



Cboe® S&P 500 3x Up, 1x Down Enhanced Growth Index Series



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As of December 2017



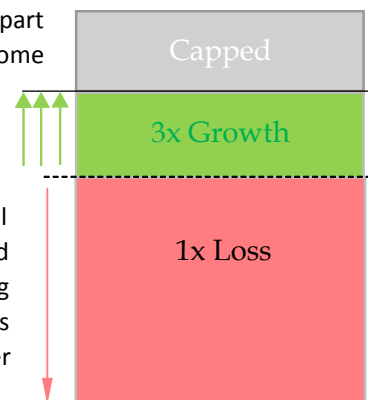
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Introduction

The Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index Series (the “Indices”) is part of a family of Target Outcome Indices. The Indices are designed to provide target outcome returns linked to the US domestic stock market.

The Indices measure the performance of a portfolio of hypothetical exchange traded Flexible Exchange® Options (“FLEX® Options”) that are based on the S&P 500® Index. Each index in the series is designed to track the returns of a hypothetical investment that over a period of approximately one year seeks to provide 3x leveraged returns on the appreciation of the S&P 500 Index up to a capped level while providing one-to-one exposure to any losses due to a decline in the index. The capped level is determined on each annual roll date such that there is no premium or discount to enter into the hypothetical investment compared to an investment in the Index.



The Index Series comprises 4 series.

There are 4 monthly series that roll on the last business day of the month:

- Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index January Series (Ticker: SPEG01)
- Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index April Series (Ticker: SPEG04)
- Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index July Series (Ticker: SPEG07)
- Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index October Series (Ticker: SPEG10)

Highlights

An Enhanced Growth Option Strategy is a leveraged strategy that is generally used in a range-bound or modest bull market environment. It seeks to provide leveraged upside up to a predetermined cap and one-to-one exposure on the downside.

The Indices are part of the outcome based approach to investing. Many investments target speculative returns, with uncertain levels of risk, over an uncertain period of time. While opportunistic, this approach to investing brings a high degree of uncertainty. Outcome based investing encourages targeting a specific defined return or “payoff”, with an allowance for a specific defined risk, at a specific point in time in the future.

The strategy seeks to provide similar returns to the S&P500 Index, with similar volatility and downside risk, but higher upside potential in market environments with modest gains.



Index Series Value and Return

First Roll Date and Starting Values

Each Monthly Index series will have an annual Roll Date(i) on the last business day of the previous month of that index series (i.e. last business day of December for the January series, last business day of January for the February series and so on) and have a value that was set as of the following dates:

- Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index January Series (SPEG01)
Set as of Roll Date (0) December 31, 2004 at a value of 1000
- Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index April Series (SPEG04)
Set as of Roll Date (0) March 31, 2005 at a value of 1000
- Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index July Series (SPEG07)
Set as of Roll Date (0) June 30, 2005 at a value of 1000
- Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index October Series (SPEG10)
Set as of Roll Date (0) September 30, 2005 at a value of 1000

On the subsequent Roll Date of each monthly series, the FLEX Option components expire and the index series simultaneously rolls to a new set of FLEX Options with the expiration of the Options as of the close on the next Roll Date.

Components

Each Monthly Index series will consist of six FLEX Option components whose strike price and expiration date will be set on the Roll Date(i) relative to the closing level of S&P 500 Index on the Roll Date:

- Purchased Call Option with strike = 60% of S&P 500 Index closing price
- Written Put Option with strike = 60% of S&P 500 Index closing price
- Purchased Put Option with strike = 120% of S&P 500 Index closing price
- Written Call Option with strike = 120% of S&P 500 Index closing price
- Purchased Call Option with strike = 100% of S&P 500 Index closing price
- Written Call Option with strike = CapRollDate(i)

All FLEX Options are European-Style Options based on the S&P 500 Index and have an expiration date that is the next Roll Date for the respective Monthly series.

Non-Roll Date Calculations

The value of the monthly index series will be calculated as follows for $t = 1$ (i.e. one day after the Roll Date) until $t = \text{Roll Date}(i+1)$ (i.e. until the next Roll Date):

$$\text{Index}_t = \text{Index}_{\text{RollDate}(i)} \times \left[\frac{\text{OptionPortfolioValue}_t}{\text{OptionPortfolioValue}_{\text{RollDate}(i)}} \right]$$

Where:

OptionPortfolioValue_t

$$\begin{aligned} &= 2 \times \text{Purchased60\%CallOption}_t - 2 \times \text{Written60\%PutOption}_t \\ &- \text{Written120\%CallOption}_t + \text{Purchased120\%PutOption}_t \\ &+ 2 \times \text{Purchased100\%CallOption}_t - 3 \times \text{WrittenVAR\%CallOption}_t \end{aligned}$$

RollDate(i) = prior roll date

Purchased60%CallOption_t = closing value of the purchased 60% call option on day t

Written60%PutOption_t = closing value of the written 60% put option on day t

Written120%CallOption_t = closing value of the written 120% call option on day t

Purchased120%PutOption_t = closing value of the purchased 120% put option on day t

Purchased100%CallOption_t = closing value of the purchased 100% call option on day t

WrittenVAR%CallOption_t = closing value of the written CapRollDate(i) call option on day t

Roll Date Calculations:

On the subsequent Roll Date of each monthly series, the FLEX Option components expire and the index series simultaneously rolls to a new set of FLEX Options with the expiration of the Options as of the close on the next Roll Date.

On the Roll Date the Index value is calculated as follows:

$$\text{Index}_{\text{RollDate}(i+1)} = \text{IndexRoll}_{i+1} \times \frac{\text{Index}_{\text{RollDate}(i)}}{\text{SPX}_{\text{RollDate}(i)}}$$

Where:

$$\text{IndexRoll}_{i+1} = \begin{cases} 3 \times \text{SPX}_{\text{RollDate}(i+1)} - 2 \times \text{SPX}_{\text{RollDate}(i)}, & \text{SPX}_{\text{RollDate}(i+1)} \leq \text{SPX}_{\text{RollDate}(i)} \\ \text{CapRollDate}(i), & \text{SPX}_{\text{RollDate}(i)} < \text{SPX}_{\text{RollDate}(i+1)} \leq \frac{\text{CapRollDate}(i) + 2 \times \text{SPX}_{\text{RollDate}(i)}}{3} \\ \text{CapRollDate}(i), & \text{SPX}_{\text{RollDate}(i+1)} > \frac{\text{CapRollDate}(i) + 2 \times \text{SPX}_{\text{RollDate}(i)}}{3} \end{cases}$$

Calculation of the Cap

The value of the strike CapRollDate(i) of the Written VAR% Call Option is calculated such that the following holds true on the RollDate(i):

WrittenVAR%CallOption_{RollDate(i)}

$$\begin{aligned} &= \frac{2}{3} \text{Purchased60\%CallOption}_{\text{RollDate}(i)} - \frac{2}{3} \text{Written60\%PutOption}_{\text{RollDate}(i)} \\ &\quad - \frac{1}{3} \text{Written120\%CallOption}_{\text{RollDate}(i)} + \frac{1}{3} \text{Purchased120\%PutOption}_{\text{RollDate}(i)} \\ &\quad + \frac{2}{3} \text{Purchased100\%CallOption}_{\text{RollDate}(i)} - \frac{1}{3} \text{SPX}_{\text{RollDate}(i)} \end{aligned}$$

To determine the value and CapStrike of the Written Call Option, Cboe uses an interpolation methodology that it deems is most appropriate for the market conditions at the time. To do so, Cboe values at least two written call options. The value of these options is then used to estimate the value and strike of the Written Call Option.

Following is an illustration of the possible methodology that Cboe may use to interpolate using two option prices:

The value of two additional Options is determined on the Roll Date:

- Written Call Option 1
- Written Call Option 2

Denote the weights as: W1 and W2 for the Written Call Option 1 and Written Call Option 2 with Strike 1 = 105% of the S&P500 Index closing price and Strike 2 = 115% of the S&P500 Index closing price, respectively. The value and strike of the Written Call Option is interpolated such that the following equalities hold true:

- Written Call Option = W1 x Written Call Option 1 + W2 x Written Call Option 2
- Strike = W1 x Strike 1 + W2 x Strike 2
- W1 + W2 = 1

Valuation

To value the component Options that comprise the Monthly index series, a model based valuation offered by a Cboe affiliate is used.



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Model based valuation is used for valuing the options. Cboe constructs an implied volatility surface from listed S&P 500 option prices by applying the SABR model. The SABR model is a stochastic volatility model, which attempts to capture the volatility smile in derivatives markets. The name stands for "stochastic alpha, beta, rho", referring to the parameters of the model, introduced by Hagan et.al., as an attempt to model the volatility surface and capture the empirically observed dynamic behavior of the smile. Valuations are then calculated for the options on the roll dates and for the official close of Cboe each trading date.

Index Maintenance

Index Construction

Cboe gathers information for the option components and applies the methodology to create individual index series.

Valuation and Equations

Cboe determines an evaluated value for each component option and associated equation in the Indices.

Calculation and Dissemination

Cboe compiles, calculates, maintains and disseminates the values of the Indices. Calculation will occur once a day upon the official close of Cboe trading hours.

Index Dissemination

Index levels are available through Cboe Global Markets website www.cboe.com/Index, major quote vendors (see codes below), numerous investment-oriented websites, and various print and electronic media.

Index	Bloomberg	Reuters
Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index January Series	SPEG01 <Index>	.SPEG01
Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index April Series	SPEG04 <Index>	.SPEG04
Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index July Series	SPEG07 <Index>	.SPEG07
Cboe S&P 500 3x Up, 1x Down Enhanced Growth Index October Series	SPEG10 <Index>	.SPEG10



Disclaimer

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 S&P 500 3x Up, 1x Down Enhanced Growth Index Series (the "Indices") are designed to represent a proposed hypothetical yield enhancement strategy. Like many passive indexes, the Indices do 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 Indices, the options components of each monthly index series are assumed to be purchased and sold at a certain price on the last business day of the month. However, there is no guarantee that all investors will be able to buy or sell at this price, and investors attempting to replicate the Indices should discuss with their brokers possible timing and liquidity issues. Transaction costs and taxes for a strategy such as the Indices 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. Multiple leg strategies involve multiple commission charges. 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 Indices.

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