Online Manual

Retrieval of Spot and Non-Spot Market Exchange Rates¹

Step by Step: Refinitiv Eikon²

I. Spot Transactions

The retrieval of the **spot** market exchange rate data from Refinitiv Eikon should be done by following the steps outlined below.

Step 1: Log in to your Refinitiv Eikon account in Excel.

1. Open Excel and click Add-ins.



2. Click "Excel Add-ins", then select "Refinitiv Eikon Datastream Excel Formulas" and "Refinitiv Excel Formulas" in the pop-up tab and click OK.

Add-ins		?	\times
Add-ins available:			
Analysis ToolPak Analysis ToolPak - VBA		ОК	
Dlx Euro Currency Tools		Cance	el 👘
Fusionxi Refinitiv Eikon Datastream Excel Formulas (Shim) Refinitiv Evcel Formulas (Shim)		Browse	e
Solver Add-in	A	<u>u</u> tomati	on
	, 		
Refinitiv Eikon Datastream Excel Formulas (Shim)			
ProgID: Thomson.Reuters.AFOSpreadsheetFormulas			

¹ As noted in the Guidance Note for the Fund's Policy on Multiple Currency Practices, IMF staff utilize exchange rate data provided by Refinitiv Eikon as the primary source and Bloomberg as the secondary source. Retrieval of data from Bloomberg relies on access through the IMF's Library, which is not available to external users. Therefore, the Online Manual provided to external audiences details the retrieval process using Refinitiv Eikon, which is accessible to any individual/institution with a license to Refinitiv Eikon.

² For external audiences, the retrieval of exchange rate market data from Refinitiv Eikon for the purpose of the MCP Monitoring File by individuals/institutions not affiliated to the IMF is subject to the permissions of the data license the individual/institution has with Refinitiv Eikon.

3. Click Add-in, select "Com Add-ins, select Refinitiv Eikon - Microsoft Office." Click OK.

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COM Add-ins					? ×
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Inquire					
Microsoft Da	ata Streamer for Excel				٨dd
Microsoft Po	wer Map for Excel				<u>A</u> uu
Microsoft Po	wer Pivot for Excel				
Refinitiv Eike	on - Microsoft Office				<u>R</u> emove
Location:	C:\Program Files (x86)\Thomson Reuters\Ei	kon\EikonOfficeShim.dll			
Load Behavior:	Load at Startup				

4. Refinitiv Eikon add-in should show up in your Add-ins.

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	Get Data			Apps		Deals		C	Data Tools		Contr	ibute Data	Options

5. Click Refinitiv Eikon, click Sign In and enter your account information to log in.

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File	Home	Insert	Draw	Page Layou	t Form	ulas D	ata Revi	ew View	Help	DM	Refinitiv Eiko	on Refiniti	v Eikon Datastream
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6. If you log in successfully, the Online tab should show up.



Step 2: Download daily highest and lowest exchange rate.

1. Open the MCP Assessment Test – Eikon Excel file.

2. Open the *Spot* tab and enter the currency code (RIC) of interest in cell B2. For example, if you are interested in US Dollar/Albanian Lek, enter RIC "ALL".

Note: The RICs for spot rates are constructed using the standardized ISO 4217 currency codes. See the *RICs* tab for a complete list of standard RICs available.

	А	В			
1	Instructions: Insert curre	ncy, time zo			
2	Currency	ALL			
3	Time Zene	(GMT -5:00			
4	nme zone	EST			
5	Start Date	31-Dec-22			
6	End Date	28-Jan-24			

3. After selecting the currency code, select the time zone in cell B3 to reflect the country's local time. For example, for Albania, select GMT +1:00 Tirana.

	А	В	С	D		
1	Instructions: Insert of	urre	ncy, time zo	ne start dat	e, end date in Co	lum
2	Currency		ALL			
3	Time Zene		(GMT -5:00)	US EASTER	N EST	-
4	Time Zone	(GM1	(+1:00) PARIS F	PAR		^
5	Start Date	(GMT	[+1:00) PRAGU [+1:00) βάβατ	E PRG RAB		
6	End Date	(GMT	(+1:00) SKOPJE	SKO		_
7	Date	(GMT	+1:00) STOCK	HOLM STO		
<u>′</u>	Date	(GM1	「+1:00) TIRANA	TIR		
8	26-Jai	(GMT	+1:00) TUNIS 1	ΓUN		
0		(GMT	+1:00) VALEN(CIA VAL		×

4. The start and end date will automatically set to de done 12 months backwards from t-1 date. Additionally, the file will automatically refresh the Ht and Lt wholesale spot market rate the in the *Spot* tab (columns B and C respectively).³

³ Screenshots are based on Refinitiv Eikon services. References to specific data providers do not imply any endorsement or recommendation by the IMF. The screenshots published in this manual are for illustration purposes only. The IMF does not warrant or guarantee the accuracy, completeness, or fitness for purpose of any information or material included in this manual. In case of data required to replicate the steps documented in this manual, the necessary licenses must be purchased directly from the provider(s). The IMF is not responsible for providing access to the data.

	А	В	С	D	E	F	G	н
1	Instructions: Insert curre	ncy, time zo	ne start dat	e, end date in Colu	umn B & official ra	ite data in o	column D, t	he current
2	Currency	ALL						
3	Time Zene	(GMT +1:00)	TIRANA TI	λ				
4	Time Zone	TIR						
5	Start Date	31-Dec-22						
6	End Date	28-Jan-24						
7	Date	High (H _t)	Low (L _t)	R (official rate)		M _{H/L}	M _{H/L} +2%	M _{H/L} -2%
8	26-Jan-24	96.50	94.95			95.73	97.64	93.81
9	25-Jan-24	96.49	94.49			95.49	97.40	93.58
10	24-Jan-24	96.72	94.45			95.59	97.50	93.67
11	23-Jan-24	96.73	94.65			95.69	97.60	93.78
12	22-Jan-24	96.10	94.55			95.33	97.23	93.42
13	19-Jan-24	96.58	94.58			95.58	97.49	93.67
14	18-Jan-24	96.50	94.25			95.38	97.28	93.47
15	17-Jan-24	96.77	94.32			95.55	97.46	93.63
16	16-Jan-24	96.15	94.50			95.33	97.23	93.42
17	15-Jan-24	96.11	93.92			95.02	96.92	93.11
18	12-Jan-24	95.65	94.05			94.85	96.75	92.95
19	11-Jan-24	96.09	93.95			95.02	96.92	93.12
20	10-Jan-24	97.50	94.30			95.90	97.82	93.98
21	09-Jan-24	96.36	94.36			95.36	97.27	93.45
	Instructions RICs	Spot Non-	Spot Theor	etical Non-Spot - For	wards Theoretica	l Non-Spot -	(+) 🕴 .	•
Read	🖌 Calculate 🛛 👷 FOR OFFICIAL US	EONLY 🔟 🏾	🗞 Accessibility: In	vestigate	Av	erage: 262.27	Count: 1523 S	um: 145822.45

5. The Mid_{H/L} and the +/- 2% tolerance margin as well will automatically populate once the Ht and Lt have been retrieved (columns F, G, and H respectively).

	А	В	С	D	E	F	G	Н
1	Instructions: Insert curre	ncy, time zo	ne start date	e, end date in Colu	umn <mark>B &</mark> official ra	te data in o	column D, t	he current
2	Currency	ALL						
3	Timo Zono	(GMT +1:00)) TIRANA TIF	र				
4		TIR						
5	Start Date	31-Dec-22						
6	End Date	28-Jan-24						
7	Date	High (H _t)	Low (L _t)	R (official rate)		M _{H/L}	M _{H/L} +2%	M _{H/L} -2%
8	26-Jan-24	96.50	94.95			95.73	97.64	93.81
9	25-Jan-24	96.49	94.49			95.49	97.40	93.58
10	24-Jan-24	96.72	94.45			95.59	97.50	93.67
11	23-Jan-24	96.73	94.65			95.69	97.60	93.78
12	22-Jan-24	96.10	94.55			95.33	97.23	93.42
13	19-Jan-24	96.58	94.58			95.58	97.49	93.67
14	18-Jan-24	96.50	94.25			95.38	97.28	93.47
15	17-Jan-24	96.77	94.32			95.55	97.46	93.63
16	16-Jan-24	96.15	94.50			95.33	97.23	93.42
17	15-Jan-24	96.11	93.92			95.02	96.92	93.11
18	12-Jan-24	95.65	94.05			94.85	96.75	92.95
19	11-Jan-24	96.09	93.95			95.02	96.92	93.12
20	10-Jan-24	97.50	94.30			95.90	97.82	93.98
21	09-Jan-24	96.36	94.36			95.36	97.27	93.45
-	Instructions RICs	Spot Non-	Spot Theor	etical Non-Spot - For	wards Theoretica	I Non-Spot -	(+) 🗄	•

II. Non-Spot Transactions

The retrieval of the market exchange rate data for **non-spot** transactions from Refinitiv Eikon should be done according to the type of transaction from those outlined below.

A. Forwards

For the assessment of daily rates for foreign exchange forwards, the forward outright price should be retrieved. The inputs to extract non-spot exchange rate data is similar to those applied for the retrieval of spot exchange rate data.

Retrieving Daily Highest and Lowest FX Forwards Exchange Rates

Open the Non-*Spot* tab and enter the currency code of interest in cell A6 followed by tenor of the forward contract (e.g., one, month, six months, one year, etc.) in cell A9, followed by 'V' in the cell A12.

1. For example, if the assessment is on a one-month forward contract quoted as US Dollar/Iceland Krona, enter (1) ISK in cell A6; (2) 1M in cell A9; and (3) V in cell A12. Cell A25 concatenates those inputs to create the RIC.

	А
1	Instructions: Please select the yello
2	Input or Custom Search
3	Input
4	
5	Currency (or Cross Rate)
6	ISK
7	
8	Tenor
9	1M
10	
11	Contract
12	V
13	
14	Start Date
15	31-Jan-23
16	
17	End Date
18	28-Jan-24

2. Alternatively, if users wish to type in their own RIC, select the drop-down tab in A3 and select "Custom Search". Once this is selected, the user can type in their RIC of interest in cell A28.



	A	
10		
11	Contract	
12		
13		
14	Start Date	
15		31-Jan-23
16		
17	End Date	
18		28-Jan-24
19		
20	Time Zone	
21	(GMT -11:00) APIA API	
22	API	
23		
24	Symbol	
25		0
26		
27	Custom Search	
28		

3. After selecting the currency code, tenor, and contract, select the time zone in cell A21 to reflect the country's local time. For example, for Iceland, select GMT +0:00 Rekyjavik.



4. Like the *Spot* tab, the start and end date alongside the H_t, L_t, and Mid_{H/L} (and +/-2% tolerance margin) will automatically populate once the above-mentioned parameters are selected.

	А	В	K	L	Μ	N	0	Р	Q
1	Instructions: Please select the yell	ow highlig	hts [currency, t	enor, cont	ract, time z	zone, start date a	nd end dat	e] in colum	n A & offi
2	Input or Custom Search								
3	Input								
4									
5	Currency (or Cross Rate)		Date	High (H _t)	Low (L _t)	R (official rate)	M _{H/L}	M _{H/L} +2%	M _{H/L} -2%
6	ISK		01/26/24	137.57	136.41		136.99	139.73	134.25
7			01/25/24	137.44	135.91		136.68	139.41	133.94
8	Tenor		01/24/24	137.33	135.51		136.42	139.15	133.69
9	1M		01/23/24	137.67	136.29		136.98	139.72	134.24
10			01/22/24	137.41	136.24		136.82	139.56	134.09
11	Contract		01/19/24	138.24	136.47		137.36	140.10	134.61
12	V		01/18/24	138.48	137.34		137.91	140.67	135.15
13			01/17/24	138.60	137.43		138.02	140.78	135.26
14	Start Date		01/16/24	138.21	136.54		137.37	140.12	134.63
15	31-Jan-23		01/15/24	137.58	136.42		137.00	139.74	134.26
16			01/12/24	138.09	136.54		137.32	140.06	134.57
17	End Date		01/11/24	137.89	136.68		137.28	140.03	134.54
18	28-Jan-24		01/10/24	138.26	136.84		137.55	140.30	134.80
19			01/09/24	138.55	137.58		138.07	140.83	135.31
20	Time Zone		01/08/24	138.63	137.53		138.08	140.84	135.32
21	(GMT +0:00) REYKJAVIK RVK	v	01/05/24	138.94	136.89		137.91	140.67	135.15
22	RVK		01/04/24	138.67	137.42		138.04	140.80	135.28
23			01/03/24	138.95	137.71		138.33	141.09	135.56
24	Symbol		01/02/24	138.40	136.13		137.26	140.01	134.52
25	ISK1MV		01/01/24	136.64	136.12		136.38	139.10	133.65
26		at No.				The sent	106 07	120.00	
	RICS Sp	Non-	spot ineor	etical ivon-	spot - Forv	varus ineoret	ical ivon-S	(+	ן ו ו

Note: If Refinitiv Eikon does not provide a forward outright, staff can calculate a forward outright price by adding the spot exchange rate + forward swap points.

Forward swap points follow a similar RIC as a forward outright. Enter the currency code of interest in cell A6 followed by the tenor of the forward contract in cell A9, then leave cell A12 blank. In the above example, US dollar/Iceland Krona 1M Forward Swap Points would appear as "ISK1M" in cell A25.

B. Non-Deliverable Forwards

As stated in the Guidance Note, NDFs arising from official action are generally not assessed under the **new MCP policy.** NDFs arising from official action will only be assessed if they are sufficiently closely related to an actual exchange transaction. The benefit from the NDF (subsidy) or the cost of the NDF (tax) is considered as part of the effective spot exchange rate of the exchange transaction.

Retrieving Daily Highest and Lowest FX Non-Deliverable Forward Exchange Rates

The procedure follows the same exact procedure as an FX forward. Enter the currency code of interest in cell A6 followed by tenor of the non-deliverable forward contract (e.g., one, month, six months, one year, etc.) in cell A9, followed by 'NDFOR' in the cell A12 (or custom search in cell A28).

1. For example, if the assessment is on a one-month non-deliverable forward contract quoted as US Dollar/Brazilian Real, after entering the parameters above, cell A25 would appear as "BRL1MNDFOR=". Like FX forwards, common tenors include 1M, 2M, 3M, 6M, 1Y, and 2Y.

	A
1	Instructions: Please select the yell
2	Input or Custom Search
3	Input
4	
5	Currency (or Cross Rate)
6	BRL
7	
8	Tenor
9	1M
10	
11	Contract
12	NDFOR
13	
14	Start Date
15	31-Jan-23
16	
17	End Date
18	28-Jan-24
19	
20	Time Zone
21	(GMT -3:00) SAO PAULO SAO
22	SAO
23	
24	Symbol
25	BRL1MNDFOR

2. After adjusting the time zone, the start and end date alongside the H_t , L_t , and $Mid_{H/L}$ (and +/-2% tolerance margin) will automatically populate once the above-mentioned parameters are selected.

	А	В	К	L	М	N	0	Р	Q
1	Instructions: Please select the yell	ow highlig	hts [currency, 1	tenor, cont	ract, time z	zone, start date a	nd end dat	e] in colum	nn A & off
2	Input or Custom Search								
3	Input								
4									
5	Currency (or Cross Rate)		Date	High (H _t)	Low (L _t)	R (official rate)	M _{H/L}	M _{H/L} +2%	M _{H/L} -2%
6	BRL		01/26/24	4.94	4.92		4.93	5.03	4.8
7			01/25/24	4.96	4.92		4.94	5.04	4.84
8	Tenor		01/24/24	4.95	4.92		4.94	5.03	4.84
9	1M		01/23/24	5.02	4.96		4.99	5.09	4.89
10			01/22/24	5.01	4.94		4.97	5.07	4.8
11	Contract		01/19/24	4.96	4.92		4.94	5.04	4.84
12	NDFOR		01/18/24	4.97	4.94		4.95	5.05	4.86
13			01/17/24	4.96	4.94		4.95	5.05	4.8
14	Start Date		01/16/24	4.95	4.90		4.93	5.02	4.83
15	31-Jan-23		01/15/24	4.90	4.87		4.88	4.98	4.79
16			01/12/24	4.90	4.85		4.87	4.97	4.7
17	End Date		01/11/24	4.91	4.88		4.89	4.99	4.80
18	28-Jan-24		01/10/24	4.92	4.89		4.91	5.01	4.8:
19			01/09/24	4.93	4.89		4.91	5.01	4.8
20	Time Zone		01/08/24	4.92	4.88		4.90	5.00	4.80
21	(GMT -3:00) SAO PAULO SAO		01/05/24	4.96	4.88		4.92	5.02	4.82
22	SAO		01/04/24	4.96	4.91		4.94	5.03	4.84
23			01/03/24	4.96	4.92		4.94	5.04	4.84
24	Symbol		01/02/24	4.94	4.87		4.90	5.00	4.8:
25	BRL1MNDFOR		12/28/23	4.89	4.84		4.86	4.96	4.7
<u> </u>	Instructions RICs Sp	ot Non-	Spot Theor	etical Non-	Spot - Forv	vards Theoret	ical Non-Sp	pot - 1 (1	→ → → → →

C. Options

The retrieval of the market exchange rate data for FX options from Refinitiv Eikon should be done following the same steps outlined for FX forwards and non-deliverable forwards above. However, due to the bespoke nature of a typical FX option contract, retrieval of FX options exchange rates for assessment may primarily rely on theoretical calculation.

Retrieving Daily Highest and Lowest FX Option Rates

Although options are often idiosyncratic in their composition and typically not standardized enough to provide relevant market data from benchmark providers, Refinitiv Eikon does carry FX options data.

The standard ticker for Refinitiv Eikon is the currency code of interest followed by the length of the contract and the implied volatility. The Excel file offers several standard volatilities in cells A35 – A39 in the *Non-Spot* tab.

30	Contract	
31	V (Forward Outright)	
32	Leave Blank (Forward Swap)	
33	NDF (NDF)	
34	NDFOR (Non-Deliverable Outright	
35	O (ATM Option)	
36	R10 (10 Delta Risk Reversal)	
37	RR (25 Delta Risk Reversal)	
38	B10 (10 Delta Butterfly)	
39	BF (25 Delta Butterfly)	

1. For example, a US Dollar/Brazilian Real 1 Month at the Money Option, you would select 'O' in cell A12 (or custom search in cell A28), which cell A25 would be presented as "BRL1MO=".

	А	В
1	Instructions: Please select the yell	ow highligł
2		
3	Currency (or Cross Rate)	
4	BRL	
5		
6	Tenor	
7	1M	
8		
9	Contract	
10	0	
11		
12	Start Date	
13	31-Jan-23	
14		
15	End Date	
16	21-Jan-24	
17		
18	Time Zone	
19	(GMT -3:00) RIO DE JANIERO RIO	
20	RIO	
21		
22	Symbol	
23	BRL1MO=	
24		
-	RICs Spot Non-Spot	Theore

	A	В	K	L	М	N	0	Р	Q
1	Instructions: Please select the yell	ow highlig	hts [currency, t	tenor, cont	ract, time a	zone, start date ar	nd end dat	e] in colum	n A & offi
2	Input or Custom Search								
3	Input								
4									
5	Currency (or Cross Rate)		Date	High (H _t)	Low (L _t)	R (official rate)	M _{H/L}	M _{H/L} +2%	M _{H/L} -2%
6	BRL		01/26/24	11.99	9.61		10.80	11.02	10.58
7			01/25/24	12.10	9.83		10.96	11.18	10.74
8	Tenor		01/24/24	12.31	10.36		11.33	11.56	11.11
9	1M		01/23/24	12.27	9.98		11.12	11.34	10.90
10			01/22/24	11.91	9.35		10.63	10.84	10.41
11	Contract		01/19/24	11.40	9.30		10.35	10.56	10.14
12	0		01/18/24	11.96	9.18		10.57	10.78	10.36
13			01/17/24	12.06	9.95		11.00	11.22	10.78
14	Start Date		01/16/24	11.98	9.39		10.68	10.89	10.47
15	31-Jan-23		01/15/24	11.46	9.51		10.49	10.69	10.28
16			01/12/24	11.66	9.70		10.68	10.89	10.47
17	End Date		01/11/24	12.41	10.18		11.29	11.52	11.07
18	28-Jan-24		01/10/24	12.66	11.12		11.89	12.13	11.65
19			01/09/24	13.16	11.20		12.18	12.42	11.93
20	Time Zone		01/08/24	13.75	11.06		12.40	12.65	12.15
21	(GMT -3:00) SAO PAULO SAO		01/05/24	14.31	11.01		12.66	12.91	12.40
22	SAO		01/04/24	13.81	12.34		13.07	13.33	12.81
23			01/03/24	14.61	11.75		13.18	13.44	12.91
24	Symbol		01/02/24	14.64	11.60		13.12	13.38	12.85
25	BRL1MO		01/01/24	14.17	11.59		12.88	13.14	12.62
26	Instructions RICs Sn	ot Non-	Spot Theor	etical Non-	Spot - Forv	wards Theoret	12 EC	12 01	1221

2. After adjusting the time zone, the start and end date alongside the H_t, L_t, and Mid_{H/L} (and +/-2% tolerance margin) will automatically populate once the above-mentioned parameters are selected.

Using Theoretical Calculators for Non-Spot Exchange Rates

If representative data from benchmark providers or the alternative sources are not available, staff should conduct the MCP assessment based on theoretical prices using calculators. The theoretical forward rate can be computed by adding the difference between the domestic and foreign interest rate for the maturity of the forward to the spot wholesale market rate. The Monitoring Tool includes a spreadsheet for such calculations.

Moreover, theoretical prices should be used in case of forwards which are infrequently traded on international currency markets, or in case rates are not available for longer tenors. In these instances, the theoretical forward exchange rate should be calculated utilizing spot wholesale market exchange rate and interest rate data provided by Refinitiv Eikon.

As mentioned in Paragraph 12 of Appendix V staff would need to assess whether the domestic and foreign interest rates used by the benchmark administrator is the most representative one among the available data. Staff may use alternative data sourced from local markets to change the parameters of the calculation if such data appears to be more representative of the market conditions in the country. For forwards, data sourced from local markets on the actual funding rate in that market for a given maturity can be used. For options, in the absence of implied volatility, historical volatility based on prices formed in the domestic market that reflect exchange rate volatility and local interest rates based on actual cost of funding for the relevant maturities should be used.

The assessment based on theoretical prices is as follows and *R* must satisfy the condition to avoid an MCP:

$$\mathbf{T}_t - \mathbf{2\%} \leq \mathbf{R}_t \leq \mathbf{T}_t + \mathbf{2\%}$$

where,

R is the official rate arising from official action settling at more than t+2T is the exchange rate calculated using a theoretical model, and t is a given trading day.

The theoretical forward exchange rate is computed by adding the difference between the domestic and foreign interest rate for the maturity of the forward to the spot wholesale market exchange rate. At the inception of the contract, the exchange rate arising from official action must remain in the tolerance buffer of the theoretical price. An MCP arises whenever the forward exchange rate is not within the tolerance buffer.

In practice the theoretical price *T* would be computed using the concept of covered interest parity, based on the following formula:

$$T = \frac{(1+i)S}{1+i^*}$$

where,

i is the interest rate at which a bank can place funds in domestic currency over the same horizon as the maturity of the swap (e.g., three months)

 i^* is the domestic interest rate at which a bank can place funds in foreign currency over the same horizon as the maturity of the swap; and

S is the spot market exchange rate prevailing on the day of the transaction (day of inception of the contract).

I. Calculating the Theoretical Forward Exchange Rate via Covered Interest Parity

On Refinitiv Eikon, one can extract the referenced benchmark interest rate via the procedure detailed in the step-by-step for retrieving **spot** and **non-spot** market data. The Monitoring Tool provides a *Theoretical Non-Spot – Forwards* tab which follows takes the spot Ht and Lt rate followed by the mid yield of the domestic and foreign interest rate to create a theoretical forward.

The example below indicates the retrieval and application of data to calculate a forward exchange rate with covered interest parity on Refinitiv Eikon.

To calculate the theoretical forward exchange rate for a five-year forward contract priced in United States Dollar/Indian Rupee, follow the steps below:

- 1. Open the MCP Assessment Test Eikon Excel file.
- 2. Open the *Theoretical Non-Spot -Forwards* tab and enter the currency code of interest in cell B2. In this

example, "INR".

3. Enter the respective domestic interest rate and associated maturity date in cell D4. In this example, it will be "US5YT=RR" (United States 5 Year Benchmark).

	А	В	С	D
1	Instructions: Insert curr	ency, start da	te, end date ir	n Column B , do
2	Currency	INR		Domestic Rate
3	Time Zene	(GMT +5:30)	MADRAS MDS	Type RIC in D4
4	Time Zone	MDS		US5YT=RR
5	Start Date	31-Dec-22		
6	End Date	28-Jan-24		

4. Repeat the same process for the domestic interest rate and associated maturity date in cell E4. In this example, it will be "IN5YT=RR" (India 5 Year Benchmark).

	А	В	С	D	E
1	Instructions: Insert curr	ency, start dat	te, end date ir	n Column B , do	mestic and fore
2	Currency	INR		Domestic Rate	Foreign Rate
3	Time Zene	(GMT +5:30) I	MADRAS MDS	Type RIC in D4	Type RIC in E4
4	Time Zone	MDS		US5YT=RR	IN5YT=RR
5	Start Date	31-Dec-22			
6	End Date	28-Jan-24			

Note: Once the user has retrieved the relevant domestic and foreign interest rate from Refinitiv Eikon, they may need to divide both the domestic and foreign interest rate time series in columns D and E by 100 to convert the values into percentage. Staff and authorities must determine what is the appropriate domestic and foreign interest rate to use for the theoretical calculation.

5. After adjusting for the appropriate the time zone, in this example, using the prevailing US Dollar/ Indian Rupee Spot Rate, the Mid_{H/L} and the +/-2% tolerance margin theoretical forward exchange rate for a contract with a 5-year maturity would populate in columns G, H, and I respectively.

II. Calculating the Theoretical Forward Exchange Rate via Linear Interpolation

In some instances, benchmark rate yields may not be available on Refinitiv Eikon for the contract tenor of interest. In these cases, the theoretical yield can be obtained by interpolating the midpoint of two referenced benchmark rate yields with similar time durations.

For example, to source the yield of a Sri Lanka Generic Govt 8 Year, the unknown rate can be estimated by means of linear interpolation:

1. Let R_n denote the unknown government yield rate, with maturity n. The closed *designated maturities* available are 6-year (R₁) and 10-year (R₂) which bracket the unknown rate from above and below. Linear interpolation, which calculates the unknown rate as if it lies on a straight line between the two rates, proceeds as follows:

Today's date: January 01, 2019. Maturity date of unknown rate: January 01, 2027. Days to maturity of unknown rate: 2,922. Today's 6-year Sri Lanka Generic Government Yield (R₁): 11.58%. Maturity date of R₁: January 01, 2025. Days to maturity of R₁(t₁): 2,192. Today's 10-year Sri Lanka Generic Government Yield (R₂): 11.8%. Maturity Date of R₂: January 01, 2029. Days to maturity of R₂(t₂): 3,653.

2. Linear interpolation assumes that the unknown rate (R_n) lies on the line (R₁, R₂) between the two known rates. Because R₁, R₂ is linear, the slope of the line connecting R₁ and R_n is the same as the slope of line R₁, R₂. Using the "rise over run" formula for the slope of the line, we solve for R_n as follows:

$$egin{aligned} R_n &= R_1 + rac{R_2 - R_1}{t_2 - t_1} imes (t_n - t_1) \ &= 11.58\% + rac{11.8\% - 11.58\%}{3,653 - 2,192} imes (2,922 - 2,192) \ &= 11.58\% + 0.00015\% imes (730) = 11.69\% \end{aligned}$$

III. Calculating Options on Refinitiv Eikon

In the case of options, representative exchange rates, including from the authorities, could be used when benchmark providers do not have the data. The option test would have to rely mainly on calculated price, as option markets are often not deep and standardized enough to provide relevant price benchmarks. Like the previous test, it would take the following form:

where,

R is the price at which the central bank transacts or instructs to transact (i.e., the option price),

T is the theoretical price of the option, calculated according to an option pricing model (e.g., Black-Scholes model).

The calculation of theoretical option prices is as follows:

- 1. On your web browser, go to the Refinitiv Eikon homepage (https://eikon.refinitv.com/) and log into your account.
- 2. In the search bar in the left-hand corner, type "Calc" and select *More search results for "Calc"* at the bottom of the drop-down menu (or Shift + Enter).



3. In the search results menu, select "CALC Eikon Calculators" under the "APPS & TOOLS" tab.



4. A separate window will open, "Calculator Menu". In this window select "FX Options Calculator – FXOC" under the "OPTIONS" tab.

Calculator Menu - Work - Microsoft Edge					- 0
https://amers2-apps.platform.refinitiv	.com/web/Apps,	/CalculatorMenu?enowparentmodules=ops	console-csm%2Ci	usage-tracking-csm%2Cdata-api-proxy-csm	
FOREX AND MONEY MARKET		RATES, SWAPS AND DERIVATIVES		FIXED INCOME	
FX CASH		FRA AND OIS		BONDS	
Fx Cross Matrix Swap Points and Outrights Swap Points from ZC Broken Dates Par Forward / Weighted Rates FX Forwards from Futures FX Spot Arbitrage Best FX/MM Curve FX Forecast DEPO CASH Deposit Analysis Deposits vs FX Forwards Overview FX Carry Trade Non Deliverable Forwards	FXCM SPO SPOZC BRKD PARF FXFT FXBP FXCV FXFCST DEAN DEFO FXCT NDFX	Forward Curve FRA Arbitrage FRA Pricing Overnight Index Swap PREVIEW STIR Futures SWAPS Swap Pricer Swap Curve Monitor All Quotes OPTIONS Swaption Cap and Floor	FWDC FRAA FRAP OISC STIR SWPR SWCM ALLO SWPN CAPF	Bond Calculator Fixed-to-FRN Calculator (PREVIEW) All Quotes Asset Swap Bond Hedge Bond Repo Bond Return Bond Strategy OAS Calculator TED Bond Futures Bond Futures Bond Monitor FI Fixed Income Portfolio Analytics CREDIT	BNDC FRFF ALLQ ASWP BDHG BDRE BNDC BDST OASC TEDC BDFC BMON FIPA
OPTIONS FX Options Calculator Currency Options Currency Options Strategy Currency Options Portfolio	FXOC COPT COPS COPP			Credit Default Swap Credit Default Swap (Legacy)	CDS CDSV
COMMODITIES		EQUITIES AND DERIVATIVES		CROSS MARKET	
CURVES AND OUTRIGHTS		CASH		ZERO CURVES	
Metals Outright and Arbitrage Commodity Forward Curve Average Calculator	METO COFC AVRGC	Total Return Pairs Calculator DR Arbitrage	SRET PAIR DARB	ZC Builder Yield Curve Builder STATISTICS	ZCBR YCBR
SWAPS		Stock Arbitrage	SARB	Regression Analysis	REGR
Commodity Swaps Pricer	COSP	DERIVATIVES		Correlation Matrix	CORR
OPTIONS Commodity Option Analyzer Option Pricer	COOA OPR	Index Futures Fair Value Option Pricer - NEW Volatility Surface	IFFV OPR SURF	Average Calculator Historical Return Analysis VOLATILITY	AVRGC HRA
Option Calculator	OPTC	STATISTICS		Volatility Surface Calculator	VOLS

5. This will present the calculator with a host of parameters for staff to adjust for assessment. For example, if staff are interested in a Euro/Japanese Yen 5 Year Option, with a pricing date of June 20, 2022, the parameters include:

Asset: In the top left-hand corner staff will see the currency pair and the spot rate. This will autopopulate with the ask high and bid low price in the tabs to right (which can be adjusted). Click refresh or press enter to update the calculator with the latest market data. Alternatively, you can enter the date on which the option is price in DDMMYYYY format.



A half-moon symbol indicates that there are only a handful of possible values for a field. Click or use spacebar to cycle through the different values. All other fields in the calculator can be manually edited as well. These edited values can be reverted to the default value with a double click.

Additionally, for fields with two values, click the half-moon will provide the mid-rate. For example, instead of the bid/ask values, clicking the half-moon will provide the user the mid- rate of the two values.

EURJPY	C	141.99	
Jun 20, 2022	₩	Spot Date Jun 22, 2022	

On the right-hand side of the calculator, will provide the source of the market rates. The defaults are Refinitiv Eikon's composite rates. However, staff can adjust utilize data from options such as e-trading platforms, inter-dealer brokers, or individual Refinitiv Eikon contributors (and interest rate fixing for the deposit sources).

Market Rates Payout Profile Ca	alculation Parameters				
Calculated Data :	JPY Deposits	\sim			
EUR/JPY Spot Source :	Composite	\sim	FX Swap Source :	Composite	
EUR Depo Source :	Composite	\sim	JPY Depo Source :	Composite	— ~
EUR/JPY Volatility Source :	Composite	\sim	Vol Strategy Source :	Composite	~
Display Settings :	O Bid/Ask		Show Conventions		
	Mid/Spread				

For example, one can change the EUR deposit source from Refinitiv Eikon's composite rate to EURIBOR.

Market Rates	Payout Profile	Calculation Parameters		
	Calculated Da	ata: JPY Deposits	\sim	
EU	JR/JPY Spot Sour	ce : Composite	~	
	EUR Depo Sour	ce : Composite	\sim	
EUR/J	PY Volatility Sour	ce: Composite		
	Display Settin	gs : Interest Rate Fixings		EURIBOR
		E-Trading platforms	>	
		Inter-dealer Brokers	\rightarrow	
▼ EUR/JPY V	OLATILITY	Contributors	>	
Premium Curren	cv:EUR Expirv	cut time . new tork to.ou		

Staff can use the panel on the left to define the terms of the option, which are as follows:

Option Terms: Deal type (buy/sell), tenor, style (European, American), call/put, strike price, notional value (in currency of interest).

Market Data: At the money volatility, risk reversal, butterfly spread, forward rates/points, deposit rate.

Vanilla			\sim				
▼ OPTION TERMS							
Deal Type			Sell				0
Expiry Tenor /	Date 🤆	9	5Y	Jun	18, 2027	iii	1824d
Delivery			Jun 22, 20)27		Ë	1826d
Style			European	i.			•
Call/Put			EUR	(🕽 Call		•
Strike			121.19				
Notional			EUR		1,000,00	0	
• MARKET	DATA						
ATM Vol (%)			10.270		12.970		
RR (%)	10D	0	-4.506		-3.556		
BF (%)	10D		2.620	2.620			
Fwd Points ①		-1,740.60	00	-1,425.7	7000		
EUR Depo (%)		2.860		3.260			
JPY Depo (%)			0.093		0.953		0

The results of the calculation are shown in the pricing subsection with Greeks, those parameters include as follow:

Pricing: Pricing model (default setting uses the Black-Scholes formula), premium (in currency of interest), premium price, premium date (spot/forward), delta (spot/forward), delta notional, and Vega.

All Greeks: Adjustable Greeks (Gamma, Theta, Vanna, Volga, Rho) to adjust option's risk parameters.

• PRICING		Black a	Black and Scholes			\sim
Volatility (%)		10.270			12.970	•
Premium	EUR 🛈	82,337			129,686	
Premium Pric	e (%)	8.2337			12.9686	0
Premium Dat	e	Spot	0	Ji	ın 22, 2022	
Delta (%)		Spot	0	4	10.056	
Delta Notional (EUR)		-400,56	2			
Vega (EUR)		-7,558				0
• ALL GRE	EKS					
Gamma (EUR)	-10,721				0
Theta (EUR)		-18				
Vanna (EUR)		-2,358			0	
Volga (EUR)		833				0
Rho (EUR)		-20,017				

- 6. Once all fields are adjusted, click the "Solve for" tab in the bottom left-hand corner of the calculator, and (1) select a field to be solved and then (2) a field to be the target. For the MCP assessment, *R* should remain within the theoretical option price (strike rate plus option premium).
- 7. Proceed to input the strike rate and option premium the in the *Theoretical Non-Spot Options* tab of the MCP Assessment Monitoring Tool (columns B and C respectively).