ScientificBeta
An EDHEC-Risk Institute Venture

Smart Beta: More for Less

Enhancing the Index Industry by Extracting Better Global Risk / Return Utilizing Multi-Factor Approach

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About ERI Scientific Beta

- ERI Scientific Beta was established in December 2012 by EDHEC-Risk Institute:
  - Objective: Provide smart beta indices drawing on the expertise of EDHEC-Risk Institute in portfolio construction and risk allocation
  - ERI Scientific Beta provides the highest levels of academic rigour, the largest choice, the best transparency, and the most extensive risk control and analysis capabilities
  - A team of 45 people, drawing on EDHEC-Risk Institute's experience in index production

2003

Launch of the **EDHEC-Risk Alternative Indices**

Used by more than 7,500 professionals worldwide to measure hedge fund performance

2009

EDHEC launches the **FTSE EDHEC-Risk Efficient Indices**, in cooperation with FTSE

Constructed using a methodology developed by EDHEC-Risk Institute

FTSE-EDHEC Risk Efficient USA Index has an annualised outperformance for the first five years of **live track record** (November 23, 2009 to December 31, 2014) of +2.49%

2012

In cooperation with Russell Investments, EDHEC-Risk Institute publishes **Solvency II Benchmarks**

2013

ERI Scientific Beta **launches Smart Beta 2.0**

The most complete and transparent platform for investing in smart beta

Over 2,500 asset owners and asset managers are using our smart beta indices either to invest in, or to benchmark, active smart beta strategies. The Scientific Beta platform currently has over 17,000 users

2014

Launch of 582 smart factor indices and 148 multi smart factor indices by ERI Scientific Beta

Launch by Morgan Stanley and Amundi of two UCITS ETFs replicating ERI Scientific Beta's multi-beta multi-strategy indices

2015

Launch of two ETFs by ETF Securities replicating ERI Scientific Beta's multi-beta multi-strategy indices

Launch of two new smart factor indices – High Profitability and Low Investment

Outline

- Smart Beta: An Answer to Criticism of Cap-Weighted Indices
- Smart Beta 2.0 and Smart Factor Indices
- Multi-Factor Allocation

- **Smart Beta: An Answer to Criticism of Cap-Weighted Indices**
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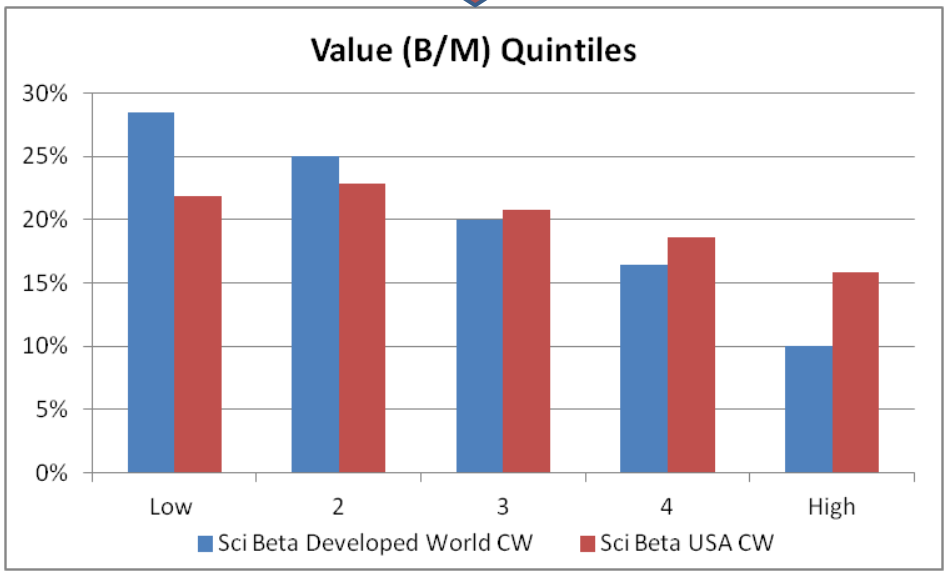
Smart Beta

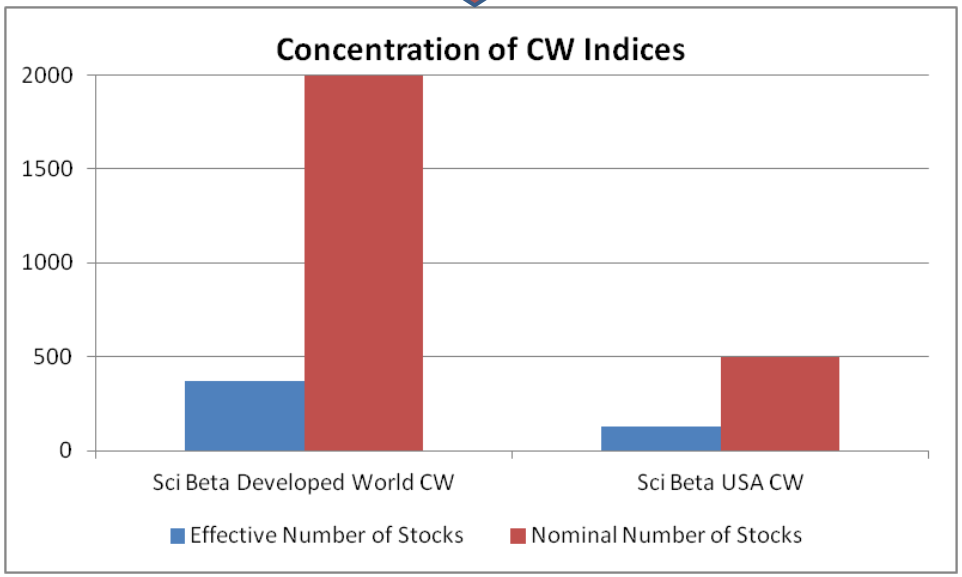
A Response to the Limitations of CW Indices

- Cap-weighted indices have two shortcomings:

Dominance of large cap growth stocks leads to "wrong" exposures to (rewarded) systematic factors

Concentration in few stocks leads to poor risk-adjusted reward for a given factor exposure

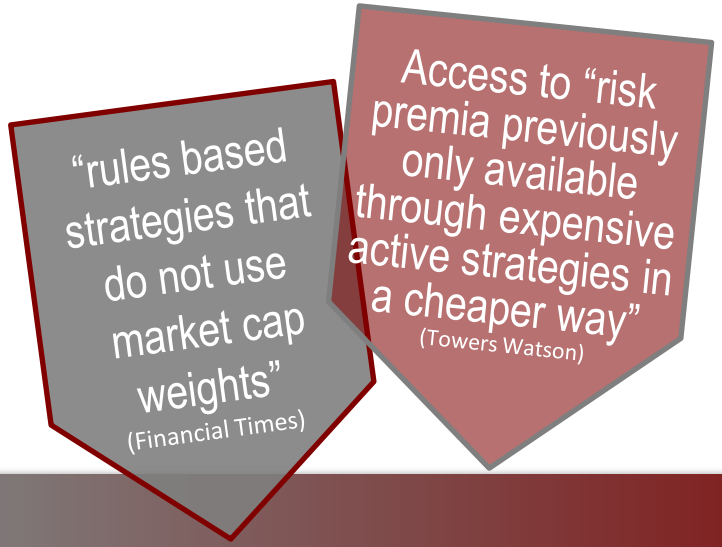




Based on quarterly weights from June 2002 to December 2013. The geographical regions and total number of stocks are: Developed World (2000), USA (500). All index data is obtained from www.scientificbeta.com.

Smart Beta

Blending Advantages of Active and Passive Investing



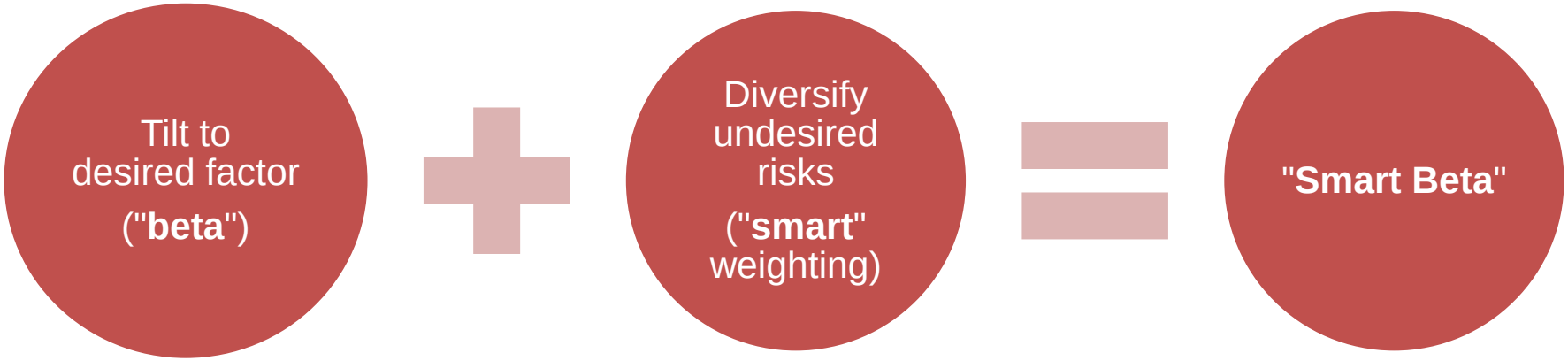
Passive Strategies | **Smart Beta** | **Active Strategies**

- **Low cost** (low turnover and fees)
- **Transparent** ground rules and data
- **Potential for outperformance** (factor tilts and portfolio construction)

- Smart Beta: An Answer to Criticism of Cap-Weighted Indices
- **Smart Beta 2.0 and Smart Factor Indices**
- Multi-Factor Allocation

Smart Beta 2.0
Better Factor Tilts and Better Diversification

- Smart Beta 2.0[1,2] harnesses the full benefits of smart beta:
  - The stock selection defines exposure to the right (rewarded) risk factors
  - The smart weighting scheme allows unrewarded risks to be reduced:
    - Diversification strategies reduce stock-specific risk (management decisions, product success, etc.)
    - Multi-strategy weighting reduces weighting scheme-specific risk (parameter estimation risk)[3]

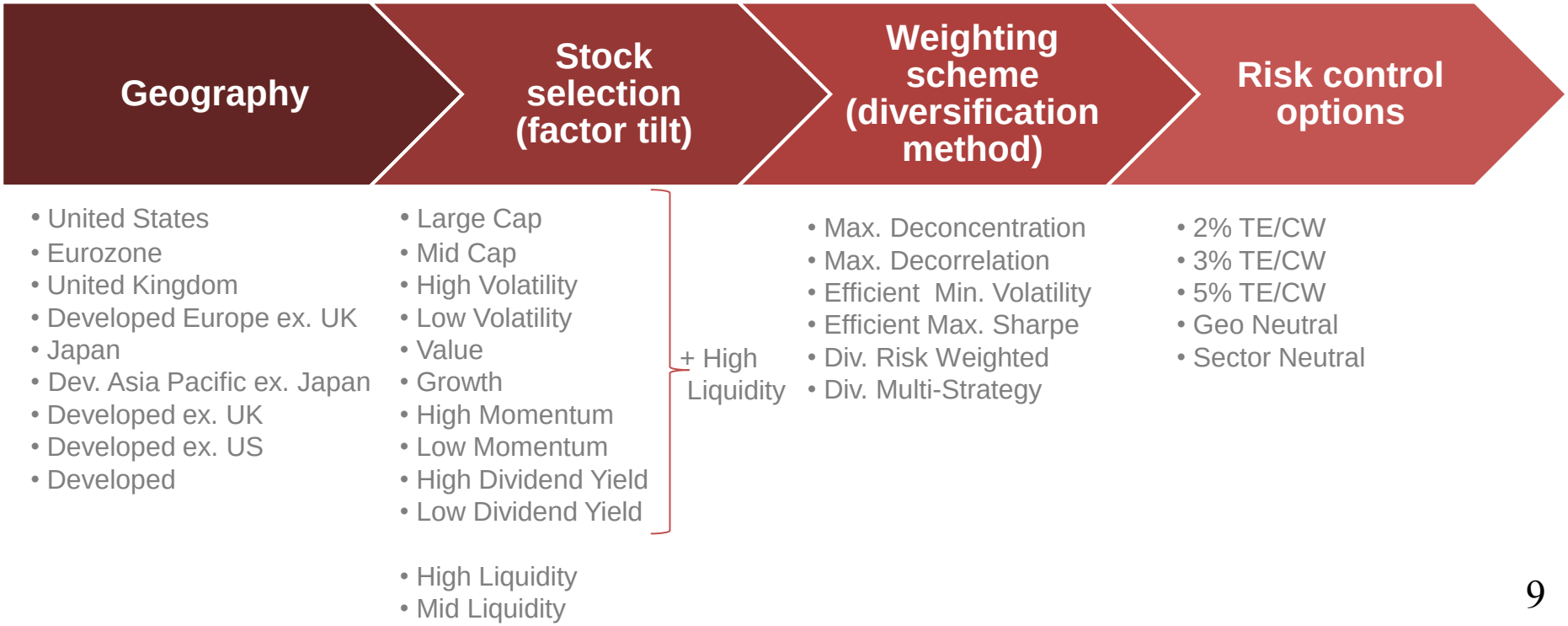


1. Amenc, N., F. Goltz, A. Lodh. 2012. Choose Your Betas: Benchmarking Alternative Equity Index Strategies. ***Journal of Portfolio Management***.
2. Amenc, N., F. Goltz. 2013. Smart Beta 2.0. ***Journal of Index Investing***.
3. Amenc, N. F. Goltz, A. Lodh, L. Martellini. 2012. Diversifying the Diversifiers and Tracking the Tracking Error: Outperforming Cap-Weighted Indices with Limited Risk of Underperformance. ***Journal of Portfolio Management.***

Smart Beta 2.0

A Consistent Index Design Framework

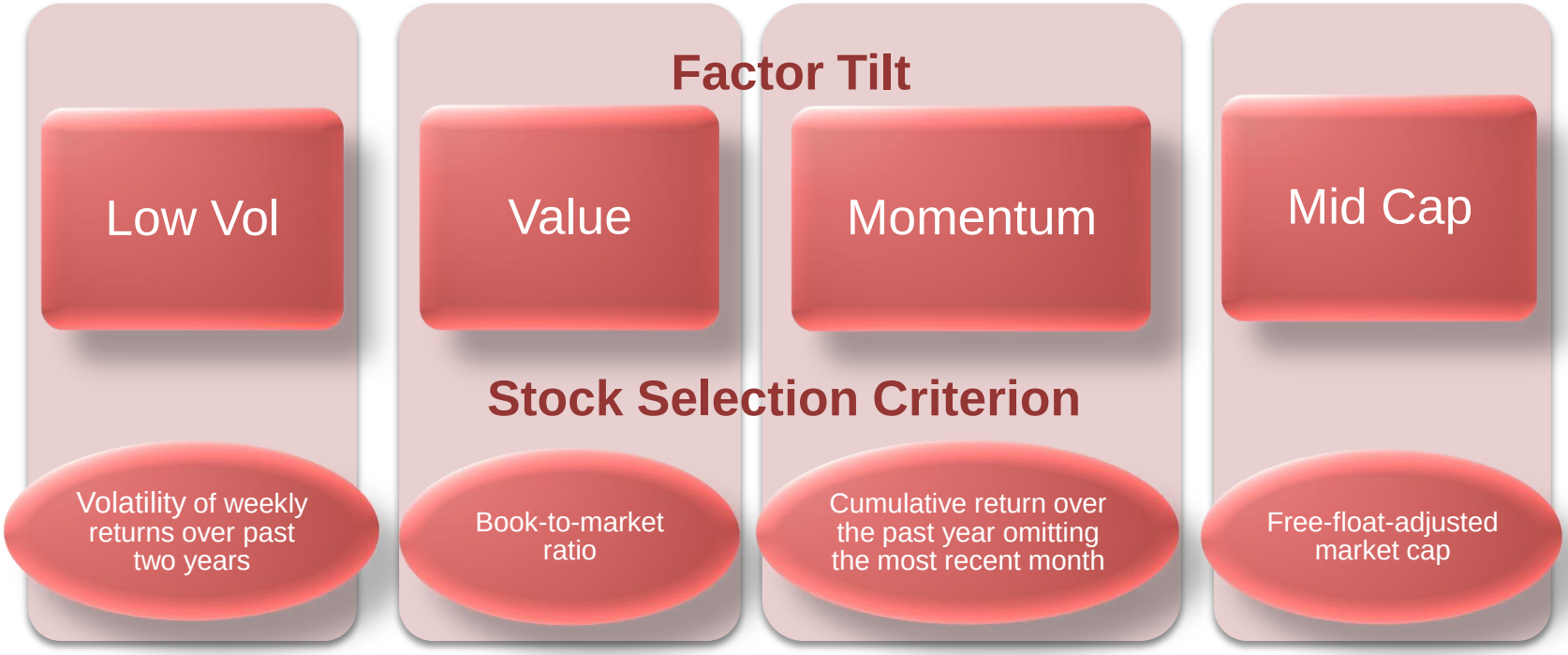
- Smart Beta 2.0 provides a consistent index design framework:
  - Allows a conscious and explicit choice of risks
  - Avoids unintended risks due to ill-defined consequences of ad hoc methodologies



Selection of Factors

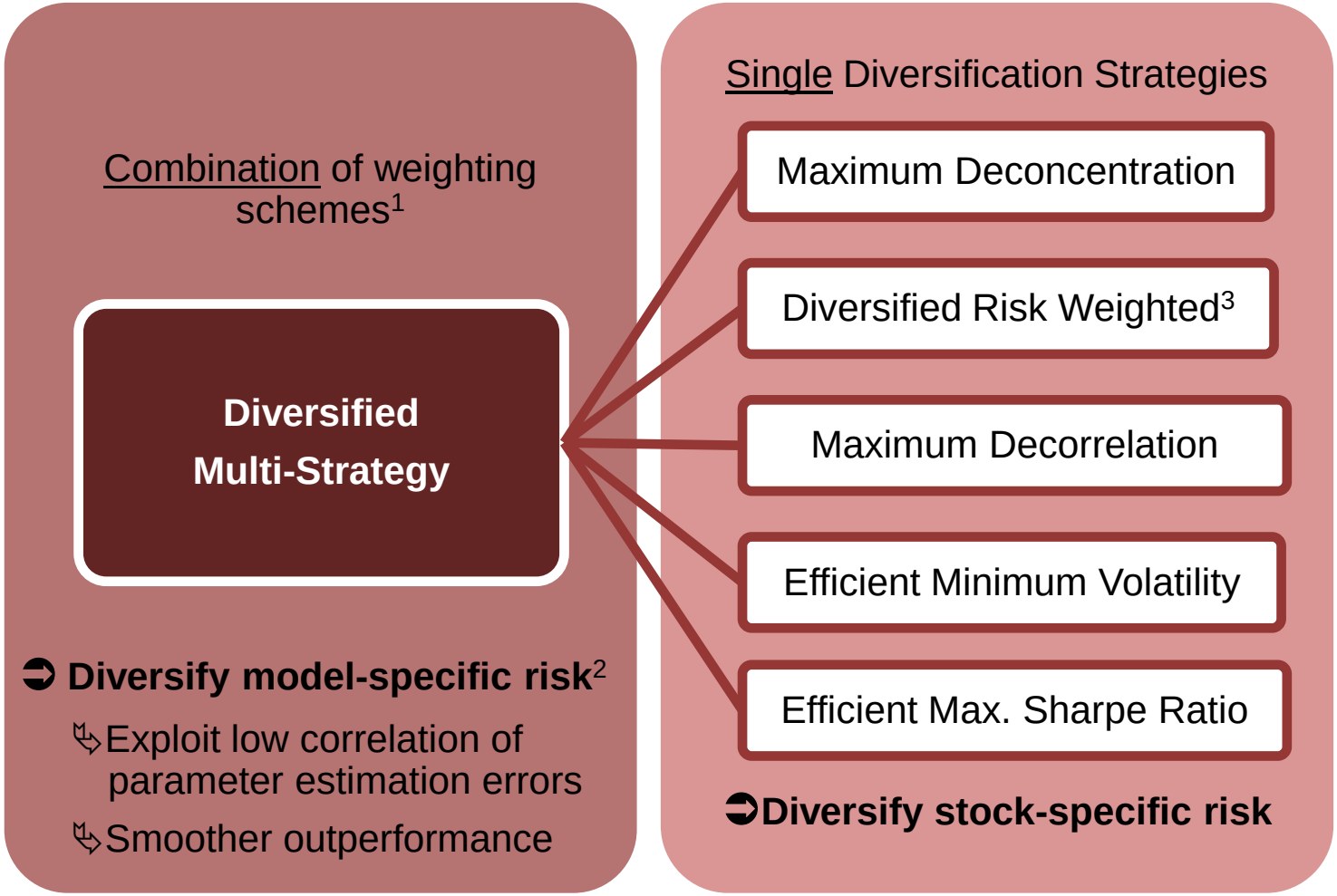
Consensual and Rewarded Factors

- **Straightforward factor definitions** put investors in control of the risks they choose and avoid the risk of data-mining of complex and unproven factor definitions
- ERI Scientific Beta has constructed indices that tilt towards (or away from) six common factors. Among all available tilts, four main factor tilts, which are **rewarded** in the long term, have been selected for inclusion in multi-beta indices



Multi-Strategy Weighting Scheme

"Diversifying the Diversifiers"



1. Diversified Multi-Strategy indices equal-weight each of the five diversification strategies.
2. See Timmermann (2006), Kan and Zhou (2007), Tu and Zhou (2010), Amenc, Goltz, Lodh, Martellini (2012) on benefits of combining portfolio strategies.
3. This weighting scheme was formerly known as "Diversified Risk Parity".

Smart Factor Indices: Be Smart With Your Beta

- Multi-Strategy factor indices improve risk-adjusted performance compared to cap-weighted factor-tilted indices

US Long-Term (Dec 1973 - Dec 2013)	SciBeta US Broad CW	Size Factor		Momentum Factor		Low Vol Factor		Value Factor	
		CW	SciBeta Mid Cap Div. Multi-Strategy	CW	SciBeta Momentum Div. Multi-Strategy	CW	SciBeta Low Vol. Div. Multi-Strategy	CW	SciBeta Value Div. Multi-Strategy
Ann. Returns	10.95%	14.28%	15.67%	11.95%	14.57%	11.19%	13.90%	12.78%	15.70%
Ann. Volatility	17.38%	17.75%	16.69%	17.52%	16.26%	15.79%	14.34%	17.97%	16.51%
Sharpe Ratio	0.32	0.50	0.62	0.38	0.57	0.37	0.60	0.42	0.63
Max. Drawdown	54.53%	60.13%	58.11%	48.91%	49.00%	50.50%	50.13%	61.20%	58.41%
Ann. Excess Returns		3.32%	4.72%	1.00%	3.62%	0.24%	2.95%	1.83%	4.75%
Ann.Tracking Error		5.90%	6.65%	3.50%	4.83%	4.46%	6.13%	4.69%	5.74%
95% Tracking Error		9.39%	11.53%	6.84%	8.58%	9.20%	11.53%	8.72%	10.14%
Information Ratio		0.56	0.71	0.29	0.75	0.05	0.48	0.39	0.83
Outperf. Prob. (1Y)		61.74%	68.07%	61.89%	68.22%	49.61%	67.24%	61.98%	70.43%
Outperf. Prob. (3Y)		69.62%	74.69%	78.99%	84.52%	52.54%	76.45%	67.34%	78.83%

The analysis is based on daily total return data from 31/12/1973 to 31/12/2013 (40 years). The benchmark used for the relative analytics is the SciBeta CW US 500 index. Mid Cap, High Momentum, Low Volatility, and Value selections all represent 50% of stocks with such characteristics in a US universe of 500 stocks. The risk-free rate is the return of the 3 month US Treasury Bill. Maximum relative drawdown is the maximum drawdown of the long-short index whose return is given by the fractional change in the ratio of the strategy index to the benchmark index. The probability of outperformance is the probability of obtaining positive excess returns from investing in the strategy for a period of 1 (or 3) years at any point during the history of the strategy. A rolling window of length 1 (or 3) years and a step size of 1 week is used. The full names of the US indices used are: SciBeta United States Mid-Cap Diversified Multi-Strategy, SciBeta United States High-Momentum Diversified Multi-Strategy, SciBeta United States Low-Volatility Diversified Multi-Strategy, SciBeta United States Value Diversified Multi-Strategy. Source: www.scientificbeta.com.

Smart Factor Indices: Be Smart with your Beta

Investability of Smart Factor Indices

Scientific Beta indices achieve investability through the following rules:

- **Turnover** is managed through optimal control of rebalancing of the indices (leading to a 36% annual one way turnover on average).
- The indices respect constraints relative to cap-weighted to ensure sufficient **capacity**
  - Holding Capacity Rule: Each stock weight is capped at a multiple of 10 of its market cap weight to avoid small investment in the smallest stocks.
  - Trading Capacity Rule: Change in weight of each stock is capped to its market cap weight to avoid large rebalancing in small stocks.
- Investors who so wish can reduce the application of the smart beta weighting scheme to the most liquid stocks in the reference universe (**high-liquidity** indices)
- In addition, **multi-strategy** indices lower the turnover (relative to the average turnover of their component indices) as some of the trades cancel between different strategies.

* This weighting scheme was formerly known as 'Diversified Risk Parity'

Smart Factor Indices: Be Smart with your Beta

Investability of Smart Factor Indices

- Scientific Beta's implementation rules lead to high investability
- Outperformance is robust even with unrealistically high transaction costs

US Long Term Track Records (Dec-73 to Dec-13)	Diversified Multi-Strategy				High Liquidity Diversified Multi-Strategy			
	Mid Cap	High Momentum	Low Volatility	Value	Mid Cap	High Momentum	Low Volatility	Value
1-Way Turnover	23.58%	64.02%	25.73%	23.91%	31.20%	67.05%	27.39%	27.45%
Days to Trade for $1 bn Initial Investment (Quantile 95%)*	0.24	0.18	0.20	0.19	0.24	0.12	0.15	0.13
Weighted Avg. Market Cap ($m)	2 959	13 601	14 614	8 984	3 549	19 720	21 048	12 599
Information Ratio	0.71	0.75	0.48	0.83	0.66	0.64	0.36	0.73
Relative Returns	4.72%	3.62%	2.95%	4.75%	4.47%	2.87%	2.08%	3.97%
Relative Returns net of 20 bps transaction costs (historical worst case)	4.68%	3.49%	2.90%	4.70%	4.41%	2.74%	2.02%	3.91%
Relative Returns net of 100 bps transaction costs (assuming extreme liquidity stress)	4.49%	2.98%	2.70%	4.51%	4.16%	2.20%	1.80%	3.69%

*The analysis is based on daily total return data from 31 December 1973 to 31 December 2013 (40 years). The cap-weighted reference index is based on the 500 largest market cap US stocks. Mean Capacity is the weighted average market capitalisation of index in $millions over the 40 year period. All statistics are average values across 160 quarters (40 years). The net returns are the relative returns over the cap-weighted benchmark net of transaction costs. Two levels of transaction costs are used - 20 bps per 100% 1-W turnover and 100 bps per 100% 1-W turnover. The first case corresponds to the worst case observed historically for the large and mid cap universe of our indices, while the second case assumes 80% reduction in market liquidity and a corresponding increase in transaction costs. The risk free rate is the return of 3 months US Treasury Bill. Source: scientificbeta.com. *. Days To Trade is the number of days necessary to trade the total stock positions, assuming a USD1bln AUM and that 100% of the Average Daily Dollar Traded Volume can be traded every day. Due to data availability, the period is restricted to last 10 years of the sample for Scientific Beta US indices.*

Best Practices to Improve Robustness

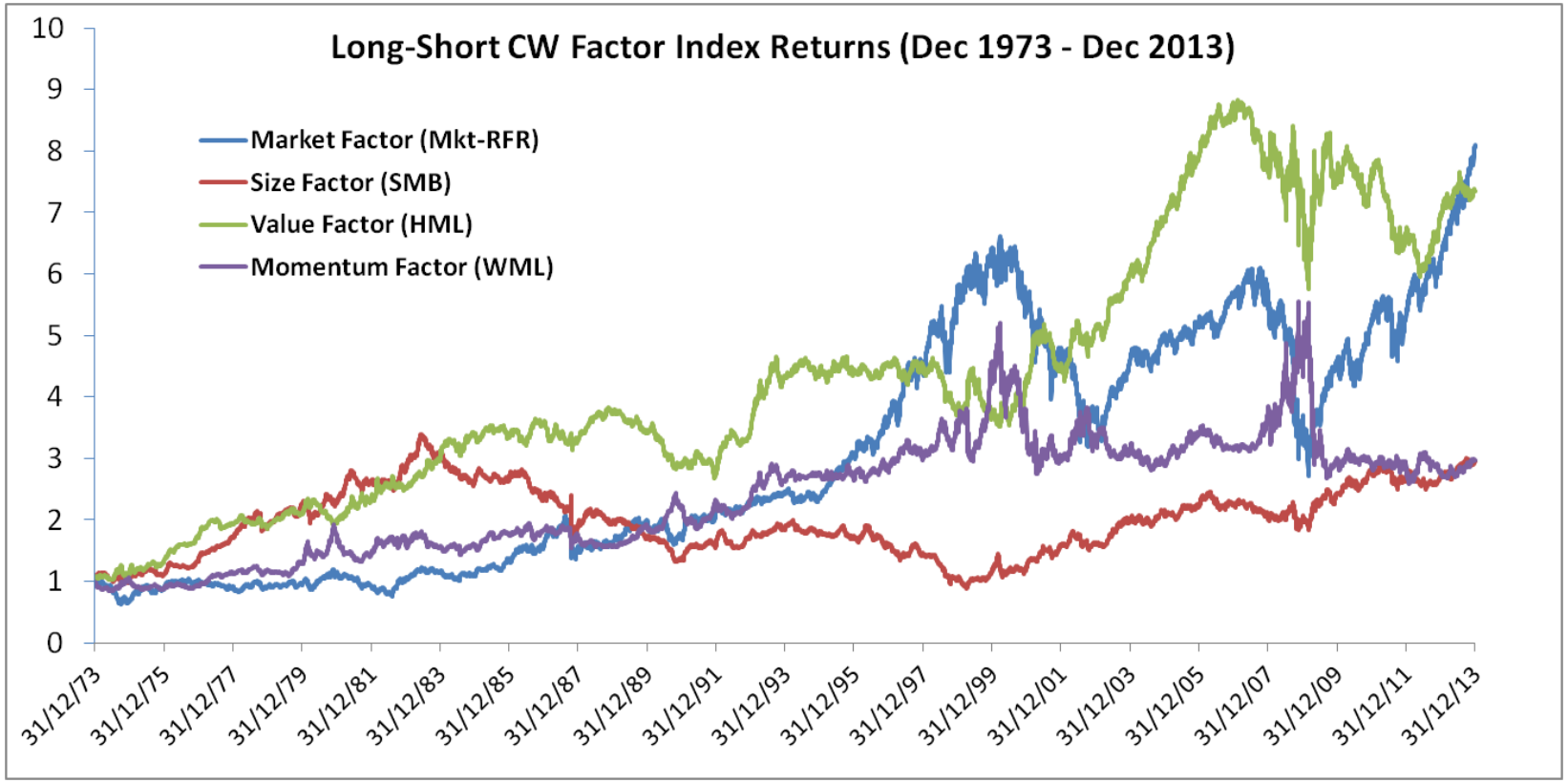
Category	Best Practices	Risk of Lack of Robustness
Methodology	Consistent Framework	Ad hoc Methodologies open the door for data mining / model mining
Factor Definitions	Simple, Tried and Tested Factors. E.g. Price to book for 'value'	Complex, Proprietary and Unproven Factor Definitions E.g. Use of proprietary variables, adjustments or constraints
Weighting scheme	Diversification of model risk and robust risk parameter estimation	Choice of a single weighting model and high sensitivity to input parameters
Transparency	Full Transparency -Free access to historical constituents and weights and unambiguous ground rules	Opaque and restricted or no access to back test data with ambiguous ground rules

- Smart Beta: An Answer to Criticism of Cap-Weighted Indices
- Smart Beta 2.0 and Smart Factor Indices
- **Multi-Factor Allocation**

Multi-Factor Allocation

Cyclicality of Factor Returns

- Factor returns are cyclical but cycles differ across factors
- Multi-factor allocation allows smoothing across the different factor cycles



Cumulative Returns of Carhart Factor *– Factors are from the SciBeta US Long-Term Track Records. The Market factor is the daily return of the cap-weighted index of all stocks that constitute the index portfolio in excess of the risk-free rate. The Small Size factor is the daily return series of a cap-weighted portfolio that is long the SciBeta cap-weighted market portfolios 6-8 (NYSE, Nasdaq, AMEX) and short the 30% largest market cap stocks of the SciBeta CW US 500 universe. The Value factor is the daily return series of a cap-weighted portfolio that is long the 30% highest and short the 30% lowest B/M ratio stocks in the SciBeta CW US 500 universe. The Momentum factor is the daily return series of a cap-weighted portfolio that is long the 30% highest and short the 30% lowest 52 weeks (minus the most recent 4 weeks) past return stocks of the SciBeta CW US 500 universe. The "Secondary Market US Treasury Bills (3M)" is the risk-free rate in US Dollars. All statistics are annualised. The analysis is based on daily total returns from 31/12/1973 to 31/12/2013.*

Multi-Factor Allocation
Low Correlation

- Correlation across smart factor indices is low
- Multi-factor allocations exploit this low correlation

SciBeta US Long-Term Track Records (Dec 1973 - Dec 2013)		Diversified Multi-Strategy		
		Momentum	Low Volatility	Value
Diversified Multi-Strategy	Mid Cap	0.69	0.64	0.86
	Momentum		0.63	0.65
	Low Volatility			0.71

SciBeta Developed (Dec 2003 - Dec 2013)		Diversified Multi-Strategy		
		Momentum	Low Volatility	Value
Diversified Multi-Strategy	Mid Cap	0.66	0.53	0.49
	Momentum		0.45	0.17
	Low Volatility			0.26

Correlation of Excess Returns *– All statistics are annualised and daily total returns from 31/12/1973 to 31/12/2013 (31/12/2003 to 31/12/2013) are used for the US (Developed) universe. The universe contains 500 (2000) stocks. The full names of the indices used are: SciBeta United States Mid-Cap Diversified Multi-Strategy, SciBeta United States High-Momentum Diversified Multi-Strategy, SciBeta United States Low-Volatility Diversified Multi-Strategy, SciBeta United States Value Diversified Multi-Strategy, SciBeta Developed Mid-Cap Diversified Multi-Strategy, SciBeta Developed High-Momentum Diversified Multi-Strategy, SciBeta Developed Low-Volatility Diversified Multi-Strategy, SciBeta Developed Value Diversified Multi-Strategy. Source: www.scientificbeta.com.*

Multi-Factor Allocation

Performance Benefits (USA)

- Combining factor tilts improves risk-adjusted performance compared to the average component index
  - EW allocation targets an improvement in the Sharpe Ratio
  - ERC allocation provides a pronounced decrease in relative risk (and a higher Information Ratio)

SciBeta US Long- Term (Dec 1973 - Dec 2013)	SciBeta US Broad CW	Diversified Multi-Strategy					
		Mid Cap	Momentum	Low Vol	Value	Multi-Beta Multi-Strategy EW	Multi-Beta Multi-Strategy ERC
Ann. Returns	10.95%	15.67%	14.57%	13.90%	15.70%	15.04%	14.84%
Ann. Volatility	17.38%	16.69%	16.26%	14.34%	16.51%	15.71%	15.66%
Sharpe Ratio	0.32	0.62	0.57	0.60	0.63	0.62	0.61
Max. DrawDown	54.53%	58.11%	49.00%	50.13%	58.41%	53.86%	53.30%
Excess Returns	-	4.72%	3.62%	2.95%	4.75%	4.09%	3.88%
Tracking Error	-	6.65%	4.83%	6.13%	5.74%	5.15%	4.83%
95% Tracking Error	-	11.53%	8.58%	11.53%	10.14%	8.95%	8.07%
Information Ratio	-	0.71	0.75	0.48	0.83	0.79	0.80
Outperf. Prob. (3Y)	-	74.69%	84.52%	76.45%	78.83%	80.43%	80.64%

Performance and Risk *– The table compares the performance and risk of the SciBeta Diversified Multi-Strategy index. The Multi-Beta Multi-Strategy EW (ERC) index is the equal weighted (equal relative risk contribution) combination of the four Diversified Multi-Strategy indices with stock selection based on Mid Cap, Momentum, Low Volatility, and Value respectively. All statistics are annualised and daily total returns from 31/12/1973 to 31/12/2013 are used for the analysis. The SciBeta CW US-500 index is used as the cap-weighted benchmark. The yield on Secondary US Treasury Bills (3M) is used as a proxy for the risk-free rate. The full names of the US indices used are: SciBeta United States Mid-Cap Diversified Multi-Strategy, SciBeta United States High-Momentum Diversified Multi-Strategy, SciBeta United States Low-Volatility Diversified Multi-Strategy, SciBeta United States Value Diversified Multi-Strategy, SciBeta United States Multi-Beta Multi-Strategy EW, SciBeta United States Multi-Beta Multi-Strategy ERC. Source: www.scientificbeta.com.*

Multi-Factor Allocation

Conditional Performance (USA)

- Combining factor tilts leads to smoother outperformance across market regimes compared to the average component index

SciBeta US Long-Term (Dec 1973 - Dec 2013)	Diversified Multi-Strategy					
	Mid Cap	Momentum	Low Vol	Value	Multi-Beta Multi-Strategy EW	Multi-Beta Multi-Strategy ERC
Bull Markets						
Ann. Rel. Returns	5.12%	3.28%	-0.99%	3.54%	2.79%	2.71%
Ann. Tracking Error	5.76%	4.04%	5.11%	5.00%	4.38%	4.13%
Information Ratio	0.89	0.81	-0.19	0.71	0.64	0.66
Bear Markets						
Ann. Rel. Returns	3.83%	3.77%	8.12%	5.99%	5.49%	5.14%
Ann. Tracking Error	8.33%	6.26%	7.94%	7.12%	6.57%	6.12%
Information Ratio	0.46	0.60	1.02	0.84	0.83	0.84

Conditional Performance *– The table shows the conditional performance and risk of multi-beta multi-strategy indices with single-beta multi-strategy indices. The Multi-Beta Multi-Strategy EW (ERC) is the equal weighted (equal relative risk contribution) combination of the four Diversified Multi-Strategy indices with stock selection based on Mid Cap, Momentum, Low Volatility, and Value respectively. Calendar quarters with positive benchmark returns comprise bull markets and the rest constitute bear markets. All statistics are annualised and daily total returns from 31/12/1973 to 31/12/2013 are used for the analysis. The SciBeta CW US-500 index is used as the cap-weighted benchmark. The full names of the US indices used are: SciBeta United States Mid-Cap Diversified Multi-Strategy, SciBeta United States High-Momentum Diversified Multi-Strategy, SciBeta United States Low-Volatility Diversified Multi-Strategy, SciBeta United States Value Diversified Multi-Strategy, SciBeta United States Multi-Beta Multi-Strategy EW, SciBeta United States Multi-Beta Multi-Strategy ERC. Source: www.scientificbeta.com.*

Multi-Factor Allocation

Outperformance Over Time (USA)

- Combining factor tilts avoids ending up with the worst performing factor tilt in a given year

Relative Return over Broad SciBeta USA CW index	Diversified Multi-Strategy					
	Mid Cap	Momentum	Low Vol	Value	Multi-Beta Multi-Strategy EW	Multi-Beta Multi-Strategy ERC
Year 2013	0.61%	2.00%	**-3.58%**	-0.68%	-0.41%	-0.29%
Year 2012	0.00%	**-2.12%**	-1.66%	-0.89%	-1.13%	-1.14%
Year 2011	0.39%	1.59%	8.00%	**-0.59%**	2.33%	2.11%
Year 2010	10.84%	5.46%	**2.41%**	3.70%	5.59%	5.16%
Year 2009	5.97%	**-4.57%**	-3.97%	1.92%	-0.13%	-0.08%
Year 2008	0.24%	**-2.17%**	8.96%	2.55%	2.44%	3.43%
Year 2007	-0.32%	2.79%	**-5.59%**	-0.63%	-0.96%	-1.91%
Year 2006	**-0.79%**	-0.09%	4.30%	2.25%	1.41%	1.94%
Year 2005	8.17%	9.55%	**1.57%**	8.88%	7.00%	6.47%

Calendar Year Relative Returns *–The Multi-Beta Multi-Strategy EW (ERC) index is the equal weighted (equal relative risk contribution) combination of the four Diversified Multi-Strategy indices with stock selection based on Mid Cap, Momentum, Low Volatility, and Value respectively. Calendar quarters with positive benchmark returns comprise bull markets and the rest constitute bear markets. The SciBeta CW US-500 index is used as the cap-weighted benchmark. The full names of the US indices used are: SciBeta United States Mid-Cap Diversified Multi-Strategy, SciBeta United States High-Momentum Diversified Multi-Strategy, SciBeta United States Low-Volatility Diversified Multi-Strategy, SciBeta United States Value Diversified Multi-Strategy, SciBeta United States Multi-Beta Multi-Strategy EW, SciBeta United States Multi-Beta Multi-Strategy ERC. Source: www.scientificbeta.com.*

Multi-Factor Allocation

Implementation Benefits (USA)

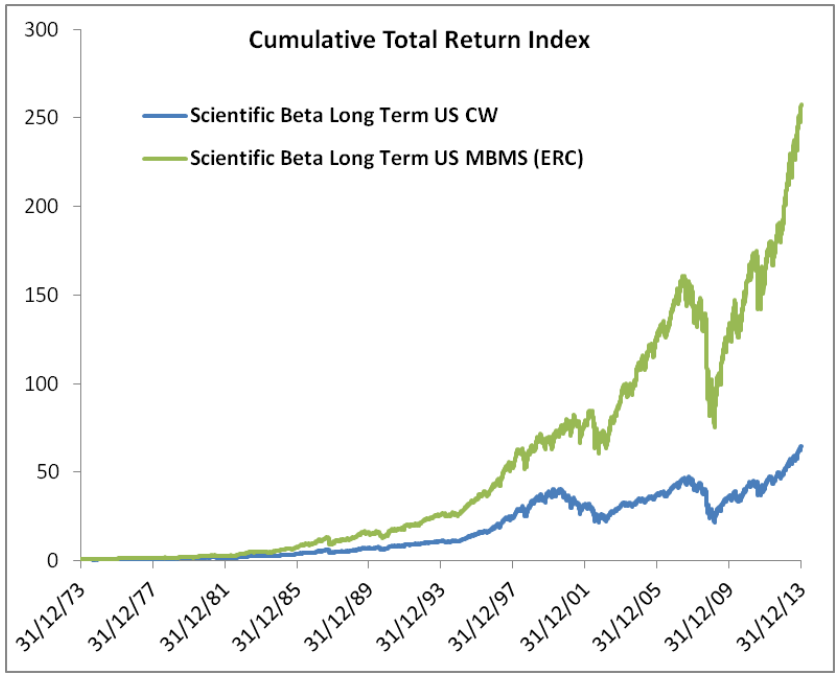
- The indices can be implemented **cost-efficiently**:
  - Turnover and capacity constraints are applied to each component index
  - Cancellation of trades in internal crossing reduces turnover
  - Optional use of a high liquidity stock selection

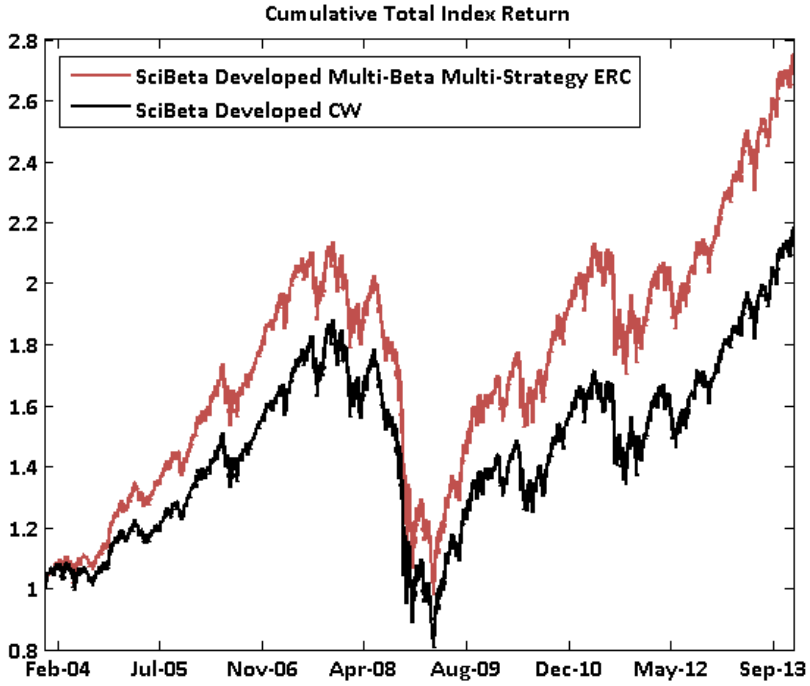
SciBeta US Long-Term (Dec 1973 - Dec 2013)	Diversified Multi-Strategy					
	All Stocks			*High Liquidity Stocks*		
	Average of 4 Smart Factor Indices	Multi-Beta Multi-Strategy EW	Multi-Beta Multi-Strategy ERC	Average of 4 Smart Factor Indices	Multi-Beta Multi-Strategy EW	Multi-Beta Multi-Strategy ERC
1-Way Turnover	34.31%	29.06%	31.54%	38.27%	33.43%	36.84%
Internally Crossed Turnover	-	5.65%	7.52%	-	5.57%	7.67%
Days to Trade for $1bn Initial Investment (Quantile 95%)*	0.20	0.12	0.12	0.16	0.07	0.07
Weighted Avg. Market Cap ($m)	10 039	10 039	10 931	14 229	14 229	16 227
Information Ratio	0.69	0.79	0.80	0.60	0.80	0.82
Relative Returns	4.01%	4.09%	3.88%	3.35%	3.46%	3.07%
Relative Returns net of 20 bps transaction costs (historical worst case)	3.94%	4.03%	3.82%	3.27%	3.39%	2.99%
Relative Returns net of 100 bps transaction costs (extreme stress scenario)	3.67%	3.80%	3.57%	2.96%	3.13%	2.70%

*The analysis is based on daily total return data from 31/12/1973 to 31/12/2013 (40 years). The SciBeta CW US 500 index is used as the cap-weighted reference. The Internally Crossed Turnover is the difference between the turnover of managing the component indices separately with the turnover of the Multi-Beta as a single mandate. Mean Capacity is the weighted average market capitalisation of the index in $million over the 40-year period. All statistics are average values across 160 quarters (40 years). The net returns are the relative returns over the cap-weighted benchmark net of transaction costs. Two levels of transaction costs are used - 20 bps per 100% 1-W turnover and 100 bps per 100% 1-W turnover. The first case corresponds to the worst case observed historically for the large and mid-cap universe of Scientific Beta indices, while the second case assumes 80% reduction in market liquidity and a corresponding increase in transaction costs. The risk-free rate is the return of the 3-month US Treasury Bill. The full names of the US indices used are: SciBeta United States Mid-Cap Diversified Multi-Strategy, SciBeta United States High-Momentum Diversified Multi-Strategy, SciBeta United States Low-Volatility Diversified Multi-Strategy, SciBeta United States Value Diversified Multi-Strategy, SciBeta United States Multi-Beta Multi-Strategy EW, SciBeta United States Multi-Beta Multi-Strategy ERC. Source: www.scientificbeta.com. *Days To Trade is the number of days necessary to trade the total stock positions, assuming USD1bn AUM and that 100% of the Average Daily Dollar Traded Volume can be traded every day. Due to data availability, the period is restricted to the last 10 years of the sample for the Scientific Beta US indices.*

Multi-Factor Allocation
Cumulative Returns (ERC)

- Multi-Beta Multi-Strategy ERC indices have outperformed steadily with few instances of underperformance



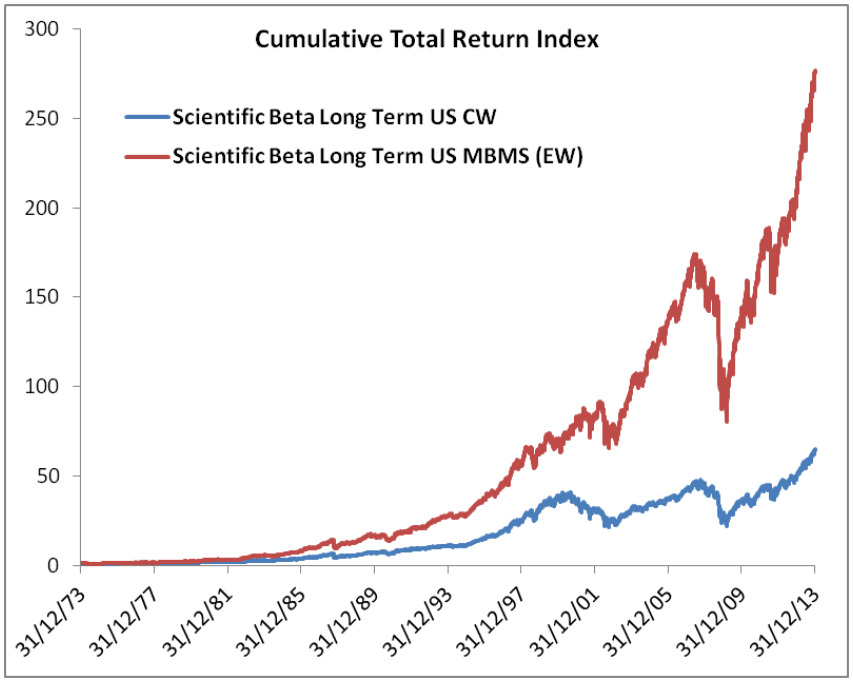


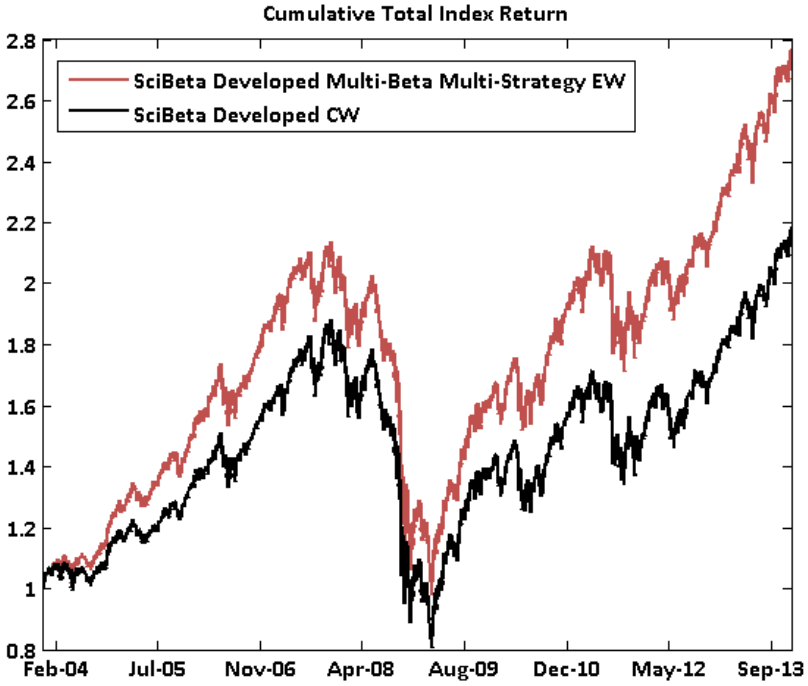
Cumulative Returns *– Based on total return (dividends reinvested) data for the period Dec 1973 to Dec 2013 for US long-term (40 years) and January 2004 to December 2013 for Developed (10 years). The cap-weighted reference index is the SciBeta USA 500 CW index, respectively the SciBeta Developed 2000 CW index. The full names of the multi-beta multi-strategy indices used are: SciBeta United States Multi-Beta Multi-Strategy ERC, SciBeta Developed Multi-Beta Multi-Strategy ERC. Source: www.scientificbeta.com.*

Multi-Factor Allocation

Cumulative Returns (EW)

- Multi-Beta Multi-Strategy EW indices have outperformed steadily with few instances of underperformance

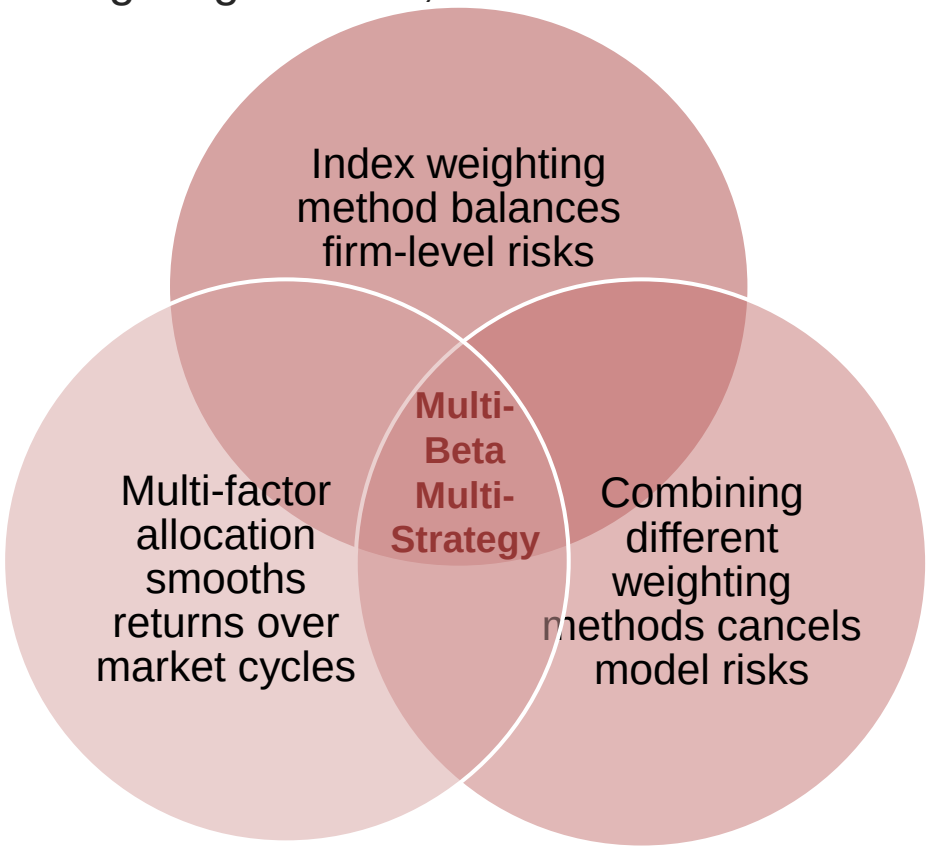




Cumulative Returns *– Based on total return (dividends reinvested) data for the period Dec 1973 to Dec 2013 for US long-term (40 years) and January 2004 to December 2013 for Developed (10 years). The cap-weighted reference index is the SciBeta USA 500 CW index, respectively the SciBeta Developed 2000 CW index. The full names of the multi-beta multi-strategy indices used are: SciBeta United States Multi-Beta Multi-Strategy EW, SciBeta Developed Multi-Beta Multi-Strategy EW. Source: www.scientificbeta.com.*

Conclusion: “Diversification, Diversification, Diversification”

- Multi-Beta Multi-Strategy indices maximise diversification
  - “A rule of behavior which does not imply the **superiority of diversification** must be rejected” (Markowitz 1952)
  - Triple diversification is a **neutral point.** It avoids taking a view on the winning stocks, the right weighting scheme, or the best factor tilt



Appendix: Multi-Factor Allocation

Performance Benefits (Global)

- Combining factor tilts improves risk-adjusted performance compared to the average component index:
  - EW allocation tends to obtain a higher Sharpe Ratio
  - ERC allocation provides a pronounced decrease in relative risk (and a higher Information Ratio)

SciBeta Developed (2004-2013)	SciBeta Developed Broad CW	Diversified Multi-Strategy					
		Mid Cap	Momentum	Low Vol	Value	Multi-Beta Multi-Strategy EW	Multi-Beta Multi-Strategy ERC
Ann. Returns	7.80%	10.45%	10.30%	10.54%	10.21%	10.41%	10.35%
Ann. Volatility	17.09%	16.12%	16.09%	13.79%	17.23%	15.68%	15.96%
Sharpe Ratio	0.36	0.55	0.54	0.65	0.50	0.56	0.55
Max. DrawDown	57.13%	54.57%	54.35%	49.55%	57.32%	53.94%	53.99%
Excess Returns	-	2.65%	2.49%	2.73%	2.40%	2.61%	2.55%
Tracking Error	-	3.33%	3.70%	4.40%	2.34%	2.65%	2.42%
95% Tracking Error	-	6.23%	7.24%	8.33%	3.69%	5.07%	4.68%
Information Ratio	-	0.79	0.67	0.62	1.03	0.98	1.05
Outperf. Prob. (3Y)	-	88.80%	79.23%	93.17%	83.06%	97.54%	100.00%

Performance and Risk *– The table compares the performance and risk of the SciBeta Diversified Multi-Strategy index. The Multi-Beta Diversified Multi-Strategy is the equal combination of the four Diversified Multi-Strategy indices with stock selection based on Mid Cap, Momentum, Low Volatility, and Value respectively. All statistics are annualised and daily total returns from January 2004 to 31/12/2013 are used for the analysis. The full names of the global developed indices used are: SciBeta Developed Mid-Cap Diversified Multi-Strategy, SciBeta Developed High-Momentum Diversified Multi-Strategy, SciBeta Developed Low-Volatility Diversified Multi-Strategy, SciBeta Developed Value Diversified Multi-Strategy, SciBeta Developed Multi-Beta Multi-Strategy EW, SciBeta Developed Multi-Beta Multi-Strategy ERC. Source: www.scientificbeta.com.*

Appendix: Multi-Factor Allocation

Conditional Performance (Global)

- Different cyclicality of factors leads to smooth outperformance across bull/bear market regimes

SciBeta Developed (2004-2013)	Diversified Multi-Strategy					
	Mid Cap	Momentum	Low Vol	Value	Multi-Beta Multi-Strategy EW	Multi-Beta Multi-Strategy ERC
Bull Markets						
Ann. Rel Returns	1.65%	1.70%	-1.76%	2.65%	1.07%	1.32%
Ann. Tracking Error	2.71%	3.06%	3.57%	1.97%	2.20%	1.93%
Information Ratio	0.61	0.56	-0.49	1.34	0.49	0.68
Bear Markets						
Ann. Rel. Returns	3.72%	3.31%	8.68%	1.87%	4.41%	3.93%
Ann. Tracking Error	4.45%	4.88%	5.87%	3.04%	3.47%	3.27%
Information Ratio	0.84	0.68	1.48	0.62	1.27	1.20

Conditional Performance *– The table shows the conditional performance and risk of multi-beta multi-strategy indices with single-beta multi-strategy indices. The Multi-Beta EW (ERC) Diversified Multi-Strategy is the equal weight (equal relative risk contribution) combination of the four Diversified Multi-Strategy indices with stock selection based on Mid Cap, Momentum, Low Volatility, and Value respectively. All statistics are annualised and daily total returns from January 2004 to 31/12/2013 are used for the analysis. The full names of the global developed indices used are: SciBeta Developed Mid-Cap Diversified Multi-Strategy, SciBeta Developed High-Momentum Diversified Multi-Strategy, SciBeta Developed Low-Volatility Diversified Multi-Strategy, SciBeta Developed Value Diversified Multi-Strategy, SciBeta Developed Multi-Beta Multi-Strategy EW, SciBeta Developed Multi-Beta Multi-Strategy ERC. Source: www.scientificbeta.com.*

Appendix: Multi-Factor Allocation

Outperformance Over Time (Global)

- Combining factor tilts avoids ending up with the worst performing factor tilt in a given year

Relative Return over Broad SciBeta Developed CW index	Diversified Multi-Strategy					
	Mid Cap	Momentum	Low Vol	Value	Multi-Beta Multi-Strategy EW	Multi-Beta Multi-Strategy ERC
Year 2013	0.16%	2.56%	**-2.47%**	-0.01%	0.05%	0.12%
Year 2012	0.21%	**-0.59%**	0.15%	0.48%	0.11%	0.22%
Year 2011	2.29%	2.49%	8.49%	**-1.49%**	2.91%	1.80%
Year 2010	9.77%	7.46%	**2.70%**	3.67%	5.89%	5.14%
Year 2009	1.46%	**-5.81%**	-5.11%	1.47%	-1.96%	-0.87%
Year 2008	1.66%	**0.47%**	8.35%	1.32%	2.97%	3.06%
Year 2007	-3.77%	-0.15%	**-4.56%**	-3.50%	-3.00%	-3.16%
Year 2006	**1.74%**	3.19%	5.60%	5.56%	4.02%	4.15%
Year 2005	5.35%	7.72%	**-0.83%**	6.77%	4.71%	4.72%

Calendar Year Relative Returns *–The Multi-Beta Multi-Strategy EW (ERC) index is the equal weighted (equal relative risk contribution) combination of the four Diversified Multi-Strategy indices with stock selection based on Mid Cap, Momentum, Low Volatility, and Value respectively. Calendar quarters with positive benchmark returns comprise bull markets and the rest constitute bear markets. The SciBeta CW Developed-2000 index is used as the cap-weighted benchmark. The full names of the global developed indices used are: SciBeta Developed Mid-Cap Diversified Multi-Strategy, SciBeta Developed High-Momentum Diversified Multi-Strategy, SciBeta Developed Low-Volatility Diversified Multi-Strategy, SciBeta Developed Value Diversified Multi-Strategy, SciBeta Developed Multi-Beta Multi-Strategy EW, SciBeta Developed Multi-Beta Multi-Strategy ERC. Source: www.scientificbeta.com.*

Appendix: Multi-Factor Allocation

Implementation Benefits (Global)

- The indices can be implemented **cost-efficiently**:
  - Turnover and capacity constraints are applied to each component index
  - Cancellation of trades in internal crossing reduces turnover
  - Optional use of a high liquidity stock selection

SciBeta Developed (2004-2013)	Diversified Multi-Strategy					
	All Stocks			*High Liquidity Stocks*		
	Average of 4 Smart Factor Indices	Multi-Beta Multi-Strategy EW	Multi-Beta Multi-Strategy ERC	Average of 4 Smart Factor Indices	Multi-Beta Multi-Strategy EW	Multi-Beta Multi-Strategy ERC
1-Way Turnover	45.69%	39.63%	38.59%	45.85%	39.83%	38.36%
Internally Crossed Turnover	-	6.22%	7.76%	-	6.27%	8.12%
Days To Trade for $1bn Initial Investment (Quantile 95%)*	0.48	0.27	0.27	0.20	0.09	0.09
Weighted Avg. Market Cap ($m)	16 047	16 047	16 493	22 391	22 391	23 737
Information Ratio	0.78	0.98	1.05	0.68	1.12	1.22
Relative Returns	2.57%	2.61%	2.55%	2.35%	2.40%	2.38%
Relative Returns net of 20 bps transaction costs (historical worst case)	2.48%	2.53%	2.47%	2.25%	2.32%	2.31%
Relative Returns net of 100 bps transaction costs (extreme liquidity stress scenario)	2.11%	2.21%	2.16%	1.89%	2.00%	2.00%

*The analysis is based on daily total return data from 31/12/2003 to 31/12/2013 (10 years). The SciBeta Developed CW index is used as the cap-weighted reference. The Internally Crossed Turnover is the difference between the turnover of managing the component indices separately with the turnover of the Multi-Beta as a single mandate. Days To Trade is the number of days necessary to trade the total stock positions, assuming a USD1bn AUM and that 100% of the Average Daily Dollar Traded Volume can be traded every day. Mean Capacity is the weighted average market capitalisation of the index in $million over the 10-year period. All statistics are computed across 40 quarters (10 years). The net returns are the relative returns over the cap-weighted benchmark net of transaction costs. Two levels of transaction costs are used - 20 bps per 100% 1-W turnover and 100 bps per 100% 1-W turnover. The first case corresponds to the worst case observed historically for the large and mid-cap universe of our indices while the second case assumes 80% reduction in market liquidity and a corresponding increase in transaction costs. The risk-free rate is the return of the 3-month US Treasury Bill. The full names of the global developed indices used are: SciBeta Developed Mid-Cap Diversified Multi-Strategy, SciBeta Developed High-Momentum Diversified Multi-Strategy, SciBeta Developed Low-Volatility Diversified Multi-Strategy, SciBeta Developed Value Diversified Multi-Strategy, SciBeta Developed Multi-Beta Multi-Strategy EW, SciBeta Developed Multi-Beta Multi-Strategy ERC. Source: www.scientificbeta.com. *Days To Trade is the number of days necessary to trade the total stock positions, assuming USD10bn AUM and that 100% of the Average Daily Dollar Traded Volume can be traded every day. Due to data availability, the period is restricted to the last 10 years of the sample for the Scientific Beta US indices.*

Appendix: Smart Factor Indices vs. Indices from Other Providers

- Scientific Beta smart factor indices outperform commercial indices over the period of available track records

Provider[1]	Tilt	Sharpe Ratio			Information Ratio		From	To	Full Index Name
		Broad CW	Commercial Index[1]	Smart Factor Index[2]	Commercial Index[1]	Smart Factor Index[2]			
Russell	Low Vol	0.29	0.41	0.50	0.18	0.47	01/01/2004	31/12/2013	Russell High Efficiency Low Vol
	Mid Cap	0.29	0.38	0.45	0.51	0.74	01/01/2004	31/12/2013	Russell Mid Cap
	Value	0.29	0.36	0.43	0.45	0.84	01/01/2004	31/12/2013	Russell High Efficiency Value
	Mom.	0.29	0.36	0.39	0.33	0.34	01/01/2004	31/12/2013	Russell High Efficiency High Mom
S&P	Low Vol	0.26	0.26	0.40	-0.06	0.31	31/03/2006	31/12/2013	S&P 1500 Reduced Vol Tilt
	Mid Cap	0.30	0.38	0.45	0.39	0.74	01/01/2004	31/12/2013	S&P Mid Cap 400
	Value	0.26	0.27	0.29	0.19	0.27	31/03/2006	31/12/2013	S&P 1500 Low Valuation Tilt
	Mom.	0.26	0.25	0.26	-0.10	-0.03	31/03/2006	31/12/2013	S&P 1500 Positive Mom Tilt
MSCI	Low Vol	0.30	0.39	0.50	0.10	0.47	01/01/2004	31/12/2013	MSCI USA Minimum Volatility
	Mid Cap	0.30	0.35	0.45	0.41	0.74	01/01/2004	31/12/2013	MSCI USA Equal Weighted
	Value	0.30	0.27	0.43	-0.04	0.84	01/01/2004	31/12/2013	MSCI USA Value Weighted
	Mom.	0.30	0.38	0.39	0.23	0.34	01/01/2004	31/12/2013	MSCI USA Momentum

Comparison with Competitors *– The table shows Sharpe Ratios and Information Ratios of Russell, S&P, and MSCI indices marketed as factor indices with the same performance metric for the corresponding SciBeta US Diversified Multi-Strategy and CW indices with stock selection based on Mid Cap, Momentum, Low Volatility, and Value, as well as the SciBeta Broad CW. All statistics are annualised and the analysis is based on daily total returns. Data is always taken for the past 10-year period: 01/2004 to 12/2013 as available on Bloomberg and www.russell.com; Indices which have data available for less than 10 years are compared for their respective period of data availability to the broad CW, the corresponding tilted CW, and the smart factor index for the same period.*

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[2]The full names of the Smart Factor Indices are: SciBeta United States Mid-Cap Diversified Multi-Strategy, SciBeta United States High-Momentum Diversified Multi-Strategy, SciBeta United States Low-Volatility Diversified Multi-Strategy, SciBeta United States Value Diversified Multi-Strategy.

Appendix
Groundings of ERC Allocation

- Equal Risk Contribution (ERC) aims to equalise risk contributions from different assets in the portfolio (Maillard *et al*, 2010)

$$\sigma_i(x) = \sigma_j(x) \qquad \text{OR} \qquad x_i . \partial_{x_i}\sigma(x) = x_j . \partial_{x_j}\sigma(x)$$

- The simplified optimisation problem is:

$$x^* = argmin \sum_{i=1}^{n} \sum_{j=1}^{n} \left(x_i . (\sum x)_i - x_j . (\sum x)_j\right)^2$$

where σ(x) is portfolio volatility, σ_i^2 is variance of asset i, $\sigma_i(x)$ is contribution of asset i to portfolio volatility, $\sum$ is the covariance matrix, and ρ_{ij} is the correlation between assets i and j

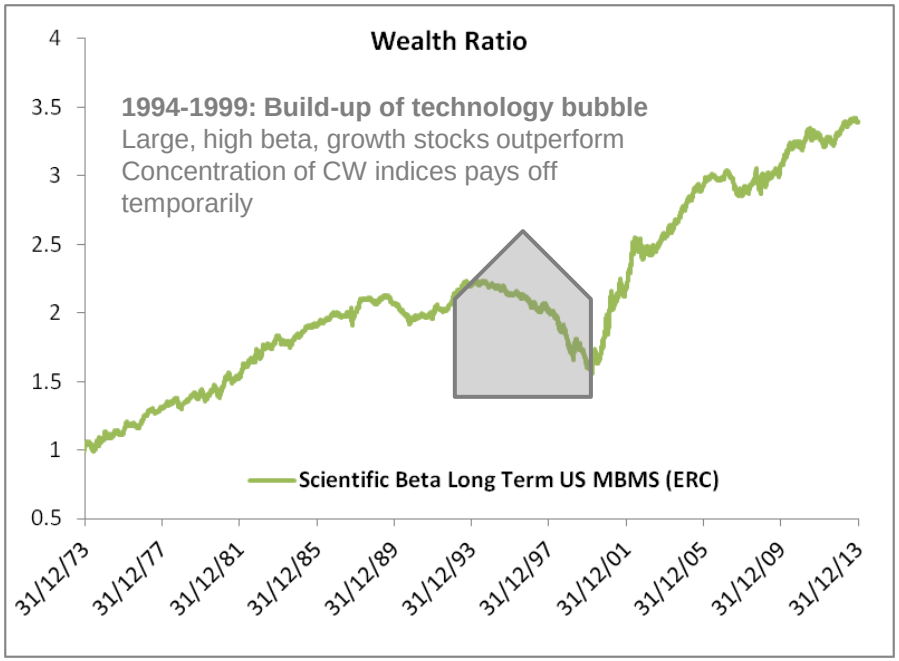
- ERC is seen as a middle ground between Min Vol and Equal-Weighted strategies

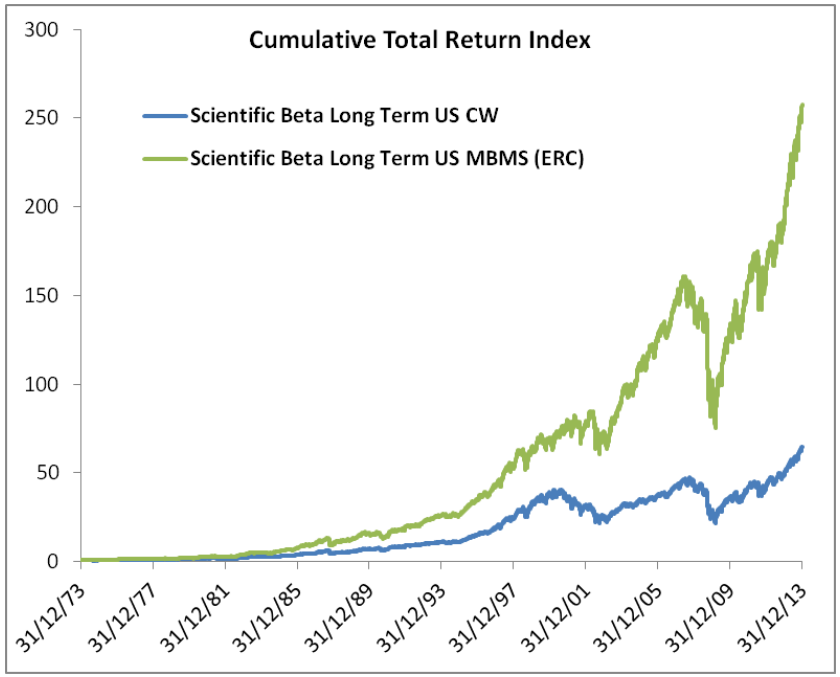
- It is straightforward, by applying ERC to the excess returns over a CW reference index, to **equalise contributions to tracking error**

Appendix

US Long Term Track Records – Multi-Beta ERC

- Multi-Beta Benchmarks have outperformed steadily with few instances of underperformance



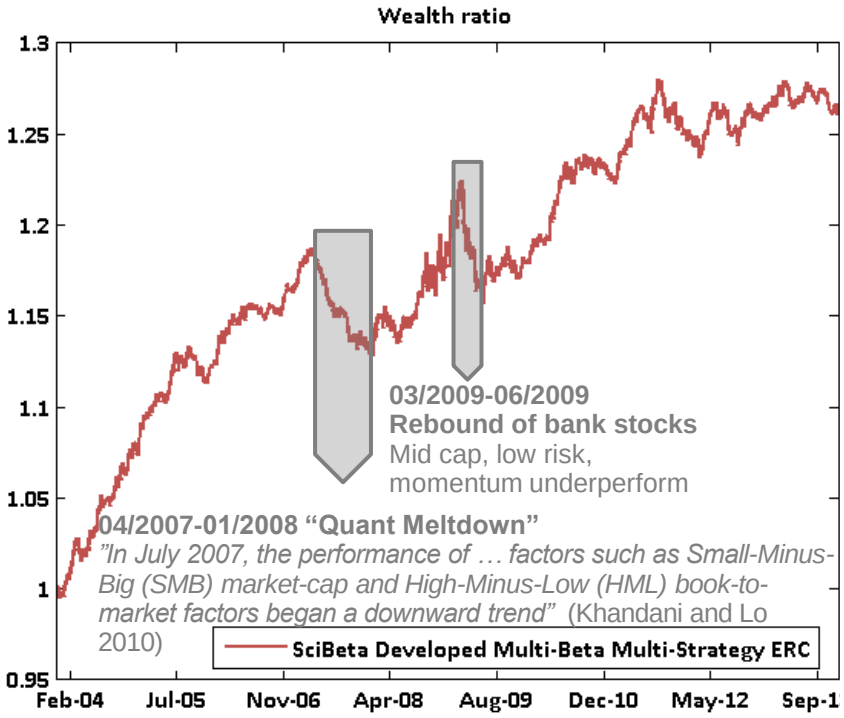


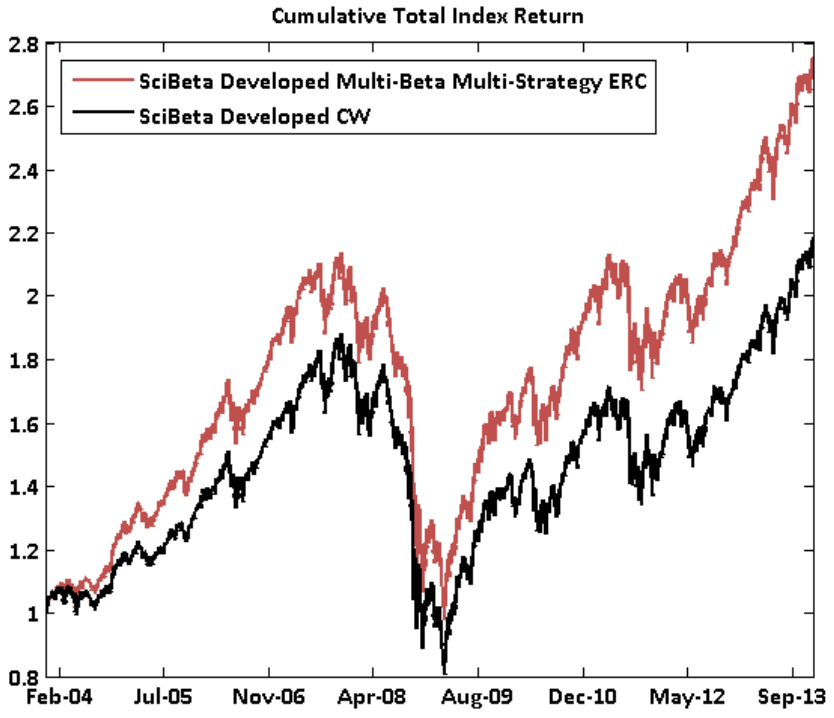
Based on data for the period Dec 1973 to Dec 2013. The Wealth ratio is the value of a 1US$ investment in the index divided by the value of a 1US$ investment in its cap-weighted reference index.

Appendix

Scientific Beta Developed Indices – Multi-Beta ERC

- Multi-Beta Benchmarks have outperformed steadily with few instances of underperformance



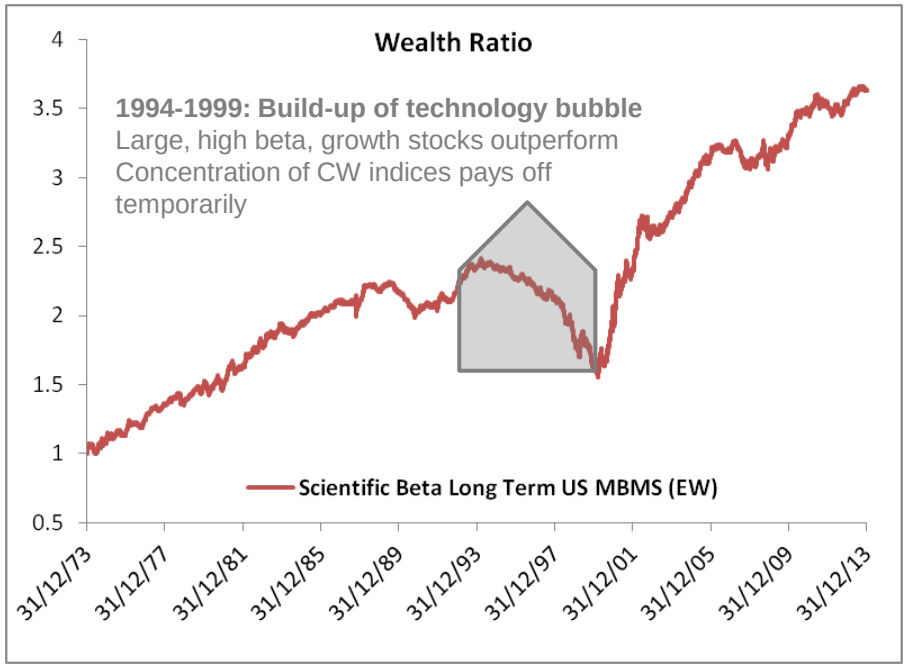


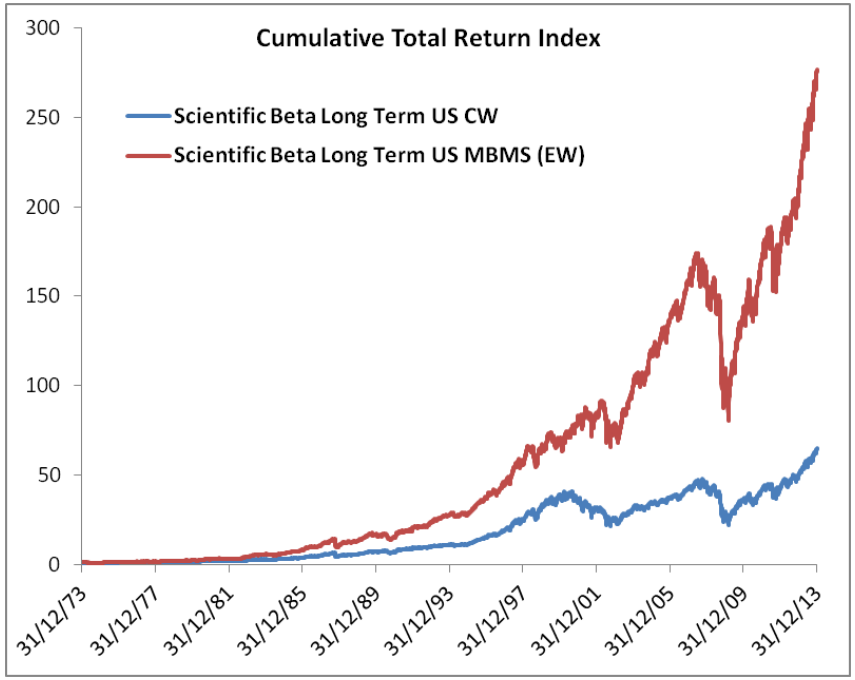
Based on data for the period 2004 to 2013. The Wealth ratio is the value of a1US$ investment in the index divided by the value of a 1US$ investment in its cap-weighted reference index.

Appendix

US Long Term Track Records – Multi-Beta EW

- Multi-Beta Benchmarks have outperformed steadily with few instances of underperformance





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Scientific Beta Developed Indices – Multi-Beta EW

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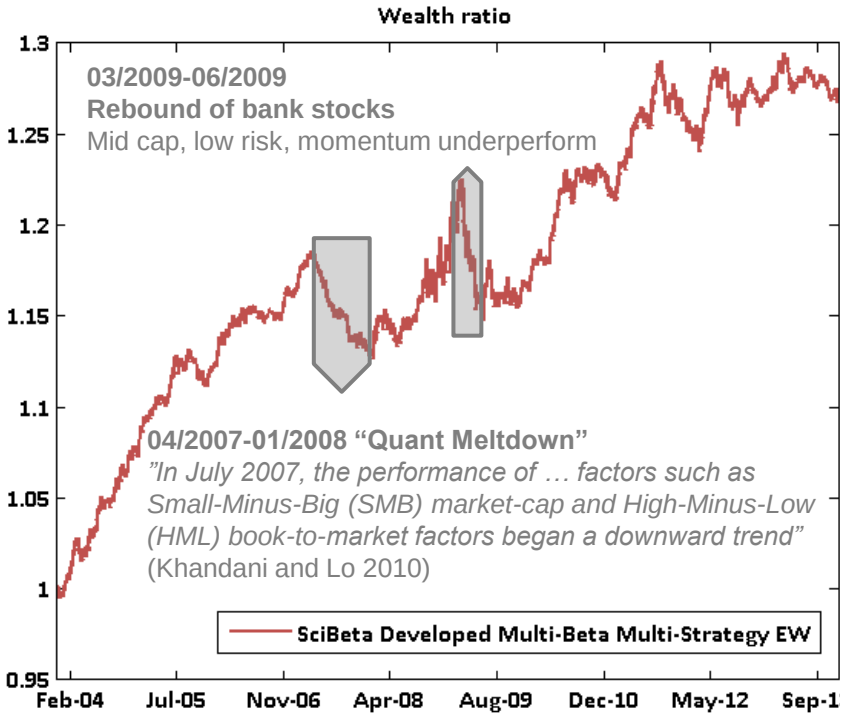

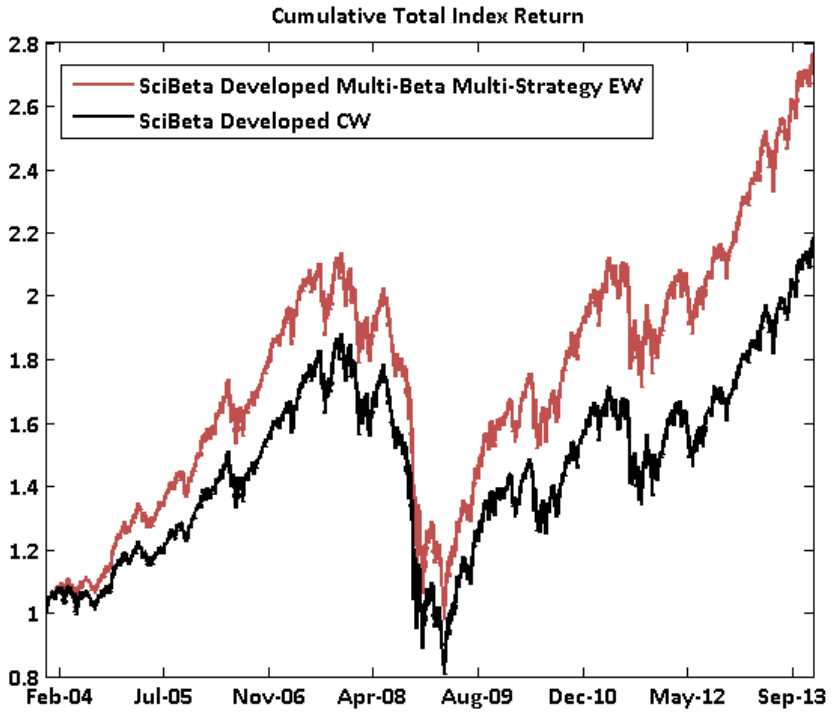

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