FRANKLIN TEMPLETON

FRANKLIN US INDEX METHODOLOGY

Inception: November 13, 2017

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1. Introduction

This methodology book describes the rules and guidelines followed by S&P Opco, LLC (a subsidiary of S&P Dow Jones Indices LLC) to calculate and maintain the Franklin US Index. The Franklin US Index is designed to represent the performance of a strategy that seeks to combine a "smart beta" equity strategy focused on US Large Cap stocks with a fixed income duration allocation to 5 or 10-year US treasuries (depending on whether rates are rising or falling). It also features a 7% volatility control methodology.

2. Quick Facts

Ticker	FTUSLX
Weighting Method	Risk Weighted
Rebalancing Frequency	Daily
Calculation Frequency	End of Day
Calculation Currencies	USD
Launch Date	November 13, 2017
First Value Date	January 3, 2001

The Franklin US Index is an excess return index. Index levels represent performance in excess of the 3-month US Dollar LIBOR rate.

3. Eligible Components for Index Calculation

Description	Ticker	Data Vendor
1 Equity: LibertyQ US Large Cap Equity Total Return Index	.TRIFLQL1	Thomson Reuters
2 Fixed Income: S&P 10Y US T-Note Fut TR	SPUSTTTR Index	S&P
3 Fixed Income: S&P 5Y US T-Note Fut TR	SPUST5TR Index	S&P
4 10Y Yield: United States Fed Reserve Bank 10 Y Benchmark	USYTFRB10y=RR	Thomson Reuters
5 Risk Free Rate: US Dollar 3 Month ICE LIBOR	USDLIBOR3M=	Thomson Reuters

4. Initial Composition of the Index

$$Index_0 = 100$$

$$Index_t = Index_{t-1} \times \left(1 + W_{E,t-1}^{final} \times \frac{S_{E,t} - S_{E,t-1}}{S_{E,t-1}} + W_{FI\ 5Y,t-1}^{final} \times \frac{S_{FI\ 5Y,t} - S_{FI\ 5Y,t-1}}{S_{FI\ 5Y,t-1}} + W_{FI\ 10Y,t-1}^{final} \times \frac{S_{FI\ 10Y,t} - S_{FI\ 10Y,t-1}}{S_{FI\ 10Y,t-1}} - \left(W_{E,t-1}^{final} + W_{FI\ 5Y,t-1}^{final} + W_{FI\ 10Y,t-1}^{final}\right) \times RF_{t-1} \times \frac{Act(t,t-1)}{360}\right)$$

Where	
$Index_t$	Index value computed on calculation date t
$W_{E,t-1}^{final}$	Final weights associated with Equity (1) on calculation date t-1
$W_{FI\ 5Y,t-1}^{final}$	Final weights associated with Fixed Income (3) on calculation date t-1, as defined in Step 3
$W_{FI\ 10Y,t-1}^{final}$	Final weights associated with Fixed Income (2) on calculation date t-1, as defined in Step 3
$S_{E,t}$	Value of Equity (1) at time t
$S_{FI\ 10Y,t}$	Value of Fixed Income (2) at time t
$S_{FI\ 5Y,t}$	Value of Fixed Income (3) at time t
RF_t	The risk-free rate (5) at date t

4a. Daily Step 1: Select Fixed Income

The Fixed Income component is selected on a daily basis as follows:

$$Fixed\ Income\ Compo_t = \begin{cases} Fixed\ Income\ (2)\ \ if\ \ \frac{1}{252}\sum_{i=1}^{252} ref.rate.4_{t-i-1} \geq \frac{1}{21}\sum_{i=1}^{21} ref.rate.4_{t-i-1} \\ otherwise\ Fixed\ Income\ (3) \end{cases}$$

4b. Daily Step 2: Compute Volatility and Covariance Estimates

Compute the daily variance over each calculation date t. Consider exactly 126 business days:

$$\sigma^2{}_{E,t}(\lambda) = 252 \times \sum_{k=0}^{125} \frac{(1-\lambda) * \lambda^{n-k}}{\sum_{j=1}^{n}(1-\lambda) * \lambda^{n-k}} \times \ln \frac{S_{E,t-k}}{S_{E,t-k-1}}^2$$

$$\sigma^2{}_{FI,t}(\lambda) = 252 \times \sum_{k=0}^{125} \frac{(1-\lambda) * \lambda^{n-k}}{\sum_{j=1}^{n}(1-\lambda) * \lambda^{n-k}} \times \ln \frac{S_{FI,t-k}}{S_{FI,t-k-1}}^2$$

$$Cov_{E,FI,t}(\lambda) = 252 \times \sum_{k=0}^{125} \frac{(1-\lambda) * \lambda^{n-k}}{\sum_{j=1}^{n}(1-\lambda) * \lambda^{n-k}} \times \ln \frac{S_{E,t-k}}{S_{E,t-k-1}} \times \ln \frac{S_{FI,t-k}}{S_{FI,t-k-1}}$$

Where	
$S_{E,t}$	Closing price of Equity (1) on date t
$S_{FI,t-k}$	Closing price on date t-k of Fixed Income (2 or 3) selected on date t
λ	Decay parameter
$\sigma_{E,t}(\lambda)$	Volatility of Equity (1) computed as in Step 2
$\sigma_{FI,t}^2(\lambda)$	Volatility of Fixed Income (2 or 3) as computed in Step 2
$Cov_{E,FI,t}(\lambda)$	Covariance between Equity (1) and Fixed Income (2 or 3) as computed in Step 2

4c. Daily Step 3: Compute Reference Equity Weight

Compute the daily reference weight of Equity (1) on date t by:

$$\begin{cases} \sigma_{target} = 7\% \ \ is\ the\ target\ annualized\ volatility \\ W_{E,t} = \min(\frac{\sigma_{target}}{\max\left(\sigma_{E,t}(0.94), \sigma_{E,t}(0.97)\right)}, 100\%) \end{cases}$$

Where	
$W_{E,t}$	Daily Reference Weight allocated to Equity (1)

4d. Daily Step 4: Compute Reference Fixed Income Weight

Compute $\boldsymbol{W_F}$, daily reference weight of Fixed Income (2 or 3)

$$W_{F,t} = 1 - W_{E,t}$$

Where	
$W_{F,t}$	Daily Reference Weight allocated to Fixed Income (2 or 3)

4e. Daily Step 5: Compute Final Weights

Using the daily reference weight for Equity (1) and Fixed Income (2 or 3) we now compute portfolio volatility:

$$\sigma^2{}_{port,t}(\lambda) = {W_{E,t}}^2 \times \sigma^2_{E,t}(\lambda) + {W_{F,t}}^2 \times \sigma^2_{F,t}(\lambda) + 2 \times W_{E,t} \times W_{F,t} \times Cov_{E,F,t}(\lambda)$$

Where	
$\sigma_{E,t}(\lambda)$	Volatility of Equity (1) computed as in Step 2
$\sigma^2_{FI,t}(\lambda)$	Volatility of Fixed Income (2 or 3) as computed in Step 2
$Cov_{E,FI,t}(\lambda)$	Covariance between Equity (1) and Fixed Income (2 or 3) as computed in Step 2
$\sigma_{E,t}(\lambda)$	Volatility of Equity (1) computed as in Step 2
$\sigma^2_{FI,t}(\lambda)$	Volatility of Fixed Income (2 or 3) as computed in Step 2
$Cov_{E,FI,t}(\lambda)$	Covariance between Equity (1) and Fixed Income (2 or 3) as computed in Step 2

$\sigma_{E,t}$ (Final portfolio variance is calculated as:

$$\sigma_{final_t} = \max\left[\sigma_{port,t}(0.94), \sigma_{port,t}(0.97)\right]$$

And thus, final weights for Equity (1) and the pre-final weight for Fixed Income (2 or 3) are computed as follows:

$$\begin{cases} W_{E,t}^{final} = W_{E,t-1} \times \min\left(\frac{\sigma_{target}}{\sigma_{final_{t-1}}}, 150\%\right) \\ W_{FI\ 5Y,t}^{pre-final} = W_{F,t-1} \times \min\left(\frac{\sigma_{target}}{\sigma_{final_{t-1}}}, 150\%\right)\ if\ the\ selected\ Fixed\ Income\ on\ t-1\ is\ Component\ 3, \\ \qquad\qquad otherwise\ 0 \\ W_{FI\ 10Y,t}^{pre-final} = W_{F,t-1} \times \min\left(\frac{\sigma_{target}}{\sigma_{final_{t-1}}}, 150\%\right)\ if\ the\ Selected\ Fixed\ Income\ on\ t-1\ is\ Component\ 2, \\ \qquad\qquad otherwise\ 0 \end{cases}$$

And final weights for the Fixed Income Components are computed as follows:

$$\begin{cases} W_{FI\ 5Y,t}^{final} = \min\left(W_{FI\ 5Y,t-1}^{final} + 20\%, \max\left(W_{FI\ 5Y,t-1}^{final} - 20\%, W_{FI\ 5Y,t}^{pre-final}\right)\right) \\ W_{FI\ 10Y,t}^{final} = \min\left(W_{FI\ 10Y,t-1}^{final} + 20\%, \max\left(W_{FI\ 10Y,t-1}^{final} - 20\%, W_{FI\ 10Y,t}^{pre-final}\right)\right) \end{cases}$$

5. Ongoing Management of the Index

Rebalancing occurs daily in accordance with the process described above in section 4, "Initial Composition of the Index". Composition weights change daily between the equity component and the fixed income component. When the rules call for a switch between the 5-year and 10-year treasuries, the existing component is bound to a 20% maximum per day shift until the final weight is achieved. During these transition periods, it is possible that the index could hold both 5 and 10-year treasuries until the switch is complete.

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