Cass Business School
CITY UNIVERSITY LONDON

powerSHARES
by Invesco

Smart Beta:
Part 3: Factors assembled

Is it possible to build smart beta portfolios?

Authors: Prof. Andrew Clare,
Prof. Stephen Thomas, Dr. Nick Motson,
Markus Umschaden

This document is for Professional Clients only in Dubai, Jersey, Guernsey, the Isle of Man and the UK, Professional Clients and Financial Advisers in Continental Europe and Qualified Investors in Switzerland and is not for consumer use.

Centre for Asset Management Research

Cass Business School in cooperation with Invesco PowerShares

November 2015

Table of content

1. Introduction

The second paper in this series examined the performance of nine smart beta strategies for US equities. We concluded that a significant proportion of the additional return from these nine strategies could be traced to the risk factors identified in the academic literature which we reviewed in the first paper in this series. The fact that this additional return could be decomposed into these factor risk building blocks led us to question whether it was possible to build smart beta strategies from the building blocks themselves. Luckily for investors, benchmark providers such as S&P have created indices based on these individual risk factors so that we have the very building blocks needed to explore this possibility. In this paper then, we extend our study to look more closely at 9 smart beta, US equity strategies that have been transformed into financial market indices by S&P and ask whether combinations of them could generate a more attractive risk-return profile for investors than could be achieved by investing in a market cap-weighted US equity portfolio. In essence we are looking for evidence to suggest that we can build 'smart US equity portfolios' from smart beta components.

2. Forming smart beta portfolios

There are now many smart beta equity strategies in existence that have been made available to investors by providers in the form of investment funds and ETFs. Here we focus on 9 smart beta strategies that are available as S&P indices[1].

So in addition to our familiar cap-weighted index, what are these 9 S&P, smart beta components?

The 9 indexed strategies are listed in column 1 of Table 1. As can be seen, they include strategies that should now be familiar to readers. For example, the list includes an equally-weighted strategy; strategies based on low volatility, dividend yield, low beta, momentum, quality, size, growth and value.

Table 1: Performance of the S&P Smart Beta Indices, Dec 2001 - Sept 2015

	Mean return (% pa)	Standard deviation	Sharpe Ratio	Maximum Drawdown
Factor indices:				
Equal	8.7%	17.3%	0.42	54.9%
Small Cap	9.0%	18.3%	0.41	52.2%
Value	5.6%	15.9%	0.27	56.8%
Momentum	6.3%	14.4%	0.35	44.3%
Low Volatility	8.6%	10.3%	0.70	35.4%
Quality	9.1%	21.1%	0.37	58.6%
Dividend Yield	7.9%	13.8%	0.47	49.3%
Growth	6.1%	14.0%	0.34	45.3%
Low Beta	6.8%	12.4%	0.44	44.7%
Benchmark				
S&P500	5.9%	14.6%	0.31	50.9%

This Table presents some performance statistics of a set of S&P Smart beta indices. Source: Datastream, Bloomberg and Standard & Poors. Past performance is not a guide to future returns.

[1] For more detailed information about each of these smart beta indices go to: www.eu.spindices.com

All of the indices listed in Table 1 are directly related to the risk factors identified in the academic literature, and comprise portfolios of US stocks. The common data period for examining all 9 begins in December 2001 and ends in September 2015.

These indices thus give us the potential building blocks for a US equity smart beta portfolio. For comparison purposes we show the performance of the representative S&P500 cap-weighted index as well as some summary performance statistics for the 9 smart beta indices in columns 2 to 5 in Table 1. The performance statistics in the table show that all of the smart beta strategies except 'Value-weighted' outperformed the S&P500 index in both absolute and risk-adjusted return terms. The average, annualised return of the S&P500 benchmark over this decade and a half is 5.9% pa with an associated Sharpe ratio of 0.31. This compares unfavourably with, for example, the Low Volatility strategy which produced an annualised return of 8.6% over the same period with an associated Sharpe ratio of 0.70. Table 1 also reports the maximum drawdown of each strategy over the sample period. This statistic essentially tells us the worst peak to trough performance of the strategy. So for example, if we take the S&P500 benchmark, had an investor invested at this peak and sold at the related trough they would have experienced a loss of 50.9%. Most of the strategies produce a very similar maximum drawdown statistic, with the Low Volatility strategy producing the lowest value of 35.4%. We will return to the painful issue of drawdown in section 4 of the paper.

Maximum drawdown aside, given such superior performance what happens if we form portfolios of smart beta strategies as an alternative to a Market Cap-weighted, 'passive' strategy? How do the strategies perform together? As long as they evolve relatively independently as the economic cycle unfolds there may be diversification and performance benefits from combining them. In the next section of this paper we begin by exploring simple combinations of smart beta strategies.

3. Simple combinations of the smart beta strategies

Intuitively since the strategies explained in section 2 are all 'long' US equities we may expect relatively little benefit from combining them in portfolios. Table 2 below shows the effect on portfolio performance of two simple methods of combining the strategies: equal dollar weights in each strategy along with equal volatility from each strategy. The results are shown in Table 3. The "S&P 500" column in Table 2 presents the summary statistics of the Cap-weighted benchmark once again, for ease of comparison. The "Equally-Weighted" column presents the performance statistics that arose from combining the 9 smart betas indices described earlier in equal proportions, rebalanced monthly. The equally-weighted approach produces a higher return of 7.8% than the market cap approach and a higher Sharpe ratio of 0.45. However, its performance was not very different from the performance of the equally-weighted strategy shown in Table 1, with a slightly lower absolute return but higher Sharpe ratio.

Table 2: Combining smart beta, US equity investment strategies, Dec 2001 - Sept 2015

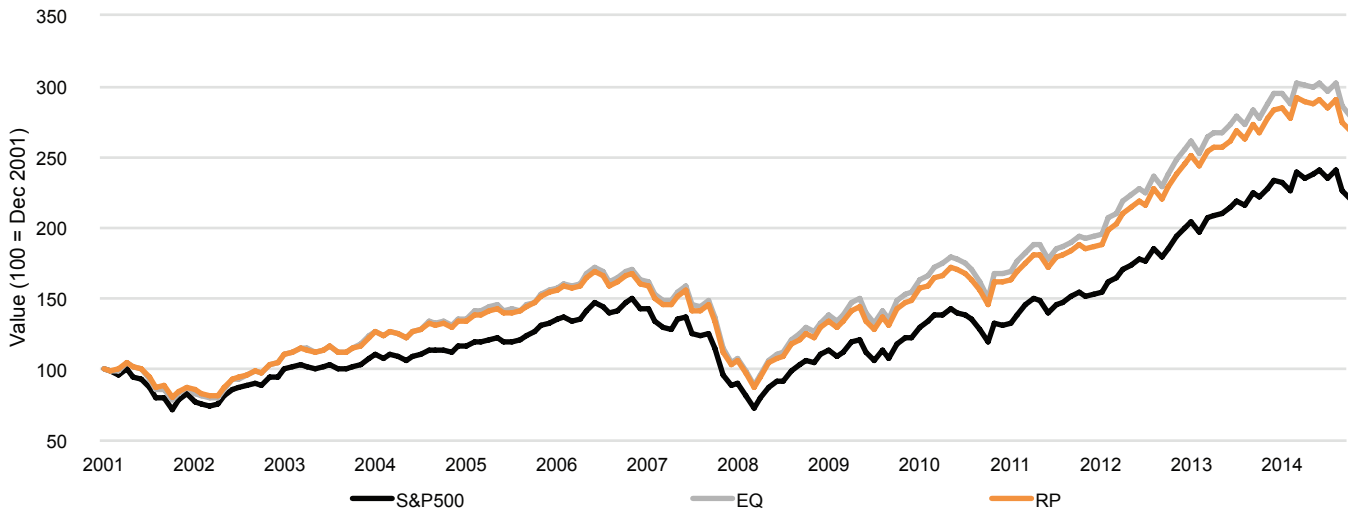
Factor Index Portfolios	S&P 500	Equally-Weighted	Risk Balanced
Annualised Returns	5.9%	7.8%	7.5%
Annualised Volatility	14.6%	14.4%	13.7%
Sharpe Ratio	0.31	0.45	0.44
Max. Drawdown	50.9%	48.6%	48.4%

This Table presents the performance of the S&P 500 and that of two investment strategies based on nine S&P smart beta indices. Source: Datastream, Bloomberg and Standard & Poors. Past performance is not a guide to future returns.

In the final column of Table 2 we present the results of a strategy that we refer to as “Risk Balanced”. This strategy involves calculating strategy weights so that the weighted volatility of each of the 9 components is equal, or ‘balanced’. Again the weights are rebalanced at the end of each month. This strategy again produced a higher return and higher Sharpe ratio than the cap-weighted strategy, but again the performance was not very different to that of the individual Equally-Weighted strategy.

Figure 1 below plots the total return indices for the S&P500, together with the equally-weighted and risk balanced portfolios of the 9 strategies as in Table 2 above: the equally weighted (blue) and risk balanced (orange) portfolio returns are almost exactly the same, resulting in almost identical lines with the orange being superimposed on the blue. The reason for this is that the risk balanced weights are, on average, not deviating a lot from the 11.11% equal weightings.

Figure 1: Equal Weighted and Risk Balanced Weighted Portfolio Returns against S&P500



This Figure presents the cumulative performance of the S&P 500 and that of two investment strategies based on nine S&P smart beta indices (see also Table 2). Source: Datastream, Bloomberg and Standard & Poors. Past performance is not a guide to future returns.

But can we improve on the simple, rather naive aggregation in Table 2 using popular investment rules? In Sections 4 and 5 of this paper we show that it was possible to improve dramatically on the performance of these simpler combinations of smart beta strategies.

4. Momentum and trend following

The first method that we look at for constructing portfolios with more attractive risk and return characteristics draws heavily on the work discussed in Paper 1 of this series, relating to momentum investing. Momentum investing involves buying assets that have performed well in the recent past relative to their peers and holding them until they underperform. This could involve, say, buying the best performing 20% of stocks in the US stock market, holding them for a month and then reshuffling the portfolio if they are no longer the best performing ones; this can be repeated every month and so on. In our case we ranked the 9 indices every month based on their performance over the previous 6 months and form a portfolio of the best 5 performing strategies (with 20% of the portfolio in each). This approach is known as 'relative momentum'; 'relative' because we form portfolios with strategies that have performed well relative to the others.

Of course, the momentum strategy does not preclude the possibility that all 9 are performing 'badly', and that we are simply choosing the best of a bad lot! An alternative approach, known as 'trend following', or by some as 'absolute momentum', involves buying an asset if its price is in an upward trend but holding the same percentage in cash, or similar low risk asset, if it is in a downtrend. Of course the idea of what constitutes an upward or downward trend is pretty controversial so we use the following, simple rules:

i. If the value of the smart beta index is above the average of the previous 8 end-month values, we 'invest' one ninth of our portfolio into this index strategy. Our results are not too sensitive to the exact definition of what constitutes a 'trend' in this context.

ii. However, if the value of the smart beta index is below this number we 'invest' one ninth of our portfolio into US T-bills.

The implication of applying such a rule to assets in general and our 9 smart beta indices in particular is that in down markets it is quite possible that the portfolio could be largely (or indeed completely) in cash: hence wealth is protected. Table 3 summarises the performance for our 9 indices using these portfolio construction rules.

Table 3: Applying momentum and trend following strategies, Dec 2001 - Sept 2015

Factor Index Portfolios	S&P 500	Momentum	Trend following
Annualised Returns	5.9%	8.4%	9.1%
Annualised Volatility	14.6%	14.0%	8.9%
Sharpe Ratio	0.31	0.50	0.87
Max. Drawdown	50.9%	46.3%	13.7%

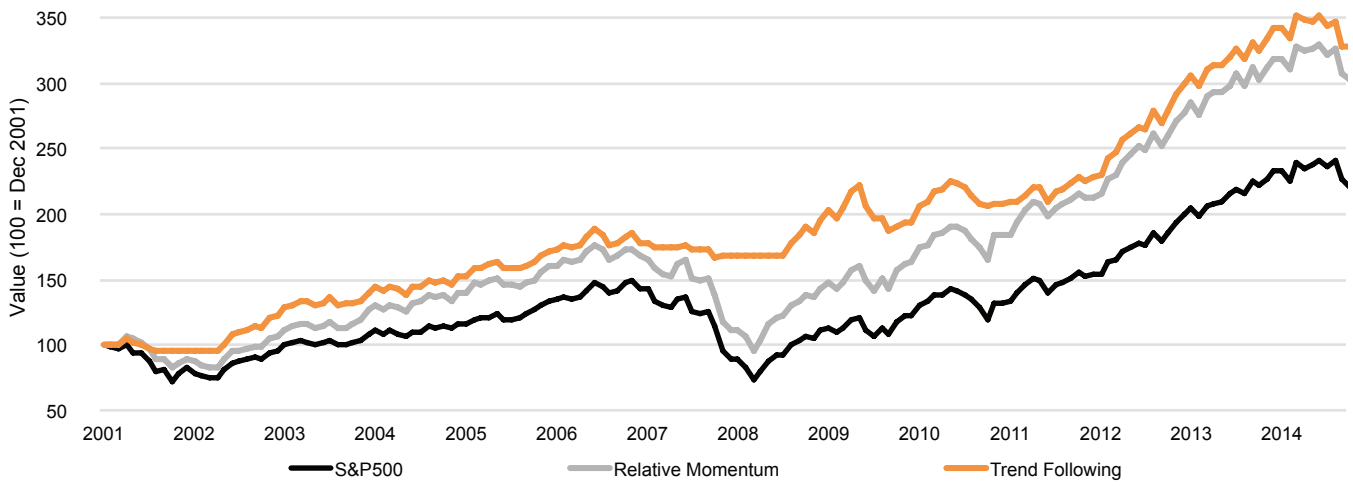
This Table presents the performance of the S&P 500 and that of two investment strategies based on nine S&P smart beta indices. Source: Datastream, Bloomberg and Standard & Poors. Past performance is not a guide to future returns.

These two strategies certainly give superior performance to the Market cap-weighted approach, and the equal-weighting of the smart beta indices shown in Table 2. But the most dramatic improvement is seen in the massively reduced maximum drawdown experienced by the trend following strategy which moves assets between cash and the individual smart beta strategies based on simple rules applied to each of the 9 indices separately. Not only is the average annualised return of 9.1% superior to all but one of the individual smart beta strategies shown in Table 1, the maximum drawdown statistic has been reduced from around 40-50% to just 13.7%. We know from behavioural finance research that what investors fear most are sharp losses, essentially because they are loss averse, rather than being risk averse as the classical modern portfolio theory assumes. The trend following smart portfolio strategy appears to have mitigated much of this downside risk[2].

Figure 2 plots the cumulative total return from the S&P500 index, along with that of the Momentum and Trend Following strategies.

[2] Researchers have applied similar trend following rules to a wide range of asset classes, including currencies, commodities, real estate and equities, using a range of sample periods, generally find that maximum drawdowns can be massively reduced, volatility slashed, with no adverse consequences for returns. For example, see Faber, M., A Quantitative Approach to Tactical Asset Allocation', The Journal of Wealth Management, Spring, 2007.

Figure 2: Momentum and Trend Following Portfolio Returns against S&P500

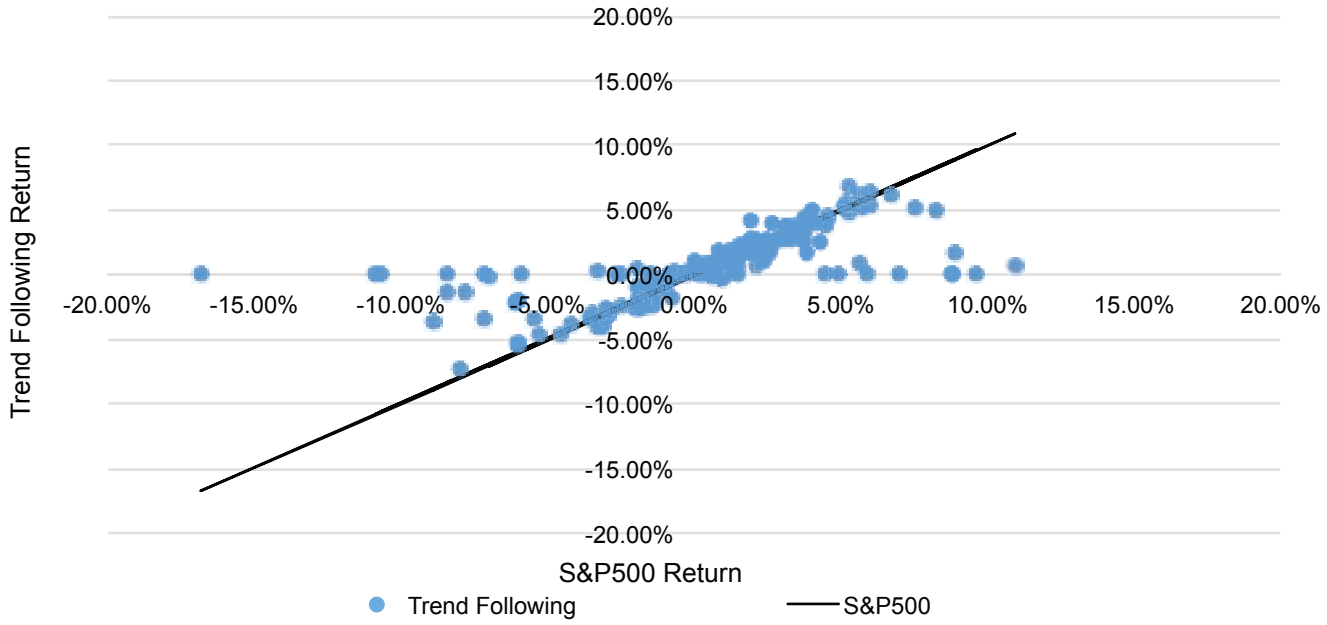


This Figure presents the performance of the S&P 500 and that of two investment strategies based on nine S&P smart beta indices (see also Table 3). Source: Datastream, Bloomberg and Standard & Poors. Past performance is not a guide to future returns.

What is the reason for the historical success of such a simple trend following rule? Behavioural finance tells us that investors are prone to numerous biases and are far from rational. Such biases include herding, continuation, regret avoidance, mental accounting, etc., all of which help to explain why investors hold on to losing positions for far too long. A rule like the simple trend following rule applied here, might be an effective way of overcoming such emotional biases.

But would it have been possible to capture this performance by seeking to protect against the downside risk embodied in say the S&P500, by using derivative instruments? In practice it turns out that just as you want to buy protective puts as volatility rises then so does the rest of the market! So the cost of protection rises, often dramatically, and performance suffers. Switching in and out of cash, by using the trend following signals, carries no such high price and, indeed, a 'pay-off type' diagram linking the underlying S&P500 return with that of the active portfolio looks very much like a conventional call option diagram. This call option-like payoff structure is shown in Figure 3. Each dot on the figure represents the return on the S&P500 index with the trend following filter on the one hand (the vertical axis) and the return in the same month derived from the (market cap-weighted) investment in the S&P500 (horizontal axis). The trend following strategy tends to produce very similar returns when the S&P500 index had a positive month, but far better returns when the market index sold off. This is the sort of protection that a call option on the market provides.

Figure 3: Optionality in Strategy Payoffs, Dec 2001 - Sept 2015
Comparing S&P500 with the S&P500 with a trend following strategy



This Figure presents the performance of the S&P 500 and a trend following investment strategy based on the S&P index. Source: Datastream, Bloomberg and Standard & Poors. Past performance is not a guide to future returns.

5. A Five Index Smart Beta Portfolio

The academic community has investigated over 250 factors[3] that might all be candidates for a basis of a smart beta index: some 20 years ago there were only five, namely market cap, value, small cap, momentum and low beta. Here we construct a simplified version of the index universe by choosing strategies with the lowest pairwise correlations, but which also have been replicated across numerous time-periods and geographies and which have some solid underpinning in financial and economic theory.

The fact that performance improves so dramatically once the strategies are allowed to switch into cash when the trend turns downward suggests that this could be key to improved performance for a range of asset classes. This leads to a well-trodden path in economics of trying to identify different economic regimes which will be associated in a fairly systematic way with up and down markets. But how do we decide if a market is in an upward (bull) or downward (bear) phase?

There are many approaches to so-called 'market-timing', but in Table 4 we use some popular economic indicators such as the implied volatility of the stock market, known as the VIX, and the sentiment indicator called the PMI, the Purchasing Managers' Index, to help us identify an economic regime in a systematic way. Both are forward-looking variables rather than an average of past values or similar. We transform these variables into bull and bear market indicators and use their signals on a monthly basis to guide portfolio construction. The results are presented in Table 4. The results in the final column of Table 4 are by far the most impressive of all the portfolio combinations we have looked at. The five factor dynamic portfolio approach, produced an annualised return of 13.4%, a Sharpe ratio of 1.10 and a maximum drawdown statistic of 13.6%.

[3] See Harvey, C.R., et al, And the Cross-Section of Expected Returns, available at http;//ssrn.com/abstract=2249314(2015)

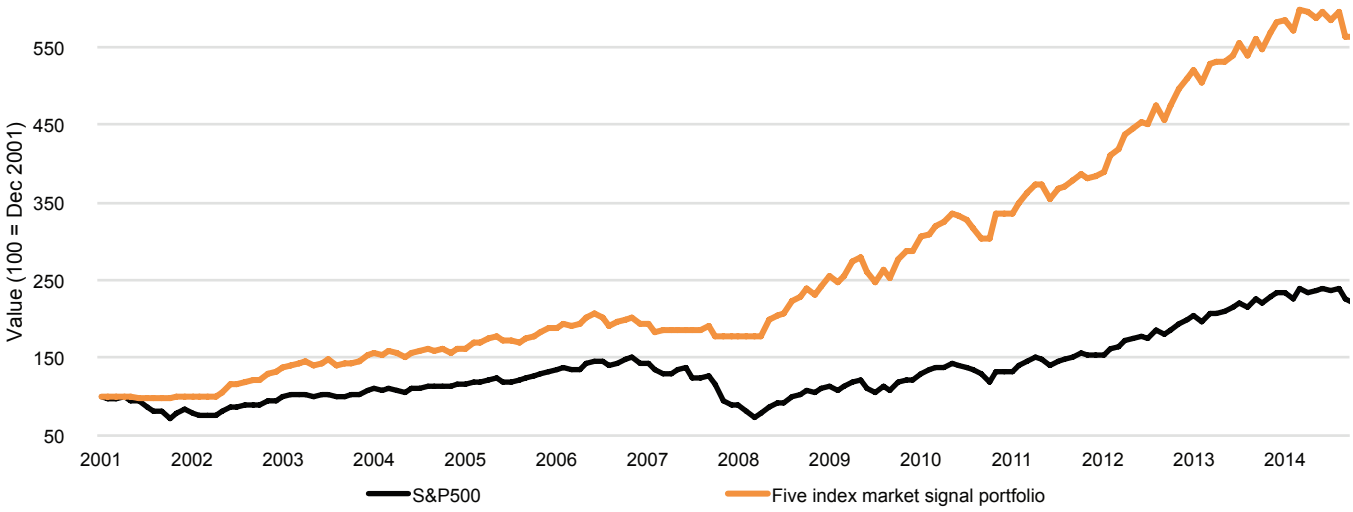
Table 4: Five Smart Beta Indices with Dynamic Portfolio Selection (Dec, 2001 – Sept, 2015)

Factor Index Portfolios	S&P 500	Equally-weighted	5 factor, active portfolio
Annualised Returns	5.9%	8.5%	13.4%
Annualised Volatility	14.6%	14.3%	10.9%
Sharpe Ratio	0.31	0.49	1.10
Max. Drawdown	50.9%	47.5%	13.6%

This Table presents the performance of the S&P 500, an equally-weighted portfolio of nine S&P smart beta strategies and that of an active investment strategy based on five S&P beta indices. Source: Datastream, Bloomberg and Standard & Poors. Past performance is not a guide to future returns.

Figure 4 shows the performance of the USA equity S&P500 versus the dynamic 'market signal' five index portfolio.

Figure 4: Market Signal Portfolio Returns against S&P500



This Figure presents the performance of the S&P 500 and that of an active investment strategy based on five S&P beta indices (See also Table 4). Source: Datastream, Bloomberg and Standard & Poors. Past performance is not a guide to future returns.

6. Conclusions

It is widely considered to be particularly difficult to choose an active US equity mutual fund that consistently outperforms the cap-weighted US equity market: hence the attraction to many investors of investing in a market cap-weighted US equity tracking portfolio. Arguably the difficulties that active US equity fund managers have in beating this benchmark stem from the efficiency of this heavily researched capital market. However, we saw in paper 2 of this series that even a Scrabble™ [4]-weighted investment strategy can outperform this benchmark, and in this paper have seen that single risk factor indices produced by S&P can also dominate the same benchmark.

However, combining smart beta equity strategies is still at an early stage. We know that individual strategies are not always the best performers. Rather, changes in the business cycle will likely influence each strategy and therefore affect their relative performance. So careful combinations of strategies into portfolios can lead to superior performance, very substantially indeed when we allow trend following or active portfolio construction as in Table 4, taking advantage of the economic cycle to identify different regimes.

The success of these results can be challenged on a number of grounds, most notably on the grounds of transactions costs and fees, that have not been included in our calculations for any of the strategies, though our initial investigations calibrating average portfolio strategy turnover and transactions costs shows that superior performance has largely been maintained. We do not claim, that past performance is a guarantee of future performance. Instead we hope that the results here will inspire investors to quiz their advisers and investment managers to take another look at how smart beta factors might be combined to produce a smart beta portfolio, with the potential for commensurately more attractive risk-adjusted returns.

In the next and final paper in this series we look at the due diligence and monitoring challenges that investors face when choosing a fund that implements a smart beta investment strategy compared with choosing a more traditional, active investment fund.

[4] This paper is being produced by CASS Business School and Invesco PowerShares. It is not endorsed by any rights holder in respect of the Scrabble game.

Contributors

Prof. Andrew Clare

Andrew Clare is the Professor of Asset Management at Cass Business School and the Associate Dean responsible for Cass's MSc programme, which is the largest in Europe. He was a Senior Research Manager in the Monetary Analysis wing of the Bank of England which supported the work of the Monetary Policy Committee. While at the Bank Andrew was responsible for equity market and derivatives research. Andrew also spent three years working as the Financial Economist for Legal and General Investment Management (LGIM), where he was responsible for the group's investment process and where he began the development of LGIM's initial Liability Driven Investment offering. He is the co-author of "The Trustee Guide to Investment". He has also published extensively in both academic and practitioner journals on a wide range of economic and financial market issues. In a survey published in 2007, Andrew was ranked as the world's ninth most prolific finance author of the past fifty years. Andrew serves on the investment committee of the GEC Marconi pension plan, which oversees the investments and investment strategy of this £4.0bn scheme, and is a trustee and Chairman of the Investment Committee of the £2.5bn Magnox Electric Group Pension scheme.

Prof. Stephen Thomas

Steve Thomas is Professor of Finance and Course Director for the Executive MBA at Cass Business School, London. Prior to this he has been a Professor of Finance at the University of Wales, Swansea, and at Southampton University, and a Visiting Professor at the ICMA Centre,University of Reading,and Queen's University, Canada. He has been a Houblon-Norman Fellow at the Bank of England (1990).

Steve has published widely in the areas of market microstructure, economics, and investment strategy and in 2005 was ranked 11th in Europe for published finance research over the previous decade. His research has won a number of awards including prizes, for the Best Paper, Global Finance Conference, Dublin, 2005 and the Best Market MicroStructure Paper, Mid-West Finance Meetings, Chicago,2006. He has also co-authored the 13 editions of the Official Training Manual for the Investment Management Certificate for CFA UK.

Steve has been involved in private client investment strategy for Firecrest Hambro, and fund strategy with Hasley Investment Management and WM Capital; he was a director of Bear Stearns Global Alpha Macro Hedge strategy London, 2005-7. In 2011 he helped create Solent Systematic Investment Strategies which creates and advises on quantitative investment strategies. He was a member of the SME Business Finance Review Advisory Board for the Welsh Assembly Government(2013).

Dr. Nick Motson

Dr Nick Motson holds a BSc from City University Business School, an MSc from London Business School and a PhD from Cass Business School. Following a 13 year career as a proprietary trader of interest rate derivatives in the City of London for various banks including First National Bank of Chicago, Industrial Bank of Japan and Wachovia Bank, Nick returned to Cass in 2005 to pursue his doctoral studies. Upon completion of his PhD he joined the faculty of finance full-time in 2008.

Nick's research interests include asset management, portfolio construction, hedge funds, alternative assets and structured products. In 2009 he was awarded the Sciens Capital Award for Best Academic Article, in The Journal of Alternative Investments for his paper Locking in the Profits or Putting It All on Black? An Empirical Investigation into the Risk-Taking Behaviour of Hedge Fund Managers.

Nick teaches extensively at masters level on alternative investments, derivatives and structured products and in recognition of the quality of his teaching he was nominated for the Economist Intelligence Unit Business Professor of the Year Award in 2012.

As well as teaching and researching at Cass, Nick actively consults for numerous banks and hedge funds and has provided research or training clients including ABN Amro, Aon Hewitt, Barclays Wealth, BNP Paribas, Financial Express, FM Capital Partners, Invesco Perpetual, NewEdge, Old Mutual and Société Générale.

Markus Umschaden

Markus Umschaden holds a BSc in Management and Electrical Engineering from the University of Technology in Munich. As Manager in PwC's Valuation & Strategy department he provided corporate finance, financial modelling and valuation advice to clients across Europe. Following his five years as transaction advisor in Munich and London, Markus completed the MBA programme at Cass Business School. His dissertation focused on the merits of factor investing and combining smart beta investment strategies, demonstrating the effectiveness of combining simple rules-based filters with forward looking indicators in a smart beta context.

Source: Cass Business School, as at end of October 2015.

About Invesco PowerShares

PowerShares was founded in the US in 2003 on a vision of delivering investment performance through the benefit-rich Exchange Traded Fund (ETF) structure. In January 2006, PowerShares expanded its vision by becoming part of Invesco Ltd, whose global presence took the Invesco PowerShares story beyond the US.

When the first ever ETF was launched in 1993, its purpose was simple — to track the S&P 500 Index while trading on a major exchange. Since then, many traditional ETFs have been designed to mirror a number of different benchmark indices. Not all ETFs, however, seek to simply track a measure of a market.

Invesco PowerShares offers a selection of ETFs that track "next generation" indices: indices that go beyond merely tracking a particular market. These indices seek to outperform the performance of a particular market through intelligent security selection and weighting.

Invesco PowerShares is part of Invesco Ltd., a leading independent global investment management company dedicated to helping people worldwide build their financial security.

About Cass Business School

In 2002, City University's Business School was renamed Sir John Cass Business School following a generous donation towards the development of its new building in Bunhill Row. The School's name is usually abbreviated to Cass Business School.

Sir John Cass's Foundation

Sir John Cass's Foundation has supported education in London since the 18th century and takes its name from its founder, Sir John Cass, who established a school in Aldgate in 1710. Born in the City of London in 1661, Sir John served as an MP for the City and was knighted in 1713.

Important information

This document is for Professional Clients only in Dubai, Jersey, Guernsey, the Isle of Man and the UK, Professional Clients and Financial Advisers in Continental Europe and Qualified Investors in Switzerland and is not for consumer use.

Where the authors from Cass Business School have expressed views and opinions, these may change without notice. These views may differ from those of Invesco Powershares.

This document is for information purposes only and is not an offering. It is not intended for and should not be distributed to, or relied upon by, members of the public. It is not an invitation to subscribe to an investment nor is it to be construed as investment advice. The information contained in this document may not have been prepared or tailored for any audience. It does not take into account individual objectives, taxation position or financial needs. Nor does this constitute a recommendation of the suitability of any investment strategy for a particular investor. While great care has been taken to ensure that the information contained herein is accurate, no responsibility can be accepted for any errors, mistakes or omissions or for any action taken in reliance thereon. You may only reproduce, circulate and use this document (or any part of it) with the consent of Invesco.

This document is issued in **Austria** by Invesco Asset Management Österreich GmbH, Rotenturmstrasse 16-18, 1010 Wien, in **Belgium** by Invesco Asset Management S.A. Belgian Branch (France), Avenue Louise 235, B-1050 Bruxelles, in **France**, **Denmark**, **Finland**, **Greece**, **Luxembourg**, **Norway** and **Portugal** by Invesco Asset Management SA, 16-18, rue de Londres, F-75009, Paris, authorised and regulated by the Autorité des Marchés Financiers in France, in **Dubai** by Invesco Asset Management Limited, PO Box 506599, DIFC Precinct Building No.4, Level 3, The Gate Precinct, Dubai, United Arab Emirates, regulated by the Dubai Financial Services Authority, in **Germany** by Invesco Asset Management Deutschland GmbH, An der Welle 5, 60322-Frankfurt/M., regulated by Bundesanstalt für Finanzdienstleistungsaufsicht, in the **Isle of Man** by Invesco Global Asset Management Limited, George's Quay House, 43 Townsend Street, Dublin 2, Ireland, regulated in Ireland by the Central Bank of Ireland, in **Italy** by Invesco Asset Management SA Sede Secondaria, Piazza del Duomo, 22 - Galeria Pattari, 2, 20122 Milano, in **Jersey** and **Guernsey** by Invesco International Limited, 2nd Floor, Orviss House, 17a Queen Street, St Helier, Jersey, JE2 4WD, regulated by the Jersey Financial Services Commission, in the **Netherlands** by Invesco Asset Management SA Dutch Branch, J.C. Geesinkweg 999, 1114 AB Amsterdam, in **Spain** by Invesco Asset Management S.A, Sucursal en España, Calle Recoletos 15–Piso 1, 28001 Madrid, in **Sweden** by Invesco Asset Management S.A, Swedish Filial, Regus Stockholm Stureplan 568 Stureplan 4C, 4th Floor, 114 35 Stockholm, in **Switzerland** by Invesco Asset Management (Schweiz) AG, Talacker 34, 8001 Zurich, and in the **UK**, on behalf of Invesco PowerShares, by Invesco Asset Management Limited. Registered address: Perpetual Park, Perpetual Park Drive, Henley-on-Thames, Oxfordshire RG9 1HH. Authorised and regulated by the Financial Conduct Authority.

CE/UK579/59831/PDF/051115

Invesco PowerShares
info@invescopowershares.net
www.invescopowershares.net
www.invescopowershares.co.uk

Cass Business School
106 Bunhill Row
London EC1Y 8TZ
T: +44 (0)20 7040 0106
www.cassknowledge.com/cass-consulting