

Factors and Factor Exposures

Asset owners and asset managers are increasingly interested in so-called “smart beta” indexes, a category that includes factor and alternatively weighted indexes. In a series of four FTSE Russell *Insights*, we explore the concept of factors in depth. We examine the differences between factor indexes and other types of smart beta indexes, illustrate how factor exposure is embedded in an index and suggest how factors can be combined most effectively.

In this *Insights*, the first of the series, we start with definitions: what are factors and how is factor exposure measured?

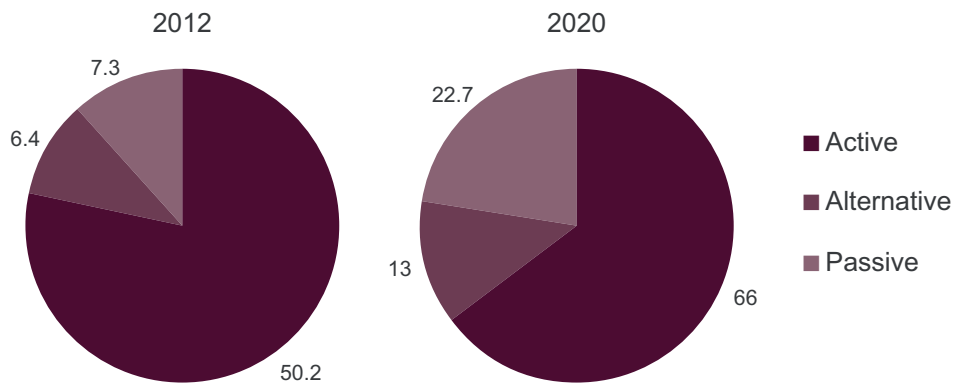
The rise of interest in factors

Interest in factors is on the rise amongst investors. Consulting firm PWC¹ recently forecast a tripling of the assets under management in index-based investment strategies worldwide between 2012 and 2020, and suggested that factor investing would be a key part of this trend. According to PWC:

“The growth of passive strategies will...be fuelled by new innovations in this space, such as factor investing...factor investing will ‘cross over’ from the realm of active managers, through highly sophisticated institutional passive investors, and into the mass-market retail space”.

¹ <http://www.pwc.com/gx/en/asset-management/publications/pdfs/pwc-asset-management-2020-a-brave-new-world-final.pdf>

Forecast Global AUM by Strategy Type (U.S.\$ trillion)



Source: PWC, "Asset Management 2020: A Brave New World"

PWC's forecast was reinforced by a recent survey of asset owners, conducted by FTSE Russell. Just under half (47%) of the 214 respondents to the 2015 FTSE Russell Smart Beta Global Survey,² with collective assets under management of over U.S.\$2 trillion, said they were now evaluating combinations of factor strategies as part of their future asset allocation plans.

What is a factor?

In the context of finance and investment theory, a factor is a common (systematic) driver of securities' returns. The component of stocks' returns that is driven by factor exposure is seen as distinct from the return component that derives from stock-specific (non-systematic) risk.

Single and multi-factor models

Classical investment theory assumed that there was a single type of systematic risk, called market risk. Under the Capital Asset Pricing Model (CAPM), a theoretical framework introduced in the 1960s, a single market factor explains stocks' returns. This market factor carries an associated risk premium, called the equity risk premium, which investors earn for holding stocks rather than traditionally perceived assets like cash or government bonds. CAPM also introduces the concept of beta, a measure of the sensitivity of a particular stock, index or portfolio to movements in the overall market.

However, critics pointed out that the single factor model had limitations in describing stocks' real-life behaviour. In particular, said critics, other characteristics, such as valuation and size, also helped explain stock performance. Under the so-called value effect, stocks with lower price-to-earnings ratios have shown a tendency to outperform those with higher price-to-earnings ratios over the long term. And over time and in many securities markets, smaller-capitalisation stocks have outperformed the shares of larger companies.

² See "Smart beta: 2015 global survey findings from asset owners", FTSE Russell.

In 1993 Eugene Fama and Kenneth French published a paper³ in which they examined three factors: a market factor, a size factor and a value factor (measured as the ratio of book to market value of equity). The authors provided empirical evidence that this three-factor model is a better representation of stock returns than the single-factor, market model.

Over time, other factors, such as momentum, volatility, quality, liquidity and yield have been examined empirically and used by investment practitioners. The FTSE Russell Global Factor Index framework includes seven equity market factors. These factors are shown in the table.

FTSE Russell Global Factor Index Framework

Name of Factor	Factor Measured As
Liquidity	The median ratio of absolute daily return to daily traded value over the previous year – Amihud Ratio.
Momentum	Cumulative total local eleven month return
Quality	Composite of Profitability (Return on Assets), Efficiency (Change in Asset Turnover), Earnings Quality (Accruals) & Leverage
Size	Full Market Capitalization
Value	Composite of trailing Cash-flow Yield, Earnings Yield & country relative Sales to Price Ratio
Volatility	Standard Deviation of 5 years of weekly (Wed/Wed) local total returns
Yield	A company's twelve month trailing dividend yield

Source: FTSE Russell

What causes factor returns?

Academics have put forward different arguments for the existence of factor-based returns. Some are risk-based, while others are behavioural or structural. Risk-based arguments suggest the existence of risk premia as compensation for investors willing to accept exposure to a particular factor; behavioural arguments focus more on collective behavioural traits amongst investors and the potential inefficiencies which these may cause; structural explanations for the existence of factor returns contend that constraints on investors, such as an inability to sell short, help generate excess returns for particular systematic investment strategies.

For example, a risk-based argument for the value factor return premium is that investors are being compensated for the higher default risk in companies with lower valuations. Similarly, the size factor premium could reflect compensation for the fact that small-capitalisation stocks tend to be riskier, less diversified in their business activities and more sensitive to economic shocks. A risk-based argument for the liquidity factor premium is that investors require excess returns to hold stocks with higher trading costs.

³ <http://www.sciencedirect.com/science/article/pii/S0304405X93900235>

Researchers have claimed⁴ that momentum in stock returns may result from a tendency for investors to underreact in the short term to new information affecting the shares they hold. Over time, as investors reassess the information, they then drive positive (or negative) trends in share prices. In turn, this may lead to a longer-term overreaction to the original news.

The low volatility effect, according to some observers,⁵ may be explained by a preference for “lottery” stocks—those promising exceptional gains. According to this theory, certain investors overpay for such high-volatility stocks, causing low-volatility shares to outperform over the long run.

A structural explanation for the low volatility effect is that many investors’ inability to use leverage causes them to overweight high-volatility (high beta) stocks, causing the expected return on those stocks to fall. Another structural explanation for the effect is that investors’ tendency to use a benchmark for performance measurement discourages arbitrage between high beta and low beta stocks.

Measuring factor exposure

Once a factor has been defined, the factor exposure of an index can be measured as the sum of the factor scores of the index’s constituents, multiplied by each constituent’s weight in the index.

In the equation below, X is the exposure of the index (or portfolio) to the factor of interest, and W_j and Z_j are the index weight and the factor Z-Score,⁶ respectively, of each index constituent j with respect to the same factor:

$$X = \sum_{j \in U} W_j * Z_j$$

Standardising factor exposures in the form of factor Z-Scores enables meaningful comparisons to be made over time. However, calculating the history of an index’s factor exposure requires knowledge of the index’s past holdings and weightings, something which is not always available.

An alternative approach, which does not rely upon holdings information, is to use a returns-based analysis: the index’s past excess returns (by comparison with a capitalisation-weighted index) are regressed against the returns to a set of factor portfolios. The factor exposures (or factor “loadings”) of the index are then the beta coefficients of the regression. However, the use of a regression as a way to measure factor loadings must be done with care as a poorly defined model may result in misleading or erroneous conclusions.

Factors and smart beta

A factor index is constructed with the objective of providing exposure over time to a factor of interest. The term “smart beta” is often used to describe indexes which seek to provide a different risk/return profile than standard indexes, which weight stocks by their market size (capitalisation). Smart beta therefore includes factor indexes and alternatively weighted indexes. In the second *Insight* of this series we explore the differences between these two categories of index.

⁴ See, for example, <https://fnce.wharton.upenn.edu/files/?whdmsaction=public:main.file&fileID=4929>

⁵ See, for example, http://forum.johnson.cornell.edu/faculty/huang/stocks_as_lotteries.pdf

⁶ The factor Z-score is the normalized factor score: raw factor scores are converted to normalized scores by subtracting the sample’s mean from each score and then dividing by the sample’s standard deviation.

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