FINANCIAL BENCHMARKS INDIA PVT LTD

FBIL ADJUSTED MUMBAI INTERBANK FORWARD OUTRIGHT RATE (ADJUSTED MIFOR) CURVE

Methodology Document

October 22, 2021

Version - 2

Overview

The FBIL MIFOR Curve is an implied Indian Rupee interest rate curve derived from the FBIL Forward Premia Curve and the USD LIBOR curve and is being published by FBIL since April 2018. It is computed for six tenors, viz. Overnight, 1 month, 2-month, 3-month, 6 month and 12 month.

This methodology document details the computation of FBIL Adjusted MIFOR Curve which can be used in the legacy contracts as a Fallback to the FBIL MIFOR curve in the event of the cessation of USD LIBOR. The FBIL Adjusted MIFOR Curve will be computed using the All-in-Fallback Rate to the USD LIBOR and the FBIL Forward Premia Curve.

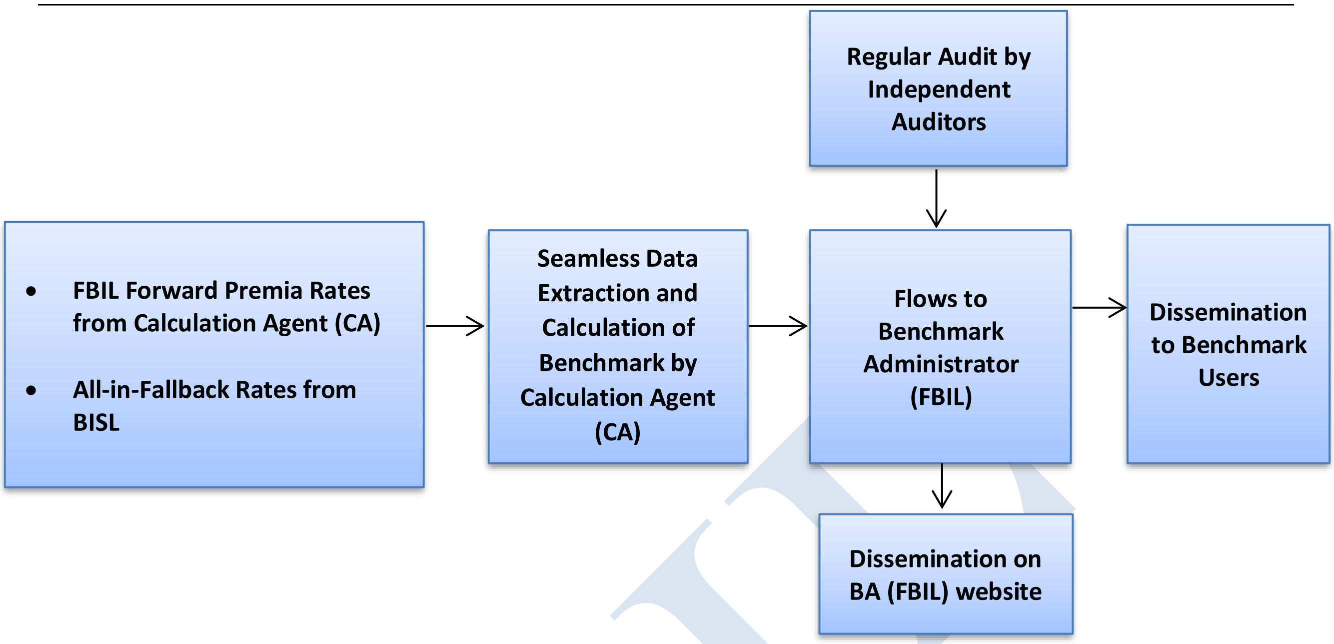
The All-in-Fallback Rate, which will be published by the Bloomberg Index Services Ltd.(BISL) is computed as sum of the Adjusted SOFR and the Spread Adjustment. The Adjusted SOFR, is the overnight SOFR compounded in arrears for the applicable tenor. The Spread Adjustment value is a historical median spread between the LIBOR and Adjusted SOFR with compounding in arrears for a 5-year “lookback” period.

The FBIL Forward Premia Curve is a transaction-based benchmark that is computed from the Cash-Tom and Spot-Forward forex swap transactions which are reported to the Clearing Corporation of India (CCIL) for settlement. Specifically, the Adjusted MIFOR is calculated based on the FBIL forward premia rates relevant for Rate Record Dates and All-in-Fallback rates as the replacement of current LIBOR.

FINANCIAL BENCHMARKS INDIA PVT LTD

FINANCIAL BENCHMARKS INDIA PVT LTD

Structure



Key Features of the Calculation

- The FBIL Adjusted MIFOR Curve will replace the FBIL MIFOR curve. This can be used for legacy contracts.
- The FBIL Adjusted MIFOR Curve would be computed using the FBIL Forward Premia Curve for the relevant Rate Record Date and the All-in Fallback Rate published by Bloomberg Index Services Ltd. (BISL).
- The FBIL Forward Premia Curve is a transaction-based benchmark computed from swap pairs of Cash-Tom and Spot-Forward trades in USD/INR pair reported to CCIL for settlement.
- The All-in-Fallback Rate consists of two components, namely, the Adjusted SOFR and the Spread Adjustment Value.
- The Adjusted SOFR, is the overnight SOFR compounded in arrears for the applicable tenor using the methodology as approved by FBIL. The Spread Adjustment value is a historical median spread between the LIBOR and Adjusted SOFR compounded in arrears for a 5-year lookback period using the methodology defined as approved by FBIL.
- Since the All-in-Fallback Rate is computed and published in arrears, the FBIL Adjusted MIFOR Curve for the relevant tenors would also be published in arrears.

1. The FBIL Adjusted MIFOR for the applicable tenors will be published in arrears, following the publication of the relevant All-in-Fallback Rate by Bloomberg Index Services Ltd(BISL). The FBIL Adjusted MIFOR will be published in arrears for each Original Rate Record Date, such that the Trade Date of the FBIL Forward Premia Rate would be mapped to a unique Original Rate Record Day for the relevant tenor.

2. In case of the Overnight tenor, the Adjusted MIFOR is estimated from the Overnight rate of FBIL Forward Premia Curve (%) and the All-in-Fallback Rate to the USD LIBOR for the overnight tenor, as approved by FBIL.

   As an example, the Overnight Adjusted MIFOR for the 27/01/2020 can be computed as:

$$\frac{\mathrm{O}}{\mathrm{N}}\text{Adjusted MIFOR}_{\frac{27}{\frac{01}{20}}} = \left[\left(1 + \text{All-in-Fallback Rate} \times \frac{\mathrm{N}}{36000}\right) \times \left(1 + \frac{\mathrm{O}}{\mathrm{N}}\text{Forward Premia Rate} \times \frac{\mathrm{N}}{36500}\right) - 1\right] \times \frac{365}{\mathrm{N}} \qquad \mathit{Equantion} - 1$$

   where

   - All-in-Fallback Rate is for the Rate Record Date of 27/01/20 and Fallback Observation Date of 27/01/20 as published by the FBIL approved data service provider.
   - O/N Forward Premia Rate is for the Cash Date of 27/01/20 and a Tom Date of 28/01/20.
   - N is the number of days from Tom Date to Cash Date.

3. The Adjusted MIFOR for tenors of 1 month, 2 months, 3 months, 6 months and 12 months are estimated using the computed US Dollar/Rupee forward premia (%) and the All-in-Fallback Rate to the USD LIBOR for the respective tenors using the equation (2) below.

   For the purpose of illustration, the time line for the computation of the 1-Month Adjusted MIFOR for the Trade Date of 27/01/2020 is provided in Annexure 1 and can be computed as follows:

$$\text{Adjusted MIFOR}_{27/01/20} = \left[\left(1 + \text{All-in-Fallback Rate}^{1} \times \frac{\text{N}}{36000}\right) \times \left(1 + \text{FBIL Forward Premia Rate} \times \frac{\text{N}}{36500}\right) - 1\right] \times \frac{365}{\text{N}} \qquad Equation - 2$$

$$Adjusted\ \ MIFOR_{27/01/20} = \left[\left(1 + 1.67969 \times \frac{28/02/20 - 29/01/20}{36000}\right) \times \left(1 + 3.5843 \times \frac{28/02/20 - 29/01/20}{36500}\right) - 1\right] \times \frac{365}{28/02/20 - 29/01/20} \qquad = 5.2923\%$$

where

- All-in-Fallback Rate is for the Rate Record Date of 27/01/20 and Fallback Observation Date of 27/02/20 as published by BISL.For the Rate Record Date of 27/01/20, the 1-month All-in-Fallback Rate published by BISL is 1.67969.
- FBIL Forward Premia Rate is for the Trade Date of 27/01/20 having a Spot Date of 29/01/20 and Settlement Date of 28/02/20. For the Trade Date of 27/01/20, the 1-month FBIL Forward Premia rate published by FBIL is 3.5843.
- N is the number of days from Forward Premia Settlement Date to Spot Date

4. The FBIL MIFOR for a given tenor will be published subject to the availability of the All-in Fallback rate for the given tenor by the Bloomberg Index Services Ltd. for a given Rate Record Date.

5. In case the fallback mechanism is triggered for FBIL Forward Premia Curve and the said Curve (% and Rupee premia) is repeated, the FBIL Adjusted MIFOR Curve would be computed using the repeated FBIL Forward Premia Curve but with the All-in-Fallback Rate published for the day for the respective tenor.

6. In case of non-availability of the All-in-Fallback Rate for a given Rate Record Date due to unforeseen reasons, the latest available All-in-Fallback Rate would be repeated. However, Forward Premia for the applicable Rate Record Day, would be used for computation of FBIL MIFOR using the repeated All-in-Fallback Rate.

7. In case the Rate Record Date falls on a USD Holiday, the O/N Adjusted MIFOR will not be disseminated, as the O/N FBIL Forward Premia would not published on that day. For tenors from 1 month to 12 month, the forward premia rates would be published for the respective tenors with the Trade Date of Forward Premia being the same as the Rate Record Date of the

[1] All-in-Fallback Rate would be replacing the erstwhile LIBOR

All-in-Fallback Rate. The All-in-Fallback Rates for such tenors if published by Bloomberg Index Services Ltd(BISL) for the associated Rate Record Dates would be used in the Adjusted MIFOR computation (Illustration in Annexure 2 (a)).

8. In case the Rate Record Date falls on an INR holiday, then there will be no dissemination of the Adjusted MIFOR for that tenor on that day (Illustration in Annexure 2 (b)).

9. In case the Calculation Date of the All-in-Fallback Rate is either a USD holiday, Saturday or Sunday, the All-in-Fallback Rate corresponding to that day would be released by Bloomberg Index Services Ltd(BISL) on the following USD business day. Hence, for such days, the Adjusted MIFOR would be calculated after the Fallback rates are released on the following USD business day. In such a scenario, the Adjusted MIFOR for multiple Rate Record Date for a specific tenor may be calculated and published on a unique Calculation Date (Illustration in Annexure 2 (c)).

10. In case the Calculation Date of the All-in-Fallback Rate falls on an INR holiday, the Adjusted MIFOR would not be published on that day. However, both the All-in-Fallback rate and the FBIL Forward Premia corresponding to the Rate Record Dates for the tenors would be available. Therefore, the Adjusted MIFOR calculated for such days would be disseminated on the following INR business day (Illustration in Annexure 2 (d)).

11. All computations are rounded off at each stage to 4 decimal places.

12. Rate Record Date refers to "**Original MIFOR Rate Record Day**"

13. The Methodology will be reviewed periodically (preferably annually) to align with any required modification.

14. Adjusted MIFOR rates are provided on an "as is" basis without any warranties of any kind, and FBIL shall not be liable for any damage or loss which may arise from reliance on the data obtained from the FBIL website and other dissemination channels of API and SFTP.

Publication of FBIL Adjusted MIFOR Curve

Currently the Federal Reserve publishes the SOFR next day at 8 am EST. The Bloomberg Index Services Ltd(BISL) will publish the fallbacks within 45 minutes thereafter under normal circumstances.

The Adjusted MIFOR Curve will be published at around 19:45 IST / around 20:45 IST post US

Day Light Saving. Given that the Federal Reserve has a restatement window of 6.5 hours, there could be a revision of the SOFR rate, which would be published by 2.30 PM EST. The Bloomberg Index Services Ltd(BISL) will similarly publish the restated fallbacks within 45 minutes of that announcement.

In case of revision of the SOFR and / or any error detected by FBIL, the Re-fix for the Adjusted MIFOR Curve would be published on the next Mumbai Business Day at around 10:30 A.M. IST. Further, the Re-fix for Adjusted MIFOR will take place only if the difference in the revised rate and the published rate **is 1 basis point or more**.

In case of delayed availability of the All-in-Fallback rate from BISL for any / all tenor(s) beyond 18:30 / 19:30 IST, the Adjusted MIFOR Curve for that / those tenor(s) would be published as per the methodology fallback using the last available All-in-Fallback Rate.

The FBIL Adjusted MIFOR will be published on the website of FBIL www.fbil.org.in.

Reference:

1. Issues and Challenges in Computation of Benchmark Forward Premia and MIFOR Curve by Golaka C. Nath, Sahana Rajaram and Manoel Pacheco, Rakshitra, April 2018. https://www.ccilindia.com/Research/CCILPublications/Lists/lstRakshitraArticles/Attachments/203/REvised_article.pdf
2. Bloomberg IBOR Fallback Rate Adjustments Rule Book (last updated 22 April 2020)
3. Impact of LIBOR Transition on MIFOR Benchmark (Version 2) by Golaka C Nath, Vardhana Pawaskar & Manoel Pacheco. CCIL Working Paper Series. WP/011, 22 September 2020. https://www.ccilindia.com/Research/Lists/CCILKnowledgeCenter/Attachments/49/WP011_Impact%20of%20LIBOR%20transition%20on%20MIFOR%20Benchmark_Version_2.pdf

Abbreviations

- BA-Benchmark Administrator
- CA-Calculation Agent
- CCIL-The Clearing Corporation of India Ltd.
- FBIL- Financial Benchmarks India Pvt. Limited
- INR- Indian Rupee
- LIBOR-London Interbank Offered Rate
- MIFOR-Mumbai Inter-Bank Forward Outright Rate
- O/N- Overnight
- USD- United States Dollar

FINANCIAL BENCHMARKS INDIA PVT LTD

Annexure 1: Timeline for Computation of 1- month FBIL Adjusted MIFOR with a Trade Date of 27-01-20

Table 1, highlights the application of the 1 month All-in-Fallback Rate in the computation of the 1 month FBIL MIFOR for the trade date of 27-01-2020. The FBIL Forward Premia rate for the trade date of 27-01-20 would be published on 27-01-20 itself. The 1-month All-in-Fallback Rate for the Rate Record Date of 27-01-20 would be known and published at the end of the Accrual period viz. 27-02-20. Accordingly, the 1-month FBIL adjusted MIFOR for 27-01-20 would be published on 27-02-20.

Table 1: Timeline for Computation of 1- month FBIL Adjusted MIFOR with a Trade Date of 27-01-20

Date	**27-01-20**	**28-01-20**	**29-01-20**	**30-01-20**	**31-01-20**	**. . .**	**26-02-20**	**27-02-20**	**28-02-20**	**29-02-20**	**01-03-20**	**02-03-20**
Day	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**. . .**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**	**Mon**
All-in Fallback Rate	LIBOR Rate Record Date Accrual Start Date Offset Lag of 2 Business Days		Accrual Spot Date			. . .		Accrual End Date All-in-Fallback Calculation Date				Payment Date
FBIL Forward Premia Rate	Trade Date		Spot Value Date			. . .			1 month Settlement Date			
FBIL MIFOR	Trade Date		Spot Value Date			. . .		**1-month MIFOR Publication Date for a Trade Date of 27-01-20**	1 month Settlement Date			

a) **Rate Record Date falling on USD Holiday** – In case the Rate Record Date falls on a US holiday, the O/N Adjusted MIFOR is not disseminated, as the O/N Forward Premia is not available on that day. For tenors from 1 month to 12 month, the forward premia rates would be published for the respective tenors with the Trade Date of Forward Premia being the same as the Rate Record Date of the Fallback Rate (Table 2). The fallback rates for such tenors published by the FBIL approved data service provider for the associated Rate Record Date would be used in the Adjusted MIFOR computation.

Table 2: Rate Record Date Falling on a USD Holiday: 07-09-2020 (Labour Day US Holiday)

Tenor	Calculation Date	Rate Record Date	Adjusted MIFOR Publication
O/N	07-09-20	07-09-20	There would be no dissemination of O/N Adjusted MIFOR for the 04-09-20 and 07-09-20 as the Overnight USD/INR Forward Premia would not be published due to non-availability of tom trades and cash trades respectively.
1M	05-10-20	07-09-20	Adjusted MIFOR will be calculated and disseminated on 05-10-20. It will be computed from: • 1M forward premia with a Trade Date of 07-09-20. • 1M Fallback Rate having a Rate Record Date of 07-09-20 and calculated on 05-10-20.

b) **Rate Record Date falling on INR Holiday:** In case the Rate Record Date falls on an INR holiday, then there will be no dissemination of the Adjusted MIFOR for that tenor on that day. For Example, for all tenors having their Rate Record Date as 07-05-2020 which is an INR holiday (Buddha Purnima Holiday), there will be no dissemination of Adjusted MIFOR as the corresponding FBIL Forward Premia Rate will not be available as indicated in Table 3.

Table 3: Rate Record Date Falling on an INR Holiday-07-05-2020 (Buddha Purnima INR Holiday)

Tenor	Calculation Date	Rate Record Date	Adjusted MIFOR Publication
O/N	07-05-20	07-05-20	No dissemination of Adjusted MIFOR as the FBIL Forward Premia Rates for the Trade Date of 07-05-20 would not be published.
1M	08-06-20	07-05-20	
2M	07-07-20	07-05-20	
3M	07-08-20	07-05-20	

c) **Calculation Dates falling on USD Holiday/Saturday/Sunday:** In case the Calculation Date of the All-in Fallback Rate is either a USD holiday, Saturday or Sunday, the All-in-Fallback Rate corresponding to that day would be released by the FBIL approved data service provider on the following USD business day. Hence, for such days, the Adjusted MIFOR would be calculated after the Fallback rates are released on the following USD business day. In such a scenario, the Adjusted MIFOR for multiple Rate Record Dates for a specific tenor may be calculated and published on a unique Calculation Date. For example, in case of the 1-month tenor, the All-in-Fallback Rates for the Record Dates of 05-08-20, 06-08-20 and 07-08-20 would be calculated and disseminated on a Calculation Date of 08-09-20 as 05-09-20 is a Saturday, 06-09-20 is a Sunday and 07-09-20 is a Labour Day US Holiday. The Adjusted MIFOR for the 1 month tenor would be disseminated on 08-09-2020 for multiple Rate Record Dates, as indicated in Table 4.

Table 4: Calculation Date Falling on an USD Holiday/Saturday/Sunday

Tenor	Calculation Date	Rate Record Date	Rate Record Day	Adjusted MIFOR Publication
1M	08-09-20	05-08-20	Saturday	The Adjusted MIFOR for the 1 month tenor would be disseminated on 08-09-20 for multiple Rate Record Dates.
1M	08-09-20	06-08-20	Sunday	
1M	08-09-20	07-08-20	Monday	

The tenor-wise rates for Adjusted MIFOR disseminated as on 08-09-2020 is depicted in Table 5. Each tenor would have multiple Rate Record Dates and hence multiple rates for Adjusted MIFOR corresponding to each Rate Record Date, disseminated on the same Calculation Date.

Table 5: Calculation Date Falling on an USD Holiday/Saturday/Sunday

Tenor	Calculation Date	Rate Record Date	Adjusted MIFOR Publication
O/N	08-09-20	08-09-20	The O/N Adjusted MIFOR for 08-09-20 would be disseminated on 08-09-20.
1M	08-09-20	05-08-20	The 1 month Adjusted MIFOR for 05-08-20, 06-08-20 and 07-08-20 would be disseminated on 08-09-20.
1M	08-09-20	06-08-20	
1M	08-09-20	07-08-20	
2M	08-09-20	06-07-20	The 2 month Adjusted MIFOR for 06-07-20, 07-07-20 and 08-07-20 would be disseminated on 08-09-20.
2M	08-09-20	07-07-20	
2M	08-09-20	08-07-20	
3M	08-09-20	05-06-20	The 3 month Adjusted MIFOR for 05-06-20 and 08-06-20 would be disseminated on 08-09-20.
3M	08-09-20	08-06-20	
6M	08-09-20	05-03-20	The 6 month Adjusted MIFOR for 05-03-20 and 06-03-20 would be disseminated on 08-09-20.
6M	08-09-20	06-03-20	
12M	08-09-20	05-09-19	The 12 month Adjusted MIFOR for 05-09-19 and 06-09-20 would be disseminated on 08-09-20.
12M	08-09-20	06-09-19	

d) **Calculation Dates falling on INR Holiday:** In case the Calculation Date of the All-in Fallback Rate falls on an INR holiday, the Adjusted MIFOR would not be published on that day. However, both the All-in-Fallback rate and the FBIL Forward Premia corresponding to the Rate Record Dates for the tenors would be available. Therefore, the Adjusted MIFOR calculated for such days would be disseminated on the following INR business day. For example, the Adjusted MIFOR would not be disseminated on 02-10-20 (Friday) as it is an INR holiday. However, the Fallback rate and the Forward Premia corresponding to the Rate Record date for 02-10-20 for the various tenors are available. Hence, the Adjusted MIFOR for 02-10-20 would be released on the next business day i.e. 05-10-2020 as shown in Table 6. (Note: 03-10-20 and 04-10-20 are Saturday and Sunday respectively.)

Table 6: Calculation Date falling on an INR Holiday –Dissemination Date as on 05-Oct-2020

Tenor	Calculation Date	Rate Record Date	Rate Record Day	Adjusted MIFOR Publication
O/N	05-Oct-20	05-Oct-20	Monday	The O/N Adjusted MIFOR for 05-10-20 would be disseminated on 05-10-20.
1M	**02-Oct-20**	**02-Sep-20**	**Wednesday**	The 1 month Adjusted MIFOR for 02-09-20, 03-09-20, 04-09-20 and 07-09-20 would be disseminated on 05-10-20.
1M	05-Oct-20	03-Sep-20	Thursday	
1M	05-Oct-20	04-Sep-20	Friday	
1M	05-Oct-20	07-Sep-20	Monday	
2M	05-Oct-20	03-Aug-20	Monday	The 2 month Adjusted MIFOR for 03-08-20, 04-08-20 and 05-08-20 would be disseminated on 05-10-20.
2M	05-Oct-20	04-Aug-20	Tuesday	
2M	05-Oct-20	05-Aug-20	Wednesday	
3M	**02-Oct-20**	**02-Jul-20**	**Thursday**	The 3 month Adjusted MIFOR for 02-07-20 and 03-07-20 would be disseminated on 05-10-20.
3M	**02-Oct-20**	**03-Jul-20**	**Friday**	
6M	**02-Oct-20**	**02-Apr-20**	**Thursday**	The 6 month Adjusted MIFOR for 02-04-20 and 03-04-20 would be disseminated on 05-10-20.
6M	05-Oct-20	03-Apr-20	Friday	
12M	**02-Oct-20**	**02-Oct-19**	**Wednesday**	The 12 month Adjusted MIFOR for 02-10-19 03-10-19 and 04-10-19 would be disseminated on 05-10-20.
12M	05-Oct-20	03-Oct-19	Thursday	
12M	05-Oct-20	04-Oct-19	Friday	

--Figures in bold indicate that the Calculation Date falls on an INR Holiday.

FINANCIAL BENCHMARKS INDIA PVT LTD

Annexure 3: Website Display of Adjusted MIFOR Curve

Adjusted MIFOR As of Calculation Date: dd-mmm-yyyy				
Rate Record Date	Time	Tenor	Settlement Date	FBIL MIFOR (%)
dd-mmm-yyyy	7:45:00 PM	O/N	dd-mmm-yyyy	6.1151
dd-mmm-yyyy	7:45:00 PM	1M	dd-mmm-yyyy	6.4477
dd-mmm-yyyy	7:45:00 PM	2M	dd-mmm-yyyy	6.8353
dd-mmm-yyyy	7:45:00 PM	3M	dd-mmm-yyyy	6.6543
dd-mmm-yyyy	7:45:00 PM	6M	dd-mmm-yyyy	6.5463
dd-mmm-yyyy	7:45:00 PM	12M	dd-mmm-yyyy	6.7062

** Rate record date is the Trade Date for the corresponding All-in-Fallback rate for a given tenor*

**Settlement date follows modified following day convention*

FINANCIAL BENCHMARKS INDIA PVT LTD

Annexure 4: Summary of Revisions in the FBIL Adjusted MIFOR Methodology

Description as per the approved Methodology	Revisions in the Methodology
Para 6: In case of non-availability of the All-in-Fallback Rate for a given Rate Record Date due to unforeseen reasons, **the All-in-Fallback Rate of the previous day would be repeated (subject to the repetition upto 2 business days).** However, Forward Premia for the applicable Rate Record Day, would be used for computation of FBIL MIFOR using the repeated All-in-Fallback Rate.	**Para 6:** In case of non-availability of the All-in-Fallback Rate for a given Rate Record Date due to unforeseen reasons, **the latest available All-in-Fallback Rate would be repeated**. However, Forward Premia for the applicable Rate Record Day, would be used for computation of FBIL MIFOR using the repeated All-in-Fallback Rate.
Publication of FBIL Adjusted MIFOR Curve: The Re-fix for Adjusted MIFOR will take place only if the difference in the revised rate and the published rate is **5 basis points or more.**	**Publication of FBIL Adjusted MIFOR Curve:** In case of revision of the SOFR and / or any error detected by FBIL, the Re-fix for the Adjusted MIFOR Curve would be published on the next Mumbai Business Day at around 10:30 A.M. IST. Further, the Re-fix for Adjusted MIFOR will take place **only if the difference in the revised rate and the published rate is 1 basis point or more.**
Publication of FBIL Adjusted MIFOR Curve: The Adjusted MIFOR Curve publication time would be 45 minutes after the All-in Fallback Rate is made available by Bloomberg Index Services Ltd(BISL) which is at around 19:15 IST.	**Publication of FBIL Adjusted MIFOR Curve:** The Modified MIFOR Curve will be published at **around 19:45 IST / around 20:45 IST (post US Day Light Saving period).**
Review: No review clause	**Review: Para 13:** The Methodology will be reviewed periodically (preferably annually) to align with any required modification.
Disclaimer: No. Disclaimer	**Disclaimer:** Adjusted MIFOR rates are provided on an "as is" basis without any warranties of any kind, and FBIL shall not be liable for any damage or loss which may arise from reliance on the data obtained from the FBIL website and other dissemination channels of API and SFTP.