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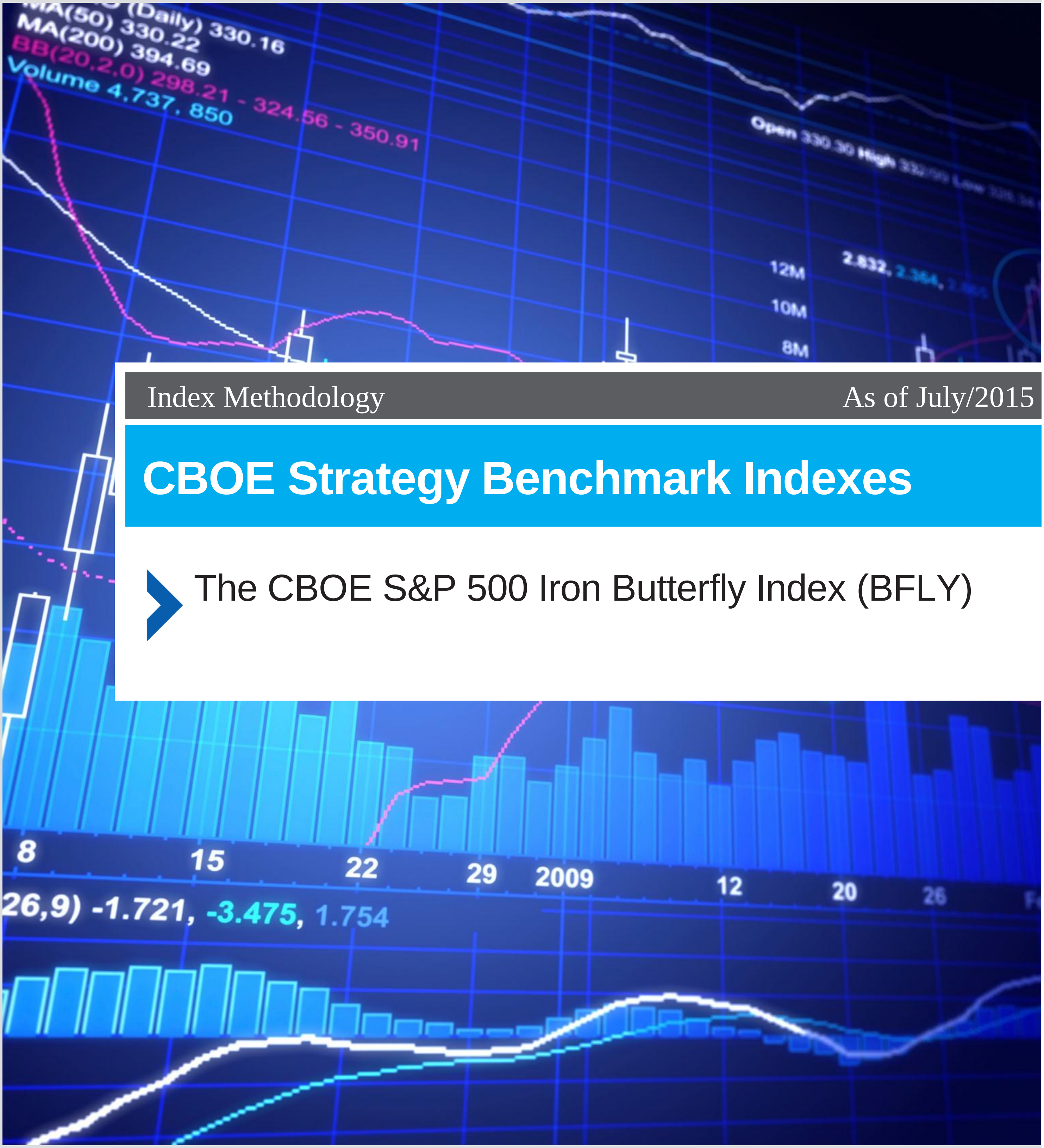

Index Methodology As of July/2015

CBOE Strategy Benchmark Indexes

The CBOE S&P 500 Iron Butterfly Index (BFLY)

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Introduction:

The CBOE S&P 500 Iron Butterfly Index (BFLY) is a benchmark index designed to track the performance of a hypothetical options trading strategy that: (1) sells a rolling monthly At-the-Money (ATM) SPX Put and SPX Call option, (2) buys a rolling monthly 5% Out-of-the-Money (OTM) SPX Put and SPX Call option to reduce the risk and (3) holds a money market account invested in one-month Treasury bills, which is rebalanced on the option Roll Day to limit the downside return of the BFLY Index. All SPX options involved are AM-settled and roll on a monthly basis. All option positions are one unit.

Index Design:

On June 20, 1986, the initial roll date of the BFLY Index, the strikes of the four monthly SPX options are selected before 11:00 am ET. The strike of the ATM SPX Call and Put option is the first listed strike above the last disseminated value of the S&P 500 Index (SPX Index) before 11:00 am ET. The strike of the 5% OTM SPX Put option is the first available strike below 95% of the last disseminated value of the SPX Index before 11:00 am ET. The strike of the 5% OTM SPX Call option is the first available strike above 105% of the last disseminated value of the SPX Index before 11:00 am ET. Each option is purchased or written at the average of the last bid-ask quote of the applicable option before 11:00 am ET.

Given the strike prices of the new SPX options, the worst possible payoff from the new option positions is:

$$Max\,(K_{Call\_5\%} - K_{Call\_atm}\,,\, K_{Put\_atm} - K_{Put\_5\%}).$$

Where $K_{Call\_5\%}$, K_{Call_atm}, K_{Put_atm} & $K_{Put\_5\%}$ stand for the strike prices of the 5% OTM SPX Call option, the ATM SPX Call option, the ATM SPX Put option and the 5% OTM SPX Put option, respectively. To provide a downside limit of negative return of the BFLY Index, a money market account with initial cash that equals ten times the worst possible payoff of the new option positions is set up at 11:00 am ET. The money market account is designed such that the worst possible payoff from final settlement of the new option positions is approximately 10% of the total value of the account. The money market account accumulates interest at one month T-bill rate.

Typically, on the third Friday (Roll Day) of every month since the inception date, all old options settle at 9:30 am ET against the Special Opening Quotation of the SPX Index (SOQ). The old money market account is liquidated at the same time. At 11:00 am ET, the two new ATM monthly SPX options are sold and the two new OTM monthly SPX options are purchased simultaneously. The strike prices and premiums of the new options are determined the same way as on the initial roll date, at the average of the last bid-ask quote of the applicable option before 11:00 am ET.[1] A new money market account with initial cash that equals ten times the worst possible payoff of the new option positions is set up at 11:00 am ET.

Index Calculation:

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

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

$$R_t = (M_t + Put\_5\%_t + Call\_5\%_t - Put\_atm_t - Call\_atm_t)$$
$$/\,(M_{t-1} + Put\_5\%_{t-1} + Call\_5\%_{t-1} - Put\_atm_{t-1} - Call\_atm_{t-1})$$

$$M_t = R_f * M_{t-1}$$

Where M_t is the value of the money market account on day t, R_f is the one month T-bill rate de-annualized to the daily rate, *Put_5%* is the price of the 5% OTM SPX Put option, *Call_5%* is the price of the 5% OTM SPX Call option, *Put_atm* is the price of the ATM SPX Put option, and *Call_atm* is the price of the ATM SPX Call option. Each SPX option price with subscript t is the average of the last bid-ask quote of the applicable option before 4:00 pm ET. Each SPX 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.

[1] On the Roll Date, when selecting the SPX option strike price, it is possible that the OTM SPX option strike price corresponding to the 5% strike selected is not available. In such cases, the most OTM SPX option strike price available would be selected to be purchased. If there are no OTM SPX option strike prices available for the given expiration month, the 5% OTM SPX options that expire in the following month would be selected (two months out from the roll date). In this instance, the BFLY Index would exit out of those SPX options at bid-ask mid quote on the next rolling date, at the same time as the other monthly options are settled.

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

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

$$R_1 = (M\_old_{\,t-1} + Put\_5\%\_old_{\,settle} + Call\_5\%\_old_{\,settle} - Put\_atm\_old_{\,settle} - Call\_atm\_old_{\,settle}) \\ / \,(M\_old_{\,t-1} + Put\_5\%\_old_{\,t-1} + Call\_5\%\_old_{\,t-1} - Put\_atm\_old_{\,t-1} - Call\_atm\_old_{\,t-1})$$

Where $M\_old_{\,t-1}$ is the value of the money market account on the previous day. Note there is no interest accumulated on the Roll Day. All prices with subscript *settle* are settlement values against the SOQ and are calculated as:

$$Put\_5\%\_old_{\,settle} = Max\,(0, K_{put\_5\%\_old} - SOQ_{\,t})$$

$$Put\_atm\_old_{\,settle} = Max\,(0, K_{put\_atm\_old} - SOQ_{\,t})$$

$$Call\_5\%\_old_{\,settle} = Max\,(0, SOQ_{\,t} - K_{call\_5\%\_old})$$

$$Call\_atm\_old_{\,settle} = Max\,(0, SOQ_{\,t} - K_{call\_atm\_old})$$

Each option price with subscript *t-1* is the average of the last bid-ask quote for the applicable option before 4:00 pm ET on the previous day.

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

$$R_2 = (M\_new_{\,t} + Put\_5\%\_new_{\,t} - Put\_atm\_new_{\,t} - Call\_atm\_new_{\,t} + Call\_5\%\_new_{\,t}) \\ / \,(M\_new_{\,t} + Put\_5\%\_new_{\,11am} - Put\_atm\_new_{\,11am} - Call\_atm\_new_{\,11am} + Call\_5\%\_new_{\,11am})$$

$$M\_new_{\,t} = Max\,(K_{Call\_10\%} - K_{Call\_5\%}\,,\, K_{Put\_5\%} - K_{Put\_10\%}) * 10$$

Where $M\_new_{\,t}$ is the value of the new money market account. Note there is no interest accumulated on the Roll Day. Each SPX option price with subscript *11am* is the average of the last bid-ask quote for the applicable option before 11:00 am ET. Each SPX option price with subscript *t* is the average of the last bid-ask quote for the applicable option before 4:00 pm ET on Roll Day t.

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

$$R_{\,t} = R_1 * R_2$$

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 S&P 500 Iron Butterfly Index (BFLY) is designed to represent a proposed hypothetical option spread strategy. Like many passive indexes, the BFLY 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 BFLY index, the BFLY options are assumed to be sold at a certain price on the third Friday of the month. However, there is no guarantee that all investors will be able to sell at this price, and investors attempting to replicate the BFLY Index should discuss with their brokers possible timing and liquidity issues. Transaction costs and taxes for a strategy such as the BFLY 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 BFLY index.

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