

SPIKES™ Volatility Index Options

(Index Symbol: SPIKE)

MIAX Options and T3 Index to Launch Options
on the SPIKES™ Volatility Index



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Overview

MIAX Options and T3 Index are launching options on the SPIKES™ Volatility Index (index symbol: SPIKE), a measure of expected 30-day volatility in the SPDR S&P 500 ETF (SPY). MIAX anticipates listing SPIKES options in the second half of 2018, pending regulatory approval and the rollout of proprietary, patent pending functionality.

SPIKES™ and SPY Levels



The SPIKES™ Formula

SPIKES™ has a defined rules-based approach to selecting components—a series of options on the SPY—and weighting them to derive a single price for the index. The general formula for SPIKES™ is as follows:

1

$$SPIKES = 100 \times \sqrt{\left(\frac{t_1}{t_M} \frac{t_2 - t_M}{t_2 - t_1} \sigma_1^2 + \frac{t_2}{t_M} \frac{t_M - t_1}{t_2 - t_1} \sigma_2^2 \right)}$$

- t₁** Time (in seconds) to near-term expiration
- σ₁** Estimated volatility computed by variance swap approximation, near-term
- t₂** Time (in seconds) to next-term expiration
- σ₂** Estimated volatility computed by variance swap approximation, next-term
- t_M** Number of seconds in 30 days (30 x 86,400 = 2,592,000)

The formula for expected T-term variance is as follows:

2

$$\sigma^2 = 100 \times \frac{1}{T} \left[2e^{RT} \sum_i \frac{\Delta K_i p_i}{K_i^2} - \left(\frac{e^{RT} (p^{c_{ATM}} - p^{p_{ATM}})}{K_{ATM}} \right)^2 \right]$$

- p^{c_{ATM}}** Price of the at-the-money (ATM) SPY call option
- p^{p_{ATM}}** Price of the ATM SPY put option
- K_{ATM}** Strike closest to the point where linearly interpolated SPY call and put prices intersect

- T** Time to options expiration (in years, with 1-second precision)
- K_i, p_i** A list of unique SPY options strikes, ordered from lowest to highest, and corresponding SPY options prices; of a call if K_i > K_{ATM}; and of a put if K_i < K_{ATM}; if K_i = K_{ATM} then an average between the ATM SPY put and call prices
- ΔK_i** Half the difference between the strikes on either side of K_i;

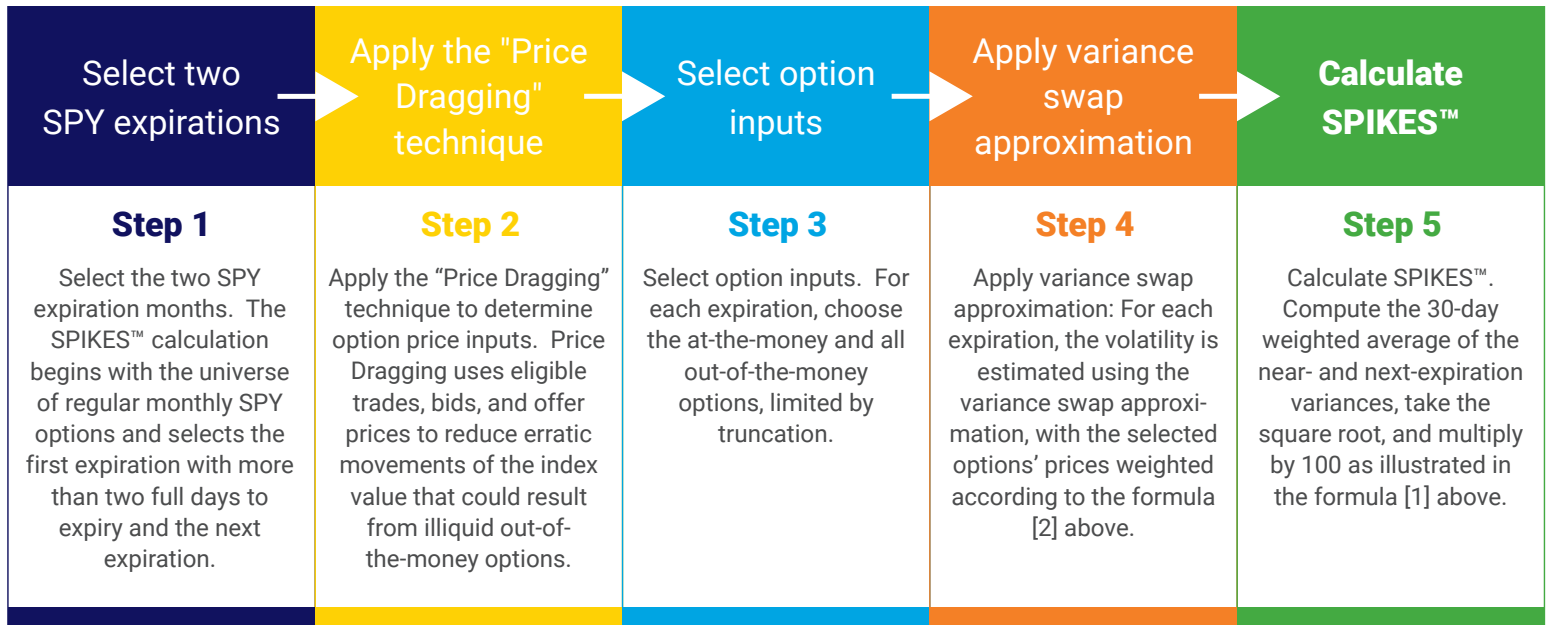
$$\Delta K_i = \frac{(K_{i+1} - K_{i-1})}{2}$$

- For the last (highest and lowest) selected strikes, ΔK_i is simply the absolute difference between K_i and the nearest option's strike
- R** Risk-free interest rate to option's expiration

Calculation Process

SPIKES™ is calculated using only standard options on the SPY that expire on the third Friday of each calendar month. Although weekly options on the SPY are available, these are not used in the calculation of the SPIKES™ Index.

The following process is used to calculate SPIKES™:



New MIAX Functionality

SPIKES™ Special Settlement Auction (a modified Opening Process)

The SPIKES™ Special Settlement Auction occurs on MIAX Options in the SPY options that have 30 days to expiration on the Wednesday that is 30 days prior to the third Friday of the calendar month immediately following the month in which the contract expires. If that Wednesday or the expiration Friday that is 30 days following that Wednesday is a holiday, the final settlement date for the contract shall be on the business day immediately preceding that Wednesday.

Before and during the opening process for each relevant SPY option, MIAX Options will disseminate robust imbalance information over its AIS feed. Anyone (members and non-members) may subscribe to the AIS feed.

New order types called Settlement Auction Only (SAO) orders and SAO eQuotes were created for this process.

Contract Specifications for SPIKES™ Options

| | |
|----------------------------------|--|
| Description | SPIKES™ measures changes in expected volatility of the SPDR S&P 500 ETF (commonly known and referred to by its ticker symbol, SPY) |
| Symbol | SPIKE |
| Multiplier | \$100 |
| Strike Interval | Strike price intervals are set at \$0.50 where the strike price is less than \$15, \$1 or greater where the strike price is between \$15 and \$200, and \$5 where the strike price is greater than \$200 |
| Minimum Trading Increment | \$0.05 for series trading below \$3 and \$0.10 for series trading at or above \$3 |

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Contract Specifications for SPIKES™ Options (continued)

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|-------------------------------------|---|
| Expiration Date | The Wednesday that is thirty days prior to the third Friday of the calendar month immediately following the expiring month |
| Expiration Month | Up to six expiration months. Short Term Option Series, Quarterly Option Series and LEAPS may also be available |
| Exercise Style | European |
| Last Trading Day | Trading will ordinarily cease at 4:15 p.m. (New York Time) on the Tuesday preceding an expiration Wednesday |
| Settlement Type | Cash |
| Settlement Value Symbol | SPKCS |
| Settlement Value | The exercise and settlement value will be calculated on Wednesday at the open using opening prices, and if no trade has occurred, the mid-point of the opening market for the SPY options used in the calculation of the Index at that time. The exercise-settlement amount will be equal to the difference between the settlement value and the exercise price of the option, multiplied by \$100. Exercise will result in the delivery of cash on the business day following expiration |
| Settlement of Exercise | Next business day following expiration |
| Position and Exercise Limits | No position and exercise limits |
| Trading Hours | 9:30 a.m. - 4:15 p.m. Eastern Time (New York time) |

About MIAX Options and MIH

Miami International Securities Exchange, LLC (MIAX Options) is a fully electronic options trading exchange and wholly-owned subsidiary of Miami International Holdings, Inc. (MIH). MIAX Options currently lists and trades options on over 2,700 multi-listed classes. MIAX Options' unparalleled system throughput is approximately 38 million quotes per second. The average latency for a single quote on MIAX Options is approximately 17.03 microseconds for a full round trip. At the 99th and 99.9th percentiles, the latency on MIAX Options is approximately 25.12 and 54.76 microseconds, respectively. MIAX Options is part of the MIAX Exchange Group along with MIAX PEARL, LLC (MIAX PEARL), MIH's second options exchange.

About T3 Index

T3 Index is a research-driven financial indexing firm, specializing in volatility and option benchmarking. T3 Index is dedicated to developing investible, proprietary indices that track related strategies across a range of asset classes to transform the way people invest and manage risk. Further information on T3 Index can be found at www.t3index.com.

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SPIKES™ is a trademark of T3 Index. Certain aspects of the methodology and related functionality of the SPIKES™ Index is owned by MIH and may be covered by one or more patents or pending patent applications.

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