basic tenets are generally checked at the door.

WHY DO INVESTORS FAVOR EXPENSIVE STOCKS?

Sometimes people go wrong because theories that sound plausible are flawed. But long-term investors also make poor decisions for very human reasons. They might decide to continue holding an expensive stock and not to buy a value stock because...

- › Sentiment is contagious
- › Timing price corrections is hard
- › Everybody wants to brag about tenbaggers⁹
- › Irrational markets can outlast investors' conviction and courage

The conscious rationale for holding overpriced stocks and shunning underpriced ones runs like this:

- › "This company could be the next Google or Apple; at the current 600 P/E multiple, it is attractively priced."
- › "There is a risk that the fundamentals continue to deteriorate and this cheap firm gets cheaper."

The dread of catching a falling knife and the desire to collect the greatest possible gain are not wrong qualitatively. Many value stocks eventually go bust and some growth stocks succeed fantastically. But fear and greed are off quantitatively.

- › The majority of value stocks overcome temporary setbacks and recover in price
- › Most of the growth stocks never fulfill the market's hopes

FOR MORE INFORMATION, SEE **"SLUGGING IT OUT IN THE EQUITY ARENA."**

WHY IS CONTRARIAN INVESTING SO UNCOMFORTABLE?

Many if not most of us are driven by fear and greed. These are human emotions, and, on our evolutionary path, they probably helped us survive. Value investing may be uncomfortable because it goes against our genetic programming.

From the perspective of cognitive and behavioral science, the question to ask is, "Why would *anyone* pursue a contrarian value investing strategy?"

FOR MORE INFORMATION, SEE **"A PREFERENCE FOR DISCOMFORT"** AND **"THE PSYCHOLOGY OF CONTRARIAN INVESTING."**



HOW CAN I USE THIS KNOWLEDGE?

TIP Very few people are able to be contrarian. But in the long run those who succeed in overcoming their predispositions may earn a hefty premium.

⁹A "tenbagger" is a stock that appreciates to 10 times the price at which it was bought.

THE VALUE PREMIUM IS MEAN-REVERTING

IT IS WELL ESTABLISHED THAT THE EQUITY RISK PREMIUM IS MEAN-REVERTING. THERE IS GROWING EMPIRICAL EVIDENCE THAT THE VALUE PREMIUM LIKEWISE TENDS TO REVERT TO THE MEAN. IN THIS CASE, IT MAKES SENSE TO DOLLAR-COST-AVERAGE CONTRARIAN BETS. THAT'S WHAT REBALANCING DOES.

THE EQUITY RISK PREMIUM IS MEAN-REVERTING

The equity risk premium—the difference between the equity market return and the risk-free rate—is known to be mean-reverting. The behavioral interpretation of this phenomenon is:

1. Investors over-extrapolate recent price movements and news (including news about recent price movements), causing prices to overshoot rational levels
2. Subsequent earnings growth disappoints investors' irrational expectations, causing a reversal in returns

Two familiar examples are the tech bubble and the global financial crisis. **Table 4** below displays month-end U.S. equity P/E ratios (using Shiller's cyclically adjusted P/E measure, often called CAPE) and the annualized and cumulative returns for the following three years.

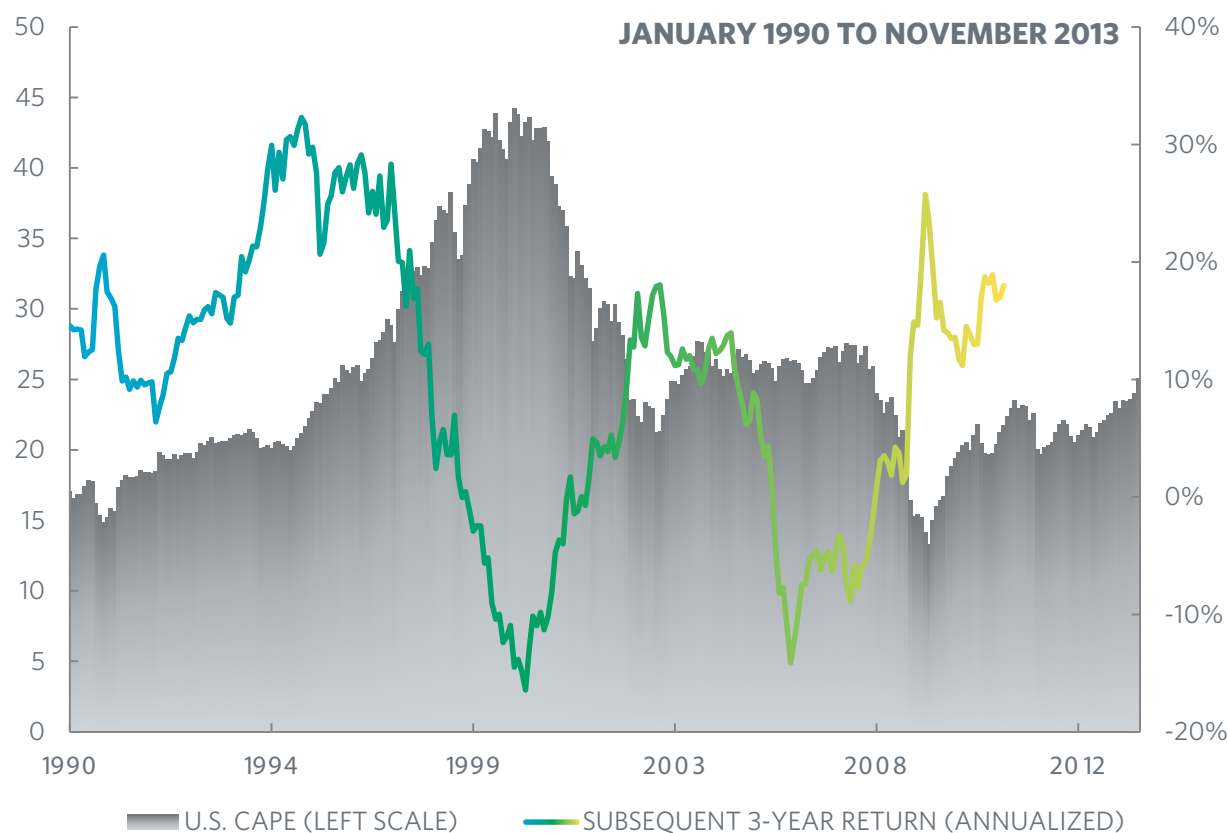
TABLE 4: MONTH-END P/E RATIOS AND SUBSEQUENT RETURNS

Index	SUBSEQUENT THREE-YEAR RETURN		
	U.S Shiller PE	Annualized	Cumulative
December 1999	44.2	-14.5%	-37.5%
March 2009	13.3	23.5%	88.5%

- › What Federal Reserve Board chairman Alan Greenspan called irrational exuberance¹⁰ during the tech bubble drove the Shiller P/E ratio to a breathtaking high of 44.2 at the end of 1999, and the U.S. stock market return in the subsequent three years was -14.5% per year or -37.5% cumulatively.
- › Fear in the depths of the global financial crisis plunged the Shiller P/E to its lowest level in the prior two decades, 13.3, in March 2009, and the U.S. stock market returns were 23.5% per year, or 88.5% cumulatively, in the following three years.

For each month-end from January 1990 to November 2010, **Figure 2** below shows on the left axis the cyclically adjusted Shiller P/E ratio and, on the right axis, the annualized rate of return for the subsequent three years. (P/E ratios are shown through November 2013.) The chart indicates that, to some extent, rates of return can be predicted on the basis of P/E ratios.

FIGURE 2: MONTH-END P/E RATIOS AND SUBSEQUENT RETURNS



Source: Research Affiliates, LLC using P/E data from Robert J. Shiller's website.

¹⁰Greenspan used the phrase in a speech in December 1996.

WHAT ABOUT THE VALUE PREMIUM?

There is growing empirical evidence that the value premium is also mean-reverting. **Table 5** shows three examples using the relationship between the P/B of growth stocks and the P/B of value stocks as a valuation measure:

TABLE 5: P/B SPREADS AND SUBSEQUENT GROWTH AND VALUE RETURNS (CUMULATIVE)

	MONTH-END P/B RATIO			SUBSEQUENT THREE-YEAR RETURN		
	Growth	Value	Ratio	Growth	Value	Value Premium
July 2000	10.98	0.75	14.65	-35.6%	24.7%	60.3%
January 2006	5.68	1.30	4.36	-26.5%	-59.5%	-33.1%
March 2009	3.08	0.27	11.50	86.4%	130.9%	44.4%

- › The tech boom drove the ratio of the growth P/B to the value P/B to 14.65 in July 2000. (In other words, the average P/B of growth stocks was 14.65 times the average P/B of value stocks.) In the subsequent three years, value cumulatively outperformed growth by 60.3%.
- › The housing and sub-prime mortgage bubble drove up prices for banking and consumer staples (traditional value sectors), and in January 2006 the growth stock P/B was 4.36 times the value stock P/B. In the subsequent three years, value cumulatively underperformed growth by 33.1%.
- › As the economy recovered from the global financial crisis, the ratio of growth P/B to value P/B expanded to 11.5 times in March 2009. In the subsequent three years, value cumulatively outperformed growth by 44.4%.

For each month-end from January 1988 to November 2010, **Figure 3** below displays the ratio of growth and value P/B ratios (left axis) along with the corresponding difference between annualized growth and value returns for the three years then starting (right axis).

HOW REBALANCING ACCOMPLISHES DOLLAR-COST AVERAGING

Investors can capture the value premium by *either*:

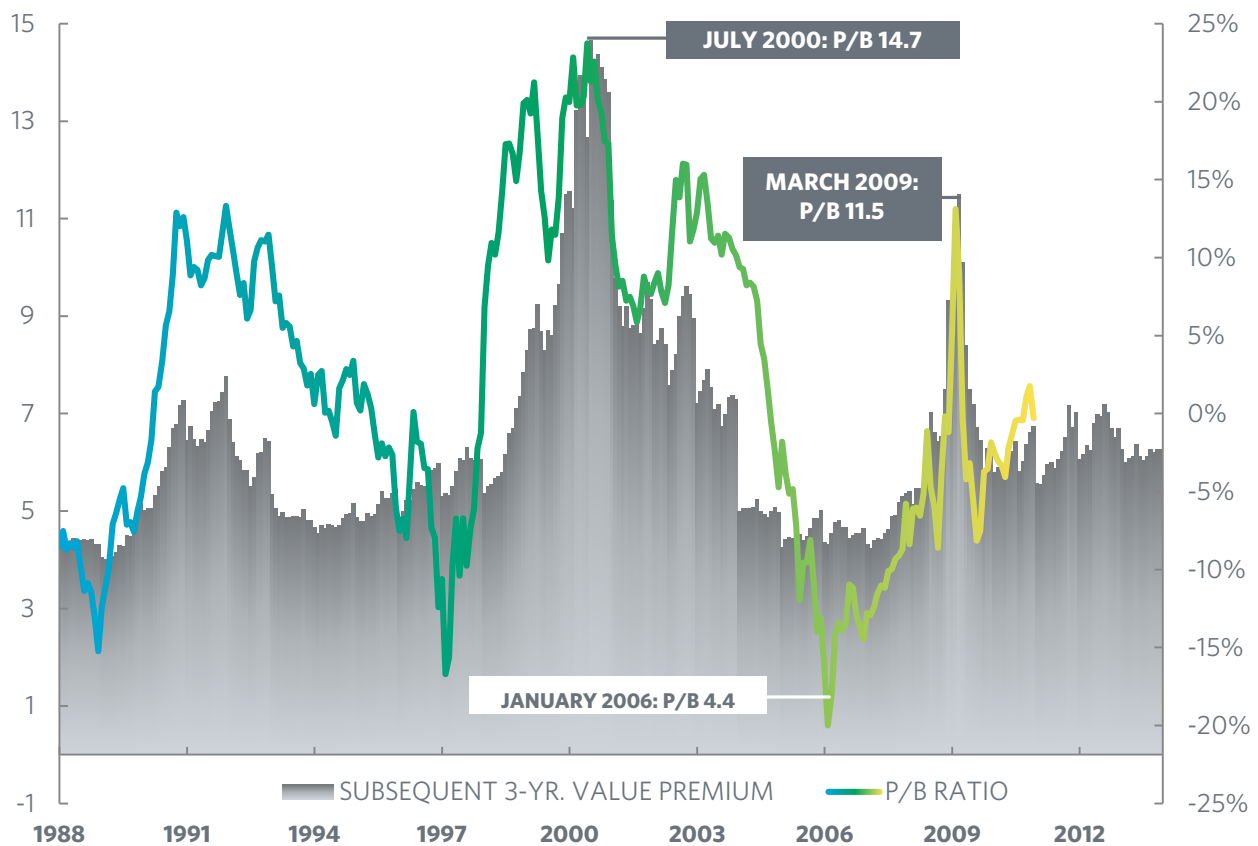
- › Investing in low P/B stocks *or*
- › Rebalancing from the last few years' winner stocks (those whose prices have appreciated the most) into the losers.

Many research papers refer to the value premium interchangeably with contrarian profits or the mean-reversion effect.

But when momentum carries prices away for a long time, rebalancing can cause value stocks to underperform, perhaps substantially.

- › The larger and more prolonged the value underperformance, the bigger the spread between growth and value stock P/B ratios.
- › The large P/B spread is then a signal for the magnitude of the impending return reversal.

FIGURE 3: MONTH-END P/B RATIOS AND SUBSEQUENT VALUE PREMIA



Source: Research Affiliates, LLC.

Thus there is evidence of mean reversion in the mean-reversion effect. And that means dollar-cost averaging makes good sense!

Consider two portfolios:

- › One portfolio allocates a constant tracking error to low P/B stocks
- › The other portfolio dynamically allocates more tracking error when the gap between growth and value P/B ratios widens.

The first portfolio is akin to traditional value style strategies, which tilt toward cheap stocks. The second portfolio is similar to fundamentally weighted and other simpler smart beta indices, whose rebalancing procedures implicitly contain dollar-cost averaging. **Table 6** shows simulated long-term results for these two portfolios.

TABLE 6: P/B SPREADS AND SUBSEQUENT GROWTH AND VALUE RETURNS (CUMULATIVE)

JANUARY 1963 TO NOVEMBER 2013						
	Annual Return	Annual Volatility	Sharpe Ratio	Value Added	Tracking Error	Information Ratio
Constant Tracking Error	11.61%	16.20%	0.40	1.34%	5.04%	0.27
Dynamic Tracking Error	12.09%	16.52%	0.42	1.82%	5.00%	0.36

The value portfolio with the dynamically adjusted tracking error (that is, the value portfolio that automatically engages in dollar cost averaging) *outperforms* the value portfolio whose tracking error is held constant (the traditional portfolio with a value bias) by 48 bps with *no incremental risk*.



HOW CAN I USE THIS KNOWLEDGE?

TIP When selecting a value strategy, bear in mind that merely tilting toward cheap stocks may leave a good part of the total value premium on the table. Some smart beta approaches may produce better results by means of a rebalancing rule that effectively implements dollar-cost averaging.

AFI®: Delivering on the Promise of Smart Beta
Jason Hsu, Ph.D.



JASON HSU, PH.D.

CO-FOUNDER AND VICE CHAIRMAN

Jason Hsu, the co-founder of Research Affiliates, leads the firm's strategic initiatives related to transforming the industry for the benefit of investors. Jason is a strong advocate for investor education and products that add value by systematically exploiting known sources of excess returns and delivering them in low-cost and transparent index chassis.

Jason is at the forefront of the smart beta revolution and is a recognized thought leader in the space. Building on his pioneering work on the RAFI™ Fundamental Index™ approach to investing with Rob Arnott in 2005, he has published numerous articles on the topic, notably including **"A Survey of Alternative Equity Index Strategies,"** which won a 2011 Graham and Dodd Scroll and the Readers' Choice Award from CFA Institute and **"The Surprising Alpha from Malkiel's Monkey and Upside-Down Strategies,"** which won the 2013 Bernstein Fabozzi/Jacobs Levy Award for Outstanding Paper in the *Journal of Portfolio Management*. In 2005 and 2013, he received the William F. Sharpe Award for Best New Index Research, which is awarded by Institutional Investor Journals, for his research on smart beta.

In addition to Jason's research and advocacy work, he takes great interest in shaping Research Affiliates' vision and culture. He is a member of the board of directors at the Anderson School of Management at UCLA, as well as an adjunct professor in finance. For his service to UCLA's Anderson School, Jason received the 2009 Outstanding Service Award. Jason is also a visiting professor in international finance at the Taiwan National University of Political Science.

Jason has authored more than 30 academic and practitioner articles. He is an associate editor of the *Journal of Investment Management* and serves on the editorial board of the *Financial Analysts Journal*, the *Journal of Index Investing*, the *Journal of Investment Consulting*, and the *Journal of Investment Management*.

Jason graduated with a BS (*summa cum laude*) in physics from the California Institute of Technology, was awarded an MS in finance from Stanford University, and earned his Ph.D. in finance from UCLA, where he conducted research on the equity premium, business cycles, and portfolio allocations.

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