

Russell Currency Hedging Methodology

v1.5



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Section 1

Introduction

1. Introduction

- 1.1 These rules provide a detailed description of the standard currency hedging methodology, which is applied to create a wide range of currency hedged indices.
- 1.2 The currency hedged indices are constructed by adding a layer of currency forward contracts to the underlying unhedged indices, such as the Russell US 3000 Index. The forward rates are standard one-month contracts that are rolled at each rebalance day. The number of foreign currencies to sell is estimated once a month based on the unhedged index constituents, which stays unchanged for the remainder of the month until the next rebalance.
- 1.3 A list of key features in this methodology includes:
 - Rolling of the forward contracts uses currency weights (adjusted for corporate events) from one day prior to each rebalance day. For example, on 31 January 2015, FTSE Russell determine the currency weights to hedge based on the equity index close as of 30 January 2015 but adjust the weights for corporate events and constituent changes after the close of business on 31 January 2015. The purpose of doing this is to avoid having to wait until the equity markets close to trade the currencies and thus improve tradability and reduce operational costs. The mismatch this causes with regard to the monthly roll is adjusted in the index performance calculation.
 - Currency quotations of stocks within the country are used when determining the currency weights. For example, a Singapore-traded stock quoted in USD will be attributed to USD exposure rather than SGD exposure.
 - Global depositary receipts (GDRs) are included based on the currency quotation of the underlying security when determining the notional currency amounts.
 - FTSE Russell will use one-month forward rates to calculate odd-day forward contracts when valuing the hedge between rebalances to interpolate the relevant amount.
 - Currency settlement dates are taken into account when valuing the forward contracts.
 - Where applicable, non-deliverable forwards (NDFs) based on WM Refinitiv 16:00 UK time service are used to value the forward positions intra rebalance. Furthermore, one week and one-month forwards are used to derive the forward points to avoid the mismatch of the spot and NDF rates. For example, the KRW spot rate in the WM Refinitiv service stays unchanged after the local close around 12:00pm London time, whereas the KRW 1M NDF rate changes even after the local close. So there exists a mismatch between the spot and 1M NDF at the 16:00 fixing. To eliminate the mismatch, spot week (SW) (one week forward) and 1M NDF are used when calculating the forward points.
 - Non-deliverable forwards (NDFs) using local market hours WM Refinitiv rates are used to roll the forward positions at the rebalance.
- 1.4 These ground rules should be read in conjunction with the ground rules of the underlying unhedged indices.

Section 2

Currency data

2. Currency data

2.1 The following WM Refinitiv 16:00 UK time service mid-rates will be used as part of the index calculation:

- spot rates;
- forward rates; and
- non-deliverable forward rates.

2.2 The following WM Refinitiv hourly spot and non-deliverable forward rates will be used as part of the monthly roll process:

Currency	Currency code	Fixing time (local time)	Fixing time (GMT)
Chinese Renminbi	CNY	11:00	03:00 (GMT +8 hrs)
Indonesia Rupiah	IDR	10:00	03:00 (GMT +7 hrs)
India Rupee	INR	13:30	08:00 (GMT +5.5 hrs)
South Korea Won	KRW	15:00	06:00 (GMT +9 hrs)
Malaysia Ringgit	MYR	15:00	07:00 (GMT +8 hrs)
Philippines Peso	PHP	11:00	03:00 (GMT +8 hrs)
Taiwan Dollar	TWD	11:00	03:00 (GMT +8 hrs)

2.3 Where rates are not published by WM Refinitiv, the previous day's rates will be used in the index calculation. In the event of either the spot or forward rates being unavailable, both spot and forward rates of the previous day will be used.

2.4 The currency hedged index will be calculated at the end of each working day and follow the underlying unhedged index holiday calendar. The monthly rebalance day of the hedged index is selected as the common business day, based on WM Refinitiv and the underlying index holiday calendar.

2.5 The following table specifies whether a forward or NDF should be used for any country/currency as part of the currency hedging calculation. This table is subject to change.

Table one: example of Russell countries using forwards/NDFs

Region	Country	Currency	ISO currency code	Forward/NDF
Europe/	Austria	Euro	EUR	Forward
Middle East/	Belgium	Euro	EUR	Forward
Africa	Czech Republic	Koruna	CZK	Forward
	Denmark	Krone	DKK	Forward
	Egypt	Pound	EGP	NDF*

Region	Country	Currency	ISO currency code	Forward/NDF
	Finland	Euro	EUR	Forward
	France	Euro	EUR	Forward
	Germany	Euro	EUR	Forward
	Greece	Euro	EUR	Forward
	Hungary	Forint	HUF	Forward
	Iceland	Krona	ISK	
	Ireland	Euro	EUR	Forward
	Israel	Shekel	ILS	Forward
	Italy	Euro	EUR	Forward
	Kuwait	Dina	KWD	
	Netherlands	Euro	EUR	Forward
	Norway	Krone	NOK	Forward
	Poland	Zloty	PLN	Forward
	Portugal	Euro	EUR	Forward
	Romania	Leu	RON	
	Saudi Arabia	Riyal	SAR	
	Spain	Euro	EUR	Forward
	South Africa	Rand	ZAF	Forward
	Sweden	Krona	SEK	Forward
	Switzerland	Franc	CHF	Forward
	Turkey	Turkish Lira	TRY	Forward
	United Arab Emirates	Emirati Dirham	AED	Forward
	United Kingdom	Pound	GBP	Forward

Region	Country	Currency	ISO currency code	Forward/NDF
Americas	Brazil	Real	BRL	NDF*
	Chile	Peso	CLP	NDF*
	Colombia	Peso	COP	NDF*
	Canada	Dollar	CAD	Forward
	Mexico	Peso	MXN	Forward
	United States	Dollar	USD	Forward

Region	Country	Currency	ISO currency code	Forward/NDF
Asia	Australia	Dollar	AUD	Forward
	China	Renminbi	CNY	NDF
	Hong Kong	Dollar	HKD	Forward
	India	Rupee	INR	NDF
	Indonesia	Rupiah	IDR	NDF
	Japan	Yen	JPY	Forward

Region	Country	Currency	ISO currency code	Forward/NDF
	Malaysia	Ringgit	MYR	NDF
	New Zealand	Dollar	NZD	Forward
	Pakistan	Rupee	PKR	Forward
	Philippines	Peso	PHP	NDF
	Singapore	Dollar	SGD	Forward
	South Korea	Won	KRW	NDF
	Thailand	Baht	THB	Forward
	Taiwan	Dollar	TWD	NDF

*Please note that the NDFs highlighted are part of the WM Refinitiv Closing Forward Rate Service and will be treated as forward rates in the calculation of the Currency Hedged Indices. Where NDF rates are made available as part of the WM Refinitiv NDF Service, they will be used in the currency hedging calculation and treated as NDFs. See Section 3 for further information on the calculation treatment of forward rates and NDF rates.

**WM Refinitiv do not publish NDF spot week rates. Spot rate and one-month NDF rate will be used when calculating the FIR (see rule 3.4 for its calculation).

2.6 The majority of currency pairs will settle on a t+2 settlement cycle. Currencies with different settlement dates are included in table two below. This table is subject to change.

Table two: countries with T+1 settlement period

Country	ISO currency code	Currency name
Canada	CAD	Canadian Dollars
Philippines	PHP	Philippine Peso
Turkey	TRY	Turkish Lira

2.7 Price, net of tax total return and total return indices are available as a standard offering in AUD, CAD, CHF, EUR, GBP, JPY, USD, SGD and ZAR.

2.8 Availability of currency data due to an extraordinary market event

2.8.1 If an extraordinary market event occurs that causes WM Refinitiv not to provide the relevant currency values used as part of the index calculation, based on market information FTSE Russell may suspend the hedging of the respective currency. Suspending the currency forward or NDF rate will change the way the forward/NDF rate is used in the index calculation.

2.8.2 The index calculation will adjust for the suspension depending on whether it is a rebalance date or not. When a currency forward or NDF rate is suspended from trading prior to a rebalance date, the index will continue to calculate until the rebalance date using the last available currency forward or NDF rate (at the suspension date) along with its associated spot price on that date. If the suspension remains or occurs at a rebalance date, then the currency will not be hedged.

2.8.3 If currency data becomes available from WM Refinitiv following its suspension, FTSE Russell will use this data in the index calculation at the next rebalance date provided sufficient information is available that will ensure its continued supply.

- 2.8.4 Where a currency forward or NDF rate is suspended and WM Refinitiv confirm that it will no longer be published, the currency will be unhedged in the index calculation.
- 2.8.5 If a currency is not suspended and data is not provided by WM Refinitiv, the currency hedging calculation will use the previous days spot and forward until both rates are available until the next rebalance. In the case of NDFs, the previous days spot week or NDF rates will be used in pairs as well. Where no currency information is provided by WM Refinitiv at the rebalance, the currency will not be hedged.

Section 3

Currency hedged index calculation

3. Currency hedged index calculation

This section highlights the major components required to calculate the Currency Hedged Indices.

3.1 Calculation formula

The currency hedged index is calculated as a combination of the performance from the unhedged index performance and the impact of hedging:

$$HI_t = HI_{t-x} \times \frac{UI_t}{UI_{t-x}} + HI_{t-x-1} \times IH_t$$

Where:

- HI_t = Hedged index at the close of the value date t
- HI_{t-x} = Hedged index at the close of the previous hedging date
- HI_{t-x-1} = Hedged index one business day prior to the previous hedging date
- UI_t = Unhedged index at the close of the value date t
- UI_{t-x} = Unhedged index at the close of the previous hedging date
- IH_t = Impact of hedging, which is defined as follows:

$$IH_t = \frac{\sum_{i=1}^n \{Mcap_{i,t-x-1} \times CIH_{i,t} \times HF_{i,t}\}}{\sum_{i=1}^n \{Mcap_{i,t-x-1}\}}$$

Where:

- $Mcap_{i,t-x-1}$ = Notional amount to hedge for currency i as of one business day prior to the previous hedging date. A more detailed definition is provided in rule 3.2
- n = Number of currencies to hedge in the index
- $HF_{i,t}$ = Hedging factor (0 or greater) – this is the proportion of the currency i to be hedged. Note that for FTSE's standard currency hedged indices the HF will be 1
- $CIH_{i,t}$ = Currency impact of hedge for currency i between the previous hedge date (t-x) and the value date t, which is defined as follows:

$$CIH_{i,t} = \frac{S_{i,t-x-1}}{F_{i,t-1}} - \frac{S_{i,t-x-1}}{FIR_{i,t}}$$

Where:

- $S_{i,t-x-1}$ = Spot exchange rate into the base currency at the close one business day prior to the previous hedging date
- $F_{i,t-1}$ = One month forward/NDF rate at the close of the previous hedging date

$FIR_{i,t}$ = Forward interpolated rate into the base currency for currency i . A more detailed calculation of this odd day forward is provided in rule 3.4

Where forward/NDF rates are not available at the rebalance day, the currency will not be hedged and the $CIH_{i,t} = 0$.

3.2 Treatment of currency settlements

3.2.1 Rules to determine the spot value date

For USD-based currency pairs, a preliminary spot value date is first selected by adding the number of settlement convention days to the trade date, following the quoted currency's holiday calendar. If the preliminary spot value date is a non-business day according to the USD holiday calendar, then the spot value date is the first good business day on both the quoted currency and the USD calendar following the preliminary spot value date. The one-month maturity date is selected by adding one calendar month to the spot value date.

For non-USD based cross pairs, all three currency calendars (quoted currency, base currency and USD) are taken into account. Firstly, a preliminary spot value date is picked from the latter of the quoted/USD and base/USD. Then the spot value date is the first business day of the quoted currency, base currency and USD calendars following the preliminary spot value date.

3.2.2 Rules to determine the maturity date of a one-month contract

If the spot value date is on a month-end, then the maturity date is the next month-end. If such date is a non-business day according to the holiday calendar of the quoted currency, USD or base currency (if different from USD), the date is rolled backwards to the previous good business day.

The month-end of a currency pair is the last business day of a month, according to the holiday calendar of the two legs (plus USD calendar if it is a cross rate).

If the spot value date is not on a month-end, then the maturity date is selected by adding one calendar month to the spot value date. If such date is a non-business day according to the holiday calendars of the quoted currency, USD or the base currency (if different from USD), the date is rolled forward to the next good business day.

3.3 Determination of notional values to hedge at rebalance day

3.3.1 Hedging quantity

Currency quotations of the index constituents are used when determining the notional amount of currencies to hedge. For example, a Hong Kong traded constituent quoted in USD will be attributed to USD exposure rather than HKD exposure.

Depositary receipts (DRs) are included based on the currency of quotation of the underlying security when determining the notional currency amounts. For example, a Russian RUB denominated security with a DR listed in New York would be treated as a RUB exposure rather than USD exposure. If the underlying security listing does not exist, the currency of the country of domicile will be hedged.

3.3.2 Hedging timing

The notional values to hedge at each rebalance day are determined based on the unhedged index as of one business day prior to the rebalance day. The purpose of this treatment is to avoid having to wait until the equity market closes to trade the currencies. Any index changes in the composition of the index due to index reviews or corporate actions effective on the first business day following the rebalance are taken into account.

The following is an example of how the notional amount to hedge based on index changes is adjusted.

This example shows how the notional and currency weights are evaluated to sell on 28 February 2013 for an index consisting of four currencies: USD, CAD, GBP and KRW. The index is quoted in EUR.

First the closing notional and currency weights are calculated as of the close of 27 February 2013, as follows.

Currency	Notional (EURbn)	Weight
USD	11,122.59	76.8299%
CAD	882.09	6.0931%
GBP	1,940.53	13.4043%
KRW	531.70	3.6727%

Then on 28 February 2013 when the hedge is implemented, the notional values are adjusted (and currency weights accordingly) based on the composition changes effective at the open of 1 March 2013. In this instance, two US constituents had corporate events causing an increase in market capitalisation in USD. Therefore, the notional value to hedge from USD is adjusted higher, as shown in the table below.

Currency	Notional (EURbn)	Weight
USD	11,124.27	76.8326%
CAD	882.09	6.0924%
GBP	1,940.53	13.4028%
KRW	531.70	3.6723%

Note: when a market is on holiday the market values used in the calculation will be based on the previously traded data updated for exchange rate movements.

3.4 Calculation of odd-day forwards

3.4.1 Treatments of standard forward contracts

The calculation of an odd-day forward rate is used to reflect the mark to market price of the forward that does not have a standard time to maturity (odd-day forward). A linear interpolation approach is used:

$$FIR_{i,t} = S_{i,t} + \frac{(F_{i,t} - S_{i,t}) * n}{T}$$

Where:

$S_{i,t}$ = Spot exchange rate into the base currency for currency i at time t

$F_{i,t}$ = One-month forward rate into the base currency for currency i at time t

T = Number of days from spot value date to maturity date of the one-month forward at time t

n = Number of days left for the contract initiated at the previous hedging date

Example

On 12 February 2013: to value a EUR/USD one month forward (initiated on 31 January 2013). The maturity date of this forward is 4 March 2013. Firstly, the spot and standard one-month tenor forward rate as of the trade date are obtained:

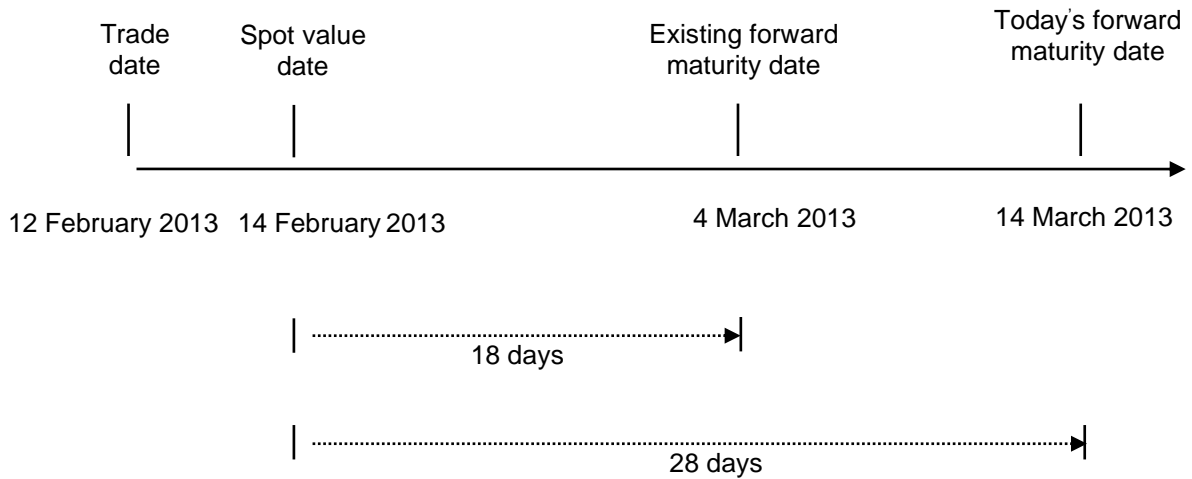
$$S_{Feb\ 12} = 1.3465$$

$$F_{Feb\ 12} = 1.3467$$

The number of calendar days between the spot value date and the forward maturity date are counted, which is 28 days as shown in the chart one. Next the number of days left until the maturity of the existing forward that is being priced is counted. In this example the answer is 18 days. Lastly, a linear interpolation is used to calculate the 18-day forward rate:

$$FIR_{Feb\ 12} = 1.3465 + \frac{(1.3467 - 1.3465) * 18}{28} = 1.3466$$

Chart one: timeline for calculating the number of days as part of the odd-day forward rate



3.4.2 Treatments of non-deliverable forward contracts for intra-rebalance valuation

The example in the previous section shows how to interpolate a forward rate, which can also be used to interpolate non-deliverable forward (NDF) rates, with a spot rate adjustment.

FTSE Russell uses WM Refinitiv 16:00 London NDF rates for some of the currencies in the hedging calculation to value the currency positions intra-rebalance (see Section 2 for further details). As the corresponding spot rates are fixed at the local close, there exists a mismatch between the fixings of the spot and the NDFs, which may cause erroneous results when calculating the odd-day forward. To eliminate the mismatch, an implied spot rate is used to match the NDF rates.

Firstly, the points per day (PPD) are calculated for the currency using a spot week (SW) and a one-month NDF contract:

$$PPD_{i,t} = \frac{(NDF_{i,t} - SW_{i,t})}{(N_{NDF} - N_{SW})}$$

Where:

- $NDF_{i,t}$ = one-month NDF rate for currency i at value date t
- $SW_{i,t}$ = one-week NDF rate for currency i at value date t
- N_{NDF} = number of days to maturity of the one-month NDF
- N_{SW} = number of days to maturity of the one-week NDF

Then the implied spot (IS) rate is calculated as:

$$IS_{i,t} = SW_{i,t} - (PPD_{i,t} * N_{SW})$$

Here is an example demonstrating how the implied spot is calculated.

On 12 February 2013, to calculate the implied spot rate of Korean Won (KRW), given the following data:

Tenor	Start date	End date	Day count	Rate
SW	14 February 2013	21 February 2013	7	1,093
One month	14 February 2013	14 March 2013	28	1,090

The points per day and implied spot are calculated as follows:

$$PPD_{KRW,2013-02-12} = \frac{(1090 - 1093)}{(28 - 7)} = -0.14286$$

$$IS_{KRW,2013-02-12} = 1090 - (-0.14286 * 7) = 1094$$

This implied spot will be used in the *FIR* calculations for all NDF contracts. In the scenario where the spot week rate is unavailable, the conventional spot rate will be used instead.

3.4.3 Treatment of non-deliverable forward contracts at the rebalance

At the rebalance, the relevant currency positions will be rolled using non-deliverable forward rates and spot rates at local market fixings as outlined in rule 2.2. This process will follow the treatment of standard forward contracts (see rule 3.4.1) as both spot and forward rates are available at the local fixing times. These rates will be crossed (where applicable) with standard forward contracts using the WM Refinitiv 16:00 UK time service. For example, a USD/KRW position will be taken at the local market fixing time and a EUR/USD position at 16:00 UK time.

3.5 Treatment of cross currency pairs with different settlement dates

The term cross rate is used to refer to a currency pair that does not involve the USD. For example, the exchange rate between the Euro and Yen is considered a cross rate and can be derived from the USD-based currency pairs USD/EUR and USD/JPY. When crossing through the USD, the two currencies may have different settlement dates due to different settlement conventions or local holidays. Therefore, it is necessary to align the settlement dates and thus adjust the rates before multiplying the two pairs. The adjustment is done by interpolating/extrapolating using the one month forward.

Similar to the implied spot rate calculation, points per day (PPD) between the spot value date and the one-month forward maturity date is firstly derived:

$$PPD = \frac{(1MRate - SpotRate)}{(1MDate - SpotDate)}$$

Then the adjusted spot or forward rate can be calculated as:

Adjusted spot rate

$$SpotRate_{Adj} = SpotRate + PPD * (SpotDate_{Adj} - SpotDate)$$

Where the adjusted spot value date is the spot value date of the cross rate, which is selected as the latter of the two USD-based currency spot value dates, as described in rule 3.2.

Adjusted one-month forward rate

$$1MRate_{Adj} = SpotRate + PPD * (1MDate_{Adj} - SpotDate)$$

Where the adjusted maturity date is the maturity date of the cross rate, which is selected as the latter of the two USD-based currency maturity dates, as described in rule 3.2.

If the cross rate involves NDFs in either of the legs, the PPD will be calculated using one-month and spot-week contracts, as demonstrated in rule 3.4.2, and the adjusted spot or forward rate will be calculated based on the implied spot rate.

For example, on 2 July 2013, to calculate the cross rate of EUR/CAD spot and one-month forward rate, given the following data:

Currency	Trade date	Spot date	Spot rate	Maturity date	1M forward rate
CAD	2 July 2013	3 July 2013	1.0529	2013-08-06	1.05375
EUR	2 July 2013	5 July 2013	0.768256	2013-08-05	0.768167

First, the spot and maturity date of the cross pair are determined. The spot date is the latter of the CAD spot date 2013-07-03 and the EUR spot date 2013-07-05, which gives us 2013-07-05. Similarly, the maturity date is the latter of 2013-08-06 and 2013-08-05, which is 2013-08-06.

Next the cross spot and maturity date are calculated. Before multiplying the pair, the rates are adjusted so that the spot or maturity date of either leg aligns with that of the cross pair. For CAD, the spot date needs to be adjusted to 2013-07-05 from 2013-07-03. The adjusted spot rate is calculated in the following steps:

$$PPD^{CAD} = \frac{(1.05375 - 1.0529)}{(2013 - 08 - 06) - (2013 - 07 - 03)} = 0.000025$$

Days between the original spot date and the cross-spot date:

$$(2013 - 07 - 05) - (2013 - 07 - 03) = 2$$

The adjusted CAD spot rate is:

$$1.0529 + 0.000025 * 2 = 1.05295$$

The maturity date of the one-month CAD contract is the same as the maturity date of the cross rate and therefore, there is no adjustment to the one-month CAD forward rate.

For EUR, the spot date is unchanged compared to the cross-pair but the one-month forward maturity date needs to be adjusted from 2013-08-05 to 2013-08-06. The adjusted forward rate is calculated as:

$$PPD^{EUR} = \frac{(0.768167 - 0.768256)}{(2013 - 08 - 05) - (2013 - 07 - 05)} = -0.000003$$

Days between the original spot date and the cross one-month maturity date:

$$(2013 - 08 - 06) - (2013 - 07 - 05) = 32$$

The adjusted EUR one-month forward rate is:

$$0.7683 + (-0.000003) * 32 = 0.768164$$

Currency	Trade date	Adjusted spot date	Adjusted spot rate	Adjusted maturity date	Adjusted 1M forward rate
CAD	2 July 2013	5 July 2013	1.05295	2013-08-06	1.05375
EUR	2 July 2013	5 July 2013	0.768256	2013-08-06	0.768164

Now the rates are crossed by multiplying the two:

EUR/CAD spot rate = CAD adjusted spot rate * (1/EUR adjusted spot rate)

$$= 1.05295 * (1/0.768256)$$

$$= 1.370572$$

EUR/CAD 1M rate = CAD adjusted one-month rate * (1/EUR adjusted one-month rate)

$$= 1.05375 * (1/0.768164)$$

$$= 1.371777$$

Section 4

Further information

4. Further information

A Glossary of Terms used in FTSE Russell's ground rule documents can be found using the following link:

[Glossary.pdf](#)

For further information, visit www.lseg.com/en/ftse-russell/ or e-mail info@ftserussell.com. Contact details can also be found on this website.

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