

Smart Beta 2.0

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Introduction

- Cap-weighted (CW) indices have been widely criticised for being overly concentrated, trend-following and providing inefficient risk-reward properties.
- Smart Beta strategies move away from CW indices, by applying a **systematic** set of constituent selection and stock weighting rules.
- The purpose of this presentation is two-fold:
 - Part 1: To understand and control for the risks associated with smart beta: the **Smart Beta 2.0** approach
 - Part 2: Where does Smart Beta belong in the investment process?
 - Replacement versus complement in cap-weighted indices; plain vanilla index or custom benchmark



Part 1: Understanding and Controlling the Risks of Smart Beta

- Providers of smart beta strategies (Smart Beta 1.0) have documented outperformance of these strategies without documenting the risks.
 - Commercial offerings (Smart Beta 1.0) are pre-packaged bundles of methodological choices. Their focus of Smart Beta 1.0 offers is on generating performance over cap-weighted indices without a main concern on risk transparency and risk choice.
- Investors should be able to fully understand and control the risks inherent in their smart beta benchmark.
- As Smart Beta strategies gain in importance in the investment process, the question of the impact of Smart Beta strategies on the risk of an investor's allocation arises, both in terms of absolute risk and relative risk.

Part 1: Performance of Smart Beta Strategies

- The capacity to outperform cap-weighted indices has been documented for a variety of smart beta strategies.

Scientific Beta USA	Relative Return over CW
Flagship (High Liquidity) Indices	
Maximum Deconcentration	+1.84%
Diversified Risk Parity	+1.80%
Maximum Decorrelation	+1.22%
Efficient Min Volatility	+1.81%
Efficient Max Sharpe Ratio	+1.80%
5 Best Performing Indices	
Mid Cap Efficient Minimum Volatility (5% TE)	+3.50%
Mid Cap Efficient Minimum Volatility	+3.40%
Mid Cap Maximum Decorrelation	+3.25%
Mid Cap Efficient Minimum Volatility (3% TE)	+3.14%
Mid Liquidity Efficient Max Sharpe Ratio (SN)	+3.02%
Median across all of 242 Scientific Beta USA Indices	+1.44%

The table shows the relative returns (over CW) of the five USA high liquidity (flagship) strategy indices and the five best performing indices in the USA. Maximum relative drawdown is the maximum drawdown of the long-short index whose return is given by the fractional change in the ratio of strategy index to the benchmark index. Extreme tracking error is the 95th percentile of the tracking error computed using a rolling window of one year and step size of one week. All statistics are annualized, all portfolios are rebalanced quarterly and the analysis is based on daily total returns from 21/06/2002 to 31/12/2012. Total number of stocks in the USA scientific beta universe is 500. Source: www.scientificbeta.com.

Part 1: Risk of Smart Beta Strategies

- Performance depends on market conditions. The worst performing strategy (among the flagship indices) in one period can turn out to be the best performer in a subsequent period.

Year	Scientific Beta USA High Liquidity (flagship) Indices					Median across all US indices
	Maximum Deconc.	Diversified Risk Parity	Maximum Decorrel.	Efficient Min Volatility	Efficient Max Sharpe	
2012	0.39%	-0.16%	-0.85%	-1.99%	-1.50%	-0.18%
2011	-3.44%	-0.42%	-4.01%	5.26%	-0.38%	-0.63%
2010	3.53%	2.03%	2.35%	-2.61%	2.02%	3.87%
2009	16.94%	12.97%	12.01%	1.44%	10.67%	4.26%
2008	-3.78%	-1.25%	-3.56%	5.10%	-0.23%	-0.75%
2007	-0.02%	-1.26%	1.37%	-1.43%	1.35%	-1.53%
2006	-2.98%	-1.78%	-5.35%	0.51%	-4.02%	-0.13%
2005	4.08%	3.09%	5.70%	3.10%	5.24%	3.79%
2004	3.64%	4.13%	6.08%	6.59%	5.90%	5.80%

The table shows the **annual excess returns** over the cap-weighted benchmark of various Scientific Beta USA high liquidity indices and the median excess returns among all 242 USA Scientific Beta indices over calendar years from 2004 to 2012. All returns are annualised. Total number of stocks in the USA scientific beta universe is 500. The analysis is based on daily total return data from 01 January 2004 to 31 December 2012, downloaded from www.scientificbeta.com.

Part 1: Smart Beta 2.0

- The first part of our presentation deals with understanding and controlling for the risks in smart beta strategies
- The **Smart Beta 2.0** approach contains three key ingredients:
 - Measurement and control of systematic risks
 - Measurement and management of the specific risk of a weighting scheme
 - Ex-ante control of potential deviations with respect to a CW reference

Part 1: Understanding the Risks of Smart Beta Indices

Systematic Risks

- Any deviation from cap-weighting will potentially lead to different exposures to common equity risk factors.

	Scientific Beta USA High Liquidity (flagship) Indices				
	Maximum Deconc.	Diversified Risk Parity	Maximum Decorr.	Efficient Min Volatility	Efficient Max Sharpe
Ann Alpha	0.49%	0.80%	0.30%	1.97%	1.15%
Market Exposure	1.08	1.03	1.03	0.90	0.99
Small Cap Exposure	0.34	0.26	0.29	0.07	0.29
Value Exposure	-0.01	-0.01	-0.05	-0.06	-0.05
R-square	100%	99%	98%	98%	99%

The table shows the Fama-French factor exposures of the Scientific Beta USA High Liquidity (flagship) indices. The market factor is the daily return of cap-weighted index of all stocks that constitute USA scientific beta universe. The small cap factor is the daily return series of a cap-weighted portfolio that is long 30% smallest market-cap stocks and short 30% largest market-cap stocks. The value factor is the daily return series of a cap-weighted portfolio that is long 30% highest B/M ratio stocks and short 30% lowest B/M ratio stocks. The risk free rate is the return of 3 months US Treasury Bill. Betas significant at the 5% confidence level are highlighted in bold and alphas are annualized. All statistics are annualized, all portfolios are rebalanced quarterly and the analysis is based on daily total returns from 21/06/2002 to 31/12/2012. Total number of stocks in the USA scientific beta universe is 500. Source: www.scientificbeta.com.

Part 1: Understanding the Risk of Smart Beta Strategies

Relative Risks

- Although Smart Beta strategies have strong probability to outperform CW indices over the long-run, given their different sources of risk, they bear large relative risks (tracking error and relative drawdowns).
- All smart beta strategies show pronounced relative drawdowns (up to 14%) and extreme tracking error (up to 9%).

Scientific Beta USA	Tracking Error	Extreme Tracking Error	Max Rel Drawdown
Flagship (High Liquidity) Indices			
Maximum Deconcentration	4.43%	7.45%	14.34%
Diversified Risk Parity	3.02%	5.19%	8.83%
Maximum Decorrelation	4.03%	6.17%	14.46%
Efficient Min Volatility	3.78%	6.89%	6.25%
Efficient Max Sharpe Ratio	3.30%	5.25%	8.52%
5 Best Performing Indices			
Mid Cap Efficient Minimum Volatility (5% TE)	4.96%	8.24%	6.47%
Mid Cap Efficient Minimum Volatility	5.82%	9.60%	10.45%
Mid Cap Maximum Decorrelation	5.51%	8.71%	14.50%
Mid Cap Efficient Minimum Volatility (3% TE)	4.90%	7.63%	9.57%
Mid Liquidity Efficient Max Sharpe Ratio (SN)	5.05%	7.71%	8.29%

The table shows the extreme risk analytics of the five USA high liquidity (flagship) strategy indices and the five best performing indices in the USA. Maximum relative drawdown is the maximum drawdown of the long-short index whose return is given by the fractional change in the ratio of strategy index to the benchmark index. Extreme tracking error is the 95th percentile of the tracking error computed using a rolling window of one year and step size of one week. All statistics are annualized, all portfolios are rebalanced quarterly and the analysis is based on daily total returns from 21/06/2002 to 31/12/2012. Total number of stocks in the USA scientific beta universe is 500. Source: www.scientificbeta.com.

Part 1: Understanding the Risks of Smart Beta Indices

Specific Risks

- Smart Beta weighting schemes are exposed to strategy-specific risks.
 - **Estimation risk** (input parameters are measured with some error)
 - **Optimality risk** (optimality - in the sense of achieving the highest Sharpe ratio - is subject to assumptions)

Strategy	Condition for Optimality Risk to be zero	Sources of Estimation Risk
Maximum Deconcentration / Equal Weighting	Expected returns, volatility and correlations are identical	None
Diversified Risk Parity	Sharpe Ratios and Correlations are identical	Volatilities
Maximum Decorrelation	Expected returns and volatilities are identical	Correlation matrix
Efficient Minimum Volatility	Expected returns are identical	Correlation matrix, volatilities
Efficient Maximum Sharpe Ratio	None (optimal by construction)	Correlation matrix, volatilities, expected returns

Part 1: Controlling the Risks: Smart Beta 2.0

Controlling Small Cap Exposure

- Small cap exposure of the Maximum Deconcentration strategy can be reduced by using a large cap **stock selection**.
- The performance of the Large Cap Max Deconcentration strategy remains superior the that of the CW reference index.

	CW Benchmark	Scientific Beta USA Maximum Deconcentration	
		All Stocks	Large Cap Selection
Ann Alpha	N.A.	0.40%	0.49%
Market Exposure	N.A.	1.01	1.00
Small Cap Exposure	N.A.	0.44	0.19
Value Exposure	N.A.	-0.01	0.06
R-square	N.A.	100%	99%
Ann Returns	6.07%	8.09%	7.51%
Sharpe Ratio	0.21	0.28	0.26
% increase in Sharpe	-	33.3%	23.8%

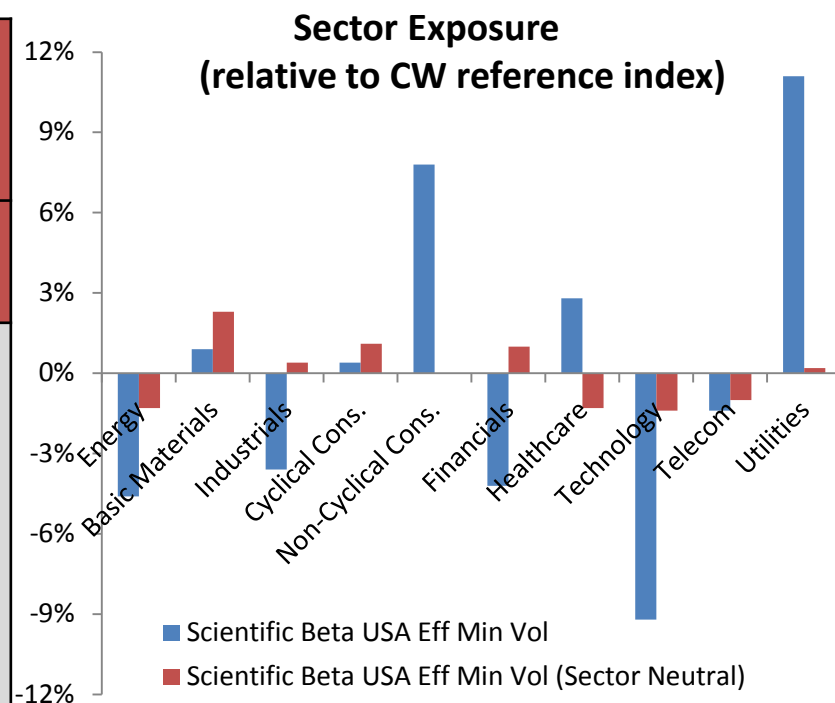
The table shows the Fama-French factor exposures and Risk-Return analytics of the Scientific Beta CW strategy, Scientific Beta USA Maximum Deconcentration and Scientific Beta USA Large Cap Maximum Deconcentration strategy. The market factor is the daily return of cap-weighted index of all stocks that constitute USA scientific beta universe. The small cap factor is the daily return series of a cap-weighted portfolio that is long 30% smallest market-cap stocks and short 30% largest market-cap stocks. The value factor is the daily return series of a cap-weighted portfolio that is long 30% highest B/M ratio stocks and short 30% lowest B/M ratio stocks. The risk free rate is the return of 3 months US Treasury Bill. Betas significant at the 5% confidence level are highlighted in bold and alphas are annualized. All statistics are annualized, all portfolios are rebalanced quarterly and the analysis is based on daily total returns from 21/06/2002 to 31/12/2012. Total number of stocks in the USA scientific beta universe is 500. Source: www.scientificbeta.com.

Part 1: Controlling the Risks: Smart Beta 2.0

Controlling Sector Weights

- Smart Beta Indices may be subjected to sector neutrality constraints.
- Imposing such constraints on a Minimum Volatility strategy does affect performance but the strategy maintains considerable benefits versus cap-weighting

	CW Index	Scientific Beta USA Efficient Minimum Volatility	
		No Sector Control	Sector Neutral
Ann. Returns	6.07%	8.23%	8.02%
Sharpe Ratio	0.21	0.36	0.33
Volatility	21.31%	18.32%	19.24%



The table shows annualised performance statistics based on daily total returns from 21/06/2002 to 31/12/2012. Total number of stocks in the USA scientific beta universe is 500. Source: www.scientificbeta.com.

The figure shows excess sector weights with respect to the cap-weighted reference index, as of the last rebalancing date (in 2012 21 December 2012).

Part 1: Controlling The Risks: Smart Beta 2.0

Controlling Relative Risk

- The overall tracking error and extreme tracking error of smart beta strategies can be reduced through a suitably designed relative risk control methodology.

	Scientific Beta USA Maximum Decorrelation		
	5% TE Target	3% TE Target	2% TE Target
Excess Returns over CW	1.55%	0.99%	0.72%
Tracking Error	3.31%	2.03%	1.38%
Information Ratio	0.47	0.49	0.52
95% Tracking Error	5.87%	3.55%	2.38%
Max Rel Drawdown	13.48%	8.36%	5.25%

The 3% and 2% target tracking error portfolios are obtained by combining a 5% TE controlled (and beta constrained) satellite with the cap-weighted core. Maximum relative drawdown is the maximum drawdown of the long-short index whose return is given by the fractional change in the ratio of strategy index to the benchmark index. 95% tracking error is the 95th percentile of the tracking error computed using a rolling window of one year and step size of one week. All statistics are annualized. Total number of stocks in the USA scientific beta universe is 500. The analysis is based on daily total return data from 21 June 2002 to 31 December 2012, downloaded from www.scientificbeta.com.

- The tracking error and relative drawdown can be reduced to a desired level by setting an appropriate level of target TE without cancelling out-performance.

Part 1: Controlling The Risks: Smart Beta 2.0

Specific Risk: Smoothing Performance over Time

Calendar Year	Scientific Beta USA					Div. Multistrategy
	Max Deconc.	Div Risk Parity	Max Decorr.	Efficient Min Vol	Efficient Max Sharpe	
2012	0.93%	0.40%	-1.23%	-2.37%	-1.91%	-0.81%
2011	-2.59%	0.05%	-2.30%	5.78%	0.95%	0.36%
2010	6.58%	5.54%	6.59%	3.44%	5.24%	5.48%
2009	10.59%	7.60%	7.52%	0.20%	6.24%	6.43%
2008	-3.24%	-0.99%	-3.16%	4.02%	-1.49%	-0.98%
2007	-2.24%	-3.56%	-0.33%	-4.08%	-1.32%	-2.31%
2006	-0.04%	0.65%	-1.84%	1.76%	-0.87%	-0.07%
2005	4.79%	3.68%	4.84%	2.80%	5.54%	4.33%
2004	6.68%	7.32%	6.76%	7.59%	6.24%	6.92%

The table shows the excess return over the cap-weighted benchmark of various Scientific Beta USA strategies over calendar years from 2004 to 2012. The Scientific Beta Diversified Multistrategy weighting scheme is an equal weighted combination of the Maximum Sharpe Ratio, the Minimum Volatility, the Maximum Deconcentration, the Maximum Decorrelation and the Diversified Risk Parity weighting schemes. All returns are annualised. Total number of stocks in the USA scientific beta universe is 500. The analysis is based on daily total return data from 01 January 2004 to 31 December 2012, downloaded from www.scientificbeta.com.

- Results show that compared to the individual smart beta strategies, a diversified multistrategy index (combination of all strategies) more stable performance over time.

Part 1: Controlling The Risks: Smart Beta 2.0

Specific Risk: Smoothing Performance over Time

Scientific Beta USA	Excess Return over Scientific Beta USA CW			
	Bull Market	Bear Market	High Vol. Market	Low Vol. Market
Maximum Deconcentration	1.05%	-0.28%	0.13%	0.89%
Diversified Risk Parity	0.59%	0.38%	0.28%	0.73%
Maximum Decorrelation	0.56%	0.14%	0.15%	0.63%
Efficient Minimum Volatility	-0.44%	1.91%	0.72%	0.33%
Efficient Maximum Sharpe Ratio	0.29%	0.63%	0.31%	0.56%
Diversified Multistrategy	0.41%	0.56%	0.33%	0.63%

The table shows the excess return over the cap-weighted benchmark of various Scientific Beta USA strategies for four different market regimes. Bull Market comprises of top 50% quarters sorted on quarterly cap-weighted benchmark's returns and the Bear Market comprises the rest. High Volatility market comprises of top 50% quarters sorted on quarterly cap-weighted benchmark's volatility and the Low Volatility market comprises the rest. All returns are **quarterly**. Total number of stocks in the USA scientific beta universe is 500. The analysis is based on daily total return data from 21 June 2002 to 31 December 2012, downloaded from www.scientificbeta.com.

- The multi-strategy approach averages out the excess returns over different market regimes.
- Unlike some of smart beta strategies, its performance in bull/bear markets and high/low volatility markets is not extreme.

Part 2: Where does Smart Beta belong in the Investment Process?

- The asset management industry traditionally has separated product offerings into active management based on security selection and passive management based on cap-weighted market indices.
- An increasing number of alternative equity index strategies or “advanced beta” strategies has been introduced recently as a “third way” of managing equity portfolios
 - based on the principle of systematic and transparent rules
 - deviating from pure buy and hold strategies and allowing for objectives other than representation of the market (such as minimising volatility, balancing risk contributions etc.)
- Such advanced beta strategies may be useful building blocks for designing passive and active management strategies.

Part 2: Smart Beta and Passive Management *Replacing vs. complementing cap-weighted indices*

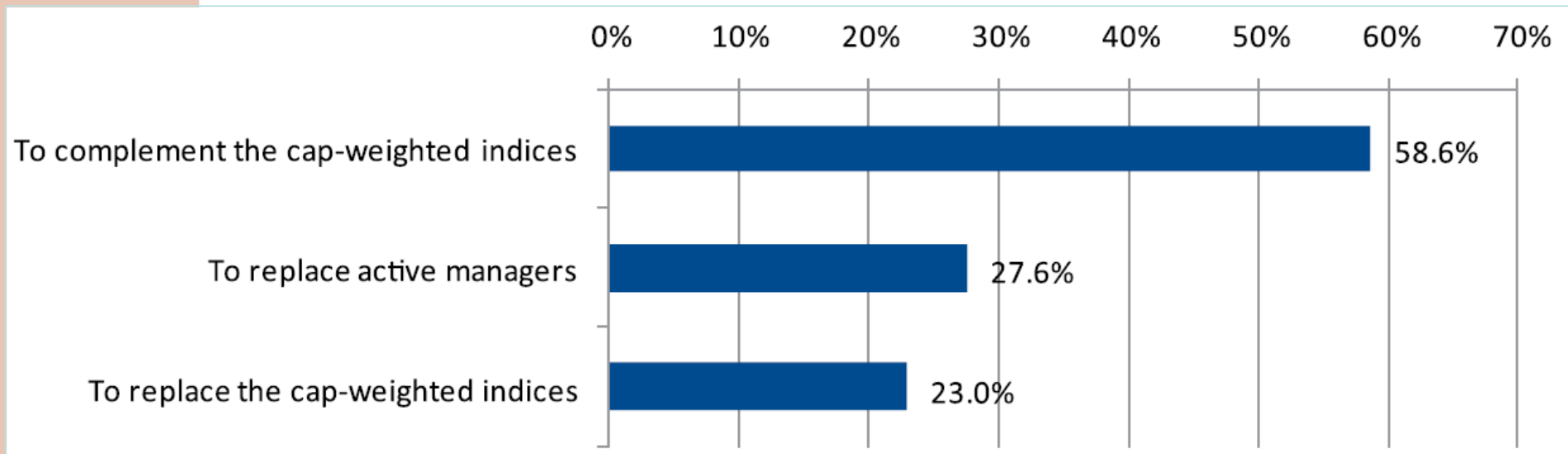
- Smart beta strategies maintain some of the advantages of cap-weighted indices (systematic and transparent rules, low cost, low turnover) and can thus be used in passive management:
 - As a **Replacement** of Cap-Weighted indices: The smart beta index (or combination of indices) becomes the strategic equity benchmark.
 - As a **Complement** of Cap-Weighted Indices (in 2 ways):
 - ***As a Replacement for Active Benchmarked Managers:***
 - The aim of the strategy is to beat the cap-weighted benchmark while respecting a tracking error target (CW index remains the reference).
 - Therefore Investor will focus on IR and ex ante control of tracking error
 - ***Blended Benchmark in Passive Management:***
 - A blended portfolio (core-satellite) of smart beta strategy and cap-weighted index becomes the strategic benchmark.
 - The idea is to control the risk of extreme underperformance with the mix of CW and smart beta indices, so the smart beta portfolio used has no explicit tracking error control.

Part 2: Smart Beta and Passive Management

What do investors say?

Results from the EDHEC-Risk North American Index Survey:

The following graph shows investors' purposes in using alternative weighting schemes. This question is only applicable to those of the 139 respondents (of which 80% are professionals in institutional investment management and who have used, who are going to use and who are still considering using alternative weighting schemes.



Part 2: Using Smart Beta in Passive Management Diversification of a Large Cap Index (Blended Approach)

- We select two indices (Value Max Decorrelation and Low Vol Efficient Min Vol indices) that have weak correlation and very different risk factor exposures.

Correlation of excess returns (over CW) = 0.089

- The Multi Smart Beta: 50% Value Max Decorr + 50% Low Vol Efficient Min Vol.

Scientific Beta USA Indices	Cap Weighted	Value Max Decorr	Low Vol Efficient Min Volatility	Multi Smart Beta (50/50 mix)
Ann Alpha	0.00%	1.02%	2.51%	1.76%
Market Beta	1.00	0.94	0.73	0.83
Small Cap Beta	0.00	0.33	0.07	0.20
Value Beta	0.00	0.14	-0.03	0.06
R-square	100%	97.66%	92.50%	97.32%
Ann. Return	6.07%	8.73%	8.04%	8.48%
Relative Return	0%	2.66%	1.98%	2.41%
Volatility	21.31%	22.06%	16.27%	18.93%
Sharpe Ratio	0.21	0.32	0.39	0.36
Tracking Error	0%	4.70%	7.23%	4.48%
95% TE	0%	6.99%	12.97%	7.32%

The table shows the Correlation, the Fama-French factor exposures, and Risk-Return analytics of Scientific Beta USA CW strategy, Value Maximum Decorrelation, Low Volatility Efficient Minimum Volatility and Multi Smart Beta (50% Value Max Decorrelation + 50% Low Vol Efficient Min Vol) strategy. The market factor is the daily return of cap-weighted index of all stocks that constitute USA scientific beta universe. The small cap factor is the daily return series of a cap-weighted portfolio that is long 30% smallest market-cap stocks and short 30% largest market-cap stocks. The value factor is the daily return series of a cap-weighted portfolio that is long 30% highest B/M ratio stocks and short 30% lowest B/M ratio stocks. The risk free rate is the return of 3 months US Treasury Bill. Betas significant at the 95% confidence level are highlighted in bold and alphas are annualized. The analysis is based on daily total returns from 21/06/2002 to 31/12/2012. Total number of stocks in the USA scientific beta universe is 500. Source: www.scientificbeta.com.

Part 2: Using Smart Beta in Passive Management *Diversification of a Large Cap Index (Blended Approach)*

- Performance of Value Max Decorrelation index, Low Vol Efficient Min Vol index and the Multi Smart Beta index relative to the cap-weighted benchmark in different sub-periods.

Full (June '02 – Dec '12)	Cap Weighted	Value Max Decorr	Low Vol Efficient Min Volatility	Multi Smart Beta (50/50 mix)
Ann. Return	6.07%	8.73%	8.04%	8.48%
Relative Return	0%	2.66%	1.98%	2.41%
1st Half (June '02 – Sep '07)	Cap Weighted	Value Max Decorr	Low Vol Efficient Min Volatility	Multi Smart Beta (50/50 mix)
Ann. Return	11.35%	16.31%	11.76%	14.07%
Relative Return	0%	4.96%	0.41%	2.72%
2nd Half (Sep '07– Dec '12)	Cap Weighted	Value Max Decorr	Low Vol Efficient Min Volatility	Multi Smart Beta (50/50 mix)
Ann. Return	1.04%	1.64%	4.45%	3.17%
Relative Return	0%	0.61%	3.42%	2.13%

The table shows the absolute and relative returns of the Scientific Beta USA CW strategy, Value Maximum Decorrelation, Low Volatility Efficient Minimum Volatility, Multi Smart Beta (50% Value Max Decorrelation + 50% Low Vol Efficient Min Vol) in 3 different time periods. The risk free rate is the return of 3 months US Treasury Bill. All statistics are annualized, all portfolios are rebalanced quarterly and the analysis is based on daily total returns from 21/06/2002 to 31/12/2012. Total number of stocks in the USA scientific beta universe is 500. Source: www.scientificbeta.com.

Part 2: Using Smart Beta in Passive Management *Diversification of a Large Cap Index (Blended Approach)*

- The Multi Smart Beta index can be blended with a CW index to create a blended benchmark with lower levels of relative risk.

Scientific Beta USA Indices				
% weight in SciBeta USA CW	100%	80%	70%	60%
% weight in Multi Smart Beta	0%	20%	30%	40%
Ann. Return	6.07%	6.56%	6.81%	7.05%
Relative Return	0%	0.50%	0.74%	0.98%
Volatility	21.3%	20.8%	20.5%	20.3%
Sharpe Ratio	0.21	0.24	0.25	0.27
Tracking Error	0%	0.90%	1.34%	1.79%
95% Tracking Error	0%	1.46%	2.20%	2.93%
Max Relative Drawdown	-	1.31%	1.97%	2.62%

The table shows the absolute and relative Risk-Return analytics of the Scientific Beta USA CW strategy, Multi Smart Beta (50% Value Max Decorrelation + 50% Low Vol Efficient Min Vol) strategy and different mix of CW and Multi Smart Beta portfolios. The risk free rate is the return of 3 months US Treasury Bill. All statistics are annualized, all portfolios are rebalanced quarterly and the analysis is based on daily total returns from 21/06/2002 to 31/12/2012. Total number of stocks in the USA scientific beta universe is 500. Source: www.scientificbeta.com.

Conclusion

New Opportunities with Smart Beta 2.0

- Smart Beta 2.0 is a framework that allows investors to control the risks of smart beta investing
 - Investors can control which systematic risk factors and which levels of relative risk they do or do not wish to be exposed to.
 - Strategy specific risks can be diversified away by combining different smart beta strategies.
- Within a passive investment framework Smart Beta indices are being used as a complement of cap-weighted indices to enhance performance at very low marginal cost.

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Question and Answer Session



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