SOLACTIVE
German Index Engineering

INDEX GUIDELINE

Currency Hedge Indices Methodology

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INTRODUCTION

We currently have the following methods in place to calculate a currency hedge index:

- Hedge using FX forwards (1-week, 1-month, 2-month, 3-month).
- Daily hedge using Spots/Forwards (currently, this is only possible for an index with 100% exposure to one currency).

Additional Features:

- For fixed Income Indices, calculation with a projected Market Value is possible.
- Possibility to filter currencies (for example, block a currency from hedging).
- Possibility to underhedge/overhedge the underlying unhedged index.

For all these methods, the performance of an underlying unhedged index in the same currency is used and on top a hedge impact is calculated.

INDEX SPECIFIC INFORMATION

Closing index levels are calculated using Reuters Spot or 4pm London time WM fixing/4pm NY time WM fixings.

If FX forward hedging, the following additional information is necessary:

- Rebalancing date (*RT*)
  It is freely configurable.
- Selection date (*ST*)
  Selection date is the date on which the weights for the currency hedge are determined and is stated in days from the rebalancing date, that is, 1 means one business day before rebalancing date. If ST = 0, then ST = RT.

If daily hedging, the following additional information is necessary:

- Rebalancing date (*RT*)
  The standard is the last business day of the month, but this is freely configurable.

INDEX CALCULATION USING FX FORWARDS

1. Calculating FX weight

If the underlying unhedged index contains more than one foreign currency, the weight of each currency is calculated based on the close of business (COB) on the selection date. If only one foreign currency is included in the index or the index is a local currency index, the weight is set to 1.

Simple example:

The underlying unhedged Index is calculated in USD and includes six shares, 2 in CHF, 2 in EUR, 2 in USD:

Share	Currency	Weight (COB ST)
1	CHF	5%
2	CHF	15%
3	EUR	20%
4	EUR	20%
5	USD	30%
6	USD	10%

The weight of CHF is 20% and of EUR is 40%.

2. Calculation of the Hedge Impact (*HIM*)

The Hedge impact is calculated as follows:

$$HIM_t = AF_{RT} \cdot \sum_{i=1}^{n} W_{i,ST} \cdot S_{i,ST}^{m} \cdot \left(\frac{1}{F_{i,RT}^{m}} - \frac{1}{IF_{i,t}^{m}} \right)$$

with,

AF_{RT} = Adjustment Factor on the last rebalancing date which is calculated as follows:

$$AF_{RT} = \frac{HI_{ST}}{HI_{RT}},$$

where,

HI_{ST} = Value of the hedged index on ST

HI_{RT} = Value of the hedged index on RT

n = Number of different currencies in the unhedged Index (without considering the currency in which the index is calculated)

$W_{i,ST}$ = Weight of currency i on selection date ST

$S_{i,ST}^{m}$ = Mid Spot Rate of currency i on selection date ST

$F_{i,RT}^{m}$ = Mid Forward Rate of currency i on rebalancing date RT

$IF_{i,t}^{m}$ = Interpolated Forward Rate on day t which is calculated as follows:

$$IF_{i,t}^{m} = S_{i,t}^{m} + \left(F_{i,t}^{m} - S_{i,t}^{m}\right) \cdot \frac{D-d}{D}$$

where,

$S_{i,t}^{m}$ = Mid Spot Rate of currency i on day t

$F_{i,t}^{m}$ = Mid Forward of currency i on day t

D = number if calendar days between the last and the next rebalancing date

d = number of calendar days between t and the last rebalancing date

3. Index calculation

The hedged index is calculated as follows:

$$HI_t = HI_{RT} \cdot \left(1 + \left(\frac{UI_t}{UI_{RT}} - 1\right) + HIM_t\right)$$

with,

UI_t = underlying unhedged index on day t

UI_{RT} = underlying unhedged index on the last rebalancing date RT

INDEX CALCULATION USING A DAILY HEDGING

Currently it is only possible to calculate a hedged variant of an unhedged index which does not include more than one currency. Further the formula needs not only an unhedged index, but also a local currency index. Regarding daily hedging, only the calculation of the hedge impact (*HIM*) changes and is calculated as follows:

When t is the day after the rebalancing:

$$HIM_t = \sum_{t=1}^{d} AFL_t \cdot \left(\frac{S_{RT}^m}{F_{RT}^m} - \frac{S_{RT}^m}{IF_t^m} \right)$$

otherwise,

$$HIM_t = HIM_{t-1} + \sum_{t=1}^{d} AFL_t \cdot \left(\frac{S_{RT}^m}{IF_{t-1}^m} - \frac{S_{RT}^m}{IF_t^m} \right)$$

where,

AFL_t = Adjustment Factor of the local currency index which is calculated as follows:

$$AFL_t = \frac{ULI_{t-1}}{ULI_{RT}}$$

where,

ULI_{t-1} = unhedged Index in local currency on day t-1.

ULI_{RT} = unhedged Index in local currency on the rebalancing date RT.

CONTACT

Solactive AG
German Index Engineering
Platz der Einheit, 1
60327 Frankfurt am Main
Germany

Tel.: +49 (0) 69 719 160 00
Fax: +49 (0) 69 719 160 25
Email: info@solactive.com
Website: www.solactive.com