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Smart Beta: Strategies and Implementation

People don't need extraordinary insight or intelligence. What they need is the character to adopt simple rules and stick to them.

—Quote attributed to Benjamin Graham

PNC first introduced smart beta strategies in October 2013 with the launch of our proprietary price momentum strategy, PNC STAR. (For more information, please refer to our September 2013 white paper, *PNC STAR: PNC Systematic Tactical Asset Rotation*.) Since then, smart beta products and assets in the investment marketplace have continued to grow. According to Empirical Research Partners, smart beta exchange-traded funds (ETFs) have about \$440 billion in assets, or roughly one-quarter of the total assets in ETFs as of April 2015.

As PNC Managing Director of Investment and Portfolio Strategy and Chief Investment Strategist E. William Stone noted in his *Forbes* article¹, smart beta strategies using robust factor exposures can be very attractive additions to portfolios, but the added complexity relative to the straightforward use of market-capitalization-weighted index exposure makes deeper analysis and due diligence an absolute necessity. This white paper serves as our introduction of a wider number of smart beta strategies and the addition of third-party smart beta products to the PNC platform. It also reflects the in-depth due diligence and research that we feel should be performed on any smart beta product.

Smart Beta Strategies Are Based on Factors

A large body of academic research has shown that long-term performance of equity portfolios can be attributed to various factors. A factor can be thought of as any quantifiable measure that relates to the return and risk patterns of an asset class. (For more information about factors, please see our February 2014 white paper, *Factor Analysis: What Drives Performance?*) Smart beta strategies leverage such factors. The strategies use rule-based methodologies to gain systematic exposures to specific factors, which are believed to capture long-term outperformance or help reduce risk. Even though active managers have been using factors in their investment for at least the past decade, smart beta strategies provide more transparency and are typically delivered at a lower fee than active management.

More specifically, smart beta strategies use factors to screen stocks—they calculate factor scores for each stock in the universe and then rank stocks based on their factor scores. To construct a portfolio, a smart beta strategy can either own or overweight the stocks in the top percentage group or own the ones in the top group and then short sell the ones in the bottom group.

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¹ Bill Stone, "How Smart Is Smart Beta?" forbes.com (September 3, 2014).

The Fama-French three-factor model is a factor model designed by Eugene Fama and Kenneth French to describe stock returns. It expands on the capital asset pricing model (CAPM) by adding size and value factors in addition to the market risk factor in CAPM.

Recognizing the dominant factors that drive the performance of an asset class is key to smart beta investing. Though numerous factors have been recognized since the **Fama-French three-factor model**, only a few have been able to earn a persistent premium or reduce volatility over reasonably long periods. In this paper, we introduce six well-known systematic factors that are on this short list and commonly used in smart beta strategies:

- low volatility;
- high quality;
- value;
- low size;
- momentum; and
- dividend growth.

Why Factor-Based Investing Would Work and Persist

Why do we think a systematic factor-based investment style would work, and why would it persist? In the MSCI white paper *Foundations of Factor Investing*², the investment research firm noted that there are two main camps arguing what really drives factor returns and why they would persist.

The first camp believes there are systematic risks that cannot be diversified away, and factors gain excess return because they are attached to such risks. For example, some argue that factors such as value and momentum are linked to macroeconomic events, and due to their sensitivity to those events, they earn a positive return premium.³

The second camp approaches the issue from a behavioral finance point of view. Their argument is that factors earn excess returns because of investors' systematic errors, that is, investors' behavioral biases such as chasing winners and overconfidence. These types of biases are difficult for rational investors to arbitrage away⁴ and, it is argued, are likely to persist.

Yet we point out that even though those well-researched smart beta factors have been proven to be resilient over the long term, they may exhibit cyclical behavior and underperform a market-capitalization-weighted index for prolonged periods. Investors who have the patience and capability to stomach relative losses in those periods should be rewarded eventually, in our view.

Six Categories of Factors Used in Smart Beta Strategies

We summarize the definition of the six categories of factors in Table 1 (page 3).

Low Volatility

Low volatility strategies look for stocks with lower-than-average (compared to a market-capitalization-weighted index) volatility, beta, and/or idiosyncratic risk.

² Jennifer Bender, Remy Briand, Dimitris Melas, and Raman Aylur Subramanian, "Foundations of Factor Investing," *MSCI Research Insight* (December 2013).

³ Kurt Winkelmann, Raghu Suryanarayanan, Ludger Hentschel, and Katalin Varga, "Macro-Sensitive Portfolio Strategies: Macroeconomic Risk and Asset Cash-Flows," *MSCI Market Insight* (March 2013).

⁴ Please see appendix in Bender et al. for MSCI's analysis of the theories behind the excess returns.

Table 1

Factor Category Definitions

	<u>What They Are</u>	<u>Common Factors</u>
Low Volatility	Captures excess returns to stocks with lower than average volatility, beta, and/or idiosyncratic risk	Standard deviation, Downside standard deviation, Beta
High Quality	Captures excess returns to stocks that are characterized by low debt, stable earnings growth, and other "quality" metrics	Return-on-equity, earnings stability, dividend growth stability, strength of balance sheet, financial leverage, accounting policies, strength of management, accruals, cash flows
Value	Captures excess returns of stocks that have lower prices relative to their fundamental value	Price-to-book, price-to-sales, price-to-earnings, price-to-operating cash flow, price-to-dividends
Low Size	Captures excess returns of smaller firms (by market capitalization) relative to their larger counterparts	Market capitalization
Momentum	Captures excess returns to stocks with stronger past performance	Price returns relative to previous returns (1 month, 3 month, 6 month, 12 month), historical alpha
Dividend Growth	Captures excess returns have higher-than-average dividend yield growth	Growth of dividend yield

Source: MSCI, ISI, PNC

The specific factors can range from realized measures to forecast estimates. The first documentation of low volatility effect comes from Haugen and Baker's⁵ 1991 paper, "The Efficient Market Inefficiency of Capitalization-Weighted Stock Portfolios." They found that low volatility stocks in the United States did better than their market-cap-weighted alternative for the period 1972-89. Following Haugen and Baker, others, such as Schwartz⁶, Jagannathan and Ma⁷, and Clarke, de Silva, and Thorley⁸ confirmed the same phenomenon. Furthermore, Geiger

⁵ Robert A. Haugen and Nardin L. Baker, "The Efficient Market Inefficiency of Capitalization-Weighted Stock Portfolios," *Journal of Portfolio Management* (Spring 1991): 35-40.

⁶ Tal Schwartz, "How to Beat the S&P 500 with Portfolio Optimization," Unpublished Manuscript (2000).

⁷ Ravi Jagannathan and Tongshu Ma, "Risk Reduction in Large Portfolios: Why Imposing the Wrong Constraints Helps," *Journal of Finance* 58, no. 4 (2003): 1651-84.

⁸ Roger Clarke, Harindra de Silva, and Steven Thorley, "Minimum-Variance Portfolios in the US Equity Market," *Journal of Portfolio Management* 33, no. 1 (2006): 10-24.

and Plagge⁹, Poullaouec¹⁰, and others found that similar phenomena exist in global markets.

We note, however, that although different definitions of volatility have been used in those studies (standard deviation or beta, historical or expected), the results appear to be robust.

Low volatility strategies contradict the Capital Asset Pricing Model (CAPM) model, which suggests that high volatility and high returns go hand in hand. Yet the CAPM is built upon the efficient market theory, which has not been proven to hold. Furthermore, studies have shown that the relationship between market risk and return was not as strong as the CAPM predicted, and there appears to be a diminishing reward for bearing incremental risk. This helps to explain the comparably better risk-adjusted returns of low volatility strategies.

Most explanations of the low volatility effect are in the camp of behavioral finance, with the most common among them being the “lottery effect.” The lottery effect posits that investors prefer stocks with a small expected loss but a large expected win, even though the probability of winning is very small and the weighted average of the outcomes is negative. In this way, their preference of highly volatile (yet have a small chance of big win) stocks make them overpay for such stocks and underpay for low volatility stocks. Others argue that low volatility stocks tend to represent mature companies with stable earnings, which are more likely to hold up in the long term.

Overall, low volatility strategies tend to be less sensitive to market fluctuations and usually outperform during bear markets but underperform during bull markets.

The following low volatility smart beta ETFs have been added to the platform.

- iShares MSCI USA Minimum Volatility (USMV) tracks an index of U.S.-listed firms selected by evaluating individual stock volatility and the correlations between stocks, and is then optimized to create a low volatility portfolio subject to constraints including sector exposure and maximum position size to limit overconcentration. The fund uses the Barra optimization and Global Equity Model (GEM2) risk model to build a portfolio with estimates of variances and correlations that is forecasted to have low volatility. The fund targets lower volatility, so this strategy tends to be less sensitive to market fluctuations and typically outperforms and provides downside protection during bear markets, but it will likely lag during strong bull markets. Given the portfolio constraints, the fund has a balanced sector profile and may hold more volatile stocks, but it may pair those against less volatile stocks in order to minimize overall portfolio volatility.
- PowerShares S&P 500[®] Low Volatility (SPLV) tracks an index of 100 stocks from the S&P 500 with the lowest volatility over the past 12 months and then weights those stocks by the inverse of their volatilities as measured by standard deviation over the past 12 months. The fund is a pure low volatility portfolio, designed to provide equity exposure with less risk than the overall market. By targeting the less volatile stocks

⁹ H. Geiger and J. Plagge, “Minimum Variance Indexes,” Frankfurt: Deutsche Börse AG (2007).

¹⁰ T. Poullaouec, “Things to Consider When Investing in Minimum Variance Strategies,” State Street Global Advisors (October 2008).

over the past 12 months, the fund aims to mitigate large portfolio drawdowns while maintaining exposure to the broad market. Given that the fund does not have sector constraints, it may result in sector or industry overconcentration; however, the quarterly rebalance will adjust the holdings back into the least volatile stocks as volatilities change.

High Quality

High quality strategies capture excess returns of stocks that are characterized as being less in debt, having stable earnings, or exhibiting other so-called “quality” traits. Indeed, the main challenge is how to define quality factors, though common reference of such factors reflect a company’s efficiency, growth, financial and operating leverage, and profitability sustainability.

In their paper “Quality Minus Junk,”¹¹ Cliff Asness and his co-authors defined a quality security as one with high and growing profitability, high payout ratio, and low market volatility and fundamental risk, following the **Gordon Growth Model**. They then documented strong and consistent returns to such quality securities among the 24 developed markets they studied. Their findings are consistent with many other research papers that show a positive relationship between profitability and future stock returns. For example, Sloan¹², Dechow, Weili, and Schrand¹³, and Perotti and Wagenhofer¹⁴ (2011) validated the positive relationship between stocks’ earnings quality and their excess returns, where earnings quality is measured by accruals, earnings persistence, or loss avoidance.

There is limited literature on why quality factors work since there is not a universal definition of quality factors. Yet we believe it is not difficult to see that companies with stable earnings growth and healthy financial leverage, which have less risk of overleveraging the balance sheet, would be attractive companies to investors. In the long term, these companies are more likely to outperform companies that lack such traits. In their 2010 paper, Campbell and others¹⁵ argued that the primary source of systematic risk of both growth and value stocks is in the cash flow fundamentals, not market sentiments. This also helps to explain why companies with stable cash flows are more likely to sustain performance over the long run.

The following high-quality smart beta ETFs have been added to the platform.

- iShares MSCI USA Quality Factor (QUAL) tracks an index of U.S.-listed stocks exhibiting high return on equity (ROE) ratios, low

The **Gordon Growth Model**

is a method of valuing a company’s stock price based on the theory that its stock is worth the sum of all of its future dividend payments, discounted back to their present value.

$$P = \frac{D_1}{r - g}$$

where P is the current stock price, D_1 is the expected dividend per share one year from now, g is the constant growth rate in perpetuity expected for the dividends, and r is the constant cost of equity capital.

¹¹ Clifford S. Asness, Andrea Frazzini, and Lasse H. Pedersen, “Quality Minus Junk,” AQR Working Paper (October 9, 2013).

¹² Richard G. Sloan, “Do Stock Prices Fully Reflect Information in Accruals and Cash Flows About Future Earnings?,” *The Accounting Review* 71, no. 3 (July 1996): 289-315.

¹³ Patricia Dechow, Ge Weili, and Catherine Schrand, “Understanding Earnings Quality: A Review of the Proxies, Their Determinants and Their Consequences,” *Journal of Accounting and Economics* 50, no. 2-3 (2010): 344-401.

¹⁴ Pietro Perotti and Alfred Wagenhofer, “Earnings Quality Measures and Excess Returns,” Working Paper, University of Graz (2011).

¹⁵ John Y. Campbell, Christopher Polk, and Tuomo Vuolteenaho, “Growth or Glamour? Fundamentals and Systematic Risk in Stock Returns,” *Review of Financial Studies* 23, no 1 (2010): 305-44.

debt/equity (D/E) ratios, and low earnings variability over the past five years. The fund is designed to reflect the performance of quality, growth companies with durable business models and sustainable competitive advantages, which tend to have higher ROEs, strong balance sheets with low financial leverage, and stable earnings that are less correlated with the broad business cycle. The fund focuses on profitable growth stocks with durable, competitive advantages represented by high profitability and operating metrics that help to protect earnings during market downturns, but may slightly lag in strong, low quality market rallies.

- PowerShares S&P 500 High Quality (SPHQ) uses quality rankings of stocks as published by S&P Capital IQ, which reflects the long-term growth and stability of earnings and dividends over the past 10 years. The model ranks each stock with a quality score, and those stocks with a quality ranking of A- or better are included in the index. An A+ receives a 3 quality score, an A receives a 2 quality score, and an A- receives a 1 quality score. The index is then weighted in proportion to the stock's quality score multiplied by the parent index's market-capitalization weight. The fund does not limit sector weightings, so sector or industry overconcentration may occur; however, the fund's focus on quality stocks with stable long-term earnings and dividends helps to protect profits during market downturns but may lag in strong, low-quality market rallies.

Value

Value strategies call for buying stocks that have low prices relative to companies' fundamental value, such as earnings, dividends, or book assets. The discussion of such strategies appeared as early as the 1930s, when Graham and Dodd published their book *Security Analysis*, which teaches investors to identify firms with low prices relative to their fundamental value. Later studies found significant positive relationship between book-to-price ratios and average returns.¹⁶ The value effect is also seen in other markets around the globe, as seen in Hawawini and Keim¹⁷. However, we note that value strategies may underperform during certain periods. Examples include the Internet bubble bull market in the late 1990s and the financial crisis of 2007-08, yet bad times for value do not always line up with bad times for the economy. Investors need to have the patience to weather through such tough times to be rewarded on a longer-term basis.

There are two major theories that attempt to explain value premium. The first is that there are economic reasons for value premium. Such theories perceive

¹⁶ See Barr Rosenberg, Kenneth Reid, and Ronald Lanstein, "Persuasive Evidence of Market Inefficiency," *Journal of Portfolio Management* 11, no. 3 (1985): 9-16; Werner F.M. DeBondt and Richard H. Thaler, "Further Evidence on Investor Overreaction and Stock Market Seasonality," *Journal of Finance* 42, no. 3 (1987): 557-81.

¹⁷ Gabriel Hawawini, and Donald B. Keim, "The Cross-Section of Common Stock Returns: A Review of the Evidence and Some New Findings," in *Security Market Imperfections in Worldwide Equity Markets*, ed. Donald B. Keim and William T. Ziemba (Cambridge: Cambridge University Press, 2000).

factors including investment growth, labor income risk¹⁸, nondurable consumption, and housing risk as driving forces behind the value premium. They also argue that in periods when such factors suffer, betas (also known as risk) of value stocks tend to increase as well.¹⁹ Then from the efficient market's point of view, the value premium is compensation for higher real or perceived risk. Research²⁰ suggested that compared to their more flexible growth counterparts, value firms are less capable of adapting to economic conditions.

The second camp traces value premium back to investment behaviors, believing that investors' overreaction and overextrapolation of recent news caused the value premium. For example, as Morningstar's Alex Bryan²¹ points out, value stocks tend to grow more slowly than growth stocks, so investors may read too much into past growth rates and then predict a much slower growth for value stocks going forward. This then causes mispricing, which consequently helps value stocks' performance. Indeed, different research has suggested that the value effect can also be caused by other psychological biases such as loss aversion and mental accounting.²²

The following value smart beta ETFs have been added to the platform.

- iShares MSCI USA Value Factor (VLUE) tracks an index of U.S.-listed stocks exhibiting strong value characteristics relative to their sector peers. The companies are scored on three fundamental characteristics—forward price-to-earnings (P/E), enterprise value-to-cash flow from operations, and book value—and represent the most undervalued areas of the market on a sector relative basis. The fund's focus on inexpensive stocks within each sector based on a company's value characteristics produces relatively undervalued stocks versus simply purely cheap companies or so-called "value traps," companies trading at low multiples to earnings, cash flow, or book value that remain low or deteriorate further. This allows the fund to hold up better in market downturns and participate in bull markets.
- PowerShares Dynamic Large Cap Value (PWV) evaluates a company's value and growth factors using a 10-factor style analysis and selects stocks that exhibit strong value characteristics. Factor analysis is focused on five broad categories: price momentum, earnings momentum, quality, valuation, and management action. Each sector uses 7-15 factors that have proven historically to identify those stocks with best risk/return

¹⁸ For explanation of labor income risk, see Tano Santos and Pietro Veronesi, "Labor Income and Predictable Stock Returns," *Review of Financial Studies* 19, no.1 (2006): 1-44.

¹⁹ Andrew Ang, *Asset Management: A Systematic Approach to Factor Investing*, Financial Management Association Survey and Synthesis Series (New York: Oxford University Press, 2014): 231.

²⁰ John H. Cochrane, "Production-based Asset Pricing and the Link between Stock Returns and Economic Fluctuations," *Journal of Finance* 46, no. 1 (1991): 209-37; John H. Cochrane, "A Cross-sectional Test of an Investment-based Asset Pricing Model," *Journal of Political Economy* 104, no. 3 (1996): 572-621; Lu Zhang, "The Value Premium," *Journal of Finance* 60, no. 1 (February 2005): 67-103.

²¹ Alex Bryan, "Efficient, Sector-Neutral Exposure to Value Stocks," Morningstar's Analyst Report on iShares MSCI USA Value Factor (VLUE) (October 2015).

²² For more information on this discussion, see Ang, *Asset Management*, 233-34.

potential. The fund does not limit sector weightings, so overconcentration may occur; however, the fund's focus on inexpensive stocks by identifying companies that have the greatest potential for capital appreciation through factor analysis at the sector level helps to protect profits during market downturns but may lag in strong, low-quality market rallies.

Low Size

The low size factor, one of the first factors to be discovered, captures excess returns of smaller capitalized firms over larger capitalized firms. Originally appearing in Banz²³ and similarly in Reinganum²⁴, it was shown that small cap stocks tended to outperform large cap stocks after adjusted for their CAPM betas. The 1992 Fama and French paper found that during 1962-90, the average small cap portfolio, sorted by book-to-market values, earned a monthly return of 1.47% while the average large cap portfolio earned 0.9%. Moreover, research has shown that the size effect is seen across the world; for example, Rizova²⁵ provided individual analysis of Australia, Canada, France, Germany, and the United Kingdom's small size premiums.

The explanations of the small size effect fall mainly into two camps: one from the efficient market's point of view and the other from a behavioral finance point of view. The first camp suggests that size may proxy for other unobservable risks such as liquidity, information uncertainty, and default risk²⁶ that are associated with smaller capitalized companies. The second camp argues that behavioral biases that are used to explain the value premium also apply to small size effect²⁷. Examples include incorrectly extrapolating the past returns into the future or overreacting to news.

In recent years, some research suggests that the small size effect may have been fading.²⁸ Others argue that the original discovery of the size effect might have been a result of data mining.²⁹ Yet as Ang pointed out in his book, although the pure size effect (excess returns of small stocks after adjusting for CAPM betas) may have been weakening since the mid-1980s,³⁰ the average (unadjusted)

²³ Rolf W. Banz, "The Relationship between Return and Market Value of Common Stocks," *Journal of Financial Economics* 9, no. 1 (1981): 3-18.

²⁴ M.R. Reinganum, "Misspecification of Asset Pricing: Empirical Anomalies Based on Earnings Yields and Market Values," *Journal of Financial Economics* 9 (1981): 19-46.

²⁵ S. Rizova, "International Evidence on the Size Effect," Dimensional Fund Advisors, White Paper (2006).

²⁶ Please see Y. Amihud, "Illiquidity and Stock Returns: Cross-Section and Time Series Effects," *Journal of Financial Markets* 5, no. 1 (2002): 31-56; X.F. Zhang, "Information Uncertainty and Stock Returns," *Journal of Finance* 61, no. 1 (2006): 15-136; M. Vassalou and Y. Xing, "Default Risk in Equity Returns," *Journal of Finance* 59 (2004): 831-68.

²⁷ Josef Lakonishok, Andrei Shleifer, and Robert Vishny, "Contrarian Investment, Extrapolation, and Risk," *Journal of Finance* 49 (1994): 1541-78.

²⁸ E.F. Fama and K.R. French, "Size, Value, and Momentum in International Stock Returns," *Journal of Financial Economics* 105 (2012): 457-72.

²⁹ F. Black, "Beta and Return," *Journal of Portfolio Management* 20 (1993): 8-18.

³⁰ Ang, *Asset Management*, 228-30.

returns of small cap stocks are still higher than their large cap peers. Ang further states that this may be because other factors, such as value and momentum, seem to have a stronger influence within the small cap universe.³¹

The following low size smart beta ETFs have been added to the platform.

- iShares MSCI USA Size Factor (SIZE) tracks an index of U.S.-listed stocks. The fund contains all of the constituents of the parent index, the MSCI USA Index, but re-weights the holdings according to the volatility of weekly returns over the past three years, favoring stocks with lower volatility. The fund targets exposure to the broad market by re-weighting the parent index constituents by their volatility with a focus on overall risk-reduction. This tilts the fund toward the lower end of the market cap, although the fund remains decidedly large cap at \$38 billion weighted average market capitalization. It will tend to outperform when risk is in favor but provides downside protection during bear markets given the focus on lower stock volatility.
- PowerShares Russell 1000 Equal Weighted (EQAL) equally weights each sector and then determines index constituents after using a capacity screen to remove stocks with low trading liquidity. The remaining stocks are then equally weighted within each sector. The fund targets exposure to the broad market by screening the parent index constituents on trading liquidity with a focus on preserving overall fund liquidity. The fund is tilted toward the lower end of the market capitalization, although the fund remains large cap at \$23 billion weighted average market capitalization. It will tend to outperform when risk is in favor but underperformed in bear markets given its lower market capitalization focus.

Momentum

Essentially, momentum strategies buy securities with the highest most recent performance, and sell those with the lowest relative most recent performance. Commonly estimated by 3-, 6-, or 12-month price returns, they are sometimes referred to as trend-following strategies. The momentum effect denotes the phenomena that winning stocks tend to keep winning and losing stocks tend to continue losing, for some period of time.

Extensive additional research has expanded on the various iterations of the momentum theme,³² and in 2006 Bhojraj³³ presented evidence on the existence

³¹ For size-value interactions, see T. Loughran, "Book to Market Across Firm Size, Exchange, and Seasonality: Is There an Effect?," *Journal of Financial and Quantitative Analysis* 32 (1997): 249-68; for size-momentum interactions, see J. Chen, H. Hong, and J. Stein, "Breath of Ownership and Stock Returns," *Journal of Financial Economics* 66 (2002): 171-205.

³² K. Geert Rouwenhorst, "International Momentum Strategies," *Journal of Finance* 53 (1998): 267-84; Mark Grinblatt and Tobias J. Moskowitz, "Predicting Stock Market Movements from Past Returns: The Role of Consistency and Tax-Loss Selling," *Journal of Financial Economics* 71 (2004): 541-79.

³³ Sanjeev Bhojraj and Bhaskaran Swaminathan, "Macromomentum: Returns Predictability in International Equity Indices," *Journal of Business* 79 (2006): 429-51.

of momentum for indexes. Moskowitz et al. in 2012³⁴ documented significant strong and consistent momentum performance across many diverse asset classes over 25 years, including equity index, currency, commodity, and bond futures.

Many reasons have been proposed for the existence of abnormal returns for momentum in the marketplace, with behavioral biases and arbitrage difficulty generally topping the list.

- Investors often overreact to news or information, and behavioral analysts suggest that fear and greed play a role; investors are more inclined to buy recent winners and sell recent losers, regardless of the underlying fundamental picture.
- Recent performance also confirms previously held convictions and causes investors to buy or sell more of a stock.
- Anchoring is another behavioral bias in which individuals latch onto outdated prices and beliefs and are hesitant to update their views until some later time.
- Even in a world of high-frequency trading and rapid-fire information, absorption of information is still slow to propagate through the mass of investors. As more investors absorb the new information, they will likely make buy-and-sell decisions that will affect the price of a security.
- Finally, since momentum strategies generally have a high amount of turnover, transactions costs make it difficult to arbitrage away the momentum effect, especially for baskets involving hundreds of securities.

Momentum strategies have a long history of profitability. In particular, price momentum has been shown to be profitable, on average, across many different asset classes: equities, fixed income, commodities, and currencies. Also, adding momentum strategies to traditional growth and value portfolios historically has increased absolute and risk-adjusted returns.³⁵

Yet we note that momentum strategies tend to suffer during some stressful market conditions with many price reversals. Despite their successful long-term track record, momentum strategies in general have underperformed in the wake of the great recession.

At the end of October 2013, we introduced the PNC Systematic Tactical Asset Rotation (PNC STAR) strategy, which is designed to capture exposure to macro-momentum across industries, styles, and global trends. In our PNC STAR model, we use a two-stage process that starts with selecting sectors with a positive price trend and then use the 12-month momentum to rank and select the recommended investments. PNC STAR implements its momentum exposure through a collection of diversified ETFs. (For more information, please refer to our September 2013 white paper, *PNC STAR: PNC Systematic Tactical Asset Rotation*.)

A momentum smart beta ETF has been added to the platform.

- iShares MSCI USA Momentum Factor (MTUM) tracks an index of U.S.-listed stocks exhibiting higher momentum characteristics than the traditional market cap-weighted parent index, the MSCI USA Index. The

³⁴ Tobias J. Moskowitz, Yao Hua Ooi, and Lasse H. Pedersen, "Time Series Momentum," *Journal of Financial Economics* 104 (2012): 228-50.

³⁵ A.L. Berger, R. Israel, and T.J. Moskowitz, "The Case for Momentum Investing," AQR, Working Paper (2009).

index focuses on companies that have exhibited positive relative risk-adjusted excess returns over the 6-month and 12-month time periods. The fund should strongly outperform during bull markets but struggle when the market turns down and de-risks. Momentum tends to work well when value is out of favor. The fund's focus on risk-adjusted excess returns should help moderate results and provide downside protection versus a pure price momentum strategy.

Dividend Growth

Dividend growth strategies aim to capture the outperformance of stocks with positive dividend prospects. Although called dividend growth, many of these smart beta strategies combine different dividend factors in their estimations. For example, the Morningstar U.S. Dividend Growth index³⁶ uses dividend yield, earnings forecast, and payout ratio in constructing its index.

Dividends have accounted for a large portion of an investor's long-term total returns. According to ISI³⁷, dividends contributed more than 50% of the total return of the S&P 500 during 1926-59 and contributed 81% of the index's return from 2003-08. ISI believes that the dividend-related factors help investors to spot companies with high earnings quality and consistently grow their dividends. Moreover, dividends provide an objective judgment for accounting well-being and management.³⁸

One point we think is worth noting is that some investors rely on high dividend yield as their single factor. But we want to caution that there are instances when a considerably high dividend yield may be caused by a deeply depressed price or an unsustainable dividend payout, rather than a good dividend opportunity. In fact, ISI noted that even though high-dividend-yield companies generally outperform the market, the ones with the highest dividend yield are only mediocre performers. In its 2013 study of U.S. stocks, ISI found that when using dividend yield alone as a factor, stocks in decile four, two, and three outperformed stocks in decile one, the highest-yielding decile, for the period 1980-2012. ISI concluded that dividend yield by itself does not provide sufficient information about stocks. Similarly, the Morningstar U.S. Dividend Growth index dislikes stocks with the highest dividend and specifically rule out those with the top 10% dividend yield in the index's universe. To counter such a valuation trap of high dividend yield, ISI suggests using a combination of

Chart 1
Russell 1000 Stock Returns Based on Dividend Yield Grouping
through 11/30/15



Source: Russell, FactSet Research Systems Inc., PNC

³⁶ "Construction Rules for Morningstar US Dividend Growth IndexSM", Morningstar Methodology Paper Version 1.0 (April 25, 2014).

³⁷ P.N. Patel and S. Yao, "Sustainable and Growing Dividend Portfolio," International Investing and Strategy Group Quantitative Research (2013).

³⁸ M.J. Brennan, "Taxes, Market Valuation and Financial Policy," *National Tax Journal* 3, no. 3 (1970): 417-29; R. Litzenger and K. Ramaswamy, "The Effects of Personal Taxes and Dividends on Capital Asset Prices: Theory and Empirical Evidence," *Journal of Financial Economics* 7, no. 2 (1979): 163-95.

Chart 2
MSCI EAFE Stock Returns Based on Dividend Yield Grouping
 through 11/30/15



Source: MSCI, FactSet Research Systems Inc., PNC

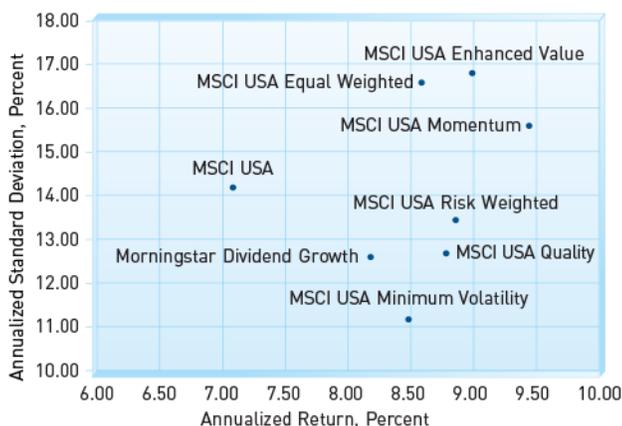
different dividend factors, including dividend yield, dividend growth, and payout ratio.

We ran a simple test to confirm and expand upon ISI’s findings. As shown in Chart 1 (page 11), among Russell 1000 for U.S. stocks, the top decile with the highest dividend yield underperformed the second and fourth deciles in the period from 1995-2015. Interestingly, high dividend yield strategies fared better within the international developed space: Chart 2 shows that the top decile has been a clear winner in the MSCI EAFE space during the same period.

The following dividend growth smart beta ETFs have been added to the platform.

- iShares Core Dividend Growth (DGRO) tracks an index of U.S.-listed stocks that are selected by dividends, dividend growth, and payout ratios, and then weighted by dividend dollars. The focus is gaining exposure to a diversified portfolio of companies that have begun to sustainably grow their dividends. Given the focus on companies with strong balance sheets able to support ongoing operations and dividends, the fund offers a balanced sector exposure, positioned to benefit from economic growth. The fund should outperform in riskier markets and declining interest rate environments but struggle when investor seek growth or risk and when interest rates are rising rapidly.
- WisdomTree US Quality Dividend Growth (DGRW) tracks the performance of the WisdomTree US Dividend Growth Index by investing in U.S.-listed dividend-paying stocks with growth characteristics, and by focusing on potential for dividend growth versus backward-looking dividend increases. This increases the probability of gaining exposure to the strongest future dividend growers. Given the focus on companies with positive earnings growth and strong profitability characteristics to support ongoing operations and dividends, the fund should outperform in risk-off markets and declining interest rate environments while struggling when investor seek out growth/risk and when interest rates are rising rapidly.

Chart 3
MSCI Factor Indexes, Return and Risk Comparisons
 January 2004–October 2015



Source: MSCI, Morningstar, PNC

Conclusion

Overall, the six most commonly used smart beta strategies have exhibited long-term return enhancement or risk-reduction benefits. In Chart 3 we show the return and volatility characteristics of seven factor indexes (two indexes for the size factor: MSCI Equal Weighted and MSCI Risk Weighted) and that of their capitalization-weighted peer, MSCI USA. In the period from January 2004 to October 2015, all the strategies have a higher

annualized return than the MSCI USA. In addition, the quality, minimum volatility, and dividend growth strategies had a much smaller annualized volatility than the market-cap-weighted index.

Chart 4 shows the long-term cumulative performance of the same seven factor indexes. Although some of them dipped below the MSCI USA during the financial crisis of 2007, over the 11 years shown in Chart 4 the cumulative returns of smart beta strategies are significantly better than those of the market-cap-weighted index. We note, however, that such performance analysis does not consider fees or other trading costs.

Furthermore, Table 2 shows the up and down market performance of the factor indexes as well as the performance of the broader indexes, the MSCI USA and S&P 500. It is evident that most of the factor indexes held up better than the two broad indexes during down markets, though did not necessarily beat them during the expansion eras.

PNC believes that smart beta strategies can be an attractive addition to traditional investment portfolios by combining some of the attractive qualities of active management typically at a lower cost to investors. When properly selected and executed, smart beta investment strategies can provide long-term return enhancement or risk reduction. We remind investors when investing in smart beta strategies that they must be mindful that even with the strong long-term prospects, these strategies will not outperform consistently on a quarterly basis and can be subject to extended periods of underperformance relative to the typical market-cap-weighted indexes.

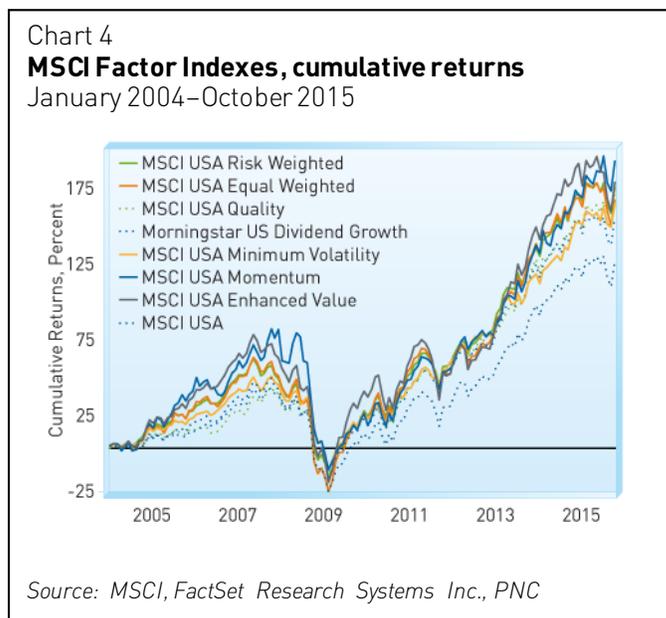


Table 2
Annualized Performance by Up/Down Markets
 (percent)

	Dot Com	Expansion	Financial Crisis	Recovery I	Taper Tantrum	Recovery II
	4/1/2000 3/31/2003	4/1/2003 10/31/2007	11/1/2007 2/28/2009	3/1/2009 4/30/2011	5/1/2011 5/31/2012	6/1/2012 6/30/2015
Factor Indexes						
MSCI USA Risk Weighted	-2.01	17.55	-38.65	38.29	-0.01	17.75
MSCI USA Equal Weighted	-8.92	19.64	-44.57	47.41	-5.78	19.43
Morningstar US Dividend Growth	N/A	N/A	-34.1	34.55	3.05	15.96
MSCI USA Enhanced Value	-8.48	21.00	-44.12	44.12	-10.75	22.37
MSCI USA Quality	-14.30	12.78	-32.70	32.01	4.99	16.59
MSCI USA Momentum	-15.33	19.89	-42.34	33.42	2.81	18.97
MSCI USA Minimum Volatility	-9.14	14.42	-33.18	30.00	7.47	14.52
Broad Indexes						
S&P 500 TR USD	-16.09	16.13	-41.39	35.76	-1.42	18.34
MSCI USA NR USD	-17.56	15.71	-41.54	35.10	-2.21	17.74

Source: Morningstar Direct, PNC

Appendix

The following tables provide additional information on the six factor categories.

Table A1
Factor Category Theory Explanations

	<u>Systematic Risk-Based Theories</u>	<u>Behavioral Finance-Based Theories</u>
Low Volatility	N/A	<ul style="list-style-type: none"> > Lottery effect > Overconfidence effect > Leverage aversion
High Quality	N/A	<ul style="list-style-type: none"> > Errors-in-expectations
Value	<ul style="list-style-type: none"> > Higher systematic (business cycle) risk 	<ul style="list-style-type: none"> > Errors-in-expectations > Loss aversion > Investment-flows-based theory
Low Size	<ul style="list-style-type: none"> > Higher systematic (business cycle) risk > Proxy for other types of systematic risk 	<ul style="list-style-type: none"> > Errors-in-expectations
Momentum	<ul style="list-style-type: none"> > Higher systematic (business cycle) risk > Higher systematic tail risk 	<ul style="list-style-type: none"> > Underreaction and overreaction > Investment-flows-based theory
Dividend Growth	<ul style="list-style-type: none"> > Higher systematic (business cycle) risk 	<ul style="list-style-type: none"> > Errors-in-expectations

Source: MSCI, PNC

Table A2
Factor Pros and Cons

	<u>Pros</u>	<u>Cons</u>
Low Volatility	<ul style="list-style-type: none"> ▪ Low-volatility stocks tend to represent mature enterprises, which are less dependent on economic growth than most companies. ▪ Low-volatility stocks have offered better risk-adjusted returns in most markets studied. ▪ They are less sensitive to market fluctuations. 	<ul style="list-style-type: none"> ▪ The sudden interest in low-volatility strategies may presage lower risk-adjusted returns for the strategy going forward. ▪ Low-volatility strategies can lag significantly during bull markets. ▪ Some implementations can be subject to large sector concentrations
High Quality	<ul style="list-style-type: none"> ▪ Companies with stable earnings and cash flows are more likely to remain attractive in the long term. 	<ul style="list-style-type: none"> ▪ Some do not take valuations into account. ▪ Quality stocks can lag the market for years.
Value	<ul style="list-style-type: none"> ▪ Offers efficient exposure to stocks that are cheap relative to their sector peers. 	<ul style="list-style-type: none"> ▪ Value stocks may underperform growth stocks for significant periods. ▪ Value stocks usually have dim growth prospects.
Low Size	<ul style="list-style-type: none"> ▪ Size factors exhibited positive premium in the past. ▪ Value and momentum factors are more prominent among small-sized stocks. 	<ul style="list-style-type: none"> ▪ Pure size effect has diminished over the years and some positive history might be due to measurement error.
Momentum	<ul style="list-style-type: none"> ▪ Momentum has been observed in nearly every market studied and across different asset classes over long investment holding periods. 	<ul style="list-style-type: none"> ▪ Momentum strategies can struggle during periods of high market volatility or market reversals.
Dividend Growth	<ul style="list-style-type: none"> ▪ Companies with growing dividend tend to be mature companies with stable earnings. ▪ Dividend growth is not affected by deeply depressed prices. 	<ul style="list-style-type: none"> ▪ Limited research on dividend growth as a factor.

Source: PNC

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