Benoit Autier
Head of Product Management
benoit.autier@etfsecurities.com

Mike McGlone
Head of Research (US)
mike.mcglone@etfsecurities.com

Alexander Channing
Director of Quantitative Investment Strategies
alexander.channing@etfsecurities.com

Smart Beta 2.0

Bringing clarity to equity smart beta

Market Cap-weighted indices: are the cornerstone for passive investments, however they have not been designed to maximize investment risk versus return.

Smart beta "1.0" indices: aim to provide superior risk adjusted performance compared to market-cap weighted indices, but generally do not adequately address the two primary drawbacks inherent in market-cap weighted portfolios:

- ***Drawback 1***: Tilt to unrewarded risk factors
- ***Drawback 2***: Lack of diversification

Smart beta "2.0" indices: This paper provides a potential innovative solution to broad market exposure by combining:

- ***Multi-factor***: four well established empirically rewarded factors; with
- ***Multi-weighting strategies***: the constituents are weighted utilizing a combination of five non-market cap-weighted strategies

Drawbacks of Market Cap Indices

Most of the well-established benchmarks such as the S&P 500 and Russell 2000 are market cap-weighted indices. They offer the advantage of being very easy to understand and replicate; however, they appear to have a fundamental issue: they are not designed to optimize investment risk/ adjusted profiles. Smart beta 1.0 indices aim to address this issue, but the proliferation of choices can make it difficult for investors to assess the benefits from the available options. With the objective of providing some clarity to the smart beta choices, it is useful to understand the potential issues with market cap-weighted indices and how to address them.

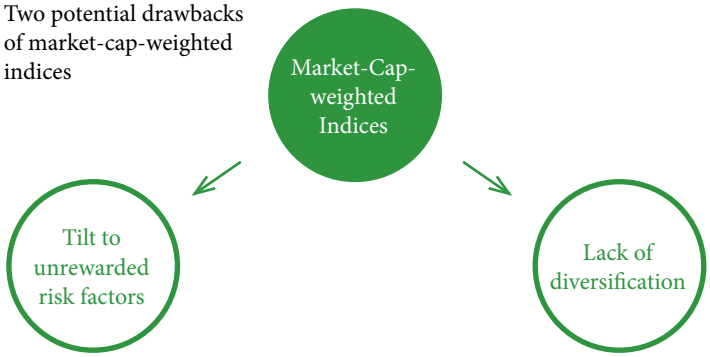
A Lesson from History

The use of market cap-weighted indices as an efficient way to manage investments was initially supported by the Capital Asset Allocation Model (CAPM), developed by William F. Sharpe in 1964, which concludes that the optimal portfolio is the "market portfolio". Under this model, the return of a stock is explained by its sensitivity to the overall market, or "market beta". Because of its simplicity, the CAPM has proven extremely popular and is still taught in business schools. At the time the CAPM was developed, there was a strong belief in market efficiency and several strong somewhat unrealistic assumptions needed to be met for the CAPM to hold.

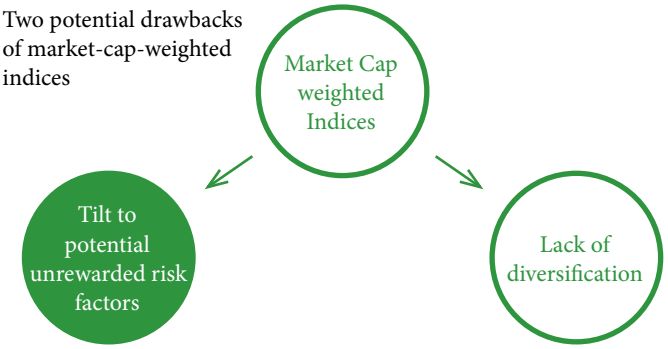
Absent of these assumptions, even the most comprehensive cap-weighted portfolios would not lie on the efficient frontier. Considering these points, it seems unlikely that in practice a market cap-weighted index would be the most efficient solution available to investors and unsurprisingly, most research confirms that market beta alone fails to explain stock returns. Since then, much research has been conducted raising two main potential draw backs concerning market cap-weighted indices:

- Tilt to potential unrewarded risk factors
- Potential lack of diversification

Two potential drawbacks of market-cap-weighted indices

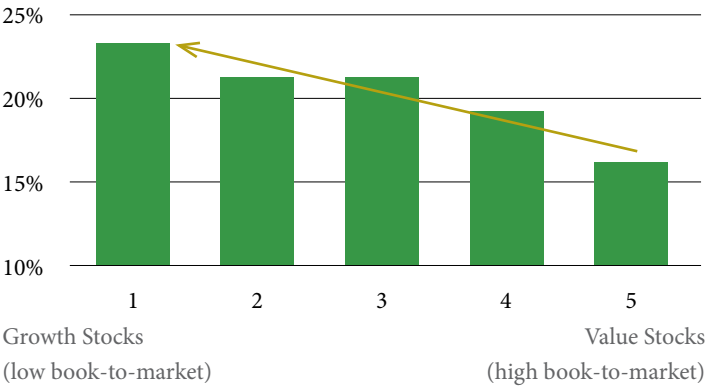


Tilt to Potentially Unrewarded Factors



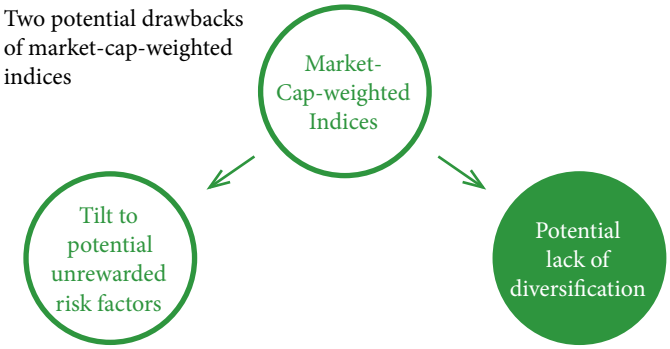
Investors should be conscious that market-cap-weighted indices are not neutral from a factor tilt point of view. By design, they naturally tilt their exposure towards (a) growth stocks and (b) the largest market-cap stocks. However in 1993, Fama and French showed that a portfolio tilted towards small-cap and value stocks would have outperformed the market. Fama and French essentially recommended doing the opposite of the market cap-weighted indices.

Market cap-weighted indices are tilted towards growth, rather than value



Source: EDHEC Risk Institute, based on quarterly weights from 06/01/2002 through 12/31/2013

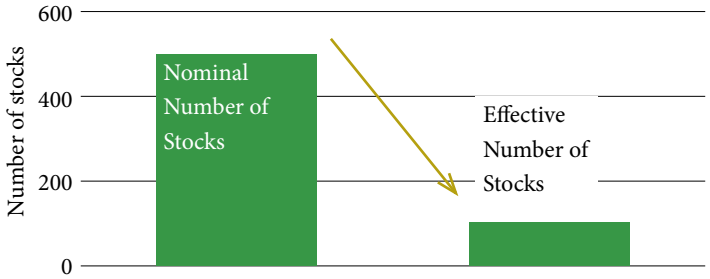
Potential Lack of Diversification



Indices are generally expected to provide well diversified exposure. Interestingly, market cap-weighted indices can be considered as not properly designed to do so, because they generally have concentrated holdings in the largest stocks. Hence, the nominal number of stocks in a market cap-weighted index can be misleading. Investors may be better informed by focusing on the number of stocks in an index having an impact on performance, a ratio sometimes called the Effective Number of Stocks (ENS). The lower the ENS, the less diversified the strategy. For example, the ENS on the S&P 500 is only around 100.

Academic research (Haugen and Baker 1991, Cochrane 2001) has shown that this potential over-concentration can lead to a sub-optima risk/return profile.

S&P 500: Nominal vs. Effective Number of Stocks

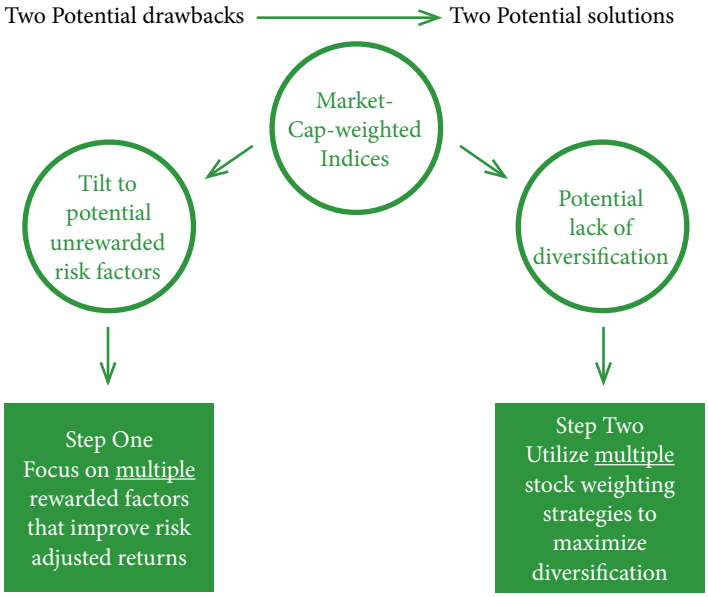


Source: EDHEC Risk Institute, as of 12/31/2013

Finding a Solution

Edhec Risk Institute (ERI) is an academic institution focusing on applied research for the investment industry. It is widely followed among large institutions, in particular pension funds and endowments. In 2012, **ERI Scientific Beta** was created with the objective to bring scientific rigor to smart beta indices. Their approach aims to address the potential issues of market cap-weighted indices and focus on a rigorous two step approach to distinguish factor exposures and weighting strategies.

Smart Beta 2.0



Smart Beta 2.0 Solution: Step 1

Finding the right factors

The CAPM initially opined that stock returns are explained by the market beta. However, in 1976 Steve Ross (of MIT Sloan School of Management) took a different view from the Arbitrage Pricing Model (APT), and argued that stock returns should be driven by several unique characteristics or **factors**. Subsequently, a multitude of factors have been identified; however, when constructing a portfolio only the most robust factors that have explained long-term excess returns over market-cap indices should be selected. In order to determine whether that is the case, a factor should display two main attributes:

- **Empirical evidence**: The performance analysis for a given factor should be conducted over an extensive period of time, covering multiple market cycles.
- **Economic rationale**: The selected factor should have a strong economic basis and should not be reverse engineered through data mining.

Based on the current status of academic research, there is a consensus of four risk factors: low-volatility, value, momentum and smaller size.

The Multi-Factor Approach

Although factors have historically generated higher returns than market cap-weighted indices, they have also displayed a high level of cyclicality, which may lead to underperformance during certain periods of time. For instance, we observe from the table below, Factor Returns that Value, Minimum Volatility, and Size underperformed the market cap-weighted index during the period 1995 to 1999.

	1990 to 1994	1995 to 1999	2000 to 2004	2005 to 2009	2009 to 2014	1990 to 2014
1	Mtm 14.5	Mtm 39.66	Size 8.30	Min. Vol 2.38	Mtm 17.4	Mtm 13.65
2	Factor Avg 11.29	Mkt-Cap 29.00	Value 2.94	Size 2.03	Size 17.29	Size 11.38
3	Value 10.88	Factor Avg 27.09	Min. Vol 1.98	Mtm 1.60	Factor Avg 16.22	Factor Avg 11.06%
4	Size 10.81	Value 25.27	Factor Avg 1.80	Factor Avg 1.2	Min. Vol 16.01	Value 10.56
5	Min. Vol 10.49	Min. Vol 22.16	Mtm -0.59	Mkt-Cap 0.04	Value 15.63	Min. Vol 10.33%
6	Mkt-Cap 9.80	Size 19.36	Mkt-Cap 3.65	Value -0.07	Mtk-Cap 14.78	Mkt-Cap 9.40

Source: ETF Securities, Bloomberg, MSCI Indices. Data from 01/01/1990 through 12/31/2004. Mtm = momentum, Min. vol = Minimum volatility (low volatility), Mkt-cap = Market-cap.

Factor returns have not been entirely correlated; they are driven by different economic forces that do not occur at the same time. Hence, by combining them, a higher degree of diversification may be achieved which should result in lower volatility over multiple market cycles.

Low Excess Return Correlations between the Factors

US Long Term Track Record 1973 - 2012	Momentum	Low Volatility	Value
Mid-Cap	0.69	0.65	0.86
Momentum		0.64	0.66
Low Volatility			0.71

Source: **Scientific Beta**, "Implementing Multi-Factor Equity Portfolios with Smart Factor Indices, May 2014".

The idea of Multi-Factor models is to improve the risk/return performance by impacting the two inputs simultaneously:

- Getting exposure to factors that potentially provide excess returns
- Diversifying the exposure across factors to potentially reduce overall volatility.

Smart Beta 2.0 Solution: Step 2

Maximize Diversification

Once a factor has been identified and the relevant stocks selected, weighting strategy decisions must be made. Applying the Modern Portfolio Theory from Markowitz, the weighting should diversify the exposure in an attempt to maximize the risk/return profile of the investment. Investors should be cautious of smart beta solutions using score/rank weighting systems as they may result in high-concentration among a few stocks. This could cause an increase in non-systemic risk (also called idiosyncratic risk) for which there is no reward, resulting in sub-optimal results. To address this issue, some index providers have introduced equal-weighted portfolios.

Equal-weighting, which is known as the "naive" route to diversification, has historically generated better performance compared to their cap-weighted counterparts but with greater volatility. Equal-weighting does not explicitly take into account any information about the risk/return characteristics of different stocks. In other words, equal-weighting may lead to a high risk-reward ratio if one is willing to assume that all stocks have the same expected return, the same volatility and that all pairwise correlations are identical, which in general does not hold.

There are several options available for investors to diversify exposure which can be ranked based upon the models' theoretical ability to diversify a portfolio:

Max De-concentration	Weighted equally, subject to constraints on liquidity and turnover
Diversified Risk Parity	Weighted in proportion to the inverse of their volatilities
Max De-correlation	Weighted according to contribution to overall portfolio correlation
Minimum Volatility	Weighted in order to minimize portfolio volatility based only on stock correlations and volatilities
Max Sharpe Ratio	Weighted in order to achieve the maximum possible risk-adjusted portfolio returns

Each weighting strategy relies on assumptions and as such, there are risks when implementing them, which can be decomposed as follows (Gonzalez and Tabault, October 2013):

Optimality risk is the risk that the model is not elaborate enough to achieve efficient diversification. Estimation risk is the risk that the assumptions on which the model relies, will not occur in practice. For instance, the Maximum Sharpe Ratio is considered to be the most advanced weighting strategy and has low optimality risk.

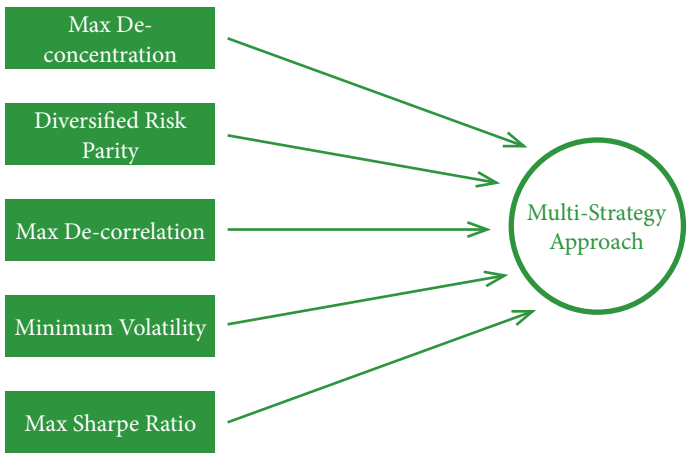
However because the Max Sharpe Ratio relies on so many estimates, there is a higher risk that, in practice, results might differ from expectations, hence the high estimation risk (chart below). Meanwhile, equal weighting strategies require no estimation, but are not optimal by design.

Stock Weighting Strategies	Optimality Risk	Estimation Risk
Max De-concentration	High	Low
Diversified Risk Parity	↓	↑
Max De-correlation		
Minimum Volatility		
Max Sharpe Ratio	Low	High

As a result, alternative weighting strategies appear to display different results depending on market conditions and historically, no alternative strategy has consistently outperformed the other strategies (Amenc, Goltz, Lodh and Martellini Journal of Portfolio Management Spring 2012).

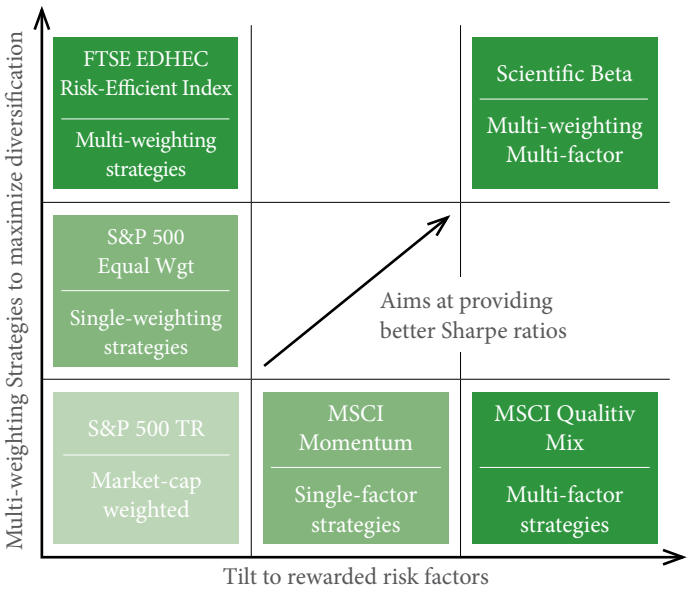
The Multi-Weighting Strategies

In order to reduce the implementation risk of each weighting strategy, a possible solution consists in combining them. Kan and Zhou (2007) show that combining strategies reduces the impact of parameter uncertainty. Meaning, the implementation risk of each approach is minimized when they are combined.



Multi-Factor Multi-Strategy Solution

By combining a multi-factor model with weighting strategies that aim to maximize diversification (multi-strategy), ERI Scientific Beta provides a comprehensive and innovative solution.



Investable Product Solution

Multi-Factor, Multi-Strategy in an ETF

ETF Securities is the first provider in the U.S. market to offer products tracking indicies from ERI Scientific Beta:

ETFS Diversified-Factor U.S. Large Cap Index Fund (SBUS)
SBUS seeks to track the price and yield performance, before fees and expenses, of the Scientific Beta United States Multi-Beta Multi-Strategy Equal-Weight Index.

ETFS Diversified-Factor Developed Europe Index Fund (SBEU)
SBEU seeks to track the price and yield performance, before fees and expenses, of the Scientific Beta Developed Europe Multi-Beta Multi-Strategy Equal Weight Index.

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The ETFs are new products with a limited operating history.

Diversification does not eliminate the risk of experiencing investment losses.

The S&P 500 Index is a capitalization-weighted index of 500 stocks selected by the Standard & Poor's Index Committee designed to represent the performance of the leading industries in the U.S. economy.

S&P 500 EW is a constituent equal weight version of the S&P 500.

Russell 2000 - an index that measures the performance of the 2,000 smallest companies in the Russell 3000 Index.

The FTSE EDHEC Risk Efficient Index is based on the FTSE All-World Index Series. Constituents' weights result from EDHEC-Risk's portfolio optimisation, which targets improvements in efficiency for a broad market index by maximising the Sharpe ratio.

MSCI Momentum index selects the top securities with the highest momentum scores.

MSCI Quality index selects top growth stocks by calculating a quality score for each security in the eligible equity universe based on three main fundamental variables: high return on equity (ROE), stable year-over-year earnings growth and low financial leverage.

Diversification does not eliminate the risk of experiencing investment losses.

Correlation – a statistical measure of how an index moves in relation to another index or model portfolio. A correlation ranges from -1 to 1. A correlation of 1 means the two indexes have moved in lockstep with each other. A correlation of -1 means the two indexes have moved in exactly the opposite direction.

Beta is a measure of the volatility, or systematic risk, of a security or a portfolio in comparison to the market as a whole.

A smart beta index is an index designed to outperform a widely followed market cap weighted benchmark index normally by altering the constituent weights.

The Sharpe ratio was developed by Nobel laureate William F. Sharpe to measure risk-adjusted performance. It is calculated by subtracting the risk-free rate - such as that of the 5-year U.S. Treasury bond - from the rate of return for a portfolio and dividing the result by the standard deviation of the portfolio returns.

The Capital Asset Pricing Model (CAPM) is model that describes the relationship between risk and expected return and that is used in the pricing of risky securities.

The effective Number of Stocks (ENS) is the effective number of stocks in an index that impact overall index performance.

The Arbitrage Pricing Model (APT) is an asset pricing model based on the idea that an asset's returns can be predicted using the relationship between that same asset and many common risk factors.

Indices are unmanaged and one cannot invest directly in an index.

Investors buy and sell shares on a secondary market (i.e., not directly from the Trust). Only market makers or "authorized participants" may trade directly with the funds, typically in blocks of 50 thousand to 100 thousand shares.

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ETF Securities (US) LLC
48 Wall Street
New York
NY 10005
United States

t +1 844 - ETFS - Buy (844 383 7289)
f +1 212 918 4801
e infoUS@etfsecurities.com