

Wilshire

FT Wilshire Factor Index Series

Index Methodolgy

1 Introduction

The FT Wilshire Factor Indexes are designed to deliver precisely defined levels of exposure to academically verified factors including Value, Momentum, Quality, Size and Beta. This is achieved via a factor tilting methodology where an initial set of index weights are multiplied by positive scores to yield a new set of index weights with the required exposures. The details of the construction are set out below.

2 Index Construction

2.1 Constituents and Free Float Market Capitalization Weights

Constituents, free float and shares are taken from post close updates on the third Friday of the review month. Price is defined as the closing price of the cutoff-date, adjusted for corporate actions between the cutoff-date and the post close updated data on third Friday of the review month.

A constituent's free float market capitalization is then defined as the product of its free-float, shares and adjusted cutoff price. A constituent's free float market capitalization weight is then defined by its free float market capitalization divided by the total free float market capitalization of the entire set of constituents.

2.2 Factor Definitions

The factor definitions set out in this section are in broad consensus with those found in the academic literature.

2.2.1 Value (V)

Value is defined as an equally weighted composite of the latest Earnings Yield, Sales to Price Ratio, Cash Flow Yield and Book to Price Ratio. Individual raw quantities are rescaled and winsorized as described in section 2.3 below. They are then averaged, and the resulting composite quantity is rescaled and winsorized again so that it has mean zero, standard deviation one and is restricted to the range -3 to +3. Historical fundamental data is lagged by two months.

2.2.2 Momentum (M)

Momentum is defined as the cumulative local price return, starting twelve months prior to, and ending one month before, the data cutoff date. Price data at the beginning and end of this period is therefore required to calculate Momentum.

2.2.3 Quality (Q)

Quality is defined as an equally weighted composite of the latest ROE, Accruals Ratio and Debt to Equity Ratio. Individual raw quantities are rescaled and winsorized as described in section 2.3 below. They are then averaged, and the resulting composite quantity is rescaled and winsorized again so that it has mean zero, standard deviation one and is restricted to the range -3 to +3. Historical fundamental data is lagged by two months.

2.2.4 Size (S)

Size is defined as minus the natural logarithm of the full company market capitalization calculated in USD. Shares are taken from post close updates on the third Friday of the review month. Price is defined as the closing price of cutoff-date, adjusted for corporate actions between the cutoff-date and the post close updated data on third Friday of the review month.

2.2.5 Beta (β)

Beta is calculated as minus the covariance between stock total return and the underlying (market) index total return divided by the variance of the underlying index total return using two years of daily data prior to the data cutoff date. A minimum of 252 daily return observations are required to calculate a valid beta.

2.2.6 Sector Dummy

The sector dummy factor is defined by the variable:

$$\delta_{i \in J} = \begin{cases} 1 & \text{if } i \in J \\ 0 & \text{if } i \notin J \end{cases} \quad (1)$$

In other words, this dummy variable takes the value of one if the stock i is a member of sector J and zero otherwise. The groupings comprise of 11 Sectors.

2.3 Calculation of Z-Scores and S-Scores

Factor values defined in Section 2 range over different scales. To put them on the same scale we subtract the cross-sectional mean from each raw value and then divide by the cross-sectional standard deviation. A winsorization process is then applied to ensure that all the results lay in the range -3 to +3. Missing values are assigned a value of zero.

Market capitalization weighted Z-Scores are then calculated as:

$$Z_{F,i} = \frac{F_i - \mu_M}{\sigma_M} \quad (2)$$

where F_i the rescaled factor value and the market capitalization weighted mean and standard deviation is given by:

$$\mu_M = \sum_{i=1}^N M_i \times F_i \quad \text{and} \quad \sigma_M = \sqrt{\sum_{i=1}^N M_i \times (F_i - \mu_M)^2} \quad (3)$$

respectively and where M_i are the free float market capitalization weights.

Factor Z-Scores are mapped to "S-Scores" according to:

$$S_{F,i} = \text{Exp}[Z_{F,i}] \quad (4)$$

Similarly, sector "S-Scores" are calculated thus:

$$S_{J,i} = \text{Exp}[\delta_{i \in J}] \quad (5)$$

Hence each stock is assigned a set of positive numbers that increase monotonically with its factor Z-Scores or sector dummies.

2.4 Multiple Tilt Equation

The factor index weights are given by the multiple tilt equation:

$$W_i = \frac{1}{\Omega} \times S_{V,i}^n \times S_{M,i}^p \times S_{S,i}^q \times S_{Q,i}^r \times S_{\beta,i}^s \times S_{1,i}^t \times \dots \times S_{11,i}^u \times M_i \quad (6)$$

where $S_{F,i}^n$ is the tilt to factor F of strength n , $S_{J,i}^t$ is the J^{th} sector tilt of strength t and:

$$\Omega = \sum_{i=1}^N S_{V,i}^n \times S_{M,i}^p \times S_{S,i}^q \times S_{Q,i}^r \times S_{\beta,i}^s \times S_{1,i}^t \times \dots \times S_{11,i}^u \times M_i \quad (7)$$

Tilt strengths can take positive or negative values. Varying the tilt strengths in equation (6) give rise to different levels of active factor and sector exposures. Other tilts that control maximum weight, capacity and turnover may also be applied.

2.5 Exposure Targets

A set of factor exposure targets T_F is specified such that:

$$\sum_{i=1}^N W_i \times Z_{F,i} = T_F \quad \text{where } F \in (V, M, Q, S, \beta) \quad (8)$$

where the L.H.S of equation (8) represents the factor exposure of a set of weights W_i . Note that since: $\sum_{i=1}^N M_i \times Z_{F,i} = 0$ this is also the active factor exposure between the factor index and the underlying free float market capitalization index.

Lower L_J and upper U_J allowable limits are also specified for active sector target weights according to:

$$L_J \leq \sum_{i=1}^N (W_i - M_i) \times \delta_{i \in J} \leq U_J \quad \text{where } J \in (1, 2, \dots, 11) \quad (9)$$

where the middle term of equation (9) gives the active J^{th} sector weight of the factor index relative to the underlying market capitalization index.

2.6 Factor Index Weights

Tilt strengths in equation (6) are then found that satisfy equations (8) and (9) along with constraints on maximum weight, minimum weight, capacity ratio (factor index weight / market cap weight) and 2-way turnover. Where a target or range is not specified for a particular factor or sector, the tilt strength is set to zero.

Should the solution be infeasible, the active factor exposure targets are reduced by 2.5%, the lower and upper sector bounds widened by 10bps either side and 2-way turnover target increased by 5%. This process is repeated until a solution is found or else up to a maximum of 40 times. Should the solution infeasible or further away from the targeted factor, sector and country exposures than the current index weights, the index weights will consist of the pre-review index weights, renormalized to account for exclusion of stocks that are not members of the underlying index on the effective date.

3 Available Factor Indexes

Table 1 sets out the various factor indexes in the series and the sets of targets and parameters that specify them:

Table 1: Targets and Parameters for Factor Indexes

Index Name	Active Exposure Targets						Implementation Parameters			
	V	M	Q	S	β	Sector	Max Weight (%)	Min Weight (bps)	Max Capacity Ratio	2-Way Turnover (%)
FT Wilshire US Large Pure Value	1.0	0	0	0	0	Neutral	5	5	20	80
FT Wilshire US Large Pure Momentum	0	1.0	0	0	0	Neutral	5	5	20	80
FT Wilshire US Large Pure Quality	0	0	1.0	0	0	Neutral	5	5	20	80
FT Wilshire US Large Pure Size	0	0	0	1.0	0	Neutral	5	5	20	80
FT Wilshire US Large Pure Beta	0	0	0	0	1.0	Neutral	5	5	20	80
FT Wilshire US Large 4-Factor Beta Neutral	0.5	0.5	0.5	0.5	0	Neutral	5	5	20	80
FT Wilshire US Large 5-Factor	0.4	0.4	0.4	0.4	0.4	Neutral	5	5	20	80

4 Ongoing Review

4.1 Index Review

The FT Wilshire Factor Index Series will be reviewed semi-annually in March and September. The data cutoff date is Wednesday before the first Friday of the review month. Constituent and free-float changes are updated after the close of trading on the third Friday of the review month.

4.1 Intra-review Additions

Additions to the underlying FT Wilshire index will be eligible for inclusion at the next index review of the FT Wilshire Factor Index in March or September.

4.2 Intra-review Deletions

A constituent will be removed from a FT Wilshire Factor Index if it is removed from the corresponding underlying FT Wilshire Index. The deletion will be concurrent with that from the underlying index and its weight will be distributed pro-rata amongst the remaining constituents in the FT Wilshire Factor Index.

5 Corporate Events

5.1 Corporate Action Treatment

The weight of a constituent of a FT Wilshire Factor Index will remain unchanged should it undergo a stock split, stock consolidation, rights issue, bonus issue, a change in the number of shares in issue or a change in free float (with the exception of tender offers).

5.2 Suspension of Dealing

Suspension of Dealing rules can be found in the FT Wilshire 5000 Index Series Rule Book.

5.3 Takeovers, Mergers and Spinoffs

The treatment of takeovers, mergers and spinoffs can be found in the FT Wilshire 5000 Index Series Rule Book.

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