

# **Financial Benchmarks India Pvt. Ltd.**

## **Valuation Methodology for State Development Loans (SDL)**

March 26, 2019

### **I. Introduction**

1. Currently, SDL valuations are done as per the master circular of RBI on valuation of investment, dated July 1, 2015. As per this master circular, on any business day the Last Traded Price/Last Traded Yield-to-Maturity (LTP/LTYTM) of the traded SDLs are used for their valuation at the end of that day. In the case of other SDLs that are not traded on that day, their prices/YTM for day-end valuation are determined by adding 25 basis points to the par YTM of the G-Sec of equivalent time-to-maturity, as calculated and published by FBIL for the purpose of valuation of G-Sec. In a recent modification of its policy in this regard, RBI directed that FBIL may publish the prices/YTM of all SDLs 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 SDLs, which normally trade without any particular credit differentiation among the issuer states. During the past 12 months (January, 2018 to December, 2018), the average number of daily trades in all the SDLs with residual maturity exceeding 10 years was 5 and their average volume was Rs.153.04 crores. The average number of SDLs that trade on any business day is thus very small compared to the aggregate number of outstanding SDLs at a little over 2500.
3. An empirically tested fact is that while a statistically significant difference between the traded prices/YTM of SDLs on the NDS-OM [i.e., NDS-OM 'Normal' trades] and the prices/YTM of the over-the-counter (OTCR) trades in the same SDLs 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 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 purposes of this methodology, no distinction has been made between "Normal" and 'OTCR' trades in SDL

4. Also, there is no empirical evidence for according different treatments to prices/YTM of proprietary trades in SDLs on any business day and the prices/YTM of CSGL (Constituent) trades in the same/similar SDLs on that day.
5. Keeping the foregoing in view and also the requirement that the prices/YTM of all SDLs 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 SDLs and the auction prices/YTM of SDLs, 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 the reversed trades when they occur, will be excluded, (b) Interpolation/ extrapolation technique will be used in respect of the remaining SDLs 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 SDLs are very small, the opportunity cost of not including any actual/observed price is high (consequence of 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. FIMMDA is the Calculating Agent (CA) for the calculation of the price/YTM of SDLs following this methodology.

## **II. Assumptions, Definitions and Main Rules**

1. All transaction level data on NDS-OM will be obtained from Clearing Corporation of India Limited. All SDLs will be identified by their respective International Securities Identification Number (ISIN). For the purpose of this methodology document, the term 'SDL' means a state development loan identified by its ISIN. The SDLs will be grouped according to the calendar year of their maturity (hereinafter referred to as 'maturity-bucket'). In other

words, the differences in the residual maturities of SDLs in any maturity-bucket will be in the range of 0-12 months. For the purpose of grouping SDLs in different maturity-buckets, no distinction will be made between the issuer states. The SDLs in a maturity-bucket will be arranged in the increasing order of their residual maturities.

2. Due to the observed *inter se* differences in the trading pattern of SDLs with residual maturities up to and including 12 months, the first maturity-bucket will contain SDLs with residual maturity up to and including six months and the second maturity-bucket will contain SDLs with residual maturity exceeding six months but less or equal to 12 months. These first two maturity-buckets will be constructed on a rolling 6-month basis, with reset taking place every business day.

**Illustrations:**

- (i) As on October 23, 2018 (Tuesday) the maturity-buckets would have been as under:
  - a. SDLs with maturity upto April 23, 2019 [First six-month]
  - b. SDLs with maturity upto October 23, 2019 [Second six-month]
  - c. SDLs maturing after October 23, 2019 till December 31, 2019 [2019 maturity-bucket]
  - d. SDLs maturing after December 31, 2019 would fall into respective Calendar Year bucket (2020, 2021, 2022, ..., etc.)
- (ii) As on October 26, 2018 (Friday), the maturity-buckets would have been as under:
  - a. SDLs with maturity upto April 26, 2019 [First six-month]
  - b. SDLs with maturity upto October 26, 2019 [Second six-month]
  - c. SDLs maturing on October 26, 2019 upto December 31, 2019 [2019 maturity-bucket]
  - d. SDLs maturing after December 31, 2019 would fall into respective Calendar Year bucket (2020, 2021, 2022, ..., etc.)
- (iii) As of January 07, 2019 (Monday), the maturity-buckets would have been as under:
  - a. SDLs with maturity upto July 7, 2019 [First six-month]
  - b. SDLs with maturity upto January 7, 2020 [Second six-month]

- c. SDLs maturing on January 8, 2020 onwards upto December 31, 2020 [2020 maturity-bucket]
  - d. SDLs maturing after December 31, 2020 would fall into respective Calendar Year bucket (2021, 2022, ..., etc.)
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- 3. The YTM of the primary issuances and of the secondary trades of all SDLs in any maturity-bucket will be treated as similar for their aggregation and statistical treatment required for the purpose of this methodology. This approach is based on the assumed homogeneity of the YTM of the trades in respect of SDLs in any maturity-bucket.
  - 4. Valuation of SDLs will be based on the transaction-level data obtained from the NDS-OM platform and the auction data released by RBI from time to time.
  - 5. The YTM of all SDL 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 SDLs in any maturity-bucket will be valued at their traded YTM. For the purpose of valuation of non-traded SDLs 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 SDLs of that maturity-bucket. Hence, the YTM of a non-traded SDL 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 SDLs 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 SDLs 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, the average number of daily trades in all SDLs is very small compared to the total number of outstanding SDLs. This way of calibrating the valuation model will ensure that the YTM of the non-traded SDLs on the start date and thereafter are estimated in conformity with this methodology. For this purpose, YTM of traded SDLs with effect from June 1, 2018 will be

taken into account. The steps used for model calibration are described in the Section V below.

7. Traded YTM of an SDL belonging to any maturity-bucket means the Volume-weighted Average YTM (VWAY) of the trades in that SDL. Before the calculation of VWAY, each SDL trade in a maturity-bucket will be subjected to a consistency and market alignment check, which aims at determining if its  $\Delta$ YTM is consistent with the  $\Delta$ YTM of other trades in the same maturity-bucket and also with its last published YTM. If the total number of 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 applying a 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-bucket is five or more:
  - a) The difference ( $\Delta$ YTM) between the YTM of trades in each SDL in the maturity-bucket and the published YTM of that SDL on the previous business day will be calculated.
  - b) The volume-weighted average difference (VWAY $\Delta$ ) in respect of all  $\Delta$ YTM in the maturity-bucket will be calculated and their sample standard deviation will be obtained.
  - c) Any trade the  $\Delta$ YTM for which falls outside (+/-) one standard deviation (SD) from the mean will be identified as an outlier trade. In case SD is < 15 basis points, it will be set equal to 15 basis points. In other words, SD will have a floor of 15 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 (ISIN).
  - e) VWAY $\Delta$  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 2020 as on 20.12.2018

SDLs	Previous day's YTM (%)	YTM (%) of trades	Volume in ₹ crores	ΔYTM	Volume Weighted Average ΔYTM	SD of ΔYTM	Check result
S1	7.43	7.28	30.00	-0.15	-0.14	0.12 as it is <0.15. 0.15 will be used for calculation of +/- 1SD	Accepted
S2	7.43	7.28	55.00	-0.15			Accepted
S3	7.43	7.28	15.00	-0.15			Accepted
	7.43	7.28	100.00	-0.15			Accepted
S4	7.43	7.50	5.00	0.07			Outlier
S5	7.43	7.52	10.00	0.09			Outlier
	VWAYΔ (-/+ ) 1SD = - 0.29 & 0.01						

Note: The outlier identification procedure as above will be applied to the first two rolling maturity-buckets as well.

9. For each maturity-bucket with total number trades at 5 or above, including for the first two rolling six-month maturity-buckets, VWAY $\Delta$  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 [WAY $\Delta_{\mu}$ ] of all such VWAY $\Delta$  in respect of all the traded maturity-buckets will be calculated, excluding the first two rolling six-month maturity - buckets.
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 trades in a maturity-bucket is less than 5 (viz. 1, 2, 3 and 4 trades) the steps, as below, will be followed:

- a)  $\Delta$ YTM of each trade will be calculated.
- b) The trades, the  $\Delta$ YTM of which fall outside (+/-) 15 basis points of WAY $\Delta_{\mu}$  (as described in the paragraph 9 above) will be identified as outliers.
- c) In case the number of trades in any SDL 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 4: Illustrative example for  $\Delta$ YTM check: Traded data as on 20.12.2018

SDL	Trades	Maturity-bucket	Volume in ₹ crores	YTM (%)	Previous day's YTM (%)	$\Delta$ YTM
S1	T1	Up to June 18, 2019	175.00	6.85	6.78	0.07
S1	T2	Up to June 18, 2019	175.00	6.85	6.78	0.07
S2	T3	Up to June 18, 2019	37.61	6.95	6.79	<b>0.16</b>
S3	T1	2022	25.00	7.73	7.74	-0.01
S3	T2	2022	25.00	7.70	7.74	-0.04
S4	T1	2025	10.00	7.97	7.91	0.06
S4	T2	2025	10.00	7.97	7.91	0.06
S5	T1	2030	6.00	8.08	8.06	0.02
S6	T2	2030	15.00	8.08	8.09	-0.01
S7	T1	2038	5.00	8.09	8.12	-0.03
S7	T2	2038	10.00	8.23	8.12	0.11
WAY $\Delta_{\mu}$						<b>-0.01</b>
WAY $\Delta_{\mu}$ -15bps						-0.16
WAY $\Delta_{\mu}$ +15bps						0.14

Trade S2-T3 will be identified as an outlier as its  $\Delta$ YTM is outside the range: (-) 16 basis points to (+) 14 basis points.

11. In a maturity-bucket having less than 5 trades, the trades that are identified as outliers will be subjected to a further check, comprising the following two alternative conditions:
- Its YTM should be within (+/-) 15 basis points of the traded YTM of the closest succeeding / preceding SDL in the same maturity-bucket, or
  - Its YTM should be within (+/-) 15 basis points of its latest traded YTM, if any, during the past 7 calendar days.

Table 5: Illustrative example for second-stage check (a): Trades **S2-T3** in Table 2.

SDL	Trades	Maturity-bucket	YTM (%)	Range of YTM (%) on the basis of closest preceding/succeeding SDL	Check result for S2-T3
S1	T2	Up to 18.06.2019	6.85		

<b>S2</b>	<b>T3</b>	<b>Up to 18.06.2019</b>	<b>6.95</b>	Preceding: (6.85+0.15) = 7.00 and (6.85-0.15) = 6.70	Pass
				Succeeding: NIL	N.A.

Table 6: Illustrative example for second-stage check (b): Trades **S2-T3** in Table 2.

<b>SDL</b>	<b>Trades</b>	<b>Maturity-bucket</b>	<b>YTM (%)</b>	<b>YTM (%) of trade in last 7 days</b>	<b>Check result for S2-T3</b>
S1	T2	Up to 18.06.2019	6.85		
<b>S2</b>	<b>T3</b>	<b>Up to 18.06. 2019</b>	<b>6.95</b>	<b>NIL</b>	<b>N.A.</b>

Since S2-T3 was identified as outlier pass one of the two alternative conditions, it will be retained for the purpose of calculation of VWAY of the SDL concerned.

Note: The consistency checks as explained above will be applied to the first two rolling maturity buckets as well.

12. VWAY $\Delta$  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).
13. Using the volume and YTM of surviving trades (even if a single trade in an SDL survives) the Volume-Weighted Average Yield (VWAY) will be calculated for each SDL.
14. Traded YTM of an SDL 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 days for the purpose to applying the check, as in the paragraph 11(b) above.
15. Treatment of Auction Data (Reissuance/New issuance):
  - a) On the day of auctions, the weighted average yield (WAY) published by RBI of the auctioned SDL will be included in the traded data set for the calculation of YTM of the auctioned SDL and MYM of different maturity-buckets:

YTM:

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



- c) All the traded YTM's 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 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 concerned.
- e) If the total number of trades in an auctioned SDL 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.
- f) If the total number of trades in an auctioned SDL 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.

MYM:

- g) In the case of a new SDL being auctioned, its  $\Delta$ YTM is calculated by subtracting the average of the previous day's published YTM of the SDLs of the maturity-bucket to which the newly-auctioned SDL belongs, from its traded YTM.
- h) If an auction results in a new maturity-bucket, then the  $\Delta$ YTM is calculated by subtracting the average of the previous day's published YTM of the SDLs 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 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 SDLs 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 in that maturity-bucket and its published YTM on the previous day ( $\Delta YTM$ ) = 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  $\Delta YTM$  of all the traded SDL of the maturity-bucket

**Table 7: Illustrative calculation of MYM**

Description of SDL (ISIN)	Maturity -bucket	Previous day's Published YTM (%)	Today's Traded YTM (%)	Volume (₹ in crores)	ΔYTM	VWAYΔ
8.05 GUJ SDL 2028	2028	8.01	8.01	10.00	0.00	-0.01
8.28 TN SDL 2028	2028	8.08				
8.28 TN SDL 2028 MAR	2028	8.05				
8.00 KL SDL 2028	2028	8.05	8.00	5.00	-0.05	
8.05 TN SDL 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 will be 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 (WAY $\Delta$ ) 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 (VTWAA) of the MYM of all traded maturity-buckets, excepting the first two rolling six-month buckets.

**Table 8: Illustrative calculation for MYM Interpolation**

<b>Maturity-bucket</b>	<b>No. of Traded SDLs</b>	<b>Volume in ₹ crores</b>	<b>MYM (%) of the maturity-bucket</b>	<b>Volume-weighted average MYM (%)</b>
<b>2022</b>	2	50.00	-0.02	
<b>2023</b>	6	240.00	<b>-0.08</b>	
<b>2024</b>				<b>-0.06</b>
<b>2025</b>				
<b>2026</b>	8	95.00	<b>-0.01</b>	
<b>2027</b>	18	142.00	-0.10	

**Table 9: Illustrative calculation for MYM interpolation/extrapolation**

<b>Maturity-bucket</b>	<b>MYM (%)</b>	<b>Volume-weighted average MYM (%)</b>	<b>Applicable MYM for interpolation/extrapolation</b>
upto 18 Jun 2019		-0.04	VTWAA of all maturity groups
upto 18 Dec 2019		-0.04	VTWAA of all maturity groups
2019		-0.04	VTWAA of all maturity groups
2020	-0.15		
2021	0.09		
2022	-0.02		
2023	-0.08		
2024		-0.05	WAA of two closest maturity groups
2025		-0.05	WAA of two closest maturity groups
2026	-0.01		
2027	-0.10		
2028	0.00		
2029		0.00	WAA of two closest maturity groups
2030	0.01		

2031		-0.02	WAA of two closest maturity groups
2032		-0.02	WAA of two closest maturity groups
2033	-0.05		
2035			VTWAA of all maturity groups
2036			VTWAA of all maturity groups
2037			VTWAA of all maturity groups
2038			VTWAA of all maturity groups
2043			VTWAA of all maturity groups
<b>Weighted Average change (Trade and Volume)</b>	<b>-0.04</b>	<b>(2019 to 2043)</b>	Excluding the first two rolling maturity buckets

3. If an auctioned SDL belongs to a maturity-bucket with no other SDL, then its  $\Delta YTM$  will be calculated as follows:

$\Delta YTM = \text{Traded YTM (subsequent to the auction) post} - (\text{minus}) \text{ the mean of the previous day's published YTM of the closest maturity-buckets on both side in the maturity ladder or the previous day's published YTM of the closest maturity group on one side in the maturity ladder, as the case may be.}$

#### IV. Valuation of SDLs in Each Maturity-Bucket

1. Valuation of traded SDLs 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 SDLs will be done on the basis of their estimated YTM. MYM of the maturity-bucket will be used to derive/estimate the Model YTM of the non-traded SDL of that maturity-bucket, applying the following formula:

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

**Table 10: Illustrative calculation/estimation of YTM**

<b>SDL</b>	<b>Maturity -bucket</b>	<b>Previous Day's Published YTM (%)</b>	<b>Day's Traded YTM (%)</b>	<b>Volum e (₹ in crores)</b>	<b>MYM</b>	<b>Traded / estimated YTM (%) for Valuation</b>
8.52% ANDHRA SDL 2028	2028	8.49	8.47	10.00	-0.02	<b>8.47</b>
8.42% ANDHRA SDL 2028	2028	8.38				8.35
8.56% ANDHRA SDL 2028	2028	8.42				8.39
8.54% ASSAM SDL 2028	2028	8.52	8.48	25	-0.04	<b>8.48</b>
8.42% ASSAM SDL 2028	2028	8.43				8.40
<b>Volume- weighted average MYM of the maturity- bucket</b>					<b>-0.03</b>	

3. On a daily basis and with effect from March 25, 2019, the YTM of SDLs that were not traded in the previous three months, [i.e., December 26, 2018 to March 25, 2019 on March 25, 2019; December 27, 2018 to March 26, 2019 on March 26, 2019 and so on] will be calculated using the following steps.
- The average of published YTM of SDLs in a maturity-bucket, which traded at least once during the previous three months are applied to the non-traded SDLs in that maturity-bucket during that period.
  - If a maturity-bucket does not contain any traded SDL, the simple mean of the VWAY of the two adjacent maturity-buckets are applied to the SDLs in the non-traded maturity-buckets.
  - 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 model will be calibrated in order to be used for commencement of valuation following the model on March 25, 2019. This will be done using a process described in the following paragraphs.
2. The process, the start date for which is June 1, 2018 begins by calculating/estimating the YTM in respect of all the then outstanding SDLs, numbering 2412. These are arranged and grouped into maturity-buckets, subject to the provisions of the paragraph 4 below.
3. YTM of all the 2412 SDLs as on the start date, viz. June 1, 2018 have been calculated/estimated through the following steps:
  - a) Traded SDL: Volume-weighted average yield (VWAY) is calculated for all traded SDLs in each maturity-bucket.
  - b) Non-traded SDL: YTM of non-traded SDLs in a maturity-bucket, if any, are set equal to the mean VWAY of traded SDLs in that maturity-bucket.
  - c) Non-traded maturity-buckets: If there is no traded SDL 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. For the purpose of applying the above-mentioned steps, the maturity-buckets for SDLs with residual maturity up to and including 12 months are recast as follows:
  - a) SDLs having residual maturity up to and including one month.
  - b) SDLs having residual maturity more than one month and up to and including 3 months.
  - c) SDLs having residual maturity more than 3 months and up to and including 6 months.
  - d) SDLs having residual maturity more than 6 months and up to and including 9 months.
  - e) SDLs having residual maturity more than 9 months and up to and including 12 months.

Illustration: On October 31, 2018, the maturity-buckets for residual maturities up to and including 12 months are as follows:

- i. SDLs maturing up to and including November 30, 2018

- ii. SDLs maturing between December 1, 2018 and January 31, 2019
- iii. SDLs maturing between February 1, 2019 and April 30, 2019
- iv. SDLs maturing between May 1, 2019 and July 31, 2019
- v. SDLs maturing between August 1, 2019 and October 31, 2019

As on June 1, 2018, there was no traded maturity-bucket beyond 2024. Hence, the VWAY of 2024 maturity-bucket has been applied to the rest of the maturity-buckets, namely, 2025, 2026, ..., 2043.

5. Auctioned SDLs have been/will be added to the list and redeemed SDLs have been/will be removed from the list of outstanding SDLs on a daily basis.
6. Thereafter, from the next business day onwards (i.e June 4, 2018) the YTM of traded SDLs are subjected to the consistency and market alignment test, based on which MYM of different maturity-buckets are calculated.
7. Traded SDLs are valued at the VWAY of the surviving trades. Non-traded SDLs in a maturity-bucket are valued by adding the MYM of the maturity-bucket to their YTM of the previous day.

## **VI. 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 SDLs, 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 up to 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 SDLs 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 SDLs in all maturity-buckets. The YTM for a maturity-bucket will be the simple mean of all the published YTM of all the SDLs in that maturity-bucket.
2. UDAY/DISCOM bonds belonging to a maturity-bucket will be valued at the YTM of that maturity-bucket.

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

Maturity Buckets	Average Published YTM of SDL(%)	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

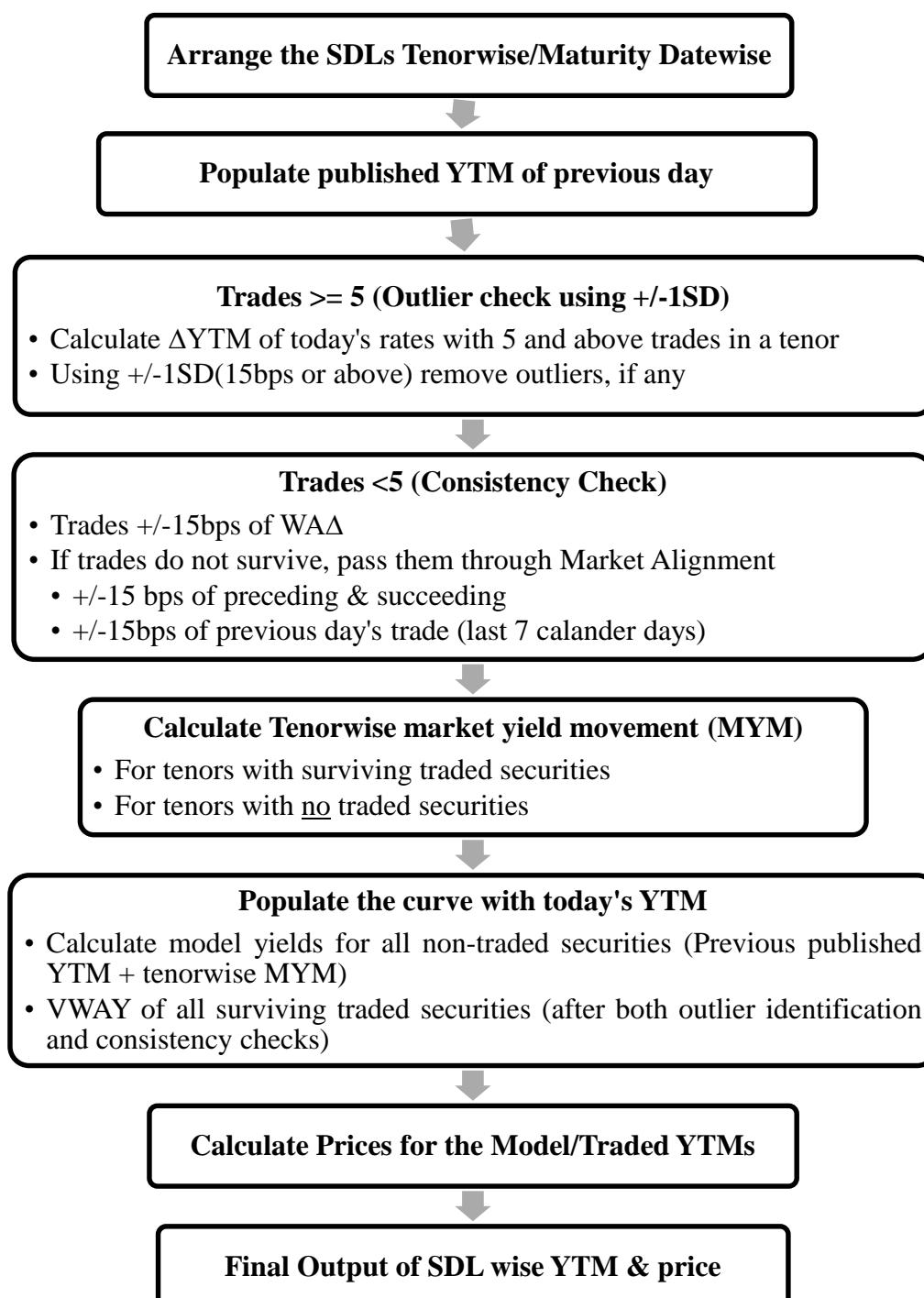
Security Description	Maturity-Bucket	Price (₹)	YTM (%)
07.68 TN UDAY 2028	2028	95.6970	8.3708
07.69 TN UDAY 2028	2028	95.7592	8.3708
07.70 TN UDAY 2028	2028	95.8215	8.3708
07.71 TN UDAY 2028	2028	95.8837	8.3708



07.72 TN UDAY 2028	2028	95.9459	8.3708
10.03 RJ SDL 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 SPL 2028DEC	2028	101.5617	8.3708

## VII. Miscellaneous:

1. The price/YTM of all the SDLs 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 market instruments and their prices will be calculated accordingly.
3. If on a particular business day, if there is no SDL trade or SDL 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/UDAY/DISCOM bonds will be derived from their YTM and will be published upto **four decimal places**.

**VIII. Flowchart of SDL Valuation Methodology**

**Annexure I**

<b>Example 1</b>										
<b>Sr. No.</b>	<b>ISIN</b>	<b>Coupon</b>	<b>Tenor</b>	<b>Maturity Date</b>	<b>Mkt Yield Change</b>	<b>Previous Traded Yield Date</b>	<b>Previous Traded Yield</b>	<b>Current Traded Yield</b>	<b>30-08-18</b>	<b>31-08-18</b>
2560	IN2020170097	07.83 KL SDL 2033	2033	03-Jan-33	0.01				8.43	8.44
2561	IN3720170098	07.90 JH SDL 2033	2033	24-Jan-33	0.01				8.43	8.44
2562	IN3720170114	08.08 JH SDL 2033	2033	14-Feb-33	0.01				8.43	8.44
2563	IN2820180072	08.50 PN SDL 2033	2033	11-Jul-33	0.01	09-Aug-18	8.44		8.43	8.44
2564	IN1020180189	08.42 AP SDL 2033	2033	25-Jul-33	0.01	24-Jul-18	8.42		8.42	8.43
2565	IN2820180080	08.49 PN SDL 2033	2033	08-Aug-33	0.01	28-Aug-18	8.47		8.44	8.45
2566	IN2120180061	08.64 MP SDL 2033	2033	03-Sep-33	0.01				8.43	8.44
Average of traded securities on 31.08.2018 is 8.44 which is imputed to non-traded securities listed Sr. No. 2560-2562 and 2566										
<b>Model yields on 30.09.18 Before realignment.</b>										
<b>Sr. No.</b>	<b>ISIN</b>	<b>Coupon</b>	<b>Tenor</b>	<b>Maturity Date</b>	<b>Mkt Yield Change</b>	<b>Previous Traded Yield Date</b>	<b>Previous Traded Yield</b>	<b>Current Traded Yield</b>	<b>29-09-18</b>	<b>30-09-18</b>
2560	IN2020170097	07.83 KL SDL 2033	2033	03-Jan-33	0.09				8.68	<b>8.77</b>
2561	IN3720170098	07.90 JH SDL 2033	2033	24-Jan-33	0.09				8.68	<b>8.77</b>
2562	IN3720170114	08.08 JH SDL 2033	2033	14-Feb-33	0.09				8.68	<b>8.77</b>
2563	IN2820180072	08.50 PN SDL 2033	2033	11-Jul-33	0.09	09-Aug-18	8.44		8.68	8.77
2564	IN1020180189	08.42 AP SDL 2033	2033	25-Jul-33	0.09	24-Jul-18	8.42		8.67	8.76
2565	IN2820180080	08.49 PN SDL 2033	2033	08-Aug-33	0.09	11-Sep-18	8.71	8.71	8.68	8.71
2566	IN2120180061	08.64 MP SDL 2033	2033	03-Sep-33	0.09	11-Sep-18	8.72	8.72	8.72	8.72
2567	IN2720180107	08.79 OD SDL 2033	2033	12-Sep-33	0.09	11-Sep-18	8.79	8.79	8.68	8.79
2568	IN3420180041	08.79 WB SDL 2033	2033	12-Sep-33	0.09	11-Sep-18	8.78	8.78	8.68	8.78
<b>Model yields on 30.09.18 After realignment.</b>										

Sr. No.	ISIN	Coupon	Tenor	Maturity Date	Mkt Yield Change	Previous Traded Yield Date	Previous Traded Yield	Current Traded Yield	29-09-18	30-09-18
2560	IN2020170097	07.83 KL SDL 2033	2033	03-Jan-33	0.09				8.68	<b>8.76</b>
2561	IN3720170098	07.90 JH SDL 2033	2033	24-Jan-33	0.09				8.68	<b>8.76</b>
2562	IN3720170114	08.08 JH SDL 2033	2033	14-Feb-33	0.09				8.68	<b>8.76</b>
2563	IN2820180072	08.50 PN SDL 2033	2033	11-Jul-33	0.09	09-Aug-18	8.44		8.68	8.77
2564	IN1020180189	08.42 AP SDL 2033	2033	25-Jul-33	0.09	24-Jul-18	8.42		8.67	8.76
2565	IN2820180080	08.49 PN SDL 2033	2033	08-Aug-33	0.09	11-Sep-18	8.71	8.71	8.68	8.71
2566	IN2120180061	08.64 MP SDL 2033	2033	03-Sep-33	0.09	11-Sep-18	8.72	8.72	8.72	8.72
2567	IN2720180107	08.79 OD SDL 2033	2033	12-Sep-33	0.09	11-Sep-18	8.79	8.79	8.68	8.79
2568	IN3420180041	08.79 WB SDL 2033	2033	12-Sep-33	0.09	11-Sep-18	8.78	8.78	8.68	8.78
Average model yield of securities traded at least once from 01.06.2018- Sr. No. 2563 to 2568 is										<b>8.76</b>
8.76 will be used as model yield for the securities not traded at least once since 01.06.2018										
We will publish the above model yields (after realignment) for 30.09.2018										

<b>Example 2</b>										
Sr. No.	ISIN	Coupon	Tenor	Maturity Date	Mkt Yield Change	Previous Traded Yield Date	Previous Traded Yield	Current Traded Yield	30-08-18	31-08-18
2509	IN3820170071	08.22 PY SDL 2030	2030	21-Feb-30	(0.00)				8.47	8.46
2510	IN2020180021	08.32 KL SDL 2030	2030	25-Apr-30	(0.00)				8.47	8.46
2511	IN1020170024	07.51 AP SDL 2030	2030	24-May-30	(0.00)				8.47	8.46
2512	IN2020180070	08.48 KL SDL 2030	2030	08-Aug-30	(0.00)	29-Aug-18	8.44		8.44	8.44
2513	IN3120180093	08.46 TN SDL 2030	2030	21-Aug-30	(0.00)	21-Aug-18	8.46		8.46	8.45
2514	IN2820180098	08.56 PN SDL 2030	2030	29-Aug-30	(0.00)	30-Aug-18	8.51	8.50	8.51	8.50
2515	IN1020180254	08.79 AP SDL 2030	2030	12-Sep-30						
Average of traded securities 2512 to 2514 is 8.46 which is imputed to non-traded securities at Sr. No. 2509-2511.										
<b>Model yields on 30.09.18 Before realignment.</b>										

Sr. No.	ISIN	Coupon	Tenor	Maturity Date	Mkt Yield Change	Previous Traded Yield Date	Previous Traded Yield	Current Traded Yield	29-09-18	30-09-18
2509	IN3820170071	08.22 PY SDL 2030	2030	21-Feb-30	0.06				8.70	<b>8.76</b>
2510	IN2020180021	08.32 KL SDL 2030	2030	25-Apr-30	0.06				8.70	<b>8.76</b>
2511	IN1020170024	07.51 AP SDL 2030	2030	24-May-30	0.06				8.70	<b>8.76</b>
2512	IN2020180070	08.48 KL SDL 2030	2030	08-Aug-30	0.06	29-Aug-18	8.44		8.68	8.74
2513	IN3120180093	08.46 TN SDL 2030	2030	21-Aug-30	0.06	21-Aug-18	8.46		8.69	8.75
2514	IN2820180098	08.56 PN SDL 2030	2030	29-Aug-30	0.06	11-Sep-18	8.80	8.80	8.74	8.80
2515	IN1020180254	08.79 AP SDL 2030	2030	12-Sep-30	0.06	11-Sep-18	8.79	8.79	8.70	8.79
<b>Model yields on 30.09.18 After realignment.</b>										
Sr. No.	ISIN	Coupon	Tenor	Maturity Date	Mkt Yield Change	Previous Traded Yield Date	Previous Traded Yield	Current Traded Yield	29-09-18	30-09-18
2509	IN3820170071	08.22 PY SDL 2030	2030	21-Feb-30	0.06				8.70	<b>8.77</b>
2510	IN2020180021	08.32 KL SDL 2030	2030	25-Apr-30	0.06				8.70	<b>8.77</b>
2511	IN1020170024	07.51 AP SDL 2030	2030	24-May-30	0.06				8.70	<b>8.77</b>
2512	IN2020180070	08.48 KL SDL 2030	2030	08-Aug-30	0.06	29-Aug-18	8.44		8.68	8.74
2513	IN3120180093	08.46 TN SDL 2030	2030	21-Aug-30	0.06	21-Aug-18	8.46		8.69	8.75
2514	IN2820180098	08.56 PN SDL 2030	2030	29-Aug-30	0.06	11-Sep-18	8.80	8.80	8.74	8.80
2515	IN1020180254	08.79 AP SDL 2030	2030	12-Sep-30	0.06	11-Sep-18	8.79	8.79	8.70	8.79
Average model yield of securities traded at least once from 01.06.2018										<b>8.77</b>
8.77 will be used as model yield for the securities not traded at least once since 01.06.2018										
We will publish the above model yields (after realignment) for 30.09.2018										