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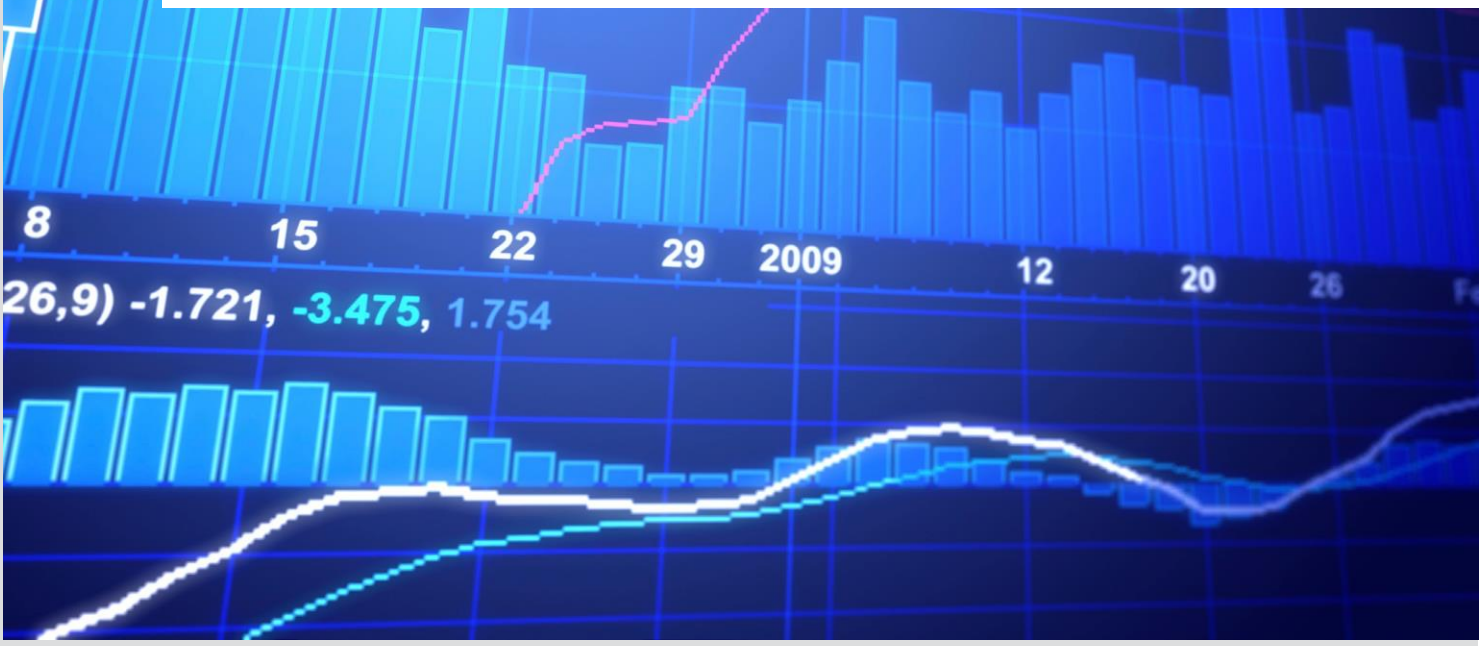
Index Methodology As of December/2015

CBOE Strategy Benchmark Indexes

The CBOE RUSSELL 2000 Zero-Cost Put Spread Collar Index (CLLR)



THE CBOE RUSSELL 2000 Zero-Cost Put Spread Collar Index (CLLR)

Introduction:

The CBOE RUSSELL 2000 Zero-Cost Put Spread Collar Index (CLLR^{SM} Index) is a benchmark index designed to track the performance of a hypothetical low volatility strategy that (1) holds a long position indexed to the RUSSELL 2000® Index, (2) buys a rolling monthly 2.5% Out-of-the-Money (OTM) RUT Put option to reduce the risk and sells a rolling monthly 5% OTM RUT Put option (RUT Put Spread), and (3) sells a rolling OTM monthly RUT Call(s) option to cover the cost of the Put spread. All options involved are AM-settled and roll on a monthly basis.

Index Design:

On January 19, 2001, the initial roll date of the CLLR Index, a long Russell 2000 Index position is purchased and the strikes of the monthly RUT options are selected before 11:00 am ET. The strikes of the RUT Put Spread are the first listed strikes below 95% and 97.5%, respectively, of the last disseminated value of the Russell 2000 Index before 11:00 am ET. The 2.5% OTM Put option is purchased at the last ask quote before 11:00 am ET, and the 5% OTM RUT Put option is sold at the last bid quote before 11:00 am ET.

Since the monthly RUT Call option is written to cover the cost of the RUT Put Spread, the strike of the RUT Call option is determined such that the premium (the last bid quote of the RUT Call option before 11:00 am ET) would equal the ask price of the 2.5% OTM RUT Put option minus the bid price of the 5% OTM RUT Put option. If there is no RUT Call option with a last bid price before 11:00 am ET equal to the cost of the RUT Put Spread, a portfolio of two RUT Call options is sold. The RUT Call option portfolio includes: (1) a monthly RUT Call option strike whose bid price is directly above the cost of the RUT Put Spread and (2) a monthly RUT Call option strike whose bid price is directly below the cost of the RUT Put Spread.[1] The relative weights of the two RUT Call options are determined as follows: the weighted average price of the two RUT Call options equals the cost of the RUT Put Spread and the sum of the weights is equal to one.

An example for illustration of the RUT Call option portfolio:

Suppose the 2.5% OTM RUT Put option is purchased at $2.4 (based on the last ask price before 11:00 am ET) and the 5% OTM RUT Put option is sold at $1 (based on the last bid price before 11:00 am ET). The cost of RUT Put Spread is $1.4. To determine which RUT Call options to sell, observe the last bid quote of the options before 11:00 am ET for the available monthly RUT Call options to be sold.

Scenario 1: If there is an OTM RUT Call option whose last bid price before 11:00 am ET is $1.4, one unit of this RUT Call option is sold.

Scenario 2: If there is no OTM RUT Call option whose bid price is exactly equal to $1.4. In this instance: (1) select the RUT Call option with the highest strike price whose bid price is directly higher than the cost of the RUT Put Spread and (2) select the RUT Call option with the lowest strike price whose bid price is directly lower than the cost of the RUT Put Spread. A portfolio of the two selected RUT Call options will be sold at 11:00 am ET. The weights of the portfolio are determined as follows: the weighted average of the RUT Call option portfolio's bid price has to be $1.4 in which the sum of the weights is equal to 1, to match the position of the RUT Put Spread. Assume the selected RUT Call options are worth (bid price) $1.36 and $1.46, respectively. Solve two equations:

$$1) \quad \$1.36 * W\_A + \$1.46 * W\_B = \$1.4$$

$$2) \quad W\_A + W\_B = 1$$

$$=> W\_A = 0.6 \text{ and } W\_B = 0.4$$

In summary, on the initial roll date of the CLLR Index, at 11:00 am ET, a unit of the Russell 2000 Index is purchased, a unit of a 2.5% OTM monthly RUT Put option is purchased at the ask price, a unit of a 5% OTM monthly RUT Put option is sold at the bid price and a unit of the selected RUT Call option (or the two RUT Call option portfolio) is sold at the bid price to cover the cost of the RUT Put Spread.

[1] On the Roll Date, when selecting the RUT Put option strike price, it is possible that the OTM RUT Put option strike price corresponding to the 2.5% and 5% strike selected is not available. In such cases, the most OTM RUT Put option strike price available would be selected to be written or purchased. If there are less than two OTM RUT Put option strike prices available for the given expiration month, the RUT Put options that expire in the following expiration month would be selected (two months out from the roll date). In this instance, the CLLR Index would exit out of those RUT Put options at bid-ask mid quote on the next rolling date, at the same time as the other RUT options are settled.

Typically, on the third Friday (Roll Day) of every month since the initial roll date, all old RUT options settle at 9:30 am ET against the Special Opening Quotation of the RUSSELL 2000 Index (SOQ). At 11:00 am ET, the new 2.5% OTM RUT Put option is purchased, the new 5% OTM RUT Put option is sold and the new RUT Call option (or the dual RUT Call option portfolio) is sold simultaneously. The strike prices and premiums of the new RUT options are determined the same way as on the initial roll date.

Index Calculation:

The CLLR Index value is calculated by CBOE in real-time, every 15 seconds.

On each trading day excluding roll dates, the daily return of the index is calculated as:

$$R_t = (RUT_t + DIV_t + Put\_2.5\%_t - Put\_5\%_t - W\_A * Call\_A_t - W\_B * Call\_B_t) / (RUT_{t-1} + Put\_2.5\%_{t-1} - Put\_5\%_{t-1} - W\_A * Call\_A_{t-1} - W\_B * Call\_B_{t-1})$$

Where:
RUT_t is the last disseminated value of the Russell 2000 Index on day t.
DIV_t is the Russell 2000 Index dividend on day t.
$Put\_2.5\%_t$ is the average of the last bid-ask quote of the 2.5% OTM RUT Put option on day t before 4:00 pm ET.
$Put\_5\%_t$ is the average of the last bid-ask quote of the 5% OTM RUT Put option on day t before 4:00 pm ET.
$Call\_A_t$ is the average of the last bid-ask quote of the first RUT Call option on day t before 4:00 pm ET.
$Call\_B_t$ is the average of the last bid-ask quote of the second RUT Call option in the portfolio on day t before 4:00 pm ET.
W_A is the weight of the first RUT Call option, and *W_B* is the weight of the second RUT Call option.
Each option price with subscript *t-1* is the average of the last bid-ask quote of the applicable option before 4:00 pm ET on the previous day.

(The index methodology follows the case with the two RUT Call option portfolio, in an instance where only one RUT Call option is rolled, simply replace the term $W\_A * Call\_A_t + W\_B * Call\_B_t$ with $Call_t$. The calculations below follow the same case.)

On Roll Days, the return is calculated in three steps:

First, calculate the return from the previous day market close to morning settlement of the expiring RUT option (9:30 am ET). Note that all option terms in this equation are regarding expiring options:

$$R_1 = (SOQ_t + DIV_t + Put\_2.5\%\_old_{settle} - Put\_5\%\_old_{settle} - W\_A\_old*Call\_A\_old_{settle} - W\_B\_old*Call\_B\_old_{settle}) / (RUT_{t-1} + Put\_2.5\%\_old_{t-1} - Put\_5\%\_old_{t-1} - W\_A\_old * Call\_A\_old_{t-1} - W\_B\_old * Call\_B\_old_{t-1})$$

Where:
$Put\_2.5\%\_old_{settle} = Max(0, K\_2.5\%\_old - SOQ_t)$ is the settlement value of the expiring 2.5% OTM RUT Put option.
$Put\_5\%\_old_{settle} = Max(0, K\_5\%\_old - SOQ_t)$ is the settlement value of the expiring 5% OTM RUT Put option.
$Call\_A\_old_{settle} = Max(0, SOQ_t - K\_Call\_A\_old)$ is the settlement value of the first expiring RUT Call option.
$Call\_B\_old_{settle} = Max(0, SOQ_t - K\_Call\_B\_old)$ is the settlement value of the second expiring RUT Call option.
W_A_new is the weight of the first new RUT Call option.
W_B_new is the weight of the other new RUT Call option.

Second, calculate the return from morning settlement of the old RUT options (9:30 am ET) to the moment the new RUT option positions are deemed purchased or sold (11:00 am ET):

$$R_2 = SOQ_t / RUT_{11am}$$

Where RUT_{11am} is the last disseminated value of the Russell 2000 Index before 11:00 am ET.

Lastly, calculate the return from the moment the new RUT options are deemed purchased and sold (11:00 am ET) to market close. Note that all option terms in the equation below are regarding new options:

$$R_3 = (RUT_t + Put\_2.5\%\_new_t - Put\_5\%\_new_t - W\_A\_new * Call\_A\_new_t - W\_B\_new * Call\_B\_new_t) / (RUT_{11am} + Put\_2.5\%\_new_{bid} - Put\_5\%\_new_{ask} - W\_A\_new * Call\_A\_new_{bid} - W\_B\_new * Call\_B\_new_{bid})$$

Where:
Put_new_{bid} is the last bid quote of the new RUT Put option before 11:00 am EST.
Put_new_{ask} is the last ask quote of the new RUT Put option before 11:00 am EST.
$Call\_new_{bid}$ is the last bid quote of the new RUT Call option before 11:00 am EST.
$Call\_new_{ask}$ is the last ask quote of the new RUT Call option before 11:00 am EST.
$Put\_2.5\%\_new_t$ is the average of the last bid-ask quote of the new 2.5% OTM RUT Put option on day t before 4:00 pm ET.
$Put\_5\%\_new_t$ is the average of the last bid-ask quote of the new 5% OTM RUT Put option on day t before 4:00 pm ET.
$Call\_A\_new_t$ is the average of the last bid-ask quote of the first new RUT Call option on day t before 4:00 pm ET.
$Call\_B\_new_t$ is the average of the last bid-ask quote of the second new RUT Call option in the portfolio on day t before 4:00 pm ET.
W_A_new is the weight of the first new RUT Call option.
W_B_new is the weight of the other new RUT Call option.

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

$$R_t = R_1 * R_2 * R_3$$

Once the daily return is calculated for every trading day, the daily index value is calculated as:

$$INDEX_t = INDEX_{t-1} * R_t$$

Options involve risk and are not suitable for all investors. Prior to buying or selling an option, a person must receive a copy of Characteristics and Risks of Standardized Options. Copies are available from your broker, by calling 1-888-OPTIONS, or from The Options Clearing Corporation, One North Wacker Drive, Suite 500, Chicago, Illinois 60606 or www.theocc.com. The CBOE RUSSELL 2000 Zero-Cost Put Spread Collar Index (CLLR) is designed to represent a proposed hypothetical option spread strategy. Like many passive indexes, the CLLR Index does not take into account significant factors such as transaction costs and taxes and, because of factors such as these, many or most investors should be expected to underperform passive indexes. In the construction of the hypothetical CLLR index, the CLLR options are assumed to be bought and sold at certain prices on the third Friday of the month. However, there is no guarantee that all investors will be able to buy and sell at these prices, and investors attempting to replicate the CLLR Index should discuss with their brokers possible timing and liquidity issues. Transaction costs and taxes for a strategy such as the CLLR could be significantly higher than transaction costs for a passive strategy of buying-and-holding stocks. Investors should consult their tax advisor as to how taxes affect the outcome of contemplated options transactions. Past performance does not guarantee future results. This paper contains index performance data based on back-testing, i.e., calculations of how the index might have performed prior to launch. Back-tested performance information is purely hypothetical and is provided in this document solely for information purposes. Back-tested performance does not represent actual performance and should not be interpreted as an indication of actual performance. It is not possible to invest directly in an index. Chicago Board Options Exchange, Incorporated (CBOE) calculates and disseminates the CLLR index.

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