



ASX Treasury Bond Futures Expiry Settlement Price Methodology

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Treasury Bond Futures Expiry Settlement Price Methodology

3, 5, 10 and 20 Year Futures | YT, VT, XT and LT

1. Background

ASX's Treasury Bond Futures are the benchmark derivative product for investors trading and hedging medium to long term Australian Dollar interest rate risk. The ASX Treasury Bond Futures Expiry Settlement Price has been declared by ASIC as one of five significant financial benchmarks in Australia.

ASX Clear (Futures) is the entity with primary oversight of the calculation and governance of the 3, 5, 10 and 20 Year Treasury Bond Futures Expiry Settlement Price (ESP). The administration of the Treasury Bond Futures Expiry Settlement Price process falls under the ASX Clear (Futures) Operating License and ASX Clear (Futures) and ASX 24 Operating Rules and Procedures. ASX Clear (Futures) is responsible for:

- Calculating the Expiry Settlement Price
- Determining and applying the Expiry Settlement Price methodology
- Disseminating the Expiry Settlement Price
- Performing all aspects of oversight and governance of the Expiry Settlement Price

The Treasury Bond Futures are underpinned by the Australian Government Bond (AGB) market with the Australian Office of Financial Management (AOFM) as the benchmark issuer. Fixed coupon Treasury Bonds constitute the bulk of debt issued by the Australian Federal Government. There are currently twenty nine benchmark lines on issue with a maximum maturity date of June 2051, totalling approximately A\$750 billion¹.

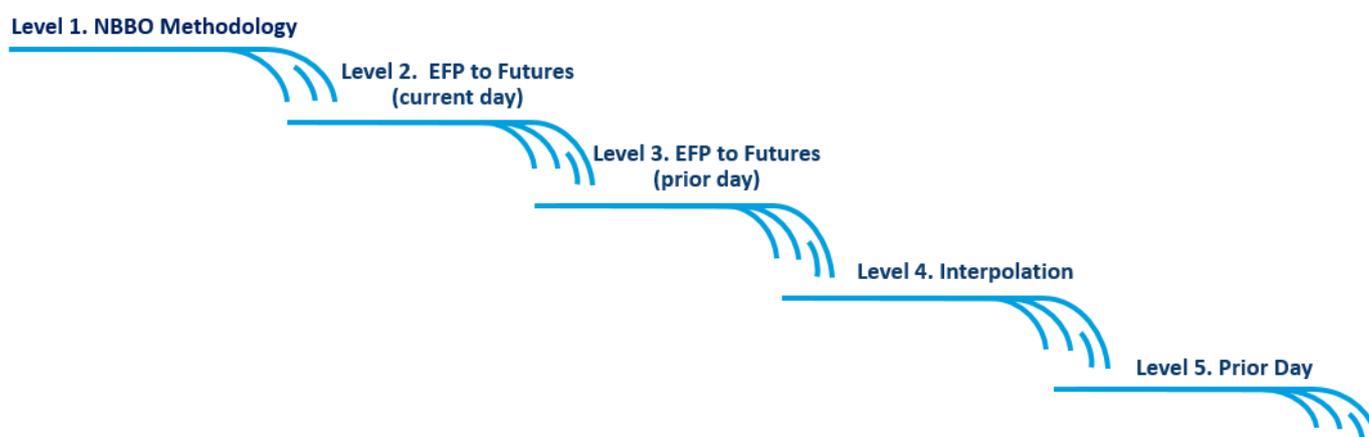
The ASX 3, 5, 10 and 20 Year Treasury Bond Futures are cash settled against the average price of a basket of physical Treasury Bonds for each contract using the methodology set out below. The ASX 24 Operating Rules outlines the primary manner for determining the Settlement Price (NBBO Methodology)². While section 3100 (Fair and Orderly Markets), gives the Market Operator the right to determine a final settlement price other than that provided for by the Rules in order to ensure that the market for a product is fair, orderly and transparent.

A list of current and historical bond basket series can be found on the ASX [website](#).

¹ As at May 2021

² See item 5 of sections 2.20.1, 2.21.1, 2.36.1 and 2.37.1

1.1. Overview of calculation waterfall



- I. **Level 1:** The National Best Bid Offer (NBBO) calculation methodology (“the NBBO Methodology”) is based on live executable bid and offer quotes for the Treasury Bonds in the underlying basket. This is the primary methodology for determining the Treasury Bond Futures Expiry Settlement Price.
- II. **Level 2:** Where a settlement price cannot be formed for one or more of the bond basket lines under the NBBO Methodology, the Exchange For Physical (EFP) to Futures Methodology (“EFP to Futures (current day)”) will be used to determine the yield for that bond line(s).
- III. **Level 3:** In the event that a settlement price cannot be formed under the NBBO Methodology or the EFP to Futures (current day) methodology for one of or more of the futures contracts, the EFP to Futures based on prior day data (“EFP to Futures (prior day)”) will be used.
- IV. **Level 4:** In the event that a settlement price cannot be formed under levels 1-3, “Interpolation” using the nearest formed tenors will be used to determine the final Settlement Price.
- V. **Level 5:** In the event that a settlement price cannot be formed under any of the preceding levels, the front (spot) contract Prior Day Settlement Price will be used as the final Settlement Price.

2. Bond basket determination

The 3, 5, 10 and 20 Year ASX Treasury Bond Futures baskets are determined and announced prior to the contract month being listed on ASX 24 for trading. Each basket is made up of a minimum of three Treasury Bond lines per basket. To determine the Treasury Bond lines that make up the basket, a number of criteria are considered including:

- The outstanding volume on issue for each bond- liquidity of the bond
- The average maturity of each bond on issue- duration of the bond
- The average maturity of the bond basket- duration of the basket

A number of options are presented using the above criteria to an external panel comprised of active price makers and investors in Treasury Bonds. Each panel member will vote on their preferred option. In the event that a consensus cannot be reached, ASX as the Market Operator will make a final decision, incorporating feedback received from panel members, on the lines to be included in the bond basket.

3. Waterfall Methodology

Waterfall Step	Description
Level 1: NBBO Methodology	<p>ASX Clear (Futures) determines the Expiry Settlement Price for each Treasury Bond Futures contract by first sampling bid and offer quotes from Authorised Trading Venues (ATVs) in each of the bond lines that make up the bond basket underpinning the futures contract. Quotes are taken for each bond line at 3 Intervals across 4 periods or “Sessions”. The NBBO rate for a Session is determined by taking an average of all the Best Bid and Offer quotes for each bond line within a Session.</p> <p>The Sessions and Intervals are as follows:</p> <p>Session 1: 8:59:00, 9:00:00 and 9:01:00 (3 Intervals) Session 2: 9:44:00, 9:45:00 and 9:46:00 (3 Intervals) Session 3: 10:29:00, 10:30:00 and 10:31:00 (3 Intervals) Session 4: 11:14:00, 11:15:00 and 11:16:00 (3 Intervals)</p> <p>At each Session the following calculation steps are implemented.</p> <ol style="list-style-type: none"> 1) Identify qualifying transactions based on the following rules: <ul style="list-style-type: none"> • Quotes originated from an ATV. • Quotes must meet minimum parcel size of AUD \$10 million. Where the parcel size is less than AUD \$10 million, the next Best Bid or Best Offer that meets the parcel size requirement will be used. 2) The Best Bid and Offer is obtained for each bond line at each Interval within a Session using the following logic: $NationalBestBid_{Session:i} = \min(All\ Valid\ Bids_{Interval\ i})$ $NationalBestOffer_{Session:i} = \max(All\ Valid\ Offers_{Interval\ i})$ 3) Each Bid and Offer quote within a Session is evaluated to determine if a qualifying NBBO rate can be calculated, based on the following criteria: <ul style="list-style-type: none"> • There is a valid National Best Bid for each Interval; • There is a valid National Best Offer for each Interval; • The National Best Offer cannot be greater than or equal to the National Best Bid (i.e. no choice or inverse pricing) within an Interval. Where the Best Bid and Best Offer create a choice or inverse market, those yields will be discarded and the next Best Bid and Best Offer will be used. <p>An NBBO rate for each bond line in an Interval is calculated by taking an average of the Best Bid and Offer within that Interval:</p> $NBBO_{interval\ i}^{T+0} = \frac{BestBid_{Interval\ i} + BestOffer_{Interval\ i}}{2}$

An NBBO rate for each bond line within a Session is then calculated by taking an average of the NBBO rate at each Interval:

$$NBBO_{Session\ i}^{T+0} = \frac{NBBO_{Interval\ 1} + NBBO_{Interval\ 2} + NBBO_{Interval\ 3}}{3}$$

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

- 4) If a valid NBBO rate can be calculated for all bond lines within a Session (following the steps and criteria laid out above), then an Indicative Session Price (ISP) will be calculated for that Session using the following equation:

$$ISP_i^{T+0} = \frac{\sum^n NBBO_{Session\ i}^{T+0}}{n}$$

Where n is the number of bonds in the basket for which there is a valid NBBO quote

- 5) The ISP is rounded to the nearest 0.002 for the 3 year contract, 0.0025 for the 5 and 20 year contracts and 0.001 for the 10 year contract and published via ASX 24 following each session.
- 6) Once the final Session has been taken, the ESP will be calculated using the below formula:

$$ESP^{T+0} = 100 - \frac{\sum^n ISP_{Session\ i}}{n}$$

*Where ISP session i is the unrounded ISP calculated under step 4
Where n is the number of valid ISP samples obtained*

The above formula requires a **minimum of 4 valid ISP samples** per bond basket (i.e. a valid ISP must be calculated for each Session) to set the ESP under the NBBO methodology.

The ESP is communicated to the market via ASX24 and a market notice published by 3:00pm on the day of expiry.

In the event that ASX is unable to determine the Bond Futures ISP using the NBBO Methodology for a Session(s), a message will be posted on the [ASX System status](#) page to notify the market that the calculation waterfall will be used to determine the ISP and final ESP.

Level 2: EFP to Futures (current day) Methodology

Where an ISP cannot be formed for 1 or more Sessions (e.g. there are no outright yields quoted on ATV screens for one or more bond lines in the bond basket or quotes are single sided-bid only or offer only) the EFP to Futures methodology will be used to calculate the Session price of the missing bond line(s).

Stage 1: EFP data is collected for each line in the bond basket from ATVs in the three days leading up to the expiry of the Treasury Bond Futures contract.

Stage 2: If the EFP to Futures (current day) data is available for the missing bond line(s) in the basket, the yield of that bond will be calculated using the below formula:

$$\text{Yield} = (100 - \text{second futures price}) + (\text{EFP to second Futures contract} / 100)$$

Stage 3: Once the yield for the missing bond line(s) has been determined, the average bond basket yield for each Session can be calculated using the below formula:

$$\text{Bond basket yield}^{T+0} = \frac{\sum^n \text{Yield}_i^{T+0}}{n}$$

Where *Yield i* is the yield of the individual bond lines in the basket calculated under either the NBBO Methodology or EFP to Futures Methodology (stage 2) for a Session.

Where *n* is the number of bonds in the bond basket.

Stage 4: The final ESP is determined by taking the average bond basket yield calculated for each Session as outlined in stage 3:

$$\text{ESP} = 100 - (\text{Sum of Bond basket yields across all Sessions} / n)$$

Where *n* is the number of Sessions.

Level 3: EFP to Futures (prior day) Methodology

Where the yield cannot be calculated for a bond line(s) using the EFP to Futures methodology, the EFP to Futures (prior day) methodology will be used. The EFP to Futures (prior day) represents the level of the EFP of the bond to the spot or expiring contract from the *prior day*.

Stage 5: If the EFP to Futures (prior day) data is available for the missing bond line(s) in the basket, the yield of each missing bond will be calculated using the below formula:

$$\text{Yield} = (100 - \text{prior day spot futures price}) + (\text{prior day EFP to spot futures} / 100)$$

Stage 6: Once the yield for each bond line has been determined, the average bond basket yield for each Session can be calculated using the below formula:

$$\text{Bond basket yield}^{T+0} = \frac{\sum^n \text{Yield}_i}{n}$$

Where Yield i is the yield of the individual bond lines in the basket calculated under either stage 5 or any of the preceding stages of the methodology.

Where n is the number of bonds in the bond basket

Stage 7: The final ESP is determined by taking the average bond basket yield calculated for each Session as outlined in stage 6:

$$ESP = 100 - (\text{Sum of Bond basket yields across all Sessions}/n)$$

Where n is the number of Sessions.

Level 4: Interpolation

Where the ESP cannot be formed under the NBBO methodology or any of the preceding levels in the calculation waterfall, interpolation using the yields formed on the nearest adjacent bond lines will be used to determine the implied yield for the missing line(s) following the formula outlined below.

Stage 8: Interpolation between the adjacent bond lines will be used to determine the implied yield for a missing bond line(s).

$$y_2 = \frac{(x_2 - x_1)(y_3 - y_1)}{(x_3 - x_1)} + y_1$$

Where:

Y_2 = yield of missing bond line

Y_1 = yield of shorter dated bond line

Y_3 = yield of longer dated bond line

X_2 = number of days to maturity on the missing bond line

X_1 = number of days to maturity on the shorter dated bond line

X_3 = number of days to maturity on the longer dated bond line

Stage 9: The final ESP is determined by taking the average bond basket yield calculated for each Session as outlined in stages 9 and 10.

Level 5: Prior Day

Where a settlement price cannot be formed under any of the preceding levels, the front (spot) contract Prior Day Settlement Price will be used as the final Expiry Settlement Price.

4. Post publication amendment of the Expiry Settlement Price

In the event that a system generated or other error in the calculation is identified post publication of the Expiry Settlement Price, ASX Clear (Futures) will republish the Expiry Settlement Price.

In accordance with ASX 24 Operating Rules procedure 2501, any Participant can object to an Expiry Settlement Price if they believe the rate to be incorrect with such request to be investigated by the Market Operator.

The cut off time for Participants to object to the Expiry Settlement Price (see section 5 below for details) is 30 minutes following the publication of the market notice sent on the afternoon of expiry confirming the Expiry Settlement Price and detailing the relevant data inputs.

In the event that a republication is required, the amended price will be sent out over ASX24 and published in a second Market Notice.

ASX Clear (Futures) will not republish the Expiry Settlement Price for errors detected or reported more than 30 minutes following the publication of the market notice confirming the Expiry Settlement Price.

All rate disputes and errors are reported to the ASX Benchmark Oversight Steering Group.

5. Complaints procedures

In accordance with procedure 2501, a Participant wishing to object to an Expiry Settlement Price must, via its Authorised Signatories, notify the Market Operator by telephone (1300 655 560) within 30 minutes of publication of the market notice confirming the Expiry Settlement Price. After the telephone request, the objection must be emailed to the Market Operator (Tradingoperations@asx.com.au) within 10 minutes of the telephone request including information as to the time of publication of the Expiry Settlement Price and the relevant security/symbol.

To lodge a general complaint in relation to the ASX Treasury Bond Futures expiry, visit: asx.com.au/contact/customerFeedback.html#/feedback.

The complete ASX Complaints Policy can be viewed [here](#).

All benchmark complaints are reported to the ASX Benchmark Oversight Steering Group.

6. Periodic review of the Expiry Settlement Price methodology

ASX Clear (Futures) will conduct a review of the Bond Futures Expiry Settlement Price Methodology at least annually.

The following measures are to be reviewed:

- The size, liquidity and dynamic of the underlying Treasury Bond market;
- The effectiveness of the methodology in representing the interests of the market it seeks to represent; and
- The robustness and performance of the methodology in a range of scenarios including periods of market stress or disruption.

7. Changes to the Expiry Settlement Price methodology

Any Material Change to the Expiry Settlement Price Methodology will require:

- Industry consultation on the scope of the proposed change;
- ASX internal review and approval;
- Regulator review and approval;
- Sufficient advance notice of the change and implementation date via publication of a market notice; and
- Communication of the change, once effective, via publication of a market notice and publication of updated documentation on the website.



Any non-material change to the Expiry Settlement Price Methodology will require:

- ASX internal review and approval; and
- Advance notice of the change and implementation date via publication of a market notice and publication of updated documentation on the website, generally providing at least one calendar month advance notice if circumstances allow.

To receive ASX 24 market notices, follow the link below to ASX Online and subscribe to receive ASX 24 market notices:

<https://www.asxonline.com/public/subscribe.html>

Appendix A

8. Definitions

- ASX Clear (Futures) - means the entity responsible for the calculation and publication of the ASX Treasury Bond Futures settlement price.
- ASX 24- means the Australian Securities Exchange Trading Platform.
- Authorised Trading Venue- means those entities that facilitate the trading of Australian Government Securities and provide live executable bids and offers data to ASX Clear (Futures) for the purpose of calculating the Treasury Bond Futures settlement price.
- Bond Basket- means a selection of Australian Government Securities that underpin the 3, 5, 10 and 20 Year Treasury Bond Futures.
- Australian Government Bonds- Treasury Bonds issued by the Australian Office of Financial Management.
- Exchange For Physical- means the price at which participants can swap futures exposure (in this case ASX 3, 5, 10 and 20 Year Treasury Bond Futures) for an offsetting physical Treasury Bond position.
- Expiry Settlement Price- means the price at which the spot or expiring ASX Treasury Bond Futures contract is closed out on a quarterly basis.
- Indicative Settlement Price- means the NBBO rate calculated at each Session time that will be used as an input to the Expiry Settlement Price.
- Interval- means the three times at which bid offer quotes are sampled within each Session
- Material Change- means a change in the primary (NBBO) calculation methodology that may impact the fair value of the futures contract.
- NBBO- means National Best Bid Offer.
- Session- Means the bid offer price obtained for each bond line in the bond baskets at the times specified in the NBBO methodology.
- Spot contract or spot futures- means the front or expiring listed futures contract up until 12pm on the day of expiry at which point the second contract becomes the spot contract.
- Second contract or second futures contract- means the second listed futures contract up until 12pm on the day of expiry at which point the second contract becomes the spot contract.

9. Change Control

This document has been revised according to the table below:

Author	Comment	Date
ASX	Publication of ASX Treasury Bond Futures Expiry Settlement Price Methodology	September 2021
ASX	Amendment to ASX Treasury Bond Futures Expiry Settlement Price Methodology incorporating additional Session time, wider Sessions and three Intervals	November 2021
ASX	Document updated to include reporting of errors, disputes and complaints to ASX's internal Benchmark Oversight Steering Group	September 2022

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