EXTERNAL

Cboe Russell 2000 30-Delta BuyWrite Index

This document details the calculation methodology of the titled index/benchmark. This document, in conjunction with the Cboe Index Rules and Governance document (available on Cboe's Governance website), provides a transparent and easily accessible view of the methodology used to calculate the Cboe S&P 30-Delta BuyWrite Index ("BXRD Index"), ticker symbol 'BXRD'.

Description of the Market or Economic Reality Measure

The Cboe Russell 2000 30-Delta BuyWrite Index (BXRD Index) is a benchmark index designed to track the performance of a hypothetical covered call strategy that establishes a long position indexed to the Russell 2000 Index and writes a monthly Out-of-the-Money (OTM) RUT Call option. The distinctive feature of this index is, when writing the OTM RUT Call option, the option with a delta closest to 0.30 is selected. The BXRD Index does not use contributed input data, and all of the input data is readily available via public sources. The BXRD Index is non-significant, as defined by EU Regulation 2016/1011 ("EU Benchmark Regulation" or "EU BMR").

Index Calculations

The following describes the methodology for calculating the BXRD Index, including applicable formulas and input data. Under the BXRD Index methodology, roll date is the third Friday of each month. Should the third Friday fall on an exchange holiday, the roll date is the preceding day.

BXRD is a total return index that is rebalanced monthly. Dividends paid on the component stocks underlying the Russell 2000 Index and the dollar value of option premium deemed received from the sold call options are functionally "re-invested" in the covered Russell 2000 Index portfolio.

On January 19, 2001, the initial roll date of the BXRD Index, a unit of an OTM monthly RUT Call option is written and a unit of the RUT Index is purchased to cover the liability. The Call option selected is the one with a delta closest to 0.30. All inputs used in the delta calculation using the Black formula should be the last available values before 11:00 a.m. ET. The premium collected from writing the RUT Call option is the volume weighted average trade price (VWAP) between 11:30 a.m. and 12:00 p.m. ET. Cboe calculates the VWAP in two steps: first, Cboe excludes trades in the new RUT Call option between 11:30 a.m. and 12:00 p.m. ET that are identified as uppercase A – H and lowercase f – t. This will remove all forms of late, cancel and spread orders; and second, Cboe calculates the weighted average of all remaining transaction prices of the new RUT Call option between 11:30 am and 12:00 pm ET, with weights equal to the fraction of total remaining volume transacted at each price during this period. The source of the transaction prices used in the calculation of the VWAP is OPRA. If there is no trade in the RUT Call option during the VWAP period, the last bid quote for the RUT Call option before 12:00 pm ET is used. As the long Russell 2000 Index position is assumed to be entered into simultaneously with the short RUT Call option position, the weighted average price of the Russell 2000 Index is calculated using disseminated values of the Russell 2000 Index based on the same time and weights used to calculate the RUT Call option VWAP. Similarly, if there is no trade of the RUT Call option during the VWAP period, the last disseminated value of the Russell 2000 Index before 12:00 pm ET is used. If the VWAP of the Russell 2000 Index and the last value before 12:00 pm ET are both not available, the last disseminated value of the Russell 2000 Index before 11:00 am ET is used.

Typically, on the third Friday (Roll Day) of every month since the initial roll date, the RUT Call option settles against the Special Opening Quotation of the RUT Index (SOQ). The option settlement value is determined as $\text{Call\_old}_{settle} = \text{Max}\ (0,\ \text{SOQ}_t - \text{K}_{old})$. A new OTM monthly RUT Call option will be subsequently written. Following the same rule as the initial roll date, the RUT Call option selected is the one with a delta closest to 0.30 at 11:00 am ET listed on the Cboe exchange. The premium collected from the RUT Call option would be the VWAP between 11:30 am and 12:00 pm ET, or the last bid quote for the RUT Call option before 12:00 pm ET, if there is no trade in the RUT Call option during the VWAP period. The long RUT Index position remains unchanged.

The BXRD Index value is calculated every 15 seconds according to the following formula:

$$BXRD_t = BXRD_{t-1} * (1 + R_t) \qquad (1)$$

where:

- $BXRD_t$ is the level of the BXRD Index;
- $BXRD_{t-1}$ is the level of the BXRD Index on the previous day; and
- R_t is the return of the BXRD Index.

<u>Non-Roll Date Calculations</u>

The non-roll date return of the index is calculated as:

$$(1 + R_t) = (RUT_t + DIV_t - Call_t) / (RUT_{t-1} - Call_{t-1}) \qquad (2)$$

where:

- RUT_t is the closing value of the Russell 2000 Index at date t. For intraday calculations, the current reported value of the Russell 2000 Index is used;
- RUT_{t-1} is the closing value of the Russell 2000 Index at date t-1;
- $Call_t$ is the arithmetic average of the last bid-ask quote of the 30-delta OTM monthly RUT Call option reported before 4:00 pm ET at date t for the closing value. For intraday calculations, the average of the current reported bid and ask prices of the call option is used;
- $Call_{t-1}$ is the average of the last bid-ask quote of the 30-delta OTM monthly RUT Call option before 4:00 pm ET on date t-1; and
- Div_t represents the ordinary cash dividends payable on the component stocks underlying the Russell 2000 Index that trade “ex-dividend” at date t expressed in Russell 2000 Index points.

<u>Roll Date Calculations</u>

First, calculate the return from the previous day market close to morning settlement of the expiring option:

$(1 + R_1) = (SOQ_t + DIV_t – Call\_old_{settle}) / (RUT_{t-1} – Call\_old_{t-1})$ (3)

where:

- SOQ_t is the Special Opening Quotation of the RUT Index on the Roll Day;
- $Call\_old_{settle}$ = Max $(0, SOQ_t – K\_old)$ is the settlement value of the expiring RUT Call option;
- K_old is the strike price of the expiring RUT Call option;
- $Call\_old_{t-1}$ is the average of the last bid-ask quote of the RUT Call option before 4:00 pm ET on the previous day; and
- Div_t represents the ordinary cash dividends payable on the component stocks underlying the Russell 2000 Index that trade "ex-dividend" at date t expressed in Russell 2000 Index points.

Second, calculate the return from morning settlement to the moment the new RUT Call option positions are deemed sold:

$(1 + R_2) = RUT_{vwap} / SOQ_t$ (4)

where:

- SOQ_t is the Special Opening Quotation of the RUT Index on the Roll Day; and
- $RUTvwap$ is the weighted average value of the RUT Index, calculated using disseminated values of the RUT Index based on the same time and weights used to calculate the new RUT Call option VWAP. Note that if there are no trades of the RUT Call option during the VWAP period, the last disseminated value of the RUT Index before 12:00 pm ET is used.

Lastly, calculate the return from the moment the new RUT Call option is deemed sold to market close:

$(1 + R_3) = (RUT_t – Call\_30d\_new_t) / (RUT_{vwap} – Call\_30d\_new_{vwap})$ (5)

where:

- $Call\_30d\_new_{vwap}$ is the VWAP price of the new OTM RUT Call option; and
- $Call\_30d\_new_t$ is the average of the last bid-ask quotes of the RUT Call option before 4:00 pm ET.

The product of the three parts is the total return of the Roll Day:

$(1 + R_t) = (1 + R_1) * (1 + R_2) * (1 + R_3)$ (6)

Calculation and Dissemination

Cboe compiles, calculates, maintains, and disseminates all BXRD Index values. The BXRD Index is calculated and disseminated every 15 seconds during U.S. trading hours, with a daily closing index value disseminated following the close of U.S. trading hours.

On roll dates, as defined above, the BXRD Index will not be disseminated intraday. A daily closing value will be disseminated on roll dates following the close of U.S. trading hours.

Judgement and Potential Limitations in Calculation

No expert judgement or discretion is used by Cboe in performing the calculation of the BXRD Index. Potential limitations for this index (i.e., situations where the index may not reflect the above described market or economic reality) include:

- where underlying index input data is unavailable, the BXRD Index value will not be able to be calculated, and
- where the underlying option contract data is not available, the BXRD Index value will not be able to be calculated.

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