



Index Methodology

September 20, 2016

CBOE Strategy Benchmark Indexes

➤ The CBOE Smile Index
(SMILESM Index)



THE CBOE Smile Index (SMILE Index)

Introduction:

The CBOE Smile Index (“SMILESM Index” or “Index”) is a benchmark which measures the performance of a hypothetical option strategy. The strategy overlays a combination of S&P 500[®] 25 delta put and call options (SPX options) on an investment in one-month Treasury Bills. The T-Bills collateralize the options. The objective is to capture the volatility premia embedded in SPX options but to mitigate the risk of a short call exposure should the S&P 500 increase. The strategy relies on the ratio of put and call prices to gauge that risk. The put position is always short, but the call position switches from short to long when the put/call price ratio falls below a specified threshold. Investors often encapsulate the curve of implied volatilities at a given maturity by the ratio of implied volatilities of 25 delta put and call options. The implied volatilities of SPX options form a smile, which skews during volatile periods. The shape of the smile is viewed as an indicator of future market conditions.

Index Design:

At 11:00 am ET on the third Friday of every month, the roll date of the Index, SPX put and call options with one month to expiration and with strikes closest to 25 delta are determined, as well as the ratio of put to call mid-quote prices (the “SMILE Ratio”). The unit portfolio of the SMILE Index is then determined: it invests 100% of the put strike in Treasury bills, sells one 25 delta put at its VWAP price¹ between 11:30 am and 12:00 pm ET, and either sells or buys one 25 delta call at its VWAP price over the same period. The call is bought if the SMILE Ratio is smaller than or equal to 1.5. The call is sold if the SMILE Ratio is greater than 1.5.

After the composition of the unit portfolio is set, the current dollar value of the SMILE Index is invested in a new portfolio with the same composition as the unit portfolio. The current dollar value of the SMILE Index is the sum of the current value of the Treasury Bill account and of the settlement values of the SPX put and call options that were bought or sold at the previous roll date. The options are deemed to expire at 11:00 am ET.

Note that the calculation of the Index time series is different for the period from June 1986 to October 1992. The roll of the Index occurred at 4:00 pm ET instead because SPX options were PM settled at the time.

Index Calculation:

The Smile Index value is calculated by CBOE in real-time, every 15 seconds. However, intraday, changes in the mid-quotes of the put and call options are marked every 15 seconds, but no interest is credited in calculating the rate of return of the Index.

The value of the Smile Index I_t is compounded daily as

$$I_t = I_{t-1} * R_t$$

where R_t is the daily rate of return of the unit portfolio, equal to the rate of return of the Index since the Index is a multiple of the unit portfolio.

Non-Roll Dates:

At the close of non-roll dates, the gross rate of return of the unit portfolio and of the Index, since it is just a multiple of the unit portfolio, are calculated as:

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

$$I_t = I_{t-1} * R_t$$

where $M_t = (1+R_f) * M_{t-1}$, M_{t-1} is the value of the Treasury account at the previous close, R_f is the effective daily Treasury Bill rate, Put_t is the average of the last bid-ask quotes of the SPX put option before 4:00 pm ET, Call_t is the average of the last bid and ask quotes of the SPX call option before 4:00 pm ET. The sign applied to the call mid-quote is positive when the call is long and negative when the call is short.

Roll Dates:

On roll dates, the daily return of the Index is compounded over two periods, from the close of the previous date to the final settlement of the options, and from final settlement to the close.

$$R_t = R_{1,t} * R_{2,t}$$

¹ The VWAP price weighs option transaction prices by the fraction of total transactions executed at those prices. The VWAP calculation excludes spread transactions. If there are no transactions, the 11:00 am CS bid (ask) price of a short (long) option CS is used instead.

$$R_{1,t} = (M_{t-1} - \text{Put settle} +/- \text{Call settle}) / (M_{t-1} - \text{Put}_{t-1} +/- \text{Call}_{t-1})$$

$$R_{2,t} = (M_{\text{new},t} - \text{Put}_{\text{new},t} +/- \text{Call}_{\text{new},t}) / (M_{\text{new},t} - \text{Put}_{\text{new},\text{VWAP}} +/- \text{Call}_{\text{new},\text{VWAP}})$$

where $M_{\text{new},t}$ is the Treasury Bill component of the new unit portfolio, equal to 80% of the strike of the new put, $\text{Put}_{\text{new},t}$ and $\text{Call}_{\text{new},t}$ are the closing mid-quotes of the new put and call options, and $\text{Put}_{\text{new},\text{VWAP}}$ and $\text{Call}_{\text{new},\text{VWAP}}$ are the VWAP of the put and call options respectively.

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 or from The Options Clearing Corporation, One North Wacker Drive, Suite 500, Chicago, Illinois 60606 or www.theocc.com. The CBOE SMILE (SMILESM Index) is designed to represent a hypothetical options strategy. Like many passive indexes, the SMILE 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. Transaction costs and taxes for a strategy such as that underlying the SMILE Index 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. It is not possible to invest directly in an index. Chicago Board Options Exchange, Incorporated (CBOE) calculates and disseminates the SMILE Index.

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