Financial Benchmarks India Pvt. Ltd.

Valuation Methodology for State Development Loans (State Government Securities) [SDL(SGS)]

August 8, 2024

Version-4

I. Introduction

1. In 2018, RBI, in modification of its direction on valuation of investments dated July 1, 2015, advised that FBIL may publish the prices/YTM of all SDL(SGS)s based on the actual /observed prices in the market.
2. It is a well-known fact that extreme illiquidity and lack of depth mark the secondary market of SDL(SGS)s, which normally trade without any particular credit differentiation among the issuer states. The average number of SDL(SGS)s that trade on any business day is very small compared to the aggregate number of outstanding SDL(SGS)s.
3. An empirically tested fact is that while a statistically significant difference between the traded prices/YTM of SDL(SGS)s on the NDS-OM [i.e., NDS-OM 'Normal' trades] and the prices/YTM of the over-the-counter (OTCR) trades in the same SDL(SGS)s that are reported on NDS-OM for settlement on the same day has been observed on a number of days, particularly when the number of trades in an SDL(SGS) is high, the difference in volume- weighted average YTM of these two types of trades is less than 5 basis points, which is small. Hence, for the purpose of this methodology, no distinction has been made between "Normal' and 'OTCR' trades in SDL(SGS).
4. Also, there is no empirical evidence for according different treatment to prices/YTM of proprietary trades in SDL(SGS)s on any business day, and the prices/YTM of CSGL (Constituent) trades in the same/similar SDL(SGS)s on that day.

5. Keeping the foregoing in view and also the requirement that the prices/YTM of all SDL(SGS)s for valuation purposes are required to be based on the actual/observed prices in the market, a framework in this regard has been formulated having the following elements: (a) On any business day, the secondary market prices/YTM of SDL(SGS)s and the auction prices/YTM of SDL(SGS)s, as available, will be used for their valuation. However, the secondary market trades that are referred to the Dispute Resolution Committee (DRC) of the Fixed Income Money Market and Derivatives Association of India (**FIMMDA**) and thereversed trades when they occur, will be excluded, (b) Interpolation/ extrapolation technique will be used in respect of the remaining SDL(SGS)s which do not trade on that day, and (c) Consistency/market alignment check, as applicable, will be applied in respect of all traded prices/YTM.
6. The methodology seeks to strike a judicious and prudent balance between two opposing considerations: Since the number of actual/observed prices in respect of SDL(SGS)s are verysmall, the opportunity cost of not including any actual/observed price is high (consequenceof the so-called Type 1 error). However, sufficient care has been exercised, by way of the imposition of a set of objective criteria, to make sure that (i) off-market data are excluded, and (ii) no incentive for market manipulation is provided (reducing the possibility of the so-called Type 2 error).

7. Calculation of SDL Valuation is done by FBIL in-house.

II. Assumptions, Definitions and Main Rules

1. All transaction level data on NDS-OM will be obtained from Clearing Corporation of India Limited. All transactions with T+1 settlement only will be considered. All SDL(SGS)s will be identified by their respective International Securities Identification Number (ISIN). For the purpose of this methodology document, the term 'SDL(SGS)' means a state development loan identified by its ISIN. The SDL(SGS)s will be grouped according to the calendar year of

their maturity (hereinafter referred to as 'maturity-bucket'). In other words, the differencesin the residual maturities of SDL(SGS)s in any maturity-bucket will be in the range of 0-12 months. For the purpose of grouping SDL(SGS)s in different maturity-buckets, no distinction will be made between the issuer states. The SDL(SGS)s in a maturity-bucket will be arranged in the increasing order of their residual maturities.

2. Due to lack of adequate transactions level data for SDL(SGS)s with residual maturities ≤ 12months, the valuation of ISINs with maturities ≤ 12 months will be done using the FBIL- published T-Bills benchmark rates plus a spread, as described in this document.
3. The YTM of the primary issuances and of the secondary trades of all SDL(SGS)s in any maturity-bucket will be treated as similar for their aggregation and statistical treatment required for the purpose of this methodology (except for trades in SDL(SGS)s with residual maturities ≤ 12 months). This approach is based on the assumed homogeneity of the YTM of the trades in respect of SDL(SGS)s in any maturity-bucket.
4. Valuation of SDL(SGS)s will be based on the transaction-level data obtained from the NDS-OM platform and the auction/OMO (Open Market Operation - sale and purchase) data released by RBI from time to time.
5. The YTM of all SDL(SGS) secondary trades of ₹5 crores and above, on the NDS OM Regular/NDS-OM Odd Lot/ NDS-OM Reported Regular/NDS-OM Reported Odd lot segments of NDS OM platform will be included as input data.
6. Traded SDL(SGS)s in any maturity-bucket (except for SDL(SGS)s with residual maturities ≤12 months) will be valued at their traded YTM. For the purpose of valuation of non-traded SDL(SGS)s in a maturity-bucket which do not trade on any business day, it will be assumed that their YTM have moved, since the last business day, in line with those of the traded SDL(SGS)s of that maturity-bucket. Hence, the YTM of a non-traded SDL(SGS) will be estimated by way of algebraic addition to its traded/estimated YTM (hereinafter referred to as 'published YTM') on the previous day an appropriate measure of the average change in the YTM of traded SDL(SGS)s belonging to the same maturity-bucket on that day. This approach makes it necessary to apply this methodology, with few necessary changes, to

calculate/estimate YTM of all SDL(SGS)s on a sufficient number of successive days prior to the date of the coming into effect of this methodology, since, as noted in the foregoing, theaverage number of daily trades in all SDL(SGS)s is very small compared to the total numberof outstanding SDL(SGS)s. This way of calibrating the valuation model will ensure that the YTM of the non-traded SDL(SGS)s on the start date and thereafter are estimated inconformity with this methodology. The steps used for model calibration are described in the Section V below.

7. Traded YTM of an SDL(SGS) belonging to any maturity-bucket means the Volume-weighted Average YTM (VWAY) of the trades in that SDL(SGS). Before the calculation of VWAY, eachSDL(SGS) trade in a maturity-bucket will be subjected to a consistency and market alignment check, which aims at determining if its ΔYTM is consistent with the ΔYTM of othertrades in the same maturity-bucket and also with its last published YTM. If the total numberof trades in a maturity-bucket is 5 or more, the check carried out by applying a Standard Deviation (SD) criteria, the details of which are in the paragraph 8 below. In case the total number of trades in a maturity-bucket is less than five, the check is done by way of applyinga set of conditions, the details of which are in the paragraphs 10 and 11.

8. Consistency and market-alignment check, if the total number of trades in a maturity-bucketis five or more:

a) The difference (ΔYTM) between the YTM of trades in each SDL(SGS) in the maturity- bucket and the published YTM of that SDL(SGS) on the previous business day will be calculated.

b) The volume-weighted average difference (VWAYΔ) in respect of all ΔYTM in the maturity-bucket will be calculated and their sample standard deviation will be obtained.

c) Any trade the ΔYTM for which falls outside (+/-) one standard deviation (SD) from themean will be identified as an outlier trade. In case SD is < 10 basis points, it will be setequal to 10 basis points. In other words, SD will have a floor of 10 basis points. However, there will be no cap on SD.

d) Using the volume and YTM of the surviving trades, Volume Weighted Average Yield (VWAY) will be calculated for each traded SDL(SGS) (ISIN).

e) VWAY∆ will be re-calculated using the surviving trades. This will be the Market Yield Movement (MYM) of the maturity-bucket (Refer to the paragraph 1 of Section IV below).

Table 1: Illustrative example for outlier detection: Traded data for maturity-bucket 2024as on 29.01.2021

SDL(SGS)	Trades	ISIN No	ISIN Descript-ton	Previousday's YTM (%)	YTM (%) of trades	Volumein ₹ crores	∆YTM	Volume Weighted Average ∆YTM	SD of ∆YTM	Applicable SD	Check Result
Security 1 (S1)	Trade 1 (T1)	IN202013014 1	09.41 KL SDL(SGS) 2024	5.23	5.56	5.00	0.33	0.25	0.07	**0.07 as it is <0.10. 0.10 will be used for calculation of +/- 1SD**	Accepted
S1	T2	IN202013014 1	09.41 KL SDL(SGS) 2024	5.23	5.54	5.00	0.31				Accepted
S2	T1	IN222014007 2	08.94 MH SDL(SGS) 2024	5.22	5.50	25.00	0.28				Accepted
S2	T2	IN222014007 2	08.94 MH SDL(SGS) 2024	5.22	5.45	25.00	0.23				Accepted
S3	T1	IN102020028 4	05.41 AP SDL(SGS) 2024	5.17	5.30	5.00	0.13				**Outlier**
S4	T1	IN152014005 5	08.43 GJ SDL(SGS) 2024	5.24	5.50	15.00	0.26				Accepted
S4	T2	IN152014005 5	08.43 GJ SDL(SGS) 2024	5.24	5.45	15.00	0.21				Accepted
				VWAY∆ (-/+) 1SD = 0.15 & 0.35							

Note: The outlier identification procedure, as above, will not be applied to the first threerolling maturity-buckets ≤ 12 months.

9. For each maturity-bucket with total number of trades at 5 or above, excluding the maturity bucket ≤ 12 months, VWAY∆ or MYM will be calculated taking into account the YTM of the surviving trades, following the above-mentioned steps. Also, the volume and number of trade-weighted average [WAYΔ_μ] of all such VWAY∆ in respect of all the traded maturity- buckets will be calculated, excluding the first three (upto 3-month, 6-month and 12-month) rolling maturity – buckets ≤12-months.

10. Consistency and market alignment check, if the total number of trades in a maturity- bucket is less than five:

If the total number of SDL(SGS) trades in a maturity-bucket is less than 5 (viz. 1, 2, 3 and 4 trades) the steps, as below, will be followed:

a) ∆YTM of each trade will be calculated.

b) The trades, the ∆YTM of which fall outside (+/-) 10 basis points of WAYΔ_μ (as described in the paragraph 9 above) will be identified as outliers.

c) In case the number of trades in any SDL(SGS) is more than one and any one of them passes the check, as above, the remaining trades will not be subjected to the check.

Table 2: Illustrative example for ∆YTM check: Traded data as on 29.01.2021

SDL(SGS)	Trades	ISIN No	ISIN Description	Maturity - Bucket	Volume in ₹ crores	YTM (%)	Previous day's YTM (%)	∆YTM
Security 1 (S1)	Trade 1 (T1)	IN1020150075	07.98 AP SDL(SGS) 2025	2025	5.00	5.61	5.52	0.09
S1	T2	IN1020150075	07.98 AP SDL(SGS) 2025	2025	5.00	5.56	5.52	0.04
S2	T1	IN2020150099	07.99 KL SDL(SGS) 2025	2025	10.00	5.60	5.59	0.01
S2	T2	IN2020150099	07.99 KL SDL(SGS) 2025	2025	10.00	5.56	5.59	-0.03
S3	T1	IN1520160178	07.14 GJ SDL(SGS) 2027	2027	20.00	6.12	5.98	**0.14**
S4	T1	IN3320170068	07.19 UP SDL(SGS) 2027	2027	92.56	6.08	6.08	0.00

S5	T1	IN1520170094	07.25 GJ SDL(SGS) 2027 23 AUG	2027	5.00	6.22	6.08	**0.14**
S6	T1	IN3320170084	07.27 UP SDL(SGS) 2027	2027	95.00	6.08	6.08	0.00
		WAYΔ_μ						**0.01**
		WAYΔ_μ **- 10bps**						-0.09
		WAYΔ_μ **+10bps**						0.11

Trade S3-T1 and S5-T1 will be identified as an outlier as their ΔYTMs are outside the range: (-) 9 basis points to (+) 11 basis points.

11. In case there is no maturity bucket with >= 5 tradeson a particular day, the below mentioned process will be adopted to remove outliers for effecting the above consistency and market alignment check:

a. Calculate the yield changes (ΔYTM) with respect to previous day's published YTM for each ISIN traded on that day.

b. Calculate the volume weighted average yield change [VWAYΔμ] of all the ΔYTMs of all the traded maturity buckets.

c. Any trade, the ΔYTM for which falls outside (+/-) 10 basis points of VWAYΔμ, will be identified as an outlier.

12. VWAYΔ will be re-calculated using the surviving trades. This will be the Market Yield Movement (MYM) of the maturity-bucket (Refer to paragraph 1 of Section IV below).

13. Using the volume and YTM of surviving trades (even if a single trade in an SDL(SGS) survives) the Volume-Weighted Average Yield (VWAY) will be calculated for each SDL(SGS).

14. Traded YTM of an SDL(SGS) that does not pass the checks described in the paragraphs 8 to 11 above will not be used further for the valuation exercise of the day. However, the data in this regard will be preserved for possible use during the next seven calendar daysfor the purpose to applying the check, as in the paragraph 11(b) above.

15. Treatment of Auction Data (Reissuance/New issuance/OMO (sales/purchase)):

a) On the day of auctions, the weighted average yield (WAY) published by RBI of the auctioned SDL(SGS) will be included in the traded data set for the calculation of YTM of the auctioned SDL(SGS) and MYM of different maturity-buckets:

YTM:

b) In case the auction involves the reissuance of an existing SDL(SGS), both the pre- and post-auction trades of ₹5 crores and above will be taken into account.

c) All the traded YTMs will be subjected to the consistency and market alignment checks, as described in the paragraphs 8, 10 and 11 above. However, WAY will not be subjected to the consistency and market alignment checks.

d) In case there is no pre- or post-auction trades, or when the SDL(SGS) has traded but all the trades are rejected due to application of the consistency and market alignment check, WAY will be taken as the YTM of the SDL(SGS) concerned.

e) If the total number of trades in an auctioned SDL(SGS) is less than 5 (1, 2, 3, and 4), the simple average of the VWAY of the surviving trades (after applying the consistency and market alignment check in para 10 above) and the WAY will be calculated and used as the VWAY for that SDL(SGS).

f) If the total number of trades in an auctioned SDL(SGS) is 5 or more, the VWAY of the surviving trades (after applying the consistency and market alignment check in para 8 above) will be calculated and used as the VWAY for that SDL(SGS).

MYM:

g) In the case of a new SDL(SGS) being auctioned, its ΔYTM is calculated by subtracting the average of the previous day's published YTM of the SDL(SGS)s of the maturity- bucket to which the newly-auctioned SDL(SGS) belongs, from its traded YTM.

h) If an auction results in a new maturity-bucket, then the ΔYTM is calculated by subtracting the average of the previous day's published YTM of the SDL(SGS)s of the closest maturity-bucket/s from its traded YTM.

i) For the purpose of calculation of MYM in respect of the maturity-bucket, which contains an SDL(SGS) that has been auctioned on the day, the auction will be

regarded as equivalent to a single trade with a volume of ₹5 crores with YTM equal to its WAY.

III. Calculation of Market YTM Movement (MYM) on the Start Day and Thereafter for Valuation Purposes

1. MYM for a maturity-bucket on any business day will be calculated using the difference between the YTM of traded SDL(SGS)s in that maturity-bucket and their published YTM on the previous day as described below:

a) Difference between the day's YTM of a traded SDL(SGS) in that maturity-bucket and its published YTM on the previous day (∆YTM) = Traded YTM of the day - (minus) previous day's published YTM, as described in the paragraph 8 under Section II.

b) Market YTM Movement (MYM) for a maturity-bucket = Volume-weighted average of ∆YTM of all the traded SDL(SGS) of the maturity-bucket

Table 5: Illustrative calculation of MYM

Description of SDL(SGS) (ISIN)	Maturity-bucket	Previous day's Published YTM (%)	Today's Traded YTM (%)	Volume (₹ in crores)	∆YTM	VWAY∆
8.05 GUJ SDL(SGS) 2028	2028	8.01	8.01	10.00	0.00	**-0.01**
8.28 TN SDL(SGS)2028	2028	8.08				

8.28 TN SDL(SGS) 2028 MAR	2028	8.05				
8.00 KL SDL(SGS) 2028	2028	8.05	8.00	5.00	-0.05	
8.05 TN SDL(SGS) 2028 APR	2028	8.02	8.01	147.50	-0.01	
MYM	**-0.01**					

2. In case there are no trades in a maturity-bucket, the following interpolation approach willbe used:

a) The maturity-bucket with no trade has traded maturity-buckets on both sides:

MYM of a maturity-bucket with no trade = Weighted Average (Volume and Trades) change (WA∆) of the MYM of the two closest traded maturity-buckets, one on each side.

b) The maturity-bucket with no trade has traded maturity-bucket only on one side:

MYM of a maturity-bucket with no trade = Weighted Average (Volume and Trades) change (VTWA∆) of the MYM of all traded maturity-buckets, excepting the first three rolling six-month buckets.

Table 6: Illustrative calculation for MYM Interpolation

Maturity - bucket	**No. of Traded SDL(SGS)s**	**Volume in ₹ crores**	**MYM (%) of thematurity-bucket**	**Volume-weighted average MYM (%)**
2022	2	50.00	-0.02	
2023	6	240.00	**-0.08**	
2024				**-0.06**
2025				
2026	8	95.00	**-0.01**	
2027	18	142.00	-0.10	

Table 7: Illustrative calculation for MYM interpolation/extrapolation (based on data fromJan 29, 2021 valuation sheet)

Maturity-bucket	MYM (%)	Volume-weighted average MYM (%)	Applicable MYM for interpolation/extrapolation
Upto 28 Apr 2021	N.A.		
Upto 28 Jul 2021	N.A.		
Upto 28 Jan 2022	N.A.		
2022		0.01	VTWAΔ of all maturity groups
2023		0.01	VTWAΔ of all maturity groups
2024	0.25		
2025	0.02		
2026		0.02	WAΔ of two closest maturity groups
2027	0.02		
2028	-0.01		
2029	0.01		
2030	-0.01		
2031	0.00		
2032	0.02		
2033	0.01		
2035	-0.01		
2036		-0.01	WAΔ of two closest maturity groups
2037		-0.01	WAΔ of two closest maturity groups
2038		-0.01	WAΔ of two closest maturity groups
2039		-0.01	WAΔ of two closest maturity groups
2040	-0.01		
2041		-0.02	WAΔ of two closest maturity groups
2043		-0.02	WAΔ of two closest maturity groups
2044		-0.02	WAΔ of two closest maturity groups
2049		-0.02	WAΔ of two closest maturity groups
2050	-0.02		

2051		0.01	VTWA∆ of all maturity groups
2054		0.01	VTWA∆ of all maturity groups
2055		0.01	VTWA∆ of all maturity groups
2059		0.01	VTWA∆ of all maturity groups
2060		0.01	VTWA∆ of all maturity groups
Weighted Averagechange (Trade and Volume)	**0.01**	**(2022 to 2060)**	Excluding the first three rollingmaturity buckets

3. If an auctioned SDL(SGS) belongs to a maturity-bucket with no other SDL(SGS), then its ∆YTM will be calculated as follows:

∆YTM = Traded YTM (subsequent to the auction) post – (minus) the mean of the previous day's published YTM of the closest maturity-buckets on both side in the maturity ladder orthe previous day's published YTM of the closest maturity group on one side in the maturityladder, as the case may be.

IV. Valuation of SDL(SGS)s in Each Maturity-Bucket

1. Valuation of traded SDL(SGS)s will be done on the basis of their traded YTM, as calculated in conformity with the relevant paragraphs under Section II and Section III.
2. Valuation of non-traded SDL(SGS)s will be done on the basis of their estimated YTM. MYMof the maturity-bucket will be used to derive/estimate the Model YTM of the non-traded SDL(SGS) of that maturity-bucket, applying the following formula:

Model YTM = SDL(SGS)'s published YTM of previous day + MYM of the maturity-bucket

Table 8: Illustrative calculation/estimation of YTM

SDL(SGS)	Maturity - bucket	Previous Day's Published YTM (%)	Day's TradedYTM (%)	Volume(₹ in crores)	MYM	Traded / estimated YTM (%) for Valuation
8.52% ANDHRA SDL(SGS)	2028	8.49	8.47	10.00	-0.02	**8.47**

2028						
8.42% ANDHRA SDL(SGS) 2028	2028	8.38				8.35
8.56% ANDHRA SDL(SGS) 2028	2028	8.42				8.39
8.54% ASSAM SDL(SGS) 2028	2028	8.52	8.48	25	-0.04	**8.48**
8.42% ASSAM SDL(SGS) 2028	2028	8.43				8.40
Volume-weighted averageMYM of the maturity-bucket					**-0.03**	

3. On a daily basis, the YTM of SDL(SGS)s that were not traded in the previous one month, [i.e., December 30, 2020 to January 29, 2021 for valuation date on January 29, 2021] will be calculated using the following steps.
   a) The average of published YTM of SDL(SGS)s in a maturity-bucket, which traded at least once during the previous one month are applied to the non-traded SDL(SGS)s in that maturity-bucket during that period.
   b) If a maturity-bucket does not contain any traded SDL(SGS), the simple mean of the VWAY of the two adjacent maturity-buckets are applied to the SDL(SGS)s in the non- traded maturity-buckets.
   c) Simple mean of the VWAY of the nearest maturity-bucket is applied to the non-traded maturity-buckets at the extreme ends of the maturity ladder.

V. Steps for Calibrating the Valuation Model

1. The realignment process will be done for a look-back period of 1-month. This will be done using a process described in the following paragraphs.
2. The process, the start date for which will be one calendar month prior to the commencement date of the revised methodology, begins by calculating/estimating

the YTM in respect of all the then outstanding SDL(SGS)s. These are arranged and grouped into maturity-buckets, subject to the provisions of the paragraph 3 below.

3. YTM of all the outstanding SDL(SGS)s as on the start date is calculated /estimated through the following steps:
   a) Traded SDL(SGS): Volume-weighted average yield (VWAY) is calculated for all traded SDL(SGS)s in each maturity-bucket.
   b) Non-traded SDL(SGS): YTM of non-traded SDL(SGS)s in a maturity-bucket, if any, are set equal to the mean VWAY of traded SDL(SGS)s in that maturity-bucket.
   c) Non-traded maturity-buckets: If there is no traded SDL(SGS) in a maturity-bucket, its VWAY is set equal to the mean VWAY of the two closest maturity-buckets on both sides of the maturity ladder.
   d) Other maturity-buckets: The VWAY of the closest maturity-bucket is applied.
4. The realignment process for SDL(SGS)s with residual maturities ≤ 12 months will not be required, as the valuation of ISINs with residual maturities ≤ 12 months will be based on FBIL T-Bill benchmark rate and a spread, as described in the section VI. below.
5. Auctioned SDL(SGS)s have been/will be added to the list and redeemed SDL(SGS)s have been/will be removed from the list of outstanding SDL(SGS)s on a daily basis.
6. Thereafter, from the next business day onwards (after the start date) the YTM of traded SDL(SGS)s are subjected to the consistency and market alignment test, based on which MYM of different maturity-buckets are calculated.
7. Traded SDL(SGS)s are valued at the VWAY of the surviving trades. Non-traded SDL(SGS)s in a maturity-bucket are valued by adding the MYM of the maturity-bucket to their YTM of the previous day.

VI. Valuation of ISINs with maturity upto and including 12-months:

As stated in the paragraph 2 of section II, the valuation of ISINs with residual maturities ≤12 months will be done using the FBIL published T-Bills benchmark rate and a spread as detailed below:

a. The entire set of ISINs with residual maturities ≤ 12 months is divided into **first**

three rolling time-buckets –

i. 0.01 to 0.25 years or 3-month
ii. 0.26 to 0.50 years or 6-month
iii. 0.51 to 1.00 years or 12-month

b. Respective FBIL T-Bill benchmark rate plus a spread will be applied to each of the all thethree sub-sets of ISINs to arrive at the final YTM.
c. FBIL T-Bill benchmark rates published daily on the FBIL's website for various tenors i.e., 3-month, 6-month and 12-month will be used.

Spread Calculation Process:

d. All traded SDL(SGS)s with residual maturities ≤ 12 months are divided into two categories: 0.5 year (6 months) and 1 year (12-months).
   i. 0.50 year – traded data for residual maturities ranging between 0.26 and 0.50 yearwill be considered for spread calculation.
   ii. 1.00 year – traded data for residual maturities ranging between 0.76 and 1.00 yearwill be considered for spread calculation.
e. A volume-weighted average rate is computed each day for all the traded SDL(SGS)s ineach of the two categories mentioned above.
f. A spread between the published FBIL T-Bill benchmark rates and YTM of SDL(SGS)s with residual maturities ≤ 12 months that are traded is computed on each business day.
g. A 20-trading day moving average of the above spread will be calculated each businessday. The spread thus calculated for 6 months will be added to the day's 3-month and 6-month FBIL-published T-Bill benchmark rates and the spread calculated for 12 months will be added to the 12-month FBIL-published T-Bill benchmark rate of the day.
h. The final rates arrived at for the aforesaid maturities will be uniformly applied to all the ISINs in the respective maturity buckets.
i. SDL(SGS) traded data for residual maturities ≤ 12 months will not be used for valuationpurpose.
j. The spread will be calculated on a 20-trading day moving average basis. If there are notrades in the last 20 trading days, the spread for the previous day will be repeated.
k. If the average spread comes to be a negative number, apply zero as the spread for thatday.
l. Since the valuation of SDL(SGS)s with residual maturities ≤ 12 months is based on T-Billbenchmark rates, so no realignment is required for this maturity bucket, as traded datafor this category of SDL(SGS)s will not be used for their valuation.

VII. Computation of spread of SDL(SGS) over G-sec:

Post realignment and after the YTMs are calculated for all the outstanding ISINs, a spread will be calculated with G-Sec YTM for each half year maturity bucket beyond one year, like1.5, 2, 2.5, 3, …, etc. The G-Sec YTM chosen is the highest YTM in a half-yearly maturity bucket selected for computation of spreads between SDL(SGS) YTMs and G-Sec YTM for that maturity bucket.

All the SDL(SGS) ISINs having negative spread over the G-sec in the relevant maturity bucketwill be identified and will go through a further fallback procedure in a water-fall approach.Under this waterfall method, the option b) is applied only when the criteria in a) is not met:

a) Lowest positive spread (SDL(SGS) –(minus) G-Sec) of the ISIN from same maturity bucket

Illustration:

Date	Description	Maturity	Resi Mat	Resi Mat round off	YTM	G-Sec YTM	Spread	Lowest of positive Maturity Bucket Spread	New YTM based on SDL(SGS) Gsec Spread
27-Nov-20	06.74 TN SDL(SGS) 2050	10-Jun-50	29.54	29.50	6.58	6.59	-0.01	0.00	6.59
27-Nov-20	06.69 TN SDL(SGS) 2050	17-Jun-50	29.56	29.50	6.58	6.59	-0.01	0.00	6.59

b) Lower of the two - lowest positive spreads (SDL(SGS) –(minus) G-Sec) of the ISIN ofthe preceding and succeeding maturity buckets.

Illustration:

Date	Description	Maturity	Resi Mat	Resi Mat round off	YTM	G-Sec	Spread

						YTM	
31-Aug-20	08.38 TS SDL(SGS) 2049	13-Mar-49	28.54	28.50	6.74	6.79	-0.04

Preceding Tenor	**Succeeding Tenor**	**Lowest positive ofthe Preceding Spread**	**Lowest positive of the Succeeding Spread**	**Lowest of the two spreads**	**New YTM based on SDL(SGS) Gsec Spread**	
23.00		0.06		0.06	6.85	Nearest maturity bucket 23.5, 29, 29.5, 34, 34.5, 39 and 39.5 were not taken as theyhave no matching g-sec

<u>Note:</u> This spread is applied to current day's Gsec i.e., same ISIN as used in the spread calculation.

c) No adjustment will be carried out in the SDL(SGS) YTMs in a maturity bucket , if G- secs for that maturity is not available. (e.g.: 2037 and 2038 outstanding G-Secs arenot available, hence, the final YTMs of the SDL(SGS) ISINs with in 2037 and 2038 maturity will not be adjusted).

VIII. Valuation of UDAY/DISCOM Bonds:

UDAY/ DISCOM bonds issued by the various State Governments are currently valued at a spread of 50 basis points to the par YTM of the G-Sec of equivalent

residual maturity. These securities trade very sparingly. Hence, their traded price/YTM are not recognised for the purpose of new valuation methodology. Like SDL(SGS)s, UDAY/DISCOM bonds will also be grouped into maturity-buckets following the provisions of the paragraph 2 of Section II above. However, the maturity-buckets for UDAY/DISCOM bonds with residual maturity upto and including 12 months will be as per the provisions of the paragraph 4 of Section V above. A UDAY/DISCOM bond belonging to a particular maturity-bucket will be valued at the average of the published YTMs of the SDL(SGS)s of that maturity-bucket, as per the steps below:

1. Following this methodology, FBIL will calculate for the purpose of publication on each business day, a YTM curve in respect of SDL(SGS)s in all maturity-buckets. The YTM for a maturity-bucket will be the simple mean of all the published YTMs of all the SDL(SGS)s in that maturity-bucket.
2. UDAY/DISCOM bonds belonging to a maturity-bucket will be valued at the YTM of thatmaturity-bucket.

A. Illustrative example: (Rates as on Feb 28, 2019)

Maturity Buckets	Average Published YTM of SDL(SGS)(%)	YTM for UDAY/DISCOM bonds(%)
1	6.6561	6.6561
2	6.9569	6.9569
3	7.0658	7.0658
4	6.9785	6.9785
5	7.0590	7.0590
2020	7.2037	7.2037
2021	7.2246	7.2246
2022	7.6149	7.6149
2023	7.8103	7.8103
2024	8.0608	8.0608

2025	8.2004	8.2004
2026	8.1684	8.1684
2027	8.3531	8.3531
2028	8.3708	8.3708
2029	8.4053	8.4053
2030	8.3729	8.3729
2031	8.3434	8.3434
2032	8.6931	8.6931

B. Illustrative example: Price and YTM for UDAY/DISCOM bonds in Maturity-bucket 2028

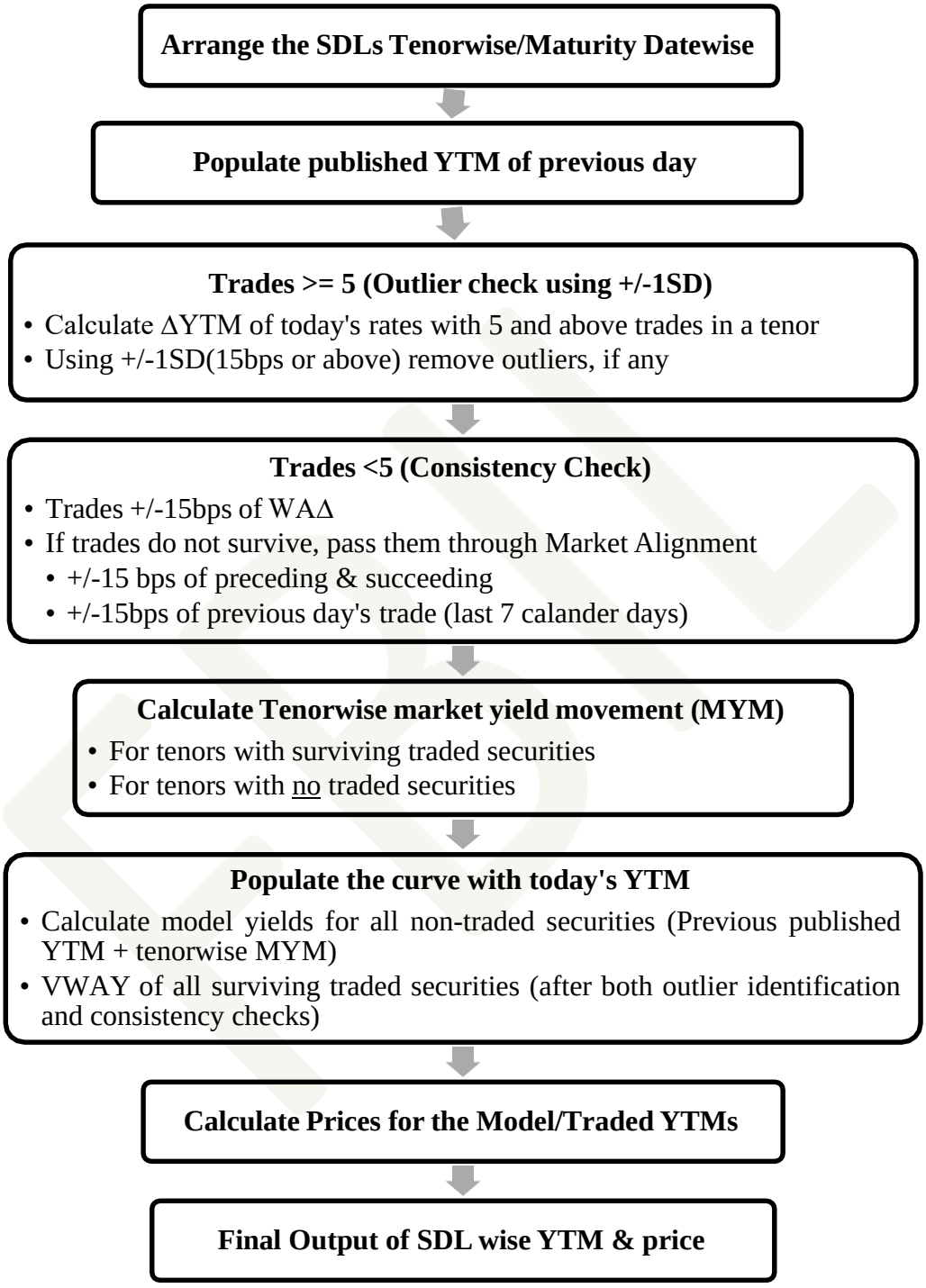
Security Description	Maturity-Bucket	Price (₹)	YTM (%)
07.68 TN UDAY 2028	2028	95.6970	8.3708
07.69 TN UDAY 2028	2028	95.7592	8.3708
07.70 TN UDAY 2028	2028	95.8215	8.3708
07.71 TN UDAY 2028	2028	95.8837	8.3708
07.72 TN UDAY 2028	2028	95.9459	8.3708
10.03 RJ SDL(SGS) SPL 2028	2028	110.8033	8.3708
07.23 AP UDAY 2028	2028	92.5441	8.3708
07.34 AP UDAY 2028	2028	93.2614	8.3708
07.35 AP UDAY 2028	2028	93.3266	8.3708
07.37 AP UDAY 2028	2028	93.4570	8.3708
08.61 UP SDL(SGS) SPL 2028DEC	2028	101.5617	8.3708

IX. Miscellaneous:

1. The price/YTM of all the SDL(SGS)s and UDAY/DISCOM bonds will be published on all Mumbai business days, excluding Saturdays, Sundays and Mumbai holidays by 7 PM.
2. The securities with residual maturity less than six months will be treated as money marketinstruments and their prices will be calculated accordingly.
3. If on a particular business day, if there is no SDL(SGS) trade or SDL(SGS) auction, or if the traded YTM do not fulfil the conditions for being used for valuation, the previous day's published YTM will be repeated.
4. The prices of SDL(SGS)/UDAY/DISCOM bonds will be derived from their YTM and will be published upto **four decimal places**.
5. **Error Re-fix:** The following error materiality threshold will be used for error re-fix if any:

Residual Maturity	Bucket	Error Materiality Thresholdin basis points
1-5 Years	Bucket 1	5
>5-15 Years	Bucket 2	3
> 15 Years	Bucket 3	2

Flowchart of SDL(SGS) Valuation Methodology for maturities above 12 months:



X. Data Quality Assurance & Disclaimer:

While FBIL makes all reasonable efforts to ensure the accuracy of the benchmarks, it makes no warranty, representation or undertaking, expressed or implied by law or otherwise, in relation to the benchmarks, and expressly disclaim, to the fullest extent permitted by applicable law, all liability in any form whatsoever with respect to any errors or omissions, or losses caused by disruptions in the service or late publication of the Rates and other benchmarks or inaccuracy thereof or otherwise arising from the use of or reliance on the Rates and other benchmarks and contents in its website.

Annexure I

Example 1 - Computation for Realignment										
Sr. No.	**ISIN**	**Security Description**	**Tenor**	**MaturityDate**	**Mkt Yield Change**	**Previous Traded Yield Date**	**Previous Traded Yield**	**Current TradedYield**	**30-12-2020**	**31-12-2020**
3230	IN2720160109	07.27 OD SDL(SGS) 2036	2036	25-Jan-36	-0.0234	10-Nov-20	6.7225		6.6308	6.6075
3231	IN1020160074	07.62 AP SDL(SGS) 2036	2036	24-Aug-36	-0.0234				6.6308	6.6075
3232	IN1620180126	08.12 HR SDL(SGS) 2036	2036	27-Mar-36	-0.0234	17-Oct-19	7.2299		6.6308	6.6075
3233	IN1020190022	08.18 AP SDL(SGS) 2036	2036	10-Apr-36	-0.0234	09-Apr-19	8.1800		6.6308	6.6075
3234	IN1020190451	07.15 AP SDL(SGS) 2036	2036	29-Jan-36	-0.0234	28-Jan-20	7.1500		6.6308	6.6075
3235	IN1020200359	06.85 AP SDL(SGS) 2036	2036	09-Sep-36	-0.0234	24-Dec-20	6.6436		6.6570	6.6336
3236	IN1920200483	06.68 KA SDL(SGS) 2036	2036	09-Dec-36	-0.0234	29-Dec-20	6.5874		6.5867	6.5633
3237	IN1020200508	06.65 AP SDL(SGS) 2036	2036	30-Dec-36	-0.0234	**31-Dec-20**		**6.6254**	6.6488	6.6254
Average MYM of traded securities on 31.12.2020 is -0.0234 which is imputed to non-traded securities listed Sr. No. 3230 to 3236										
Model yields on 29.01.2021 Before realignment.										
Sr. No.	**ISIN**	**Security Description**	**Tenor**	**MaturityDate**	**Mkt Yield Change**	**Previous Traded Yield Date**	**Previous Traded Yield**	**Current TradedYield**	**28-01-2021**	**29-01-2021**

3245	IN2720160109	07.27 OD SDL(SGS) 2036	2036	25-Jan-36	-0.0093	10-Nov-20	6.7225		6.6188	**6.6095**
3246	IN1020160074	07.62 AP SDL(SGS) 2036	2036	24-Aug-36	-0.0093				6.6188	**6.6095**
3247	IN1620180126	08.12 HR SDL(SGS) 2036	2036	27-Mar-36	-0.0093	17-Oct-19	7.2299		6.6188	**6.6095**
3248	IN1020190022	08.18 AP SDL(SGS) 2036	2036	10-Apr-36	-0.0093	09-Apr-19	8.1800		6.6188	**6.6095**
3249	IN1020190451	07.15 AP SDL(SGS) 2036	2036	29-Jan-36	-0.0093	28-Jan-20	7.1500		6.6188	**6.6095**
3250	IN1020200359	06.85 AP SDL(SGS) 2036	2036	09-Sep-36	-0.0093	28-Jan-21	6.6363		6.6363	6.6270
3251	IN1920200483	06.68 KA SDL(SGS) 2036	2036	09-Dec-36	-0.0093	14-Jan-21	6.6213		6.5861	6.5769
3252	IN1020200508	06.65 AP SDL(SGS) 2036	2036	30-Dec-36	-0.0093	13-Jan-21	6.6221		6.6283	6.6190
3253	IN4920200131	06.64 JK SDL(SGS) 2036	2036	06-Jan-36	-0.0093	08-Jan-21	6.6232		6.6243	6.6151
3254	IN3420200211	06.61 WB SDL(SGS) 2036	2036	20-Jan-36	-0.0093	21-Jan-21	6.6012		6.6188	6.6095

Model yields on 29.01.2021 After realignment .

Sr. No.	ISIN	Coupon	Tenor	MaturityDate	Mkt Yield Change	Previous Traded Yield Date	Previous Traded Yield	Current TradedYield	28-01-2021	29-01-2021
3245	IN2720160109	07.27 OD SDL(SGS) 2036	2036	25-Jan-36	-0.0093				6.6188	**6.6095**
3246	IN1020160074	07.62 AP SDL(SGS) 2036	2036	24-Aug-36	-0.0093				6.6188	**6.6095**

3247	IN1620180126	08.12 HR SDL(SGS) 2036	2036	27-Mar-36	-0.0093				6.6188	**6.6095**
3248	IN1020190022	08.18 AP SDL(SGS) 2036	2036	10-Apr-36	-0.0093				6.6188	**6.6095**
3249	IN1020190451	07.15 AP SDL(SGS) 2036	2036	29-Jan-36	-0.0093				6.6188	**6.6095**
3250	IN1020200359	06.85 AP SDL(SGS) 2036	2036	09-Sep-36	-0.0093	28-Jan-21	6.6363		6.6363	6.6270
3251	IN1920200483	06.68 KA SDL(SGS) 2036	2036	09-Dec-36	-0.0093	14-Jan-21	6.6213		6.5861	6.5769
3252	IN1020200508	06.65 AP SDL(SGS) 2036	2036	30-Dec-36	-0.0093	13-Jan-21	6.6221		6.6283	6.6190
3253	IN4920200131	06.64 JK SDL(SGS) 2036	2036	06-Jan-36	-0.0093	08-Jan-21	6.6232		6.6243	6.6151
3254	IN3420200211	06.61 WB SDL(SGS) 2036	2036	20-Jan-36	-0.0093	21-Jan-21	6.6012		6.6188	6.6095
Average model yield of securities traded at least once from 30.12.2020 - Sr. No. 3250 to 3254 is										**6.6095**
6.6095 will be used as model yield for the securities not traded at least once since 30.12.2020										
We will publish the above model yields (after realignment) for 29.01.2021										

Example 2 - Computation for Realignment										
Sr. No.	**ISIN**	**Security Description**	**Tenor**	**Maturity Date**	**Mkt Yield Change**	**Previous Traded Yield Date**	**Previous Traded Yield**	**Current Traded Yield**	**30-12-2020**	**31-12-2020**
3369	IN4520190120	07.35 TS SDL(SGS) 2054	2054	30-Oct-54	-0.0027	03-Mar-20	7.0497		6.6892	6.6866
3370	IN4520190138	07.43 TS SDL(SGS) 2054	2054	13-Nov-54	-0.0027	11-Nov-19	7.4300		6.6892	6.6866
3371	IN3120190241	07.33 TN SDL(SGS) 2054	2054	04-Dec-54	-0.0027	07-Jan-20	7.2458		6.6892	6.6866
3372	IN3120200180	06.68 TN SDL(SGS) 2055	2055	01-Jul-55	-0.0027	03-Aug-20	6.5450		6.6892	6.6866
3373	IN3120200206	06.63 TN SDL(SGS) 2055	2055	08-Jul-55	-0.0027	28-Jul-20	6.4955		6.6892	6.6866
3374	IN2920200234	06.55 RJ SDL(SGS) 2055	2055	15-Jul-55	-0.0027	06-Aug-20	6.5139		6.6892	6.6866
3375	IN4520190146	07.39 TS SDL(SGS) 2059	2059	11-Dec-59	-0.0027	11-Feb-20	7.0178		6.6892	6.6866
3376	IN4520190153	07.31 TS SDL(SGS) 2060	2060	15-Jan-60	-0.0437	28-Jan-20	7.2002		6.7281	6.6844
3377	IN4520190161	06.94 TS SDL(SGS) 2060	2060	11-Mar-60	-0.0437	**31-Dec-20**		**6.6844**	6.7281	6.6844
Average MYM of all traded securities on 31.12.2020 is -0.0027 which is imputed to non-traded securities listed Sr. No. 3369 to 3375; MYM for 2060 is -0.0437, also applied to 3376										

Model yields on 29.01.2021 Before realignment.										
Sr. No.	**ISIN**	**Security Description**	**Tenor**	**Maturity Date**	**Mkt Yield Change**	**Previous Traded Yield Date**	**Previous Traded Yield**	**Current Traded Yield**	**28-01-2021**	**29-01-2021**
3398	IN4520190120	07.35 TS SDL(SGS) 2054	2054	30-Oct-54	0.0135	03-Mar-20	7.0497		6.6050	6.6186
3399	IN4520190138	07.43 TS SDL(SGS) 2054	2054	13-Nov-54	0.0135	11-Nov-19	7.4300		6.6050	6.6186
3400	IN3120190241	07.33 TN SDL(SGS) 2054	2054	04-Dec-54	0.0135	07-Jan-20	7.2458		6.6050	6.6186
3401	IN3120200180	06.68 TN SDL(SGS) 2055	2055	01-Jul-55	0.0135	03-Aug-20	6.5450		6.6038	6.6174
3402	IN3120200206	06.63 TN SDL(SGS) 2055	2055	08-Jul-55	0.0135	25-Jan-21	6.6001		6.6038	6.6174
3403	IN2920200234	06.55 RJ SDL(SGS) 2055	2055	15-Jul-55	0.0135	06-Aug-20	6.5139		6.6038	6.6174
3404	IN4520190146	07.39 TS SDL(SGS) 2059	2059	11-Dec-59	0.0135	11-Feb-20	7.0178		6.6453	6.6589
3405	IN4520190153	07.31 TS SDL(SGS) 2060	2060	15-Jan-60	0.0135	28-Jan-20	7.2002		6.6868	6.7003
3406	IN4520190161	06.94 TS SDL(SGS) 2060	2060	11-Mar-60	0.0135	31-Dec-20	6.6844		6.6868	6.7003
Model yields on 29.01.2021 After realignment.										
Sr. No.	**ISIN**	**Security Description**	**Tenor**	**Maturity Date**	**Mkt Yield Change**	**Previous Traded Yield Date**	**Previous Traded Yield**	**Current Traded Yield**	**28-01-2021**	**29-01-2021**
3398	IN4520190120	07.35 TS SDL(SGS) 2054	2054	30-Oct-54	0.0135				6.6050	**6.6186**
3399	IN4520190138	07.43 TS SDL(SGS) 2054	2054	13-Nov-54	0.0135				6.6050	**6.6186**

3400	IN3120190241	07.33 TN SDL(SGS) 2054	2054	04-Dec-54	0.0135				6.6050	**6.6186**
3401	IN3120200180	06.68 TN SDL(SGS) 2055	2055	01-Jul-55	0.0135				6.6038	**6.6174**
3402	IN3120200206	06.63 TN SDL(SGS) 2055	2055	08-Jul-55	0.0135	25-Jan-21	6.6001		6.6038	6.6174
3403	IN2920200234	06.55 RJ SDL(SGS) 2055	2055	15-Jul-55	0.0135				6.6038	**6.6174**
3404	IN4520190146	07.39 TS SDL(SGS) 2059	2059	11-Dec-59	0.0135				6.6453	**6.6589**
3405	IN4520190153	07.31 TS SDL(SGS) 2060	2060	15-Jan-60	0.0135				6.6868	**6.7003**
3406	IN4520190161	06.94 TS SDL(SGS) 2060	2060	11-Mar-60	0.0135	31-Dec-20	6.6844		6.6868	6.7003
Average model yield for 2054 (Average YTM based on average of traded ISINs of 2051 and 2055)										**6.6186**

Average model yield of securities traded at least once from 30.12.2020 for 2055	**6.6174**
Average model yield for 2059 (Average YTM based on average of traded ISINs of 2055 and 2060)	**6.6589**
Average model yield of securities traded at least once from 30.12.2020 for 2060	**6.7003**
We will publish the above model yields (after realignment) for 29.01.2021	

Illustration for spread calculation (20-Day Moving Average):

Trade Date	ISIN	Security Description	Redemption Date	Residual Maturity (year)	No. of Trades	FV in ₹ crores	Traded VWAY	6M T-bill Rate	T-Bill Rate	Spread (bps)
05-Jan-21	IN1620110016	08.36 HARYANA SDL(SGS) 2021	08-Apr-21	0.26	1	5	3.15	3.23	3.33	-18
07-Jan-21	IN2920180048	08.15 RAJASTHAN SDL(SGS) 2021	23-May-21	0.38	1	5	3.37	3.32	3.42	-5
Volume Weighted Average Spread										0

Trade Date	ISIN	Security Description	Redemption Date	Residual Maturity (year)	No. of Trades	FV in ₹ crores	Traded VWAY	12M T-bill Rate	T-Bill Rate	Spread (bps)
05-Jan-21	IN3520180024	08.11 CHHATISGARH SDL(SGS) 2021	31-Oct-21	0.82	1	50	3.60	3.43	3.60	0
05-Jan-21	IN1920190122	06.10 KARNATAKA SDL(SGS) 2021	11-Dec-21	0.93	1	100	3.60	3.43	3.60	0
05-Jan-21	IN1220180179	07.90 ASSAM SDL(SGS) 2021	12-Dec-21	0.93	1	75	3.60	3.43	3.60	0
06-Jan-21	IN1520160129	07.03 GUJARAT SDL(SGS) 2021	26-Oct-21	0.80	1	25	3.60	3.45	3.62	-2
12-Jan-21	IN3520180040	07.90 CHHATISGARH SDL(SGS) 2021	28-Nov-21	0.88	1	20	3.80	3.49	3.67	13
12-Jan-21	IN2220110083	08.72 MAHARASHTRA SDL(SGS) 2022	11-Jan-22	0.99	1	50	3.95	3.49	3.67	28
13-Jan-21	IN2020110051	09.03 KERALA SDL(SGS) 2021	07-Dec-21	0.90	1	5	4.20	3.56	3.74	46

14-Jan-21	IN2020110051	09.03 KERALA SDL(SGS) 2021	07-Dec-21	0.89	1	5	4.01	3.57	3.76	26
14-Jan-21	IN3420110154	08.75 WEST BENGAL SDL(SGS) 2022	11-Jan-22	0.99	1	20	4.05	3.57	3.76	29
15-Jan-21	IN3420110154	08.75 WEST BENGAL SDL(SGS) 2022	11-Jan-22	0.98	1	5	4.05	3.56	3.74	31
19-Jan-21	IN1920190122	06.10 KARNATAKA SDL(SGS) 2021	11-Dec-21	0.89	2	200	3.85	3.54	3.72	13
21-Jan-21	IN1920190122	06.10 KARNATAKA SDL(SGS) 2021	11-Dec-21	0.89	1	75	3.85	3.58	3.77	8
21-Jan-21	IN1220180187	07.73 ASSAM SDL(SGS) 2021	19-Dec-21	0.91	1	100	3.85	3.58	3.77	8
21-Jan-21	IN1220180195	07.86 ASSAM SDL(SGS) 2022	02-Jan-22	0.94	1	25	4.00	3.58	3.77	23
22-Jan-21	IN3320110114	09.02 UTTAR PRADESH SDL(SGS) 2021	07-Dec-21	0.87	2	20	3.98	3.58	3.77	21
22-Jan-21	IN3420110139	09.04 WEST BENGAL SDL(SGS) 2021	07-Dec-21	0.87	2	20	3.98	3.58	3.77	21
28-Jan-21	IN2220110083	08.72 MAHARASHTRA SDL(SGS) 2022	11-Jan-22	0.95	1	25	4.00	3.65	3.84	16
Volume Weighted Average Spread										16

Annexure - 2

Modifications in the SDL(SGS) Methodology Document

Para No.	Existing Version-3	New Version-4
7	**I. Introduction** FIMMDA is the Calculating Agent (CA) for the calculation of the price/YTM of SDL(SGS)s following this methodology.	**I. Introduction** Calculation of SDL Valuation is done by FBIL in-house.

FBIL

11.	**II**. **<u>Assumptions, Definitions and Main Rules</u>** In a maturity-bucket having less than 5 trades (excluding the maturity buckets ≤12 months), the trades that are identified as outliers will be subjected to a further check, comprising the following two alternative conditions: a) Its YTM should be within (+/-) 10 basis points of the traded YTM of the closest succeeding/preceding SDL(SGS) in the same maturity-bucket, or b) Its YTM should be within (+/-) 10 basis points of its latest traded YTM, if any, during the past 7 calendar days.	**II**. **<u>Assumptions, Definitions and Main Rules</u>** The Second level consistency check has been dispensed with.

11.	**II. <u>Assumptions, Definitions and Main Rules</u>** **No provision, in case there is no maturity bucket with >= 5 Trades.**	**II. <u>Assumptions, Definitions and Main Rules</u>** 11. In case there is no maturity bucket with >= 5 trades on a particular day, the below mentioned process will be adopted to remove outliers for effecting the above consistency and market alignment check: a. Calculate the yield changes (∆YTM) with respect to previous day's published YTM for each ISIN traded on that day. b. Calculate the volume weighted average yield change [VWAY∆μ] of all the ∆YTMs of all the traded maturity buckets. **c.** Any trade, the ∆YTM for which falls outside (+/-) 10 basis points of VWAY∆μ, will be identified as an outlier.

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