Methodology overview

FTSE Russell

Qual/Vol/Yield Factor Indexes

Part of the FTSE Global Factor Index Series

Overview

The Qual/Vol/Yield Factor Indexes are designed to reflect the performance of high quality equities that exhibit relatively low volatility and high dividend yields. Available on a variety of geographical regions based on the FTSE Global Equity Index (FTSE GEIS) and FTSE UK Index Series, the Indexes apply a consistent and transparent methodology to achieve controlled exposure to target factors while considering levels of diversification and capacity. In addition, individual index constituent weights are capped at a company level to avoid over-concentration in any single security.

Features

- Eligible securities of each Qual/Vol /Yield factor index are the constituents of the relevant underlying FTSE GEIS or FTSE UK Index Series.
- The Indexes are reviewed annually in September.
- Individual securities are capped at 5% for large and mid cap securities and 3% for small cap securities to avoid over-concentration in any one company.
- Hedged indexes aim to remove the impact of foreign exchange rate fluctuations.

Results

- Tilt-Tilt methodology provides greater index factor exposure, in a more controlled manner, while balancing concerns about liquidity, capacity, diversification and turnover.
- The Indexes are designed to target specific factor return premia in a transparent, rules-based index construction process.
- Potential improvement in risk-adjusted index outcomes.
- Mitigate investment cyclicality by diversifying across multiple factors.

Qual/Vol/Yield Factor Index Series

Available Indexes:

- FTSE Developed ex US
- FTSE Developed Europe
- FTSE Developed Asia Pac
- FTSE Emerging
- FTSE USA
- FTSE USA Small Cap
- FTSE 350 ex Inv Trust

Factors at a glance

Quality	Low Volatility	Yield

The factors

A factor is a stock characteristic that is important in explaining a security's risk and return. The Qual/Vol/Yield Factor Indexes reference three equity factors, each of which is supported by academic research, with strong theoretical explanations as to why the factor historically has provided a premium.

- Factor-based investing is premised on the ability to identify factors that are expected to earn a positive premium in the future (i.e. factor exposures which are compensated).
- Not all factors are equal – some factors are uncorrelated, which means they may perform differently in different parts in the cycle.
- FTSE Russell's factors represent common factor characteristics supported by a body of empirical evidence across different geographies and time periods.

Factor premia and definitions*

Factor	Description	Definition
Quality	**The Quality Premium:** Higher quality companies tend to demonstrate higher performance than lower quality companies. **Quality tilts:** Can help capture companies with the ability to consistently generate strong future cash flows, while limiting exposures to stocks that are unprofitable or highly levered.	Composite of profitability, efficiency, earnings quality and leverage.
Low Volatility	**The Low Volatility Premium:** Stocks that exhibit low volatility tend to perform better than stocks with higher volatility. **Low volatility tilts:** Can help capture companies with a historically lower risk (and higher return) profile relative to higher risk counterparts.	Standard deviation of 5 years of weekly local total returns.
Yield	**The Yield Premium:** Higher yielding stocks (dividends) tend to perform better than stocks with lower yields. **Yield tilts:** Can help capture companies that have recently delivered strong dividends to shareholders.	12 month trailing dividend yield.

* For detailed definitions and calculations of each factor, please see the FTSE Global Factor Index Series Ground Rules.

Why Quality + Low Volatility + Yield?

The Qual/Vol/Yield Factor Indexes are multi-factor indexes that target reduced risk relative to the underlying index, while capturing the performance of sustainable, high yielding companies.

Avoiding the yield trap

Qual/Vol/Yield indexes are designed to select companies that exhibit a higher dividend yield than that of the underlying indexes. However, many dividend indexes suffer from a "yield trap" in which stocks that have experienced large price declines may receive the largest weights. Academic and practitioner studies point to ways in which the Quality factor may temper the tendency for high yielding stocks to be associated with low quality or "junk" stocks.

Consistency and stability

High quality companies have proven to be relatively resilient during periods of economic hardship. In line with the academic literature, FTSE Russell defines quality as the consistent ability to generate strong future cash flows. The combination of quality and yield selects companies with the ability to consistently pay, as well as to possibly increase, their dividends.

Targeting reduced risk

The low volatility factor targets volatility reductions based on historical return information. The rationale for combining low volatility and quality is to capture relatively stable and less volatile companies along two dimensions: returns and fundamentals.

Multi-factor indexes and the power of diversification:

In the same way that different asset classes have distinct risk and return characteristics, the returns accruing to different equity factors can also be seen as distinct, varying according to the economic cycle and market environment. For example, quality and low volatility factors are counter-cyclical and tend to perform well during periods of market turbulence. In contrast, the yield factor, which favors the highest dividend paying stocks, tends to be positively related to the market, meaning they are pro-cyclical. The uncorrelated nature of the quality and low volatility factors to the yield factor has the potential to diversify the index return across various market cycles.

The factor index construction process

Steps 1-3 explain the high level process for a single factor index construction process. There are a number of ways that multiple factors can be targeted in an index. FTSE Russell employs a 'Tilt-Tilt' approach, which is briefly described in Step 4, and over the page.

Step 1

Calculate factor scores

Assign a 'raw' value for a given factor to each stock in the underlying index. Remove outliers and normalize results (Z Score)[1]. Assign each of the Z-Scores to a score in the range 0 to 1 by mapping to the cumulative normal distribution. Stocks which exhibit the highest factor characteristics will have a score closer to 1.

Step 1 Step 2

Translate scores into index weights

Combine scores with weights in the underlying index to form a broad factor index (unadjusted weights are normalized to ensure they total 100%).

- Underlying weights may be of any type (Market cap, Risk weight etc) or geographical region. The resulting factor index can be understood as a 'Factor Tilt' on the underlying index, by tilting the underlying weights according to factor score. The index weights are then rescaled to ensure final weights sum to 100%.

Underlying Weight X Factor Score = Unadjusted Weight → Final Weight

Step 1 Step 2 Step 3

Narrow index and constrain final weights

Remove stocks which do not contribute to the overall factor objective, whilst ensuring that diversification constraints are not breached.

The following constraints are applied during this process:

- Country and Industry weight constraints
- Maximum stock level capacity ratio
- Minimum stock weight

Step 1 Step 2 Step 3 Step 4

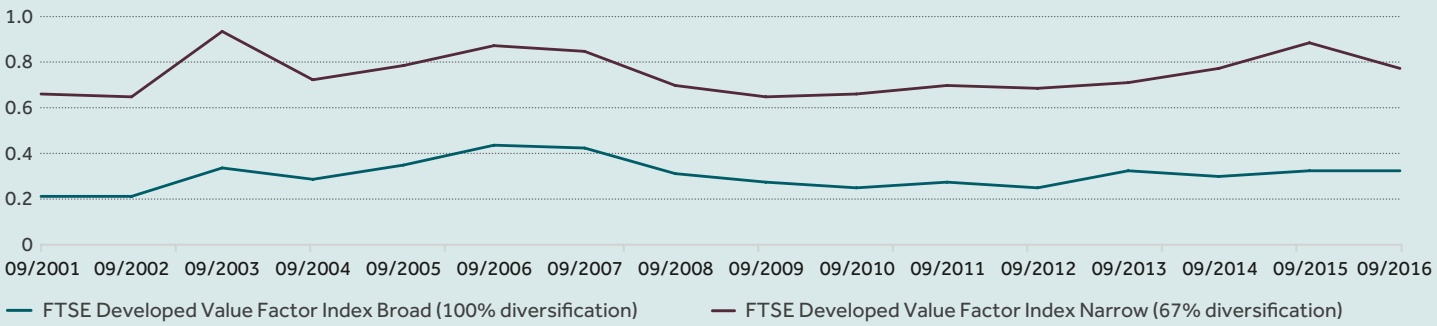
Combining factors

The application of consecutive 'factor tilts' (or, a tilt of one factor on another) towards multiple factors through the repeated application of the above steps results in a set of broad multi factor index weights. This can be understood as a modified Step 2, in which several factor scores are combined with the underlying index weight, as below.

Underlying Weight X Factor Score 1 X Factor Score 2 X Factor Score 3... = Unadjusted Weight → Final Weight

Why do we narrow?

Narrowing ensures greater Factor exposure in the final index



Source: FTSE Russell. Data as of September 30, 2016. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see page 7 for important legal disclosures.

[1] A 'Z-Score' is a statistical measurement of a score's relationship to the mean in a group of scores. A Z-Score of 0 means the score is the same as the mean. A Z-Score can be positive or negative, indicating whether it is above or below the mean.

The factor combination process

Gaining exposure to multiple factors becomes increasingly challenging using allocations to multiple individual single factor Indexes. Targeting multiple factors can be achieved in several ways:

Composite index ('Top down' portfolio construction)

- Combine the weightings of individual factor Indexes (e.g. 33.3% value, 33.3% quality, 33.3% size).
- However, at times, this may result in a dilution of exposures to the target factors.

Composite factor

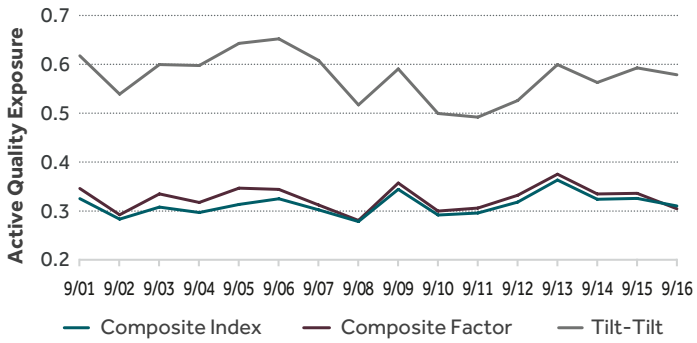
- Combine individual factor 'Z-Scores' to create a composite 'Z-Score'.
- Works for positively correlated factors (e.g. quality and low volatility) but is less effective for negatively correlated factors (e.g. quality and value).

The FTSE Russell preferred approach: Tilt-Tilt ('Bottom up' portfolio construction)

- Sequential, or 'multiplicative' tilts on each factor – outcome is independent of ordering.
- Approximately the same exposures of single factor Indexes, without the dilutive effects of other methods.
- The magnitude of tilt determined by implementation concerns such as liquidity, capacity, diversification and turnover.

Tilt-Tilt improves factor exposure for positively corrected factors

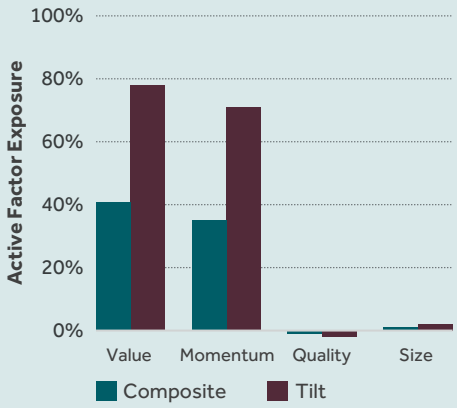
FTSE Developed, Quality + Low Volatility Factor Index



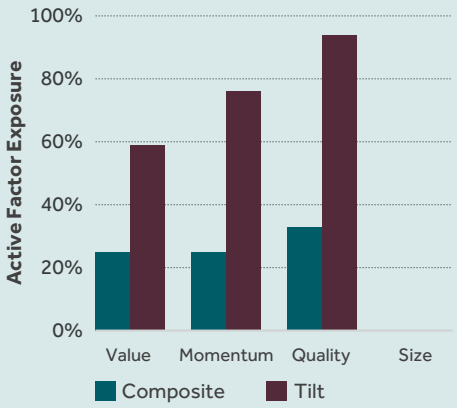
Source: FTSE Russell. Data as of September 2001 to September 2016. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see page 7 for important legal disclosures. Chart shows active factor loading relative to the FTSE Developed Index, calculated using an annual rebalance frequency.

Tilt-Tilt also improves factor exposure for negatively correlated factors

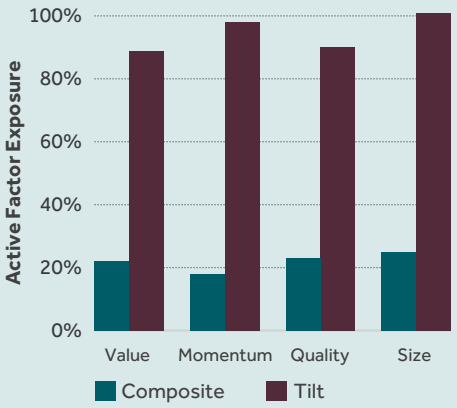
FTSE Developed Value + Momentum Index



FTSE Developed Value + Momentum + Quality Index



FTSE Developed Value + Momentum + Quality + Size Index



Greater factor exposure across all target factors, compared to other approaches:
- Composite approaches result in subdued levels of exposure to target factors.
- Tilt-Tilt results in a factor index with approximately the same level of exposure as the single factor indexes.
- Highlights stocks displaying all characteristics.

Source: FTSE Russell. Data as of September 2001 to September 2016. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see page 7 for important legal disclosures. Chart shows active factor loading relative to the FTSE Developed Index, calculated using an annual rebalance frequency. For illustrative purposes only.

Case study: Tilt-Tilt methodology and calculating constituent weights

Constituent weights are derived using FTSE Russell's 'Tilt-Tilt' methodology. Factor scores are combined with the underlying market cap weight to create a factor weight for each constituent. The weight is rescaled (to sum to 100%), the index is narrowed and constraints are applied to arrive at the final weight in the factor index.

	Cap Weight	X	Qual. Score	X	Vol. Score	X	Yield Score	=	Unadj Wgt		Final Wgt.
GlaxoSmithKline	1.19%	X	0.40	X	0.92	X	0.91	=	0.40%	→	2.29%
easyJet	0.07%	X	0.67	X	0.50	X	0.51	=	0.01%	→	0.07%
BMW	0.39%	X	0.26	X	0.41	X	0.68	=	0.03%	→	0.16%

Factor indexes rebalance away from the market cap weighted benchmark – the difference in stock weights represents active weights.

Weights are rescaled, the index is narrowed and constraints are applied.

Source: FTSE Russell, information for illustrative purposes only.

Narrowing and constraints

When building multi-factor indexes, it is important to capture the risk premia associated with the target factors while retaining the benefits of the market cap-weighted benchmark, namely diversification and capacity. We add the following general diversification parameters to the FTSE Qual/Vol/Yield Factor Index Series:

Maximum stock weight	5% (large cap Indexes) and 3% (small cap Indexes) Capped quarterly, rebalanced annually
Minimum stock weight	0.5 basis points 2 basis points (FTSE 350 ex Invt Trust)

Country and Industry Constraints:	• Upper and lower bounds:
	  • +/- 20% (relative to the starting universe weight)* AND
	  • +/- 5% (absolute) buffer

Narrowing	Stocks are removed until one of the following constraints is violated: • Effective N (narrow index) >= 0.67 Effective N (broad index) • Weighted Capacity Ratio (WCR) (narrow index) <= 2.5x WCR (broad index)

* Not applicable to the FTSE USA Small Cap Qual/Vol/Yield Indexes.

For more information about our indexes, please visit ftserussell.com.

About FTSE Russell

FTSE Russell is a leading global index provider creating and managing a wide range of indexes, data and analytic solutions to meet client needs across asset classes, style and strategies. Covering 98% of the investable market, FTSE Russell indexes offer a true picture of global markets, combined with the specialist knowledge gained from developing local benchmarks around the world.

FTSE Russell index expertise and products are used extensively by institutional and retail investors globally. For over 30 years, leading asset owners, asset managers, ETF providers and investment banks have chosen FTSE Russell indexes to benchmark their investment performance and create investment funds, ETFs, structured products and index-based derivatives. FTSE Russell indexes also provide clients with tools for asset allocation, investment strategy analysis and risk management.

A core set of universal principles guides FTSE Russell index design and management: a transparent rules-based methodology is informed by independent committees of leading market participants. FTSE Russell is focused on index innovation and customer partnership applying the highest industry standards and embracing the IOSCO Principles. FTSE Russell is wholly owned by London Stock Exchange Group.

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