A PRACTITIONER'S PERSPECTIVE ON SMART BETA

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EXECUTIVE SUMMARY

Smart Beta investing has become increasingly popular among institutional investors in recent years. There has been a significant rise in the number and variations of products, and assets flowing into this space. There are now 1,700 Smart Beta ETFs with approximately $440 billion in assets[1].

Proponents argue these Smart Beta strategies harvest established risk premia at a lower cost, potentially leading to superior solutions to traditional cap-weighted market indices. On the other hand, recent research has shown that portfolio returns for strategies published in academic journals drop in half after publication date[2]. As they are utilized by an increasing number of investors and are gaining popularity, are these Smart Beta strategies able to generate the same historical risk-return profile? How important are specific portfolio construction and implementation for Smart Beta strategies? How should Smart Beta strategies be combined?

Harvesting risk premia is not a trivial exercise. There are many nuances (e.g., factor construction, weighting, combination, and implementation) that make a significant difference to the outcome. In this paper, we demonstrate how these increasingly nuanced steps are critical and we try to measure the potential lost opportunity in a simplistic implementation. In particular we explore:

- The complexity of creating and maintaining a 'pure' exposure to specific smart beta factors
- The efficiencies and challenges of combining smart beta factors
- The realities of transaction costs and day-to-day implementation

Evaluating these topics and identifying which techniques to use, how to handle implementation, and factor selection, is at the heart of active quantitative management. A close inspection of these nuances also clarifies that managing an effective smart beta effort is not far removed from managing an active portfolio, and that some of the smart beta advantages (like transparency and simplicity) are impacted by efficient and logical implementation.

WHAT IS SMART BETA?

Broadly, Smart Beta strategies seek to provide exposure to the equity market and to one or more well-known factors at a lower cost. They are rule-based and transparent strategies that are systematically implemented and rebalanced to maintain the factor exposure – they are quantitative strategies.

We can analyze Smart Beta from two perspectives. First, Smart Beta strategies can be compared to a cap-weighted index, which is the theoretically appropriate way to obtain equity market exposure. Second, they can be compared to active quantitative management, which aims to offer higher risk-adjusted return than the benchmark from multiple factor exposures.

Capitalization-weighted indexes have long been known as inefficient[3]. In theory, an investor can achieve a higher risk-adjusted return than the cap-weighted index by taking exposure to the equity market and to one or more 'known' risk premia. Should Smart Beta deliver on this objective, it would be a more attractive investment proposition than cap-weighted indexes.

On the other hand, active quantitative management is the result of a relentless pursuit of various anomalies and portfolio construction techniques to achieve the highest risk-adjusted return. Smart Beta strategies tend to favor simplicity, transparency, and ease of applicability, often disregarding the advances in quantitative techniques and factor selection made over the past decades. A simple rules-based quantitative strategy is unlikely to produce superior risk-adjusted returns to a true active quantitative strategy (Figure 1). Therefore, an investor might not benefit from turning back the clock on much of the innovation on portfolio construction, model building, and data gathering, even if such a simple strategy comes more cheaply.

Figure 1. Philosophical difference between Active Alpha quant and Smart Beta quant

This paper aims to provide a quantitative practitioner's perspective on Smart Beta. First, we examine single-factor Smart Beta strategies with respect to return, risk, and portfolio attributes. Second, we look at multi-factor portfolios. Along the way we examine the impact of assets under management, portfolio construction, and implementation issues such as transaction costs. We build a number of Smart Beta portfolios to illustrate these concepts and use them to guide us towards what we think investors should seek from a Smart Beta strategy[4].

SMART BETA AS A TOOL

Factor Construction

Active quants seek to identify alpha sources which predict excess returns by combining broadly understood factors (such as 'value') with proprietary alpha concepts. Because these alpha signals are different from the smart beta risk premia portrayed in the academic literature, for this analysis we focus exclusively on risk premia commonly used by Smart Beta providers. Even for the smart beta risk premia we find that the use of more advanced quantitative techniques can make a substantive difference.

1. Empirical Research Partners – Portfolio Strategy: June 2015. Smart Beta, Dumb Money? Don't Fear the Robots, Fear the Humans. **2.** McLean and Pontiff, Does Academic Research Destroy Stock Return Predictability? Journal of Finance forthcoming. **3.** Haugen, Robert and Baker, Nadin, The efficient market inefficiency of capitalization-weighted stock portfolios, Journal of Portfolio Management, Spring 1991, Vol 17, No 3, pp 35-40. **4.** Data management is integral to quantitative investing. As the old adage goes, "garbage in, garbage out". We are asking the reader to take our word on the importance of this step as we are not testing this part directly. As quantitative investors we have already cleaned the historical data of errors and cross-verified it. It would be a difficult task to recreate the "bad" data.

We construct the following monthly-rebalanced Smart Beta strategies on global equities[5] from January 2003 through August 2015:

1. Value, Momentum, and an equal-weighted combination of Value and Momentum, with market-capitalization weighting. We chose these factors and capitalization-weighting given their popularity among existing Smart Beta strategies;
2. Vary the market-capitalization weighting and examine signal weighting[6], a popular approach in the construction of fundamental indices; and
3. Vary the portfolio construction by including optimization.

In the construction of the Value measure, we chose an equal-weighted mix of book-to-price (B/P), earnings-to-price (E/P), and cash flow-to-price (CF/P), given they represent popular Smart Beta value factors. For Momentum, we chose 12-month price momentum, another popular momentum measure[7]. Consistent with a long-only implementation, stocks ranking in the top 30% of an attribute across the entire universe[8] are chosen for the Smart Beta portfolio[9].

For capitalization-weighted portfolios, we create stock weights proportional to their market capitalization. For signal-weighted portfolios, we create stock weights proportional to the signal rank (e.g., a stock with a higher Value score will have a proportionally larger weight regardless of its capitalization rank)[10].

In our simulations the Smart Beta portfolios outperform the MSCI World Index (the "Benchmark") for the full sample (January 2003 – August 2015), after accounting for transaction costs ("TC")[11], except for Value cap-weighted (Table 1 – Full Sample). However, the payoff seems to have quite a significant time-variation. Over the last five years (August 2010 – August 2015), Value has significantly underperformed the Benchmark irrespective of construction method, leading to recent discussions in the industry that "value investing is dead"[12] (reminiscent of the late '90's?). Momentum, on the other hand, had stronger performance in the most recent five years for the capitalization-weighted, but not signal-weighted portfolio construction. This variation in performance is particularly noteworthy for investors seeking to time these strategies. Those seeking to invest for the "long-term" need to be fully aware of what long-term really means.

Table 1. Summary performance statistics (annualized)[13] for single factor portfolios, no optimization.

Factor - Period	Weighting	Pre-TC Alpha	Post-TC Alpha	Tracking Error	Total Volatility	Post-TC IR
Value - Full Sample	Cap	0.3%	-0.3%	5.6%	18.4%	-0.06
	Signal	4.4	3.8	7.5	18.9	0.50
Value - Last 5 years	Cap	-2.7	-3.3	4.3	14.5	-0.77
	Signal	-2.6	-3.2	4.9	14.4	-0.66
Momentum - Full Sample	Cap	2.2	1.0	5.8	14.4	0.18
	Signal	4.3	3.2	6.1	15.1	0.53
Momentum - Last 5 years	Cap	4.2	3.0	4.6	11.9	0.66
	Signal	3.6	2.5	4.9	12.3	0.52

Signal construction seems to be critical in the design of a Smart Beta strategy. Signal weighting, rather than market capitalization weighting, led to higher returns for the full sample, both before and after transaction costs. This is commonly understood among quantitative managers, many of whom design portfolio weights proportional to the alpha of a given stock (in a risk-adjusted manner). However, given the prevalence of capitalization-weighted Smart Beta products[14], the benefit of betting proportional to the alpha might not be well understood among institutional investors.

The signal-weighted strategies had higher tracking error for the portfolios constructed above, and one might argue that the substantial increase in Information Ratio justifies the higher tracking error. One way tracking error can be controlled is through risk management and optimization, as well as through combining factors with low (or negative) correlations. These are considerations active quantitative managers address in modern portfolio construction techniques.

RISK EXPOSURES

Institutional investors care about number of holdings and turnover due to custody and transaction cost-sensitivity. These institutional investors also seek high active share to avoid closet indexing and low drawdowns to avoid having their patience tested. Using single-factor Smart Beta exposures may lead to significant drawdowns (Table 2). Since these are long-only strategies, it is important to measure drawdowns in excess return space (calculating the compound return of a strategy minus the compound return of the benchmark, and then taking the difference from the maximum difference). For example, by March 2007, the capitalization-weighted Value strategy had returned 57% more than the Benchmark since the strategy's January 2003 inception. However, by February 2009, the cumulative excess return was reduced to four basis points. The 56.6% drop in cumulative excess return from the March 2007 peak to the February 2009 trough is the maximum excess return drawdown for this strategy. This drawdown measure gives investors another perspective on the volatility of the excess returns, specifically focusing on a maximum single drop in accumulated profits versus the benchmark[15]. The reason investors care about the volatility of the profits versus the benchmark is that the profit made over the benchmark arguably should more than make up for the fees charged for investing in a strategy different from the benchmark.

Table 2. Portfolio characteristics relative to MSCI World Index – Full Sample (January 2003 – August 2015)

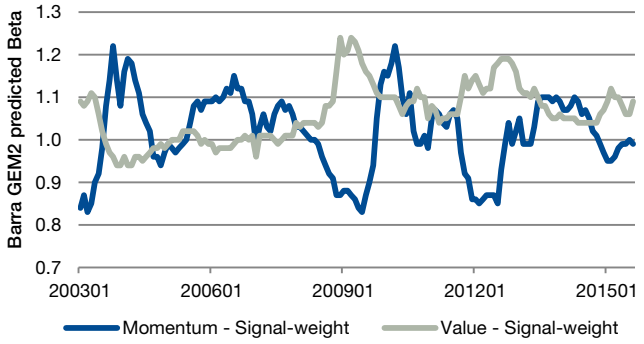
Factor	Weighting	Number of names	Active Share	Excess Return MDD	One-way Turnover
Value	Cap	501	75%	-57%	152%
	Signal	501	80	-94	157
Momentum	Cap	502	69	-24	290
	Signal	505	76	-53	267

The excess return drawdown of single-factor Smart Beta products is quite large. The models that were signal-weighted fared significantly worse in our simulation relative to those which were capitalization-weighted, which makes sense given capitalization-weighting essentially provides a risk-control versus the capitalization-weighted benchmark. As expected, Momentum had higher turnover than Value, but due to monthly rebalancing, the turnover was contained to reasonable levels. Single-factor Smart Beta strategies seem to have a reasonably high active share. The number of stocks held is quite large, especially considering that several such strategies are typically held at the same time in one investor's portfolio.

5. The universe of stocks was MSCI World for the Smart Beta strategies. We also repeated these tests in the Russell 1000 universe with similar results, but do not show the results here for the sake of brevity. **6.** About 7% of the Smart Beta market is in such strategies. 'Signal weighting' stands for weighting stocks by the extent of their exposure to the underlying factor on which the Smart Beta strategy is based. **7.** Arguably we could have chosen other measures of Value or Momentum, additional factors (such as Quality), a combination of factors, alternate portfolio weighting schemes, and superior risk controls. However, these are all refinements leading step by step to an active quantitative process, and we decided to choose the more popular factors. **8.** Our selection universe is restricted to the benchmark constituents, for all strategies, to ensure a like-for-like comparison. **9.** We winsorize factor scores before and after adding them together. **10.** We also created country-sector neutral portfolios for all tests. The results were very similar to those of the global tests reported, and we highlight any notable differences where applicable. **11.** Transaction costs were estimated as the two-way annualized turnover times 20 basis points, at the $1 billion assets under management level. We found that this simple transaction cost estimate ends up underestimating t-costs relative to a more sophisticated and realistic transaction cost measurement using stock-level information, but it nevertheless serves as a ball-park guide to the impact transaction costs have on the returns. **12.** Alliance Bernstein, Global Quantitative Strategy: Is Value 'Dead'? No!, February 2016. **13.** Starting assets for these simulations were assumed to be $1 billion. **14.** Empirical Research Partners – Portfolio Strategy: June 2015. Smart Beta, Dumb Money? Don't Fear the Robots, Fear the Humans. **15.** For the example used, an investor long $1 in the cap-weighted strategy and short $1 the benchmark would have had 56 cents in profits by March 2007, and only 0.4 cents by February 2009. The 94% drop reflects the drop in profits from this long-short investment. We looked at other measures of drawdown in excess return space, and they gave equivalent answers.

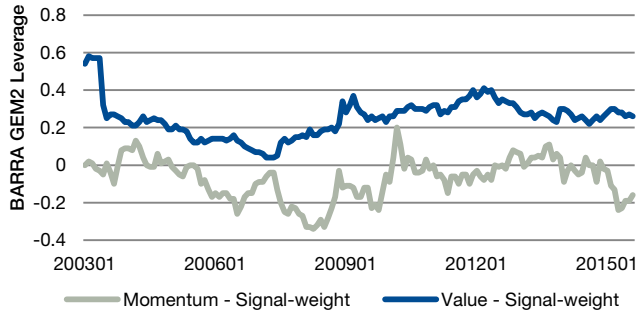
Smart Beta strategies struggled to stay free of biases other than to the desired factor. Investors expecting a straightforward, constant loading on a given factor might be surprised. The market exposure in Smart Beta portfolios varied over time meaningfully (Figure 2). While a Momentum Smart Beta portfolio cannot be faulted for changing its stripes over time, it is worth noting that a Value Smart Beta portfolio had swings in market exposure of similar magnitudes. These exposures were tamed to some extent by country-sector adjusting the Smart Beta portfolios[16]. Market capitalization and Barra Value exposures also showed significant time-series variation.

Figure 2. BARRA GEM2 predicted Beta of signal-weighted Value and Momentum Smart Beta portfolios[17]. (Smart Beta portfolios contain country-sector biases.)



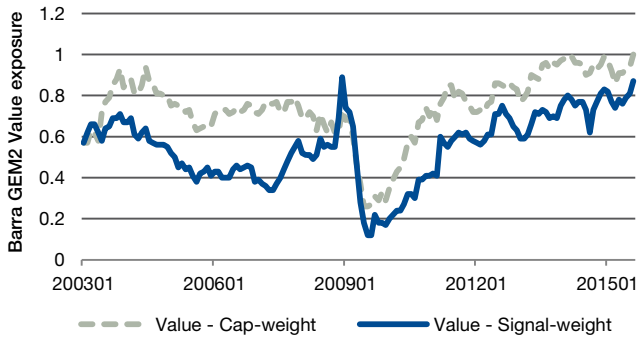
The exposure to leverage (Figure 3) also varies substantially, with Value strategies loading up on leverage during the 2008 financial crisis. The variation in exposure to leverage is not surprising as these portfolios are constructed without controlling for unintended risk exposures. Similar conclusions can be reached about other risk factor exposures.

Figure 3. BARRA GEM2 Leverage of signal-weighted Value and Momentum Smart Beta portfolios[18]. (Smart Beta portfolios contain country-sector biases.)



Even when it came to the exposure to the headlined factor, the specific definition of the Smart Beta can deviate from alternatives. As an example, the value exposure – as measured by Barra Value – of the Value Smart Beta portfolios varied substantially over time (Figure 4). This illustrates that investors expecting a straightforward, constant loading on a given factor may be surprised if they measured the exposure using slightly different versions of that factor.

Figure 4. BARRA GEM2 Value exposures of cap-weighted Value and signal-weighted Value Smart Beta portfolios. Smart Beta portfolios contain country-sector biases.



The time-series variation in risk exposures, impact of transaction costs, and drawdowns highlight the importance of using risk management and good implementation techniques.

IMPLEMENTATION CONSIDERATIONS

Testing the value added of implementation is not trivial, as it is far more difficult to implement a strategy burdened by large assets than one with very little assets. Increasing assets under management eats into the excess returns of any strategy as transaction costs grow. Generic Smart Beta strategies are no different, so we focus on transaction cost impact on these strategies.

To measure the impact of transaction costs, we measure them in two ways. First, consistent with Table 1, we estimate them simplistically as 20 basis points for each percent in turnover. Holding the weights of the portfolio constant, higher assets imply a higher requested volume. Therefore, as assets grow, we scale the transaction costs by the root of the growth in assets[19]. These costs are labeled as TC1 in Table 3. Second, we construct a transaction cost model as a function of the bid-ask spread, average daily volume, and price volatility for each stock daily throughout the full sample. Then we use the fitted model at a point in time to estimate the transaction costs associated with each stock. These costs are labeled as TC2 in Table 3. Both transaction cost estimates are approximations, likely to underestimate the actual market impact, especially at larger asset sizes. The pre-TC expected return (the gross alpha) is the same at all levels of assets (reported in Table 1), and the turnover is constant as well (reported in Table 2).

Table 3. Variation of performance statistics (annualized)[20] with increasing assets for signal-weighted single factor portfolios – Full Sample (January 2003 – August 2015)

Factor	Starting AUM (billions)	Post-TC1 Alpha	Post-TC1 IR	Post-TC2 Alpha	Post-TC2 IR
Value (Signal-weighted)	1	3.8	0.51	3.2	0.43
	5	3.0	0.40	2.4	0.32
	10	2.4	0.32	1.9	0.26
	20	1.6	0.21	1.5	0.20
Momentum (Signal-weighted)	1	3.2	0.52	2.5	0.41
	5	1.9	0.31	1.2	0.19
	10	0.9	0.15	0.4	0.07
	20	-0.5	-0.08	-0.4	-0.07

16. For brevity we omitted the country-sector neutral portfolio results and the Barra Value and cap time-series exposures, but are able to provide them upon request. **17.** The beta exposure for the cap-weighted Value and Momentum portfolios are very similar to those of the signal-weighted portfolios, therefore were omitted for the sake of brevity. **18.** The beta exposure for the cap-weighted Value and Momentum portfolios are very similar to those of the signal-weighted portfolios, therefore were omitted for the sake of brevity. **19.** According to transaction costs literature (see Trading Cost of Asset Pricing Anomalies by Frazzini, Israel, Moskowitz, 2015) costs go up by the square root of the increase in volume, so we used that to guide the increase in transaction costs as assets grew. As an example, the t-costs for a strategy at $1 billion were estimated to be two way turnover*20bps. Therefore at $5 billion we multiplied the t-costs at $1 billion by square root of 5. **20.** The strategies reported are all Value-based, as these are the most popular strategies. The conclusion is not different for momentum-based strategies.

The asset impact is strongest for signal-weighted Momentum strategies which showed a negative excess return after transaction costs at $20 billion assets under management. Value strategies also suffered significantly. The drawdown increases with the assets under management in a strategy[21]. Based on our calculations using the simple TC1 cost estimate, the breakeven assets under management for long-only signal-weighted Value strategies is $49 billion and for the long-only, signal-weighted Momentum strategies is $16 billion[22].

The simplistic transaction cost measure underestimates transaction costs relative to the stock-level measure. However, both measures showed that transaction costs were meaningful and need to be managed carefully in the implementation and execution of these strategies.

The asset impact is a ball-park estimate, but it does raise the question: what can an investor expect to achieve with hundreds of billions of dollars invested in similar strategies, all using similar investment approaches and portfolio construction? The performance impact of rising AUM was particularly large for these Smart Beta portfolios because they were constructed (as are most actual Smart Beta strategies) without transaction cost awareness. Maybe the issue with the realized Smart Beta performance highlighted by the literature[23] is related to crowding after all.

COMBINING SMART BETA

The prevalence of single-factor Smart Beta products is a bit puzzling, since multi-factor strategies are most commonly used by quantitative managers[24]. We tested the added value of combining factors in multi-factor portfolios and looked at the impact of optimization, transaction cost management, and factor selection.

We combined the two cap-weighted Smart Beta portfolios (Value and Momentum) and the two signal-weighted portfolios, at static equal weights, the way an investor might utilize two existing Smart Beta strategies in a portfolio. Then we combined the Value and Momentum signals at the stock level in equal weights and created an optimized portfolio, where we took into consideration transaction costs at the stock level as well as controlling BARRA factor risks and sector deviations tightly relative to the Benchmark. The transaction costs used to compute the post-TC alpha in Table 4 are the simple transaction cost estimates (20 basis points per percent turnover).

Table 4. Summary performance statistics (annualized)[25] of Value and Momentum combined portfolios. Transaction costs were estimated at 20 basis points per stock per percent of turnover.

Period	Weighting	Pre-TC Alpha	Post-TC Alpha	Tracking Error	Total Volatility	Post-TC IR
Full sample	Cap	1.4%	0.5%	2.5%	15.7%	0.21
	Signal	4.5	3.7	4.3	16.2	0.86
	Optimized	2.5	1.9	2.6	15.2	0.74
Last five years	Cap	0.8%	-0.1%	2.1%	12.7%	-0.01
	Signal	0.5	-0.3	3.2	12.8	-0.02
	Optimized	2.0	1.4	2.0	12.6	0.67

Combining Value and Momentum portfolios in equal weights (capitalization-weighted and signal-weighted Value and Momentum, Table 4) outperformed single factor Smart Beta by delivering a higher information ratio over the full sample. Looking at the last five years in the sample, however, shows again how difficult performance can be even for a simplistically combined portfolio over a prolonged period of time. Dynamically allocating to Value and Momentum through time (instead of equal-weighting) required timing these strategies, a very difficult task to do both subjectively and quantitatively[26].

Active quantitative investors add portfolio optimization to multi-factor selection. The goal of portfolio optimization is to help control unwanted exposures, obtain a more favorable risk-reward profile, and incorporate the impact of trading on alpha. Using portfolio optimization significantly improved the results in our simulation, even during a period when some of the individual signals were struggling, such as in the last five years of the sample. In our opinion, this highlights the importance of using portfolio optimization.

Smart Beta portfolios were constructed monthly without awareness of transaction costs (similar to how many real world Smart Beta strategies are put together) and suffered a large gap between pre-TC and post-TC returns (Table 1 and Table 4). In contrast, an optimized quantitative strategy that incorporates transaction costs while rebalancing the portfolio yielded a smaller gap between pre- and post-TC returns and lower volatility, absolute and relative (Table 4).

Combining Value and Momentum Smart Beta portfolios at 50-50 weight, the way an investor might blend Smart Beta ETFs and similar to multi-factor Smart Beta constructs, led to a lower active share of the capital deployed and was thus suboptimal to combining the factors and then constructing a portfolio using optimization (Table 5).

Table 5. Portfolio characteristics relative to MSCI World[26] – Full Sample (January 2003 – August 2015)

Factor	Weighting	Number of names	Active Share	Excess Return MDD	One-way Turnover
Value and Momentum	Cap	907	49%	-20%	217%
	Signal	907	66	-55	200
	Optimized	258	77	-23	146

Excess return drawdown was lowest for the combined portfolio of capitalization-weighted signals (as expected given the single factor results in Table 2), but the turnover was highest for these strategies with the lowest active share and a large number of names. On the other hand, the optimized portfolio had an excess return drawdown very close to the capitalization-weighted portfolio but the highest active share, significantly lower number of names, and lowest turnover. The turnover was explicitly controlled by using transaction-cost aware optimization.

In this example we only used two factors, Value and Momentum, and combined them. However, there are many other candidates that investors may choose to consider, such as Quality, Volatility, or Size. The more factors that are combined naively at the portfolio level, the lower the resulting active share. In an optimization framework, however, the alpha at the stock level can be driven by multiple signals, and the portfolio construction can efficiently take into consideration the correlations between these signals when combining them.

21. Not reported for brevity, the impact of AUM is stronger for country-sector neutral portfolios. **22.** The literature is divided on this topic. Korazjczyk and Sadka show a $5 billion AUM limit before momentum profits vanish (*Are Momentum Profits Robust to Trading Costs*, Journal of Finance V59 no3 1039-1082), while Frazzini, Israel, and Moskowitz compute a $56 billion limit to the momentum AUM (*Trading Costs of Asset Pricing Anomalies*, working paper). **23.** *How Smart are "Smart Beta" ETFs? Analysis of Relative Performance and Factor Exposure*, Denys Glushkov, University of Pennsylvania, Sept 2015. **24.** Empirical Research Partners – Portfolio Strategy: June 2015. Smart Beta, Dumb Money? Don't Fear the Robots, Fear the Humans. **25.** Starting assets for these simulations were assumed to be $1 billion. **26.** Jason Hsu, Brett Myers, Ryan Whitby: Timing Poorly: A guide to Generating Poor Returns While Investing in Successful Strategies – working paper 2015.

Overall, even for simple signals such as the ones chosen, using proven quantitative techniques seems to have had a beneficial impact on the hypothetical models we simulated.

CONCLUSION - ARE STALE INNOVATIONS THE NEW SMART BETA?

What is Smart Beta? It seems impossible to have a one-size-fits-all definition of Smart Beta. Some common characteristics among Smart Beta products are that they are more transparent, lower-cost, and offer systematic exposures to reasonably well-established factors (in addition to market exposure). While Size, Value, and Carry premiums are obvious candidates, Momentum and Quality Smart Betas also seem like natural choices. However, it is not clear where to draw the line: can a "factor" based on options data or another based on counting cars in retailers' parking lots qualify as Smart Beta? Perhaps the boundary is drawn at factors that are applicable to the entire cross section of stocks, that are commonly known, and that are based on publicly-available data. An active quantitative manager may be tempted to say that stale innovations have become the new Smart Beta.

When does Smart Beta make sense? An investor seeking transparency and simplicity may find it in a strategy using "well established" factors, more so than in an active quantitative process. The investor may simply be looking to gain equity exposure while doing better than the seemingly inefficient capitalization-weighted index. An investor may also believe in their own skill to time among factors. However, the evidence on investors' timing ability is not in their favor[27].

What is important for a Smart Beta portfolio? From the results above, it seems that it is important to limit unwanted exposures via construction or risk control (e.g., beta exposure in a Value portfolio), to combine multiple factors (rather than waste capital by buying individual Smart Beta portfolios of the same factors), and to take into account transaction costs. As the level of sophistication increases, the transparency that was originally sought decreases (and product complexity and fees likely increase as well). As the marketplace becomes more enamored with Smart Beta, we may see more well-constructed versions. Good active managers have an opportunity to distinguish themselves as Smart Beta is encroaching into what was once the exclusive domain of active management. To help mitigate some of the potential pitfalls of Smart Beta investing highlighted in our discussion, it may make sense to look at how well established an asset manager's portfolio construction models are.

What is the correct benchmark for Smart Beta? Even the most sophisticated strategy is constrained when tied to a benchmark. Some may argue that relative to the choice of benchmark, the value added by active strategies is small[28]. However, removing the benchmark as a measurement yardstick does not remove the requirements for a good investment strategy. The more esoteric the Smart Beta strategy, the less obvious the benchmark. Any long-only strategy should provide better risk-adjusted absolute performance than the current flagbearer of equity risk premium: the capitalization-weighted index. Over short time periods, Smart Beta strategies can legitimately deviate due to the performance of the advertised factor. However, it is also important to determine if there are additional causes for performance deviation such as poor construction or increased crowding. Investors also need to be cautious, as the history of style investing may repeat. Over the sample period analyzed, the Value index underperformed the capitalization-weighted index. Who is to say that the new simple variants on Value, and other styles and factors, will not suffer the same fate?

Harvesting risk premia may make sense for some investors, whether in equities or other asset classes. Accessing these risk premia may become more efficient over time as Smart Beta products are generally becoming more thoughtfully constructed and as multi-factor Smart Beta establishes itself. Investors must decide why they seek Smart Beta, what kind of Smart Beta they need, and who should build their Smart Beta strategy. Claims that simple rules-based strategies can replace active quantitative management, however, essentially turn back the clock on decades of progress on alpha and portfolio construction. Meanwhile, the evolution of Smart Beta is a welcome development for investors who seek to differentiate among active quantitative managers, helping to distinguish those managers who innovate and harness newer data sources, alpha ideas, and portfolio construction techniques.

27. Jason Hsu, Brett Myers, Ryan Whitby: Timing Poorly: A guide to Generating Poor Returns While Investing in Successful Strategies – working paper 2015. **28.** Evaluation of Active Management of the Norwegian Government Pension Fund – Global, December 14, 2009, by Andrew Ang, William Goetzmann, and Stephen Schefer.

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Simulated hypothetical performance. The model portfolios created and used throughout this paper, and the underlying components, are not available for investment and do not represent any actual investment product(s). The performance results provided herein were based on historical back tested market simulations of the models created. The simulated performance data is shown for information purposes only. The simulated data does not represent actual performance of any product and it should not be used as a guide to the future. This approach has inherent limitations, including that results may not reflect the impact material economic and market factors might have had on the investment manager's decision-making had the strategy been managed throughout the period over which the simulated performance is illustrated. The simulated performance is shown for comparison purposes and has been adjusted for transaction costs. The performance results shown for the model simulations do not reflect the deduction of investment management fees, which would reduce portfolio performance. As fees are deducted quarterly, the compounding effect would have been to increase their impact by an amount directly related to gross portfolio performance. For example, on a portfolio with a 2% annual fee, if gross annual performance is 10%, the compounding effect of the fees will result in net annual performance of 7.81%. .
Financial indices are shown for illustrative purposes only and are provided for the purpose of making general market data available as a point of reference. An index is a statistical measure that shows changes in the economy or financial markets and may serve as a benchmark against which economic and financial performance of an investment is measured. An index is not available for direct investment, and its performance does not reflect the expenses associated with the management of an actual portfolio. The Fund's/Strategy's investments are not restricted to the instruments composing any one index. Certain information is based on data provided by third-party sources and, although believed to be reliable, has not been independently verified and its accuracy or completeness cannot be guaranteed.
All investment strategies involve risks including the potential for loss of principal. Alternative strategies involve magnified risks, are speculative, are not suitable for all clients, and intended for experienced and sophisticated investors who are willing to bear the high economic risks of the investment. Past performance of an investment does not guarantee similar future results.
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