Proposed BBSW Calculation Methodology

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Executive Summary

Overview

Following the publication of the Council of Financial Regulators recommendations for the evolution of the bank bill swap rate (BBSW), ASX, in consultation with the BBSW Advisory Committee and key external stakeholders, proposes to introduce a volume weighted average price (VWAP) component to the existing BBSW calculation methodology.

The proposed BBSW methodology is aligned with international best practice and the International Organisation of Securities' Commission (IOSCO) *Principles for Financial Benchmarks*.

ASX proposes to include an additional step, which will calculate BBSW rates from transactions in eligible Bank Bill and NCD securities. The approach places an emphasis on trade activity and will ensure that BBSW remains a trusted, reliable and robust financial benchmark.

ASX intends to implement the new BBSW waterfall methodology later this year, subject to market readiness.

BBSW Calculation Methodology

Overview of Calculation Waterfall

ASX's BBSW waterfall will implement a three stage calculation process as follows:

1. VWAP Calculation	2. NBBO	3. Fall-back Waterfall
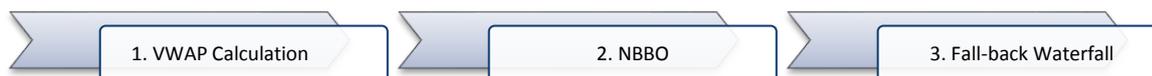
1. A VWAP calculation will be the primary method used to determine a BBSW rate for all tenors for each business day. The calculation will be performed over all eligible primary and secondary market transactions in Bank Bill and NCD securities transacted within a 10 day rolling maturity bucket, throughout the rate set window.

2. Where a BBSW rate cannot be formed under the VWAP method for a Tenor, the existing NBBO[1] calculation method will be used to determine the rate for a tenor[2].

3. In the event that a BBSW rate cannot be formed under the NBBO method for one or more tenors, the fall-back calculation waterfall will be used[3].

Key Changes to BBSW Calculation Waterfall

Change 1 - VWAP Calculation Method

ASX will introduce a VWAP calculation as the primary method for calculating BBSW rates. The calculation will be performed over all eligible transactions observed within the rate set window.

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[1] National Best Bid and Offer

[2] Further details on the NBBO calculation can be found in the ASX BBSW conventions: http://www.asx.com.au/documents/products/bbsw-conventions.pdf

[3] Further details on the Fall-back waterfall can be found in the ASX BBSW conventions: http://www.asx.com.au/documents/products/bbsw-conventions.pdf

Change 2 - 10 Day Rolling Bucket for Eligible Maturities

A set of minimum criteria will be introduced to control the transactions which can be used for the BBSW rate calculation. This includes the introduction of a 10 day rolling bucket, which will be used to determine the transactions used for calculation at each tenor.

To be eligible for use in the rate set calculation, a transaction must have a maturity date that falls within a 10 day rolling bucket of +/- 5 business days around the straight run maturity date for the tenor.

VWAP Eligibility Criteria

Component	Detail						
Qualifying Transactions	The BBSW rate set calculation will include all primary issuance and secondary trading of Eligible Securities that: • are for maturities within a 10 day rolling bucket of (+/- 5 business days) around the straight run maturity date; • meet the Minimum Notional; • are settled T+0; • are executed on or reported to an Approved Trading Venue by the end of the Reporting Window; • have at least one counterparty in Australia; and • were executed during the Rate Set Window.						
Minimum Notional	To be used in the calculation, the notional of eligible transactions must be greater than or equal to A$10 million. No maximum weighting (cap) will be applied to large transactions.						
Trade Validity		**1M**	**2M**	**3M**	**4M**	**5M**	**6M**
	Minimum volume threshold (Millions)	200	100	200	100	100	200
	Minimum number of transactions	3	3	3	3	3	3
	Minimum number of counterparties	4	4	4	4	4	4
Rate Set Window	All eligible trades transacted bilaterally or through an Approved Trading Venue (ATV) between 9:00:00 am to 10:10:00 am AEST, must be provided to the Benchmark Administrator for inclusion in the calculation prior to the end of the Trade Reporting window.						
Reporting Window	For inclusion in the Rate Set calculation, eligible transactions must be reported to the administrator by 10.30am AEST. The cut-off time for trade amendments and cancellation reporting will be 10.45am AEST.						
Publication	The publication time will be 11.00am, AEST.						
Data Transparency	ASX will publish volume data that contributed to the rate set calculation, on a weekly basis in arrears. • Volume by rate by tenor by date						

BBSW Calculation Waterfall

Waterfall Step	Description
VWAP Calculation Method	The VWAP calculation is performed over all eligible transactions observed within the rate set window, under the following equation: $$BBSW\ Rate_{Tenor} = \frac{\sum_{i}^{Qualifying\ Trades} FV_i * Rate_{i)}}{\sum_{i}^{Qualifying\ Trades} FV_i}$$ Where: • **FV_i:** Face Value of qualifying trade i. • **$Rate_i$:** Traded yield of qualifying trade i.
NBBO Calculation Method	ASX determines the NBBO rate for each tenor by first sampling quotes from ATVs at three sample periods and then calculating the average mid-point for valid bid/offer spreads from each sample period. The sample periods are as follows: Sample 1: 9:59:00 ± 5 seconds Sample 2: 10:00:00 ± 5 seconds Sample 3: 10:01:00 ± 5 seconds At each sample period the following calculation steps are implemented: 1) Identify qualifying transactions based on the following rules • Quotes originated from an ATV. • Quotes must be visible for a minimum amount of time as specified in the ASX Prime Bank Conventions. • Quotes must meet minimum transaction size of AUD$20 million. 2) The Best Bid and Best Offer, denoted in terms of yield are calculated through the following equations: $$BestBid_{Session:i} = \min(All\ Valid\ Bids_{Session:i})$$ $$BestOffer_{Session:i} = \max(All\ Valid\ Offers_{Session:i})$$ 3) Each sample period is then evaluated to determine if a qualifying NBBO rate can be calculated based on the following criteria: • There is a valid National Best Bid. • There is a valid National Best Offer. • The National Best Offer cannot be greater than the National Best Bid by more than 2 basis points. If the National Best Bid is greater than or equal to the National Best Offer then the BBSW rate is calculated through: $$NBBO_{Session\ i}^{T0} = \frac{BestBid_{Session:i} + BestOffer_{Session:i}}{2}$$ If the National Best Offer is greater than the National Best Bid the BBSW rate is calculated through:

$$NBBO^{T0}_{Session\ i} = BestOffer_{Session:i}$$

If the sample period criteria is met then the sample is deemed to be valid.

4) The NBBO Rate is calculated if there is at least 1 valid sample using the following equation:

$$BBSW^{T0}_x = \frac{\sum_i^n NBBO^{T0}_{Session\ i}}{n}$$

Where n is the number of qualifying sessions

5) The NBBO rate is rounded to 4 decimal places.

Fall-back Calculation Waterfall	ASX's Fall-back calculation is designed to populate BBSW tenors which were unable to be formed under either of the VWAP or NBBO calculation methods.

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The Fall-back calculation is separated into four stages based on what tenors still require calculation and what neighbouring tenors have been set in previous stages.

Stage 1: Tenors 2, 4, 5 month tenors set off neighbouring tenors

This calculation methodology is only applicable for the 2, 4 or 5 month tenors. Additionally a particular tenor is only calculated through this fall-back stage if there are valid BBSW rates set in either the VWAP or NBBO calculation stages for tenors no more than two months to either side of target tenor. If the previous conditions are satisfied then that tenor will be calculated by interpolation as prescribed below:

- Interpolation of the 2 month tenor requires BBSW rates in each of the 1 and 3 month tenors;
- Interpolation of the 4 month tenor requires BBSW rates in the 3 month tenor and either of the 5 month or 6 month tenor, the 6 month tenor being used in the event that no 5 month tenor exists;
- Interpolation of the 5 month tenor requires good rates in the 6 month tenor and either of the 3 month or 4 month tenor, the 3 month tenor being used in the event that no 4 month tenor exists.

The calculation used is specified through the following equation:

$$BBSW^{T+0}_x = BBSW^{T-1}_x + (BBSW^{T+0}_{avg} - BBSW^{T-1}_{avg})$$

Where:

$$BBSW^T_{avg} = \frac{BBSW^T_{Earlier} + BBSW^T_{Later}}{2}$$

Stage 2: Tenors 1, 3, 6 month tenors set off a single valid tenor

A prerequisite for the implementation of this stages is that at least a single tenor has formed in either the VWAP or NBBO stages.

For 1 and 6 month BBSW will be extrapolated from the daily absolute directional movement (T+0, T-1) in the nearest previously formed tenor. The calculated through the following equation:

$$BBSW_x^{T+0} = \ BBSW_x^{T-1} + (BBSW_n^{T+0} - \ BBSW_n^{T-1})$$

The 3 month tenor is calculated as per Stage 1 with the exception that there is no requirement insuring that the previously set tenors either side must be within two months of the 3 month tenor.

Once any missing 1, 3, 6 month tenors have been calculated, any previously uncalculated 2, 4 and 5 month tenors will thereafter be calculated using stage 1.

Stage 3: Tenors 1, 3, 6 formed from movements in the spot month ASX 90 Day Bank Bill futures

In the event that no tenors were formed under the VWAP or NBBO stages in the waterfall, the 1, 3 and 6 month BBSW tenors will be extrapolated from the absolute movement in the Time Weighted Average Mid-Price of bids and offers in the front ASX 90 Day Bank Bill Futures contract, expressed as the implied yield, for the period 9.40am to 10:00am; T+0 as compared to T-1. The unformed BBSW tenors would be calculated as follows:

$$BBSW_x^{T+0} = \ BBSW_x^{T-1} + ((100 - IR_{Active}^{T+0}) - \ (100 - IR_{Active}^{T-1}))$$

Where IR_{Active} refers to the price of the front ASX 90 Day Bank Bill Futures contract.

The use of the ASX 90 Day Bank Bill Futures contract is subject to and provided that:

   i.   On the Monday prior to the expiry day of the futures contract, the reference instrument reverts to the second contract. If the Monday is not a good business day, then the change of futures reference month will occur on the previous business day. The unformed BBSW tenors would be calculated in the following way;

$$BBSW_x^{T+0} = \ BBSW_x^{T-1} + ((100 - IR_2^{T+0}) - \ (100 - IR_2^{T-1}))$$

Where IR_2 refers to the price of the second ASX 90 Day Bank Bill Futures contract.

   ii.   On the day following the futures expiry date, the reference change is based on the first contract (T+0) less the second contract for (T-1) i.e.; using the same underlying contract. The unformed BBSW tenors would be calculated as follows:

$$BBSW_x^{T+0} = \ BBSW_x^{T-1} + ((100 - IR_1^{T+0}) - \ (100 - IR_1^{T-1}))$$

iii.   ASX 90 Day Bank Bill Futures data, which will represent a Time Weighted Average Mid-Price of the best bid and best offer for the current good business day and prior good business day (each as determined under the AFMA good business day convention). The Time Weighted Average Price will be calculated from data observed between 9:40am and 10:00am.

iv.   A bid and an offer exists on both T+0 and T-1

2, 4 and 5 month tenors will thereafter be calculated as described in Stage 1.

Stage 4: Revert to prior days BBSW

In any instance where the previous fall-back stages fail to derive any BBSW rates, then the prior days BBSW rate will be republished as T+0 BBSW.

Document Control

Version History

This document has been revised according to the table below:

Version	Author	Comment	Date
V1.0	ASX Limited	-	18 May 2017

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