

REFINITIV BENCHMARK SERVICES LIMITED

WM/REFINITIV ('WMR') FX BENCHMARKS

SPOT, FORWARD AND NDF RATES METHODOLOGY GUIDE

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About this document

BENCHMARK DESCRIPTION

Refinitiv provides an exchange rate service that publishes Spot, Forward and Non Deliverable Forward benchmark rates at specified times throughout the global trading day. Refinitiv is committed to publishing independent and transparent benchmark rates which, based on its methodology, it believes are reasonably designed to be reflective of the market at the time of each calculation. As part of its normal business practices, Refinitiv routinely reviews its policies and practices against appropriate international foreign exchange 'FX' benchmark regulations and guidance.

To view the WM/Refinitiv ('WMR') Benchmark Statement please use the [following link](#).

Chapter 1 - INTRODUCTION

1.1 HISTORY

The WMR Closing Spot Rates service was introduced in 1994 to provide a standard set of currency benchmark rates so that portfolio valuations could be compared with each other and their performance measured against benchmarks without having any differences caused by exchange rates. These rates were adopted by index compilers, the Financial Times and other users and became the de facto standard for Closing Spot Rates on a global basis.

In 1997, the WMR Closing Forward Rates service was launched to complement the Closing Spot Rates service.

In 2001, the WMR Intraday Spot Rate service was launched to extend the Spot rates product and meet customers' growing requirements. This service has since expanded to provide hourly spot rates from Monday 06:00 in Hong Kong/Singapore until Friday 22:00 in the UK.

In 2004, the WMR Intraday Forwards were launched at 08:00, 10:00, 12:00 and 14:00 UK time. Further enhancements have since seen this extended to an hourly service from 06:00 – 21:00 UK time with additional rates provided at 17:00 New York time, 10:00 and 16:00 Sydney time, 14:00 New Zealand time, 11:00 Singapore time, 11:00 Bangkok time and 10:00 Tokyo time.

In 2009, the WMR Non Deliverable Forwards (NDF) Rates were launched covering 12 currencies. The NDF service provides both Closing and Intraday Rates.

In 2012, the WMR Intraday Spot Rates service was further enhanced by the introduction of half-hourly benchmarks for the trade currencies only.

In 2014, the WMR Spot Rates service was enhanced to include the WMR Tokyo Benchmark Service covering 24 currencies against JPY, USD, GBP and EUR. In 2018 this was extended to cover 31 currencies.

1.2 USE OF THE RATES

It is understood that the majority of the main equity and bond index compilers use the WMR exchange rates in their calculations, and the original uses of the rates in portfolio valuations and performance measurement are still very relevant. However, other uses of the rates have developed and are becoming increasingly important. For example, many customers now use the rates as a benchmark for currencies in contracts of different kinds including the settlement of financial derivatives. Many banks will now provide a service to their customers whereby they will guarantee to trade certain currency pairs at, or by reference to, the WMR rates which is useful for investment customers if they are making changes to a portfolio bench-marked against an index that uses the WMR rates, and seeks to minimize any reconciliation differences from foreign exchange. Corporate users will find that it is very useful to value currency holdings held globally at a common rate, and if necessary, swap or trade them at the same rate. Using WMR rates in this way can avoid using expensive resources to check the market continually. Auditors accept the WMR rates as independently calculated and administered.

1.3 KEY POINTS

Benchmark Administration

RBSL is the benchmark administrator for the WMR rates and thus has primary responsibility for all aspects of the benchmark determination process. This includes the development, determination and dissemination, operation and governance of the Spot, Forward and Non Deliverable Forward Rate services. This methodology document provides a summary of the methodology (including the validation process and certain tolerance checks applied therein) that RBSL uses to establish the benchmark rates. However, certain portions of the methodology and related intellectual property are proprietary and confidential and are therefore not publicly disclosed.

Expert Judgement

The term Expert Judgement is used throughout this methodology, starting from Section 2.3 and refers to when employees of Refinitiv may exercise discretion with respect to the use of data in determining a benchmark. The calculation of the benchmark rate includes a validation process whereby, among other steps, employees of Refinitiv review data and calculated benchmark rates pursuant to certain pre-determined tolerance checks. When applying tolerance checks, an employee has discretion (subject to internal policies and procedures) to include or reject certain data from the calculation of the benchmark rate. Based on Refinitiv' experience interpreting market data, Refinitiv will use its own judgement when it believes it necessary with the intent of ensuring the quality and integrity of the benchmark rate. In particular, Refinitiv may rely on its own judgement more frequently in an active albeit low liquidity market where transactions may not be consistently available. Refinitiv has in place internal guidelines and quality control procedures that govern the application of Expert Judgement and are intended to provide consistency and oversight to this process. Employees receive initial and on-going training in how to comply with these guidelines and procedures.

Active Market

Refinitiv recognizes that to enable the publication of a meaningful benchmark a market in each currency pair represented by the benchmark must genuinely exist, and that market must be active. However, due to variable economic factors the meaning of 'active' may differ across currencies, as market liquidity can vary greatly from a liquid major currency to an extremely illiquid exotic currency for example, and at particular times of the day. In certain cases, Refinitiv defines an active market as having only a 'Single Source'. A list of these currencies can be provided upon request.

Data Sourcing

Refinitiv undertakes a periodic review of the appropriateness of using specific data suppliers to provide the data used in the calculation and validation of the benchmark rates. This review is intended to, among other things, assist in ensuring that the benchmark rates are (i) based on reliable and observable market data that reflect the economic realities of a given market, and (ii) that the benchmark rates themselves are reliable representations of the foreign exchange market.

There is no solicitation process to obtain underlying data, either by panel or by polling in the benchmark calculation process. Refinitiv uses transactional data entered into on an at arm's length basis between buyers and sellers in that market, where that data is available and reflects sufficient liquidity.

In a market where lower liquidity exists the benchmark may be based predominantly or exclusively on bid and offer rates, or from prior transactions.

Validation of Data

All captured rates and calculated benchmark rates are subject to a number of tolerance checks with the intent of determining benchmark rates that are reflective of the underlying market at a given time. Refinitiv performs tolerance checks at the time the data is sourced and again after the calculation of the benchmark is complete in order to ensure the quality of the source data and the benchmark rates. Captured rates that do not satisfy the tolerance checks and cannot be explained using Expert Judgement by wider market moves or events may be rejected and replaced. Replacement rates are subject to the same tolerance checks.

If the rates collected during a window do not satisfy the tolerance checks, or if no rates are available for a calculation based on a snapshot, rates will be determined using Expert Judgement with reference to earlier rates and to alternative sources that include central bank rates where applicable.

Currency and tenor specific systematic tolerances are reviewed periodically, annually as a minimum, by the Currency Review Group. This group supplements the routine monitoring and reporting of the prevailing market dynamics performed during the validation process by providing further scrutiny of the inputs and ex-post analysis of trends and outliers. The Currency Review Group is tasked with effecting and managing the change process with the intent of reflecting underlying market conditions.

If, following further scrutiny, the current source(s) of rates is considered using Expert Judgement to be of inadequate quality and a supplemental or replacement source of rates cannot be found, Refinitiv may initiate a consultation with stakeholders on the viability of the currency and tenor affected under the terms of the Cessation Policy.

Governance and Transparency

Refinitiv is subject to a corporate risk framework which is based on three lines of risk management:

1. Business procedures and controls are designed to promote consistency throughout the process.
2. The corporate risk framework applies independent governance, reporting and risk management.
3. The Board of directors and relevant subcommittee are responsible for oversight of the benchmark rates, including reviewing and advising on the policies and methodologies, by which Refinitiv calculates, administers and publishes the benchmark.

A Benchmark Oversight Committee (the "Oversight Committee") has been established to provide advice and challenge to the Benchmark administrator executive. The Oversight Committee's Terms of Reference document provides details of the responsibilities of the Oversight Committee and its current members. The terms of reference are available via the [following link](#). The Oversight Committee comprises members selected on the basis of their experience and knowledge.

Refinitiv performs periodic due diligence on third parties and data sources. Refinitiv welcomes all enquiries with regards to the determination of the benchmark.

Chapter 2 WM/Refinitiv Spot Rates

2.1 COVERAGE

The rates are intended to cover the currencies for those countries that are included in a global or regional stock market index or where there is sufficient liquidity in the currency market to provide accurate benchmark rates. The addition of currencies not meeting these criteria will be at the discretion of Refinitiv, and in theory, any world currency may be included.

The coverage of the WMR rates is shown under section 2.6, Closing and Intraday, and 2.7, Tokyo benchmarks.

The European legacy currencies (ATS, BEF, CYP, DEM, EEK, FRF, FIM, GRD, IEP, ITL, LTL, LUF, LVL, MTL, NLG, PTE, ESP, SIT and SKK) are included, but these are derived from the fixed conversion factor and the USD/EUR quote. An example of this calculation is included under section 6.2. The XEU (European Currency Unit — ECU) is also included, but this is equal to the euro value.

In addition to publishing rates at the hourly calculation times from Monday 06:00 Hong Kong/Singapore time to Friday 22:00 UK time, there is also WMR Closing Spot Rates (4 p.m. UK time) history available since 1994 and the WMR Intraday History available since 2001.

2.2 TIMING

The normal calculation times are hourly from Monday 06:00 Hong Kong/Singapore to Friday 22:00 in the UK, with half-hourly rates provided for the 'trade currencies' only. See Section 2.3 for details of these 'trade currencies.' The Tokyo benchmarks are calculated at 9.55JST (00:55GMT), see section 2.7 for details of the currencies covered.

Different calculation times may be used for reasons that include the following:

- An earlier time is chosen by Refinitiv according to the policy on national holidays (see section 5.1).
- An earlier or later time is chosen by Refinitiv due to technical difficulties in receiving or failure in supply of the source financial data.
- An earlier or later time is chosen by Refinitiv for particular currencies due to special market conditions.

Refinitiv' target for completion of calculation and publication of the service is 15 minutes after the calculation time.

The rates published as at 4 p.m. UK time are the Closing Spot rates.

2.3 SOURCING

The Refinitiv Market Data System is the primary infrastructure and technology used to source spot foreign exchange (FX) rates from multiple, market participants to be used in the calculation of the rates. Refinitiv, using Expert Judgement, determines the appropriate data sources to be used on a per currency basis. This is subject to the oversight of the governance process. Please refer to our Changes to the Methodology and Service Policy for further information. Data sources are reviewed periodically and clients will be advised prior to any material change being made.

The criteria used for selecting the source of spot FX rates are the quality and representativeness of those rates with respect to the wider market. The underlying rates used are those deemed to be the most appropriate for foreign investment transactions.

All currencies within the spot rate benchmarks are referred to as "Trade Currencies" or "Non-trade Currencies".

For Trade Currencies, the data source ("Data Source") to be used is determined by RBSL on a per currency basis and based primarily on the liquidity available on the trading platform in said currencies. Such Data Sources are reviewed periodically with respect to their quality and the representativeness of the FX rates with respect to the wider market. Data Sources for the determination of the benchmarks are the following highly liquid order matching platforms: Refinitiv Matching, EBS and Currenex. The benchmarks are not based on the contribution of input data. Readily available input data for determination of the benchmarks from these platforms are either traded rates or order rates, with traded rates taking precedence where available subject to the RBSL's expert judgment.

All other currencies are referred to as “Non-Trade Currencies”. The Data Source for Non-Trade Currencies is Refinitiv indicative quote data from multi contributor instrument codes. Wherever possible, a multi-contributor source of rates is used in preference to a single contributor unless an “official” benchmark is being used. Where data sufficiency is limited, Refinitiv will use its own Expert Judgement to determine representative and meaningful market rates. A different type of rate may be selected by Refinitiv for reasons that include the following:

- Commercial interbank bid and offer rates are not available for a particular currency.
- An “official” benchmark is created that is more appropriate for foreign investment transactions.

Refinitiv has in place internal guidelines and quality control procedures that govern the application of Expert Judgement and are intended to provide consistency and oversight to this process. Employees receive initial and on-going training in how to comply with these guidelines and procedures.

Trade Currencies

The following 25 currencies (AUD, CAD, CHF, CNH, CZK, DKK, EUR, GBP, HKD, HUF, ILS, INR, JPY, MXN, NOK, NZD, PLN, RON, RUB, SEK, SGD, THB, TOF, TRY and ZAR) are referred to as “Trade Currencies.” Bona fide arm’s length transactional Trade and Order rates are sourced from the following highly liquid platforms; Refinitiv Matching, EBS and Currenex. The Trade and Order rates are used in the validation and calculation of these currencies.

The following 14 currencies have Refinitiv Matching as their source: CZK, DKK, HUF, ILS, INR, MXN, NOK, PLN, RON, SEK, THB, TOF, TRY and ZAR. 8 currencies are sourced from Refinitiv Matching and EBS: AUD, CAD, CNH, GBP, HKD, NZD, RUB and SGD. EUR, CHF and JPY are sourced from EBS, Currenex and Refinitiv Matching. Please refer to Appendix 1 which details fully the sources used across the global day for the Trade Currencies.

The primary source of rates will be actual traded rates taken from Refinitiv Matching, EBS and Currenex, as detailed above “Traded rates/Trades”.

The secondary source of rates will be the bid/offer rates on the order matching systems of Refinitiv Matching, EBS and Currenex “Order rates/Orders”.

Bank quotes from Refinitiv RICs will be captured for instances where neither Trades nor Orders are available.

All other currencies not identified above as 'trade' currencies can be assumed to be 'non trade'.

Base Currency

The “base” currency is either the US dollar or the Euro, depending on which base currency is predominant. Presently, currencies which are predominantly based against the Euro are CHF, CZK, DKK, HUF, NOK, PLN, RON and SEK. All other currencies are based against the US dollar. However, this may be changed for particular currencies if Refinitiv believes that more appropriate or representative quotations are available against a different base currency.

Market Conventions

It is a convention in the FX markets that some currencies are quoted against the USD on an inverted basis. Normally, a local currency is expressed per 1USD: for example, 1USD = x.xxxx CAD. An inverted currency is expressed per local currency: for example, 1GBP = x.xxxx USD. Normally, a local currency amount would be divided by the exchange rate to get a USD amount, but for inverted currencies, the local currency amount is multiplied by the exchange rate to get a USD amount. This convention applies only to rates quoted against the USD, not rates quoted against any other currency. These inverted currencies are GBP, EUR, AUD, NZD, IEP, BWP, SBD, TOP, WST and XEU.

Certain rates are calculated from other currencies or from proportions of other currencies, for example, XDR (Special Drawing Rights).

All rates are published using standard market quotation conventions. ISO codes are used.

2.4 CALCULATION METHOD

2.4.1 Non-Trade Currencies

The FX market is constantly monitored by capturing rates every 15 seconds and performing continuous and interactive validation.

The captured market data is subject to currency specific systematic tolerance checks which will identify outlying data. Validation is performed on the outlying data by Operations Specialists, who will seek corroboration, or rely upon their own judgement to determine the market level. The calculated benchmark is then subject to further currency specific tolerance checks prior to publication. The use of Expert Judgement may be appropriate to assess the validity of rates throughout this process, with quality control guidelines and procedures governing each application of such judgement.

Over a five minute period snapshots of the quoted rates are taken from Refinitiv. These are extracted at 15 second intervals from 2 minutes 30 seconds before to 2 minutes 30 seconds after the calculation time.

The median bid and offer rates are independently calculated from the individual snapshots for each currency. These bid and offer rates are validated prior to publication, against currency specific thresholds and this may result in Expert Judgement being applied.

2.4.2 Traded Rates

The FX market is constantly monitored by capturing rates every 15 seconds.

Over a five-minute period, actual trades executed and bid and offer order rates from the order matching systems are captured every second from 2 minutes 30 seconds before to 2 minutes 30 seconds after the time of the calculation (e.g. hour and/or ½ hour). Trading occurs in milliseconds on the trading platforms and therefore not every trade or order is captured, just a sample.

From each data source, a single traded rate will be captured each second– this will be identified as a bid or offer depending on whether the Trade is a buy or sell. A spread will be applied to the Trade rate to calculate the opposite bid or offer. The spread applied will be determined by the Order rate captured at the same time. All captured Trades will be subjected to validation checks. This may result in some captured data being excluded from the calculation.

Valid Trades from all sources captured during the time period will be “pooled” together. Subject to a minimum number of valid Trades being present within this pool of data, using a threshold determined by Refinitiv based on Expert Judgement, the Trade rates will be used for the benchmark. A median Trade bid and Trade offer are calculated independently, using data from the single pool of trades across data sources. The mid-rate is calculated from the median Trade bid and Trade offer. A minimum “Standard Spread” is applied to the mid-rate to calculate a new bid and offer. These bid, offer and mid rates will be validated prior to publication, against currency specific tolerance thresholds, and this may result in Expert Judgement being applied.

Where the number of valid executed traded rates falls below the threshold determined by Refinitiv Expert Judgement, then data from the order matching system(s) will be used in the calculation of the benchmark rate. From each data source, the best bid and best offer rates will be captured simultaneously to the Trade data from each data source. All captured Order rates will be subjected to validation checks. This may result in some captured data being excluded from the calculation.

Order rates from different sources will not be pooled together. Using valid Order rates, a median bid and offer are calculated independently, for each data source. The mid-rate is calculated from the median Order bid and Order offer. A minimum Standard Spread is applied to the mid-rate to calculate a new bid and offer. The bid, offer and mid rates from the data source with the highest valid Orders over the time period will be selected as the rates for publication. Consequently the data source to be used will be driven by the market. These bid and offer rates will be validated prior to publication, against currency specific tolerance thresholds, and this may result in Expert Judgement being applied.

In the event that two or more data sources have an equal number of valid Orders, then an average of the mid-rate from these data sources will be used.

In the event that two or more data sources have a single Order only, the most up to date Order rates will be used.

Bid, offer and mid rates are derived. Mid rates are calculated as the arithmetic mean of rounded bid and offer rates. Bid and offer rates are published to four decimal places; the mid rates are published to five decimal places. Where a "5" is encountered, the convention is to round up.

Standard Spreads

In order to publish spreads which are reflective of currency markets, Refinitiv sets pre-defined minimum and maximum spreads for each currency, at each calculation time. These are variable across currencies to reflect different market levels and changes in liquidity at different times of day.

In order to reflect actual market conditions, if the market dictates spreads which are greater than the pre-defined minimum spread and less than the pre-defined maximum spread, then these wider spreads will be used in the benchmark calculation - up to the maximum spread as predefined in the system. In the event the market dictates spreads which are wider than the predefined maximum standard spreads, further analysis will be undertaken.

2.4.3 Local Close Currencies

For currencies where offshore trading is not permitted, the spot rates are published in line with local market levels. This means that when local markets are opened, the published spot rates will reflect activity in that market. When the local market closes, the spot rates in each subsequent publication (hourly/½ hourly) **remain unchanged**. This impacts the following currencies. Please note that the “Open Time” and “Close Time” for each currency are subject to change.

| ISO | OPEN TIME | CLOSE TIME |
|-----|-----------------|-----------------|
| CNY | 01:15 GMT | 09:00 GMT |
| IDR | 01:15 GMT | 09:00 GMT |
| INR | 03:45 GMT | 11:30 GMT |
| KRW | 23:15 GMT | 07:00 GMT |
| MYR | 23:15 GMT | 10:00 GMT |
| PHP | 00:15 GMT | 08:00 GMT |
| THB | 00:15 GMT | 10:00 GMT |
| TWD | 00:15 GMT | 07:00 GMT |
| BRL | 11:00/12:00GMT* | 20:00/21:00GMT* |

*Dependent on Local Daylight Saving Time

2.4.4 Cross Calculated Currencies

Section 2.3 details the currencies that are not captured against USD. All other currencies are captured and validated against USD.

Once the rates have been validated, cross rates to GBP and EUR are calculated. An example of these calculations is included under **section 6.1**.

Cross rates to further base currencies may be published, and if so, these will be calculated using the same principles.

T+1 Currencies

The following currencies follow the market convention where the spot date is T+1: CAD Canadian Dollar, RUB Russian Rouble, TRY Turkish Lira and PHP Philippine Peso

No adjustment is made and the calculation is performed as if both currencies are T+2.

Market Holidays

No adjustment is made in the cross calculation when market holidays are observed in either the primary, or the crossing currency.

The method of calculating the rates is protected by a patent awarded in 2008, US serial 09/972,193.

The validation process used is protected by the patent detailed above.

2.5 SPOT RATE PRODUCTS

- Closing Spot Rates
- Historical Spot Rates
- Intraday Spot Rates
- Tokyo Spot Rates
- 11am UK Intraday Spot Rates
- 2pm CET Intraday Spot Rates
- 12pm EST Intraday Spot Rates (CAD Noon)

2.6 COVERAGE OF CLOSING AND INTRADAY SPOT RATES

Coverage is currently in the following 157 currencies,

| Europe | | | | | |
|------------------------|-----|-------------------------|-----|------------------|-----|
| Albania Lek | ALL | Austrian Schilling | ATS | Belarus Ruble | BYN |
| Belgian Franc | BEF | Bosnia Herzegovina Mark | BAM | Bulgarian Lev | BGN |
| Croatian Kuna | HRK | Cyprus Pound | CYP | Czech Koruna | CZK |
| Danish Krone | DKK | Estonian Kroon | EEK | ECU | XEU |
| Euro | EUR | Finnish Markka | FIM | French Franc | FRF |
| Deutsche Mark | DEM | Greek Drachma | GRD | Hungarian Forint | HUF |
| Iceland Krona | ISK | Irish Punt | IEP | Italian Lira | ITL |
| Latvian Lat | LVL | Lithuanian Litas | LTL | Luxembourg Franc | LUF |
| Macedonia Denar | MKD | Maltese Lira | MTL | Moldova Leu | MDL |
| Dutch Guilder | NLG | Norwegian Krone | NOK | Polish Zloty | PLN |
| Portugese Escudo | PTE | Romanian Leu | RON | Russian Ruble | RUB |
| Slovakian Koruna | SKK | Slovenian Tolar | SIT | Spanish Peseta | ESP |
| British Pound | GBP | Swedish Krona | SEK | Swiss Franc | CHF |
| Turkish New Lira | TRY | Ukraine Hryvnia | UAH | Serbian Dinar | RSD |
| Special Drawing Rights | XDR | | | | |

| Africa & Gulf | | | | | |
|--------------------|-----|-----------------------|-----|-----------------------|-----|
| Algerian Dinar | DZD | Angola Kwanza | AOA | Bahrain Dinar | BHD |
| Botswana Pula | BWP | Burundi Franc | BIF | Central African Franc | XAF |
| Comorian Franc | KMF | Congo Dem. Rep. Franc | CDF | Cote D'Ivoire Franc | XOF |
| Egyptian Pound | EGP | Ethiopia Birr | ETB | Gambian Dalasi | GMD |
| Ghana Cedi | GHS | Guinean Franc | GNF | Kenyan Shilling | KES |
| Israeli Shekel | ILS | Jordanian Dinar | JOD | Lesotho Loti | LSL |
| Kuwaiti Dinar | KWD | Lebanese Pound | LBP | Mauritanian Ouguiya | MRU |
| Malagasy Ariary | MGA | Malawi Kwacha | MWK | Mozambique Metical | MZN |
| Mauritius Rupee | MUR | Moroccan Dirham | MAD | Omani Rial | OMR |
| Namibia Dollar | NAD | Nigerian Naira | NGN | Saudi Arabian Riyal | SAR |
| Qatar Rial | QAR | Qatar Rial Offshore | QOF | Rwanda Franc | RWF |
| South African Rand | ZAR | Seychelles Rupee | SCR | Sierra Leone Leone | SLL |
| Tanzania Shilling | TZS | Tunisian Dinar | TND | Swaziland Lilangeni | SZL |
| Ugandan Shilling | UGX | Yemen Rial | YER | UAE Dirham | AED |
| New Zambian Kwacha | ZMW | Zimbabwe Dollar | ZWL | | |

| Asia-Pacific | | | | | |
|-------------------|-----|------------------|-----|-----------------|-----|
| Australian Dollar | AUD | Azerbaijan Manat | AZN | Bangladesh Taka | BDT |

| | | | | | |
|--------------------|-----|------------------------|-----|-------------------|-----|
| Bhutan Ngultrum | BTN | Brunei Dollar | BND | Chinese R. Yuan | CNY |
| Chinese R. Yuan HK | CNH | Fiji Islands Dollar | FJD | Georgia Lari | GEL |
| Hong Kong Dollar | HKD | Indian Rupee | INR | Kazakhstan Tenge | KZT |
| Indonesian Rupiah | IDR | Japanese Yen | JPY | Malaysian Ringgit | MYR |
| Kyrgyzstan Som | KGS | Macao Pataca | MOP | Nepal Rupee | NPR |
| Maldives Rufiyaa | MVR | Mongolia Tugrik | MNT | Pakistani Rupee | PKR |
| New Zealand Dollar | NZD | Pacifique Franc | XPF | Samoa Tala | WST |
| Papua NG Kina | PGK | Philippine Piso | PHP | South Korean Won | KRW |
| Singapore Dollar | SGD | Solomon Islands Dollar | SBD | Thai Baht | THB |
| Sri Lanka Rupee | LKR | Taiwan Dollar | TWD | Uzbekistan Som | UZS |
| Thai Baht Offshore | TOF | Tonga Pa'anga | TOP | Vanuatu Vatu | VUV |
| Vietnam Dong | VND | | | | |

Americas

| | | | | | |
|------------------------|-----|------------------|-----|------------------------------|-----|
| Argentine Peso | ARS | Aruba Guilder | AWG | Bahamas Dollar | BSD |
| Barbados Dollar | BBD | Belize Dollar | BZD | Bermudan Dollar | BMD |
| Bolivian Boliviano | BOB | Brazilian Real | BRL | Canadian Dollar | CAD |
| Cayman Islands Dollar | KYD | Chilean Peso | CLP | Colombian Peso | COP |
| Costa Rica Colon | CRC | Cuba Peso | CUP | Dominican Republic Peso | DOP |
| East Caribbean Dollar | XCD | Ecuadorian Sucre | ECS | El Salvador Colon | SVC |
| Guatemala Quetzal | GTQ | Haiti Gourde | HTG | Honduras Lempira | HNL |
| Jamaica Dollar | JMD | Mexican Peso | MXN | Netherlands Antilles Guilder | ANG |
| Nicaragua Gold Cordoba | NIO | Panama Balboa | PAB | Paraguay Guarano | PYG |
| Peru New Sol | PEN | Surinam Dollar | SRD | Trinidad & Tobago Dollar | TTD |
| Uruguay Peso | UYU | US Dollar | USD | Venezuelan Soberano | VES |

2.7 COVERAGE OF TOKYO SPOT RATES

Coverage is currently in the following 31 currencies:

Europe

| | | | | | |
|------------------|-----|-----------------|-----|------------------|-----|
| Czech Koruna | CZK | Danish Krone | DKK | Euro | EUR |
| Hungarian Forint | HUF | Norwegian Krone | NOK | Polish Zloty | PLN |
| Romanian Leu | RON | Russian Rouble | RUB | Sterling | GBP |
| Swedish Krone | SEK | Swiss Franc | CHF | New Turkish Lira | TRY |

Africa & Gulf

| | | | | | |
|--------------------|-----|---------------|-----|---------------------|-----|
| Israeli Shekel | ILS | Kuwaiti Dinar | KWD | Saudi Arabian Riyal | SAR |
| South African Rand | ZAR | UAE Dirham | AED | | |

Asia-Pacific

| | | | | | |
|--------------------|-----|--------------------|-----|------------------|-----|
| Australian Dollar | AUD | Chinese R. Yuan HK | CNH | Hong Kong Dollar | HKD |
| Indian Rupee | INR | Indonesian Rupiah | IDR | Japanese Yen | JPY |
| New Zealand Dollar | NZD | Singapore Dollar | SGD | S. Korean Won | KRW |
| Taiwan Dollar | TWD | Thai Baht | THB | | |

Americas

| | | | | | |
|-----------------|-----|--------------|-----|-----------|-----|
| Canadian Dollar | CAD | Mexican Peso | MXN | US Dollar | USD |
|-----------------|-----|--------------|-----|-----------|-----|

Chapter 3 WM/Refinitiv Forward Rates

3.1 COVERAGE

The rates are intended to cover the currencies for those countries where a significant level of forward trading exists in the country's currency and where forward quotes are reliably available on Refinitiv.

The coverage is presently 80 currencies and is periodically reviewed as more information is made available in the market.

Bid, offer and mid rates against the USD, GBP and EUR are provided. A list of currencies covered is under section 3.6.

The time periods covered for the forward rates are:

- ON Overnight
- TN Tomorrow Next
- SW Spot Week (One Week)
- 1M One Month
- 2M Two Months
- 3M Three Months
- 6M Six Months
- 9M Nine Months
- 1Y One Year
- 2Y Two Years (Some Currencies Only)
- 5Y Five Years (Some Currencies Only)

3.2 TIMING

The rates are intended to be "intraday and closing" rates. The normal calculation times are hourly from 06:00 to 21:00 UK time Monday to Friday. In addition, Refinitiv publishes at 17:00 hours New York time, 10:00 hours Sydney time, 14:00 hours New Zealand time, 10:00 Tokyo time, 11:00 hours Singapore time, 11:00 Bangkok time and 16:00 hours Sydney time.

A different calculation time may be used for reasons that include the following:

- An earlier time is chosen by Refinitiv according to the policy on national holidays (see section 5.2).
- An earlier or later time is chosen by Refinitiv due to technical difficulties in receiving or failure in supply of the source financial data.
- An earlier or later time is chosen by Refinitiv for particular currencies due to special market conditions.

Target time for the publication of the service is 30 minutes after the calculation time.

The rates published as at 4 p.m. UK time are the Closing Forward rates.

3.3 SOURCING

The Refinitiv Market Data System is the sole infrastructure and technology system used to source the forward FX rates from multiple, market participants to be used in the calculation of the rates. Other sources may be used by exception where the appropriate rates are not available on the Refinitiv architecture

As far as possible, the underlying rates used are those deemed to be the most appropriate for foreign investment transactions. These will normally be commercial interbank bid and offer premiums or discounts.

A different type of rate may be selected by Refinitiv if commercial interbank bid and offer rates are not available for a particular currency.

Refinitiv, using Expert Judgement determines the appropriate data sources to be used on a per currency basis, subject to the oversight of the governance process please refer to our [Changes to the Methodology and Service Policy](#). Data sources are reviewed periodically and clients will be advised prior to any material change being made.

The criteria used for selecting the source of forward FX rates are the quality and representativeness of those rates with respect to the wider market. The “base” currency for rates selected from the Market Data System will normally be the US dollar. However, this may be changed for particular currencies if Refinitiv believes that more appropriate or representative quotations are available against a different base currency.

The choice of rates for any particular currency lies with Refinitiv and other market sources are used by Refinitiv for quality control purposes.

For some currencies, forward rates are not available and the market uses Non-Deliverable Forward (NDF) rates instead. The premium/discount NDF currencies, included in the Forwards services are ARS, BRL, CLP, COP, EGP and PEN. Also, due to there being distinct “onshore” and “offshore” forward rates for SGD, we provide offshore rates. For Thailand, we provide both onshore rates, THB, and offshore rates, TOF.

Where data sufficiency is limited, Refinitiv will use its own judgement to determine representative and meaningful market rates.

Refinitiv also provides outright NDF Rate services, detailed in section 4.

3.4 CALCULATION METHOD

The FX Forward market is constantly monitored by capturing rates every 2 minutes and performing continuous and interactive validation. The captured market data is subject to currency specific systematic tolerance checks which identify outlying data. Validation is performed on the outlying data by Operations Specialists, who will seek corroboration, or rely upon their own judgement to determine the market level. On the hour a snapshot of quoted rates is taken for each tenor, and considered the benchmark rate, subject to further currency specific tolerance checks prior to publication.

The use of such judgement may be appropriate to assess the validity of rates throughout this process, with quality control guidelines and procedures governing each application of such judgement.

Once the rates have been validated, premiums and discounts to GBP and EUR are calculated using the outright forward rates; an example of this is under section 6.3, with further information on the calculation of the cross rates detailed in Section 2.4.4. Legacy currency premium/discounts are calculated using the fixed euro conversion rates; an example is shown under section 6.4. Further base currencies may be published, and if so, these will be calculated using the same principles.

All forward rates are published using premiums or discounts that can be directly added to the spot rate to provide an outright forward rate. Note that ON and TN premiums/discounts should be subtracted from the spot rate to calculate an outright forward rate. ISO codes are used.

All forward rates (bid, offer and mid) are rounded to five decimal places after the decimal point. Where a “5” is encountered, the convention is to round up.

3.4.1 Local Close Currencies

For currencies where offshore trading is not permitted, the forward rates are published in line with local market levels. This means that when local markets are opened, the published forward rates will reflect activity in that market. When the local market closes, the forward rates in each subsequent publication (hourly) **remain unchanged**.

This impacts the following currencies. Please note that the “Open Time” and “Close Time” for each currency are subject to change.

| ISO | OPEN TIME | CLOSE TIME |
|-----|-----------|------------|
| CNY | 01:15 GMT | 09:00 GMT |
| IDR | 01:15 GMT | 09:00 GMT |
| INR | 03:45 GMT | 11:30 GMT |
| KRW | 23:15 GMT | 07:00 GMT |
| MYR | 23:15 GMT | 10:00 GMT |
| PHP | 00:15 GMT | 08:00 GMT |
| THB | 00:15 GMT | 10:00 GMT |
| TWD | 00:15 GMT | 07:00 GMT |

The method of calculating the rates is protected by a patent awarded in 2008, US serial 2002–0042765.

3.5 FORWARD RATE PRODUCTS

- Closing Forward Rates
- Historical Forward Rates
- Intraday Forwards Rates

3.6 COVERAGE OF FORWARD RATES

Coverage is currently in the following 80 currencies:

| Europe | | | | | |
|--------------------|-----|------------------|-----|------------------|-----|
| Austrian Schilling | ATS | Belgian Franc | BEF | Bulgarian Lev | BGN |
| Croatian Kuna | HRK | Cyprus Pound | CYP | Czech Koruna | CZK |
| Danish Krone | DKK | Estonian Kroon | EEK | Ecu | XEU |
| Euro | EUR | Finnish Markka | FIM | French Franc | FRF |
| Deutsche Mark | DEM | Greek Drachma | GRD | Hungarian Forint | HUF |
| Iceland Krona | ISK | Irish Punt | IEP | Italian Lira | ITL |
| Latvian Lat | LVL | Lithuanian Litas | LTL | Maltese Lira | MTL |
| Dutch Guilder | NLG | Norwegian Krone | NOK | Polish Zloty | PLN |
| Portuguese Escudo | PTE | Romanian Leu | RON | Russian Rouble | RUB |
| Serbian Dinar | RSD | Slovakian Koruna | SKK | Slovenian Tolar | SIT |
| Spanish Peseta | ESP | British Pound | GBP | Swedish Krone | SEK |
| Swiss Franc | CHF | New Turkish Lira | TRY | | |

| Africa & Gulf | | | | | |
|--------------------|-----|--------------------|-----|---------------------|-----|
| Bahrain Dinar | BHD | Botswana Pula | BWP | Egyptian Pound | EGP |
| Ghana Cedi | GHS | Israeli Shekel | ILS | Jordanian Dinar | JOD |
| Kenyan Shilling | KES | Kuwaiti Dinar | KWD | Moroccan Dirham | MAD |
| Omani Rial | OMR | Qatar Rial | QAR | Nigerian Naira | NGN |
| South African Rand | ZAR | Tunisian Dinar | TND | Saudi Arabian Riyal | SAR |
| Ugandan Shilling | UGX | New Zambian Kwacha | ZMW | UAE Dirham | AED |

| Asia-Pacific | | | | | |
|--------------------|-----|------------------|-----|--------------------|-----|
| Australian Dollar | AUD | Chinese R. Yuan | CNY | Chinese R. Yuan HK | CNH |
| Hong Kong Dollar | HKD | Indian Rupee | INR | Indonesian Rupiah | IDR |
| Japanese Yen | JPY | Kazakhstan Tenge | KZT | Malaysian Ringgit | MYR |
| New Zealand Dollar | NZD | Pakistani Rupee | PKR | Philippine Piso | PHP |
| Singapore Dollar | SGD | S. Korean Won | KRW | Sri Lanka Rupee | LKR |
| Taiwan Dollar | TWD | Thai Baht | THB | Thai Baht Offshore | TOF |

Vietnam Dong VND

Americas

| | | | | | |
|----------------|-----|----------------|-----|-----------------|-----|
| Argentine Peso | ARS | Brazilian Real | BRL | Canadian Dollar | CAD |
| Chilean Peso | CLP | Colombian Peso | COP | Mexican Peso | MXN |
| Peru New Sol | PEN | US Dollar | USD | | |

Chapter 4 WM/Refinitiv NDF Rates

4.1 COVERAGE

The rates are intended to cover the currencies that do not allow offshore entities to trade with the local market.

The coverage is presently 11 currencies and is periodically reviewed as more information is made available. Bid, offer and mid outright rates are published against USD, GBP and EUR. A list of currencies covered is under section 4.6.

The time periods covered for NDF rates are:

- SW Spot Week (One Week)
- 1M One Month
- 2M Two Months
- 3M Three Months
- 6M Six Months
- 9M Nine Months
- 1Y One Year
- 2Y Two Years (Some Currencies Only)
- 5Y Five Years (Some Currencies Only)

4.2 TIMING

The rates are intended to be “intraday and closing” rates. The normal calculation times are hourly from 06:00 to 21:00 UK time Monday to Friday. In addition, we publish at 17:00 hours New York time, 10:00 hours Sydney time, 14:00 hours New Zealand time, 10:00 Tokyo time, 11:00 hours Singapore time, 11:00 Bangkok time and 16:00 hours Sydney time.

A different calculation time may be used for reasons that include:

- An earlier time is chosen by Refinitiv according to the policy on national holidays (see section 5.2).
- An earlier or later time is chosen by Refinitiv due to technical difficulties in receiving or failure in supply of the source financial data.
- An earlier or later time is chosen by Refinitiv for particular currencies due to special market conditions.

Refinitiv’s target for completion of calculation and publication of the service is 30 minutes after the calculation times.

The rates published as at 4 p.m. UK time are the Closing NDF rates.

4.3 SOURCING

The Refinitiv Market Data System is the sole infrastructure and technology system used to source the NDF FX rates from multiple, market participants to be used in the calculation of the NDF rates. Other sources may be used by exception where the appropriate rates are not available on the Refinitiv architecture.

As far as possible, the underlying rates used are those deemed to be the most appropriate for foreign investment transactions. These will normally be commercial interbank bid and offer NDF.

Refinitiv, using Expert Judgement determines the appropriate data sources to be used on a per currency basis, subject to the oversight of the governance process please refer to our [Changes to the Methodology and Service Policy](#). Data sources are reviewed periodically and clients will be advised prior to any material change being made

The criteria used for selecting the source of NDF FX rates are the quality and representativeness of those rates with respect to the wider market. The “base” currency for rates selected from the Market Data System will normally be the US dollar. However this may be changed for particular currencies if Refinitiv believes more appropriate or representative quotations are available against a different base currency.

The choice of rates for any particular currency lies with Refinitiv and other market sources are used by Refinitiv for quality control purposes. Where data sufficiency is limited, Refinitiv will use its own judgement to determine representative and meaningful market rates

4.4 CALCULATION METHOD

The FX Non Deliverable Forward market is constantly monitored by capturing rates every 2 minutes and performing continuous and interactive validation. The captured market data is subject to currency specific systematic tolerance checks which identify outlying data. Validation is performed on the outlying data by Operations Specialists, who will seek corroboration, or rely upon their own judgement to determine the market level. On the hour a snapshot of quoted rates is taken for each tenor, and considered the benchmark rate, subject to further currency specific tolerance checks prior to publication.

The use of Refinitiv own judgement may be appropriate to assess the validity of rates throughout this process, with quality control guidelines and procedures governing each application of such judgement.

Once the rates have been validated, outright rates to GBP and EUR are calculated; an example of this is under section 6.5. Further information on the use and calculation of cross rates is detailed in Section 2.4.4.

All NDF rates (bid, offer and mid) are rounded to five decimal places after the decimal point. Where a “5” is encountered, the convention is to round up.

The method of calculating the rates is protected by a patent awarded in 2008, US serial 2002-0042765.

4.5 NDF RATE PRODUCTS

- Closing NDF Rates
- Historical NDF Rates
- Intraday NDF Rates

4.6 COVERAGE OF NDF RATES

Coverage is currently in the following 11 currencies:

| Europe | | | | | |
|----------------|--------|-----------------|--------|--|--|
| Russian Rouble | RUBNDF | Ukraine Hryvnia | UAHNDF | | |

| Africa & Gulf | |
|----------------|-------|
| Nigerian Naira | NGNDF |

| Asia-Pacific | | | | | |
|------------------|--------|-------------------|--------|-------------------|--------|
| Chinese R. Yuan | CNYNDF | Indian Rupee | INRNDF | Indonesian Rupiah | IDRNDF |
| Kazakhstan Tenge | KZTNDF | Malaysian Ringgit | MYRNDF | Philippine Piso | PHPNDF |
| South Korean Won | KRWDF | Taiwanese Dollar | TWDNDF | | |

Chapter 5 THE SPOT & FORWARD RATES

5.1 POLICY ON NATIONAL HOLIDAYS

The benchmark rates will be produced on all weekdays of the year, subject to the policy detailed below. For further information, there is a schedule available that covers the service alterations up to five years in advance.

[Click here to view](#)

On national holiday dates, the principle is that the rates should be calculated at the normal times up to the latest calculation time possible without compromising the quality of the rates.

In practice, national holidays in the following four financial centres will be monitored in advance: US, UK, Germany and Japan. WMR Closing Spot and Forward Rates will be produced as normal if two or more of these centres are open. WMR Intraday Spot and Forward Rates may not be produced on any day if one or more of these financial centres are closed.

If only one centre is open, the normal policy will be that no benchmark rates will be produced. When the WMR rates are not produced; benchmark rates from the **previous/last** published time would be used. However, if such a situation occurs on a month- end, then further analysis will be carried out as to other markets that are open and a decision taken as to whether or not to produce benchmark rates.

Special circumstances may arise on the last weekdays prior to Christmas and New Year's where although markets are open, they may close early and therefore be illiquid at some normal calculation times. Under these circumstances, Refinitiv may take a decision to revert to an earlier calculation time with the intent of ensuring the integrity of the rates.

Please note the 12pm EST (CAD Noon) Intraday Spot rate service observes the statutory holidays adopted by Canada and therefore these particular benchmark rates will not be published on the market holiday dates. [Click here to view](#)

On the occasions when the WMR services are being published as normal but specific market holidays result in no liquidity for particular currencies; the WMR benchmarks will continue to provide the last published benchmark rate for those currencies.

5.2 DISRUPTION TO SERVICE

Refinitiv has robust controls and resilience architecture in place and where necessary, Refinitiv will invoke these controls to minimise any disruption to the service. Refinitiv has procedures in place to minimise the impact of a potential failover, but in exceptional circumstances it may not be possible for Refinitiv to produce an accurate benchmark rate. When this arises Refinitiv will notify clients as early as possible. Following any such incident, Refinitiv will undertake a full investigation and consider any remediation steps identified.

5.3 DISRUPTION TO FX RATES

Refinitiv appreciates that economic realities could from time to time disrupt normal market conditions and could create unusually illiquid or fragmented markets. When this occurs Refinitiv will use reasonable effort to provide an email notification to clients advising the nature and impact of the disruption. If you wish to receive these notifications, please contact:

wmr.sales@refinitiv.com

In the event that a disruption prevents reliable benchmark rates from being determined, Refinitiv will endeavour to re-publish the most recent benchmark rates until the disruption has ended, or changes implemented. Reliability of benchmark rates following a disruption will be determined using Expert Judgement.

Where the disruption extends into the longer term, Refinitiv will use commercially reasonable efforts to identify additional solutions to provide a benchmark rate which is representative of the market.

5.4 CESSATION

Refinitiv accepts that it may be necessary to terminate the calculation and publication of a benchmark, currency or tenor currently provided within the WMR service. This may be due to external factors beyond Refinitiv control, for example a market

structure change or to a deterioration of data sufficiency. Refinitiv will consult with subscribers and work to identify whether a credible alternative which continues to represent the underlying interest can be identified.

If a credible alternative is identified then Refinitiv will endeavour to assess the viability of that alternative fully, again consulting with subscribers, as appropriate. If cessation is unavoidable Refinitiv will endeavour to assist subscribers in the selection process of an alternative benchmark. Contracts and other financial instruments that reference a benchmark need robust contingency provisions in the event of material changes to, or cessation of, the referenced benchmark. Please refer to our [Cessation of Rates Policy](#)

5.5 COMPLAINTS PROCEDURE

Clients are invited to raise price challenges or other queries or complaints through our mailbox wmr.ops@refinitiv.com. Each price challenge will be investigated in line with our [Price Challenge and Complaints Handling Policy](#). Other inquiries and complaints will be addressed pursuant to the appropriate internal guidelines or policies.

5.6 REPUBLICATION OF RATES

Under exceptional circumstances, it may be necessary to amend the rates for one or more currencies after publication. This will be determined by Refinitiv, after consultation with key users, if appropriate. Under no circumstances will the WMR Spot or Forward Rates for one day be amended after the publication of the following weekday's rates at the same publication time.

All material evidence will be retained as part of our [Republication Policy](#)

5.7 CHANGES TO METHODOLOGY AND SERVICE

Refinitiv shall review the methodology in accordance with the RBSL Benchmark Internal Review Procedures.

A review may suggest a material change to the methodology, including the validation process, or to changes to the tolerances used in the validation process. A material methodology change is defined as a change which fundamentally alters the process by which a benchmark rate is calculated. A review may also suggest a service change, defined as an amendment to currency coverage or to the availability of particular benchmark rates.

Changes to the methodology shall be made in accordance with the RBSL Benchmark Methodology Change Procedures. A service change shall be treated as a methodology change.

5.8 POTENTIAL LIMITATIONS OF THE METHODOLOGY

The ability of Refinitiv to determine and publish the WMR FX Benchmarks in accordance with this methodology depends on (i) activity in each currency on a case by case basis and for all tenors including spot and (ii) the quality and representativeness of the rates available to Refinitiv for the calculation of the Benchmarks. If any reduction of quality in the rates or fragmentation of activity is identified or foreseen, Refinitiv shall review the methodology and its effectiveness in determining suitable benchmarks given conditions in the underlying markets. Such reviews shall be in accordance with the procedures described in the Changes to Methodology and Service section of this methodology.

5.9 DELIVERY METHODS

All services are available directly from Refinitiv on an hourly or daily basis utilising Web-based technology. These delivery methods range from e-mail to faster methods for time-critical applications. Services are also available through Refinitiv applications such as Eikon and Datastream.

Also, the services are available via a range of data distributors. These are subject to change but currently include (in alphabetical order):

- Bloomberg
- Drillinginfo - "MarketView"

-
- Enfusion
 - FIS
 - ICE Data Services
 - Markit
 - Morningstar
 - Nomura Research Institute
 - NTT Data Financial
 - Rimes Technologies
 - SIX Financial Information
 - SS&C Technologies Inc.
 - StatPro Canada Inc.

Chapter 6 CROSS CALCULATIONS

6.1 CROSSED SPOT RATES

For currencies where the market convention is for the spot date to be T+1, no adjustment is made and the calculation is performed as if both currencies are T+2.

T+1 Currencies

The following currencies follow the market convention where the spot date is T+1:

CAD Canadian Dollar, RUB Russian Rouble, TRY Turkish Lira and PHP Philippine Peso

No adjustment is made and the calculation is performed as if both currencies are T+2.

Likewise **no adjustment is made in the cross calculation when market holidays are observed in either or the crossing currency**. Cross rates to further base currencies may be published, and if so, these will be calculated using the same principles.

6.1.1 For Currencies Quoted in Units to USD (For Example, CAD)

Sterling Cross Calculation

GBP/CAD bid = (USD/CAD bid) * (GBP/USD bid)

GBP/CAD offer = (USD/CAD offer) * (GBP/USD offer)

Euro Cross Calculation

EUR/CAD bid = (USD/CAD bid) * (EUR/USD bid)

EUR/CAD offer = (USD/CAD offer) * (EUR/USD offer)

6.1.2 For Currencies Quoted in USD per Unit (For Example, AUD)

Sterling Cross Calculation

GBP/AUD bid = (GBP/USD bid) / (AUD/USD offer)

GBP/AUD offer = (GBP/USD offer) / (AUD/USD bid)

Euro Cross Calculation

EUR/AUD bid = (EUR/USD bid) / (AUD/USD offer)

EUR/AUD offer = (EUR/USD offer) / (AUD/USD bid)

6.1.3 For Currencies Quoted in Units to EUR (For Example, CHF)

USD Cross Calculation

USD/CHF bid = (EUR/CHF bid) / (EUR/USD offer)

USD/CHF offer = (EUR/CHF offer) / (EUR/USD bid)

Sterling Cross Calculation

GBP/CHF bid = (USD/CHF bid) * (GBP/USD bid)

GBP/CHF offer = (USD/CHF offer) * (GBP/USD offer)

6.2 EMU LEGACY SPOT RATES

The same principle applies for all legacy currencies. DEM is used in the formulas below:

USD/DEM Bid Rate Calculation

Invert the EUR/USD offer rate; this now becomes the USD/EUR bid.

Then:

$$\text{USD/DEM bid} = \text{USD/EUR bid} * \text{EUR fixed conversion rate}$$

USD/DEM Offer Rate Calculation

Invert the EUR/USD bid rate; this now becomes the USD/EUR offer rate.

Then:

$$\text{USD/DEM offer} = \text{USD/EUR offer} * \text{EUR fixed conversion rate}$$

6.3 CROSSED FORWARD RATES

For currencies where the market convention is for the spot date to be T+1, no adjustment is made and the calculation is performed as if both currencies are T+2.

T+1 Currencies

The following currencies follow the market convention where the spot date is T+1: CAD Canadian Dollar, RUB Russian Rouble, TRY Turkish Lira and PHP Philippine Peso

No adjustment is made and the calculation is performed as if both currencies are T+2.

Likewise **no adjustment is made in the cross calculation when market holidays are observed in either or the crossing currency**. Cross rates to further base currencies may be published, and if so, these will be calculated using the same principles.

Example of How to Calculate the GBP/CAD 1M (One Month) Bid Premium/Discount

Use the bid rate for all of the following calculations:

- Add the USD/CAD 1M premium/discount to the USD/CAD spot rate
= the USD/CAD 1M outright forward rate
- Add the GBP/USD 1M premium/discount to the GBP/USD spot rate.
= the GBP/USD 1M outright forward rate
- Multiply these two outright forward rates together
= the GBP/CAD 1M outright rate
- GBP/CAD 1M outright forward rate – GBP/CAD spot rate
= GBP/CAD 1M premium/discount Therefore:
- USD/CAD 1M premium/discount bid + USD/CAD spot bid
= USD/CAD 1M outright rate bid
- GBP/USD 1M premium/discount bid + GBP/USD spot bid
= GBP/USD 1M outright rate bid

- USD/CAD 1M outright rate bid * GBP/USD 1M outright rate bid
= GBP/CAD 1M outright rate bid
- GBP/CAD 1M outright rate bid – GBP/CAD spot bid
= GBP/CAD 1M premium/discount bid

6.4 EMU LEGACY FORWARD RATES

Example of How to Calculate the USD/DEM 1M Bid Premium/Discount

- Add the EUR/USD 1M ask premium/discount to the EUR/USD ask spot rate
= the EUR/USD 1M outright ask forward rate
- Invert EUR/USD; this ask figure now becomes the bid
= USD/EUR 1M outright bid forward rate
- Multiply the newly created USD/EUR bid rate and the EUR/DEM fixed conversion rate
= the USD/DEM 1M outright bid rate
- USD/DEM 1M outright bid rate – USD/DEM spot bid rate
= USD/DEM 1M bid premium/discount rate Therefore:
- EUR/USD 1M premium/discount ask + EUR/USD spot ask
= EUR/USD 1M outright rate ask
- USD/EUR * EUR/DEM conversion rate
= USD/DEM 1M outright bid
- USD/DEM 1M outright rate bid – USD/DEM spot bid rate
= USD/DEM 1M bid premium/discount forward rate

6.5 CROSSED NDF RATES

Example of How to Calculate the GBP/CNYNDF 1M Bid Outright Use the bid rate for all of the following calculations:

- Add the GBP/USD 1M premium/discount to the GBP/USD spot rate
= the GBP/USD 1M outright forward rate
- Multiply USD/CNYNDF 1M outright bid * GBP/USD 1M outright bid
= GBP/CNYNDF 1M outright rate Therefore:
- GBP/USD 1M premium/discount bid + GBP/USD spot bid
= GBP/USD 1M outright bid
- USD/CNYNDF 1M outright rate bid * GBP/USD 1M outright bid
= GBP/CNYNDF 1M outright rate bid

Chapter 7 Glossary

- **Administration** - Includes all stages and processes involved in the production and dissemination of a Benchmark, including:
 - Collecting, analyzing and/or processing information or expressions of opinion for the purposes of the determination of a Benchmark;
 - Determining a Benchmark through the application of a formula or another method of calculating the information or expressions of opinions provided for that purpose; and
 - Dissemination to users, including any review, adjustment and modification to this process.
- **Administrator** - An organisation or legal person that controls the creation and operation of the Benchmark Administration process, whether or not it owns the intellectual property relating to the Benchmark. In particular, it has responsibility for all stages of the Benchmark Administration process, including:
 - The calculation of the Benchmark;
 - Determining and applying the Benchmark Methodology; and
 - Disseminating the Benchmark.
- **Arm's Length Transaction** – as defined by the IOSCO Principles, this refers to a transaction between two parties that is concluded on terms that are not influenced by a conflict of interest.
- **Benchmark** – a standard against which foreign exchange rates may be measured.
- **Benchmark Oversight Committee** – established to perform oversight of the WMR spot, forward and non-deliverable forward rate Benchmarks and Refinitiv' role as administrator of the Benchmark Rates. It will also be responsible for reviewing and advising on the policies and methodologies by which Refinitiv calculates, administers and publishes the Benchmark Rates, including for the avoidance of doubt, any cessation of Benchmark Rates.
- **Bona Fide** – as defined by the IOSCO Principles, this refers to data where the parties submitting the data have executed, or are prepared to execute, transactions generating such data and the concluded transactions were executed at arm's length from each other.
- **Closing Rate** – Refinitiv defines 4pm London as the Closing Rate benchmark rates.
- **Economic Realities** – the appreciation that the availability, depth and quality of market data will vary from one market to another depending on the evolution and liquidity available within that market.
- **Interbank** – conducted between or involving two or more banks.
- **Intraday Rate** – Refinitiv produces benchmark rates throughout the day; all rates except the Closing Rates are referred to as Intraday.
- **Inverted** – when a currency's market quotation is shown as the number of US dollars required to buy one unit of foreign currency, also known as 'American terms' or 'Direct'.
- **Non Inverted** – when a currency's market quotation is shown as the number of foreign currency required to buy one USD. Also known as 'European terms' or 'Indirect'
- **Methodology** - The written rules and procedures according to which information is collected and the Benchmark is determined.
- **IOSCO Principles** – 'The Principles for Financial Benchmarks' as at July 2013, published by The Board of the International Organization of Securities Commissions.
- **Local Close Currencies** – currencies identified by Refinitiv where offshore trading is not permitted. Rates are only published during local market opening hours, with no further updates permitted to the benchmark rate once that market closes.
- **Multi Contributor Rate** – a composite feed from Refinitiv which is typically updated by more than one contributor.

-
- [Official Benchmarks](#) – a daily exchange rate for a local currency based on market conditions, usually with involvement from the Central Bank.
 - [Offshore](#) – a market where non domestic banks can participate.
 - [Onshore](#) – a market which is accessible to domestic banks only.
 - [Single Source](#) – where currency markets are restricted or illiquid, the data inputs maybe limited to a primary provider.
 - [WMR Currency Review Group](#) – the group within Refinitiv responsible for the periodic review of currency and tenor specific systematic tolerances which enables the effective monitoring and scrutiny of pre-publication monitoring, as well as ex post analysis of trends and outliers.

Appendix 1

| Source of WMR Spot benchmark rates - Traded Currencies | | | |
|--|---|--|---|
| ISO | Refinitiv Matching | EBS | Currenex |
| AUD | Included in all benchmark rate calculations | Included in all benchmark rate calculations, except from 9pm to 12am UK Inclusive | |
| CAD | Included in all benchmark rate calculations | Included in all benchmark rate calculations, except from 9pm to 12am UK Inclusive | |
| CHF | Included in all benchmark rate calculations | Included in all benchmark rate calculations | Included in all benchmark rate calculations |
| CNH | Included in all benchmark rate calculations | Included in all benchmark rate calculations | |
| CZK | Included in all benchmark rate calculations | | |
| DKK | Included in all benchmark rate calculations | | |
| EUR | Included in all benchmark rate calculations | Included in all benchmark rate calculations | Included in all benchmark rate calculations |
| GBP | Included in all benchmark rate calculations | Included in all benchmark rate calculations, except from 9pm to 12am UK Inclusive | |
| HKD | Included in all benchmark rate calculations | Included in all benchmark rate calculations, except from 9pm to 12am UK Inclusive | |
| HUF | Included in all benchmark rate calculations | | |
| ILS | Included in all benchmark rate calculations | | |
| INR | Included in all benchmark rate calculations when the local markets are open | | |
| JPY | Included in all benchmark rate calculations | Included in all benchmark rate calculations | Included in all benchmark rate calculations |
| MXN | Included in all benchmark rate calculations | | |
| NOK | Included in all benchmark rate calculations | | |
| NZD | Included in all benchmark rate calculations | Included in all benchmark rate calculations, except from 9pm to 12am UK Inclusive | |
| PLN | Included in all benchmark rate calculations | | |
| RON | Included in all benchmark rate calculations | | |
| RUB | Included in all benchmark rate calculations | Included in all benchmark rate calculations | |
| SEK | Included in all benchmark rate calculations | | |
| SGD | Included in all benchmark rate calculations | Included in all benchmark rate calculations, except from 9pm to 12am UK Inclusive | |
| THB | Included in all benchmark rate calculations when the local markets are open | | |
| TOF | Included in all benchmark rate calculations | | |
| TRY | Included in all benchmark rate calculations | | |
| ZAR | Included in all benchmark rate calculations | | |

If you would like to learn more about the WMR Rates Service, please visit our website or contact us by telephone or e-mail. A service representative will be available 24 hours a day from Monday 06:00 Hong Kong/Singapore until Friday 22:00 UK time.

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