



SPIKES[®] Futures

Factsheet

SPIKES[®] Volatility Index

The SPIKES Volatility Index (index symbol: SPIKE), is a measure of the expected 30-day volatility in the SPDR S&P 500 ETF (SPY). SPY is the largest exchange traded fund in the world and tracks the most watched stock index in the United States.

SPIKES is built using the popular variance swap methodology and uses live SPY option prices to calculate volatility. This is consistent with the way the trading community is used to modelling risk and hedging exposure.

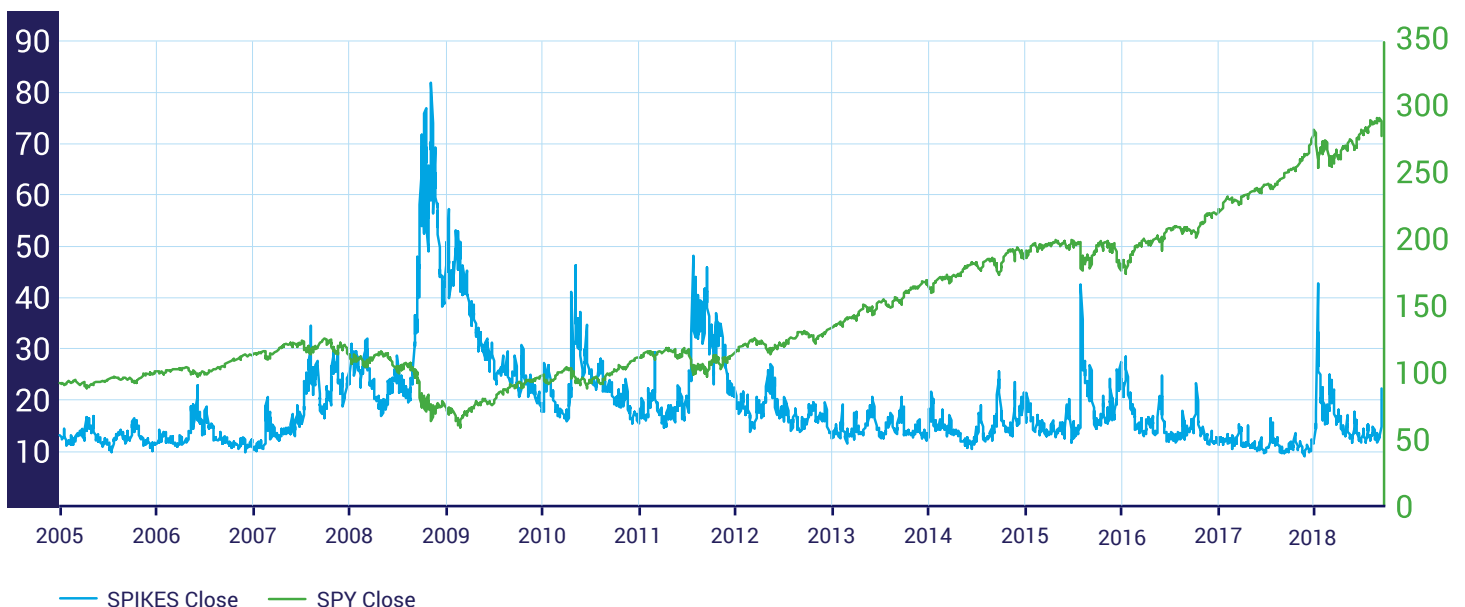
SPIKES Futures

SPIKES Futures are offered by MGEX via the CME GLOBEX[®] platform, and are cleared by MGEX.

The SPIKES Index and volatility products offer a number of unique features designed to produce highly accurate, robust data and create a transparent and open auction settlement process.

MIAX is proud to partner with T3 Index and MGEX to offer SPIKES Futures - for more confident volatility trading.

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 the SPIKES Index is as follows:

$$1 \quad \text{SPIKES} = 100 \times \sqrt{\left(\frac{t_1}{t_M} \frac{t_2 - t_M}{t_2 - t_1} \sigma_1^2 + \frac{t_2}{t_M} \frac{t_M - t_1}{t_2 - t_1} \sigma_2^2 \right)}$$

- t_1 Time (in seconds) to near-term expiration
- σ_1 Estimated volatility computed by variance swap formula, near-term
- t_2 Time (in seconds) to next-term expiration
- σ_2 Estimated volatility computed by variance swap formula, 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:

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

- 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 ;

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

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

- For the last (highest and lowest) selected strikes, ΔK_i is simply the absolute difference between K_i and the nearest selected 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 SPY are available, these are **not** used in the calculation of SPIKES.

The following process is used to calculate SPIKES:

| STEP 1 Select two SPY expirations | STEP 2 Apply "Price Dragging" technique | STEP 3 Select option inputs | STEP 4 Apply variance swap formula | STEP 5 Calculate SPIKES |
|---|---|---|---|--|
| Select the two SPY expiration months. The SPIKES calculation begins with the universe of regular monthly SPY options and selects the first monthly expiration with more than two full days to expiry and the next monthly expiration. | Apply "Price Dragging" technique to determine option price inputs. Price Dragging uses eligible trades, bids, and offer prices to reduce erratic movements of the index value that could result from illiquid out-of-the-money options. | Select option inputs. For each expiration, choose the at-the-money and all out-of-the-money options, limited by truncation. | Apply variance swap formula. For each expiration, the volatility is estimated using the variance swap formula, with the selected options' prices weighted according to the formula [2] above. | Calculate SPIKES. Compute the 30-day weighted average of the near- and next-expiration variances, take the square root, and multiply by 100 as illustrated in the formula [1] above. |

MIAX Settlement Auction

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

Trading Fees

Fees will be announced shortly.

SPIKES Futures Contract Specifications

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| Contract Name | SPIKES Volatility Index Future (SPK) |
| Ticker Symbol | Trading of the SPK Futures Contract will be available electronically via the CME Globex® platform with ticker symbol SPK. |
| Trading Hours | <p>The SPIKES futures will trade as follows (all hours listed in Central Time):</p> <ul style="list-style-type: none">Extended Trading Session I: 5:00 p.m. – 8:30 a.m. (Sunday – Friday)<ul style="list-style-type: none">Pre-Open 4:00 p.m. – 5:00 p.m. (Sunday) 4:45 p.m. – 5:00 p.m. (Monday – Thursday)Regular Trading Session: 8:30 a.m. – 3:15 p.m. (Monday – Friday)Extended Trading Session II: 3:30 p.m. – 4:00 p.m. (Monday – Friday)<ul style="list-style-type: none">Pre-Open 3:15 p.m. – 3:30 p.m. (Monday – Friday) |
| Contract Multiplier | The contract multiplier for each SPK Futures Contract is \$1,000 (USD). |
| Contract Months | The months available for trading in the SPK Futures Contract will be the nearest six (6) consecutive months. The first trading day of the new 6th month contract will begin with the evening session on the settlement day of the expiring front month. |
| Order Types | Order types for SPK Futures Contracts will include Limit, Market Order with Protection, Market to Limit, Stop Limit, and Stop Order with Protection. |
| Calendar Spreads | Standard calendar spreads are available for trading in the SPK Futures Contract with reduced tick functionality. The individual legs and net prices may be in increments of 0.01 index points, which has a value of \$10.00. |
| Block Trades | <p>Block Trades are permitted to be executed in the SPK Futures Contract given they meet minimum quantity thresholds. The Block Trade minimum threshold for the SPK Futures Contract is 200 contracts.</p> <p>Block Trades will include a minimum price increment of 0.01 index points which has a value of \$10.00.</p> |
| Exchange for Related Position | <p>Exchange for Related Position (EFRP) transactions are permitted to be executed in the SPK Futures Contract provided certain criteria are met. The transaction must also be proven to be a bona fide EFRP transaction and must be submitted to the Exchange in accordance with applicable Rules.</p> <p>See MGEX Rule 719.00. for additional information related to EFRP transactions.</p> <p>See MGEX Rule 83.16 for information related to Exchange of Contract for Related Position (“ECRP”) transactions.</p> |
| Minimum Price Increment | The minimum price increment in the SPK Futures Contract will be 0.05 index points, which has a value of \$50.00. For spread trades, the individual legs and net prices may be in increments of 0.01 index points, which has a value of \$10.00. |

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| Daily Price Limits | During the extended trading session each SPK Futures Contract will be subject to an upper price limit of 70% above the most current calculated reference value and a lower price limit of 30% below the most current calculated reference value. There are no price limits during the regular trading session. |
| Trading Halts | <p>Trading halts for SPK futures will go into effect following a NYSE Rule 80B trading halt in the cash equity market in the following convention:</p> <ul style="list-style-type: none"> Level 1: 15-minute trading halt following a 7% decline in the S&P 500 Index (unless the decline occurs after 2:25 p.m. (Central Time) or 11:25 a.m. (Central Time) in the case of early close). Level 2: 15-minute trading halt following a 13% decline in the S&P 500 Index (unless decline occurs after 2:25 p.m. (Central Time) or 11:25 a.m. (Central Time) in the case of early close). Level 3: Trading halt for the remainder of the trading session following a 20% decline in the S&P 500 Index, effective during all regular Hours of Trading. <p>Additionally, MGEX will take into consideration any trading halt in the SPDR S&P ETF Trust and/or the SPIKE Options Contract in determining whether to halt trading in the SPK Futures Contract.</p> <p>Trading halts in the SPK Futures Contract can also be triggered from a correlated trading halt in the CME E-mini S&P Futures Contract; however, these halts are limited to the trading times of 3:00 p.m. to 3:15 p.m. during the regular trading session, or 3:30 p.m. to 4:00 p.m. during the extended trading session.</p> |
| Last Trading Day/ Termination of Trading | The Last Trading Day for the SPK Futures Contract will be at 8:00 a.m. on the Final Settlement Date. |
| Final Settlement Date | The Final Settlement Date for the SPK Futures Contract is generally a Wednesday 30 calendar days preceding the Expiration Date of the monthly SPY options. If that day is an Exchange holiday, then the Final Settlement Date will be the preceding business day. The Expiration Date for the monthly SPY options is the 3rd Friday of the month following the month in which the contract expires. If that day is an Exchange holiday, then the Expiration Date is the preceding business day. |
| Final Settlement Value | SPK Futures will cash settle to the Final SPIKES settlement value, as published by MIAX, on the Final Settlement Date. Settlement of the SPK Futures Contract will result in the transfer of a cash settlement amount on the business day immediately following the Settlement Date. The cash settlement amount will be the final mark to market amount against the final settlement price of the SPK Futures Contract multiplied by \$1,000.00. |
| Trade at Settlement Transactions (TAS) | <p>Trade at settlement transactions (TAS) for SPK Futures Contracts will be available during the regular trading session hours of 8:30 a.m. to 3:13 p.m.</p> <p>All TAS transactions will trade on CME's Globex platform with ticker symbol "SPT" and will be limited to price ranges from 0.50 index points below the daily settlement price to 0.50 index points above the daily settlement price. Minimum price increments will be 0.01 index points. All TAS orders will be required to be a day order, immediate or cancel order, or fill or kill order. Both single leg and calendar spread transactions are available for trading, however no block trades or ECRPs will be permitted in TAS transactions for SPK Futures Contracts.</p> <p>Last Trade Date for TAS transactions is at 3:13 p.m. the business day prior to the SPK Future Contract's Last Trading Day.</p> |
| Position Accountability | <p>The position accountability levels for SPK Futures Contracts are as follows:</p> <ul style="list-style-type: none"> Ownership or control at any time of more than 50,000 contracts net long or short in all SPK Futures Contracts combined. Ownership or control of more than 30,000 contracts net long or net short in the expiring SPK Futures Contract, effective at the start of Hours of Trading for the Friday prior to the Final Settlement Date of the expiring SPK Futures Contract. Ownership or control of more than 10,000 contracts net long or net short in the expiring SPK Futures Contract, effective at the start of the Hours of Trading for the Business Day immediately preceding the Final Settlement Date of the expiring SPK futures. <p>Trading for the Friday prior to the Final Settlement Date and for the business day immediately preceding the Final Settlement Date will be in effect upon commencement of the first range of the extended trading session (3:30 p.m. to 4:00 p.m.)</p> |
| Reportable Position and Volume Level | <p>Any open position level in the SPK Futures Contract at the close of trading on any trading day equal to, or in excess of, 200 contracts on either side of the market is required to be reported to the CFTC.</p> <p>A volume threshold account that has trading volume in the SPK Futures Contract during a single trading day equal to, or in excess of, 50 contracts is required to be reported to the CFTC.</p> |

About MIH and the MIAX Exchange Group

Miami International Holdings, Inc. (MIH) is the parent holding company of Miami International Securities Exchange, LLC (MIAX®), MIAX PEARL, LLC (MIAX PEARL™) and MIAX Emerald, LLC (MIAX Emerald™ and together with MIAX and MIAX PEARL, the MIAX Exchange Group), which operates three fully electronic options trading exchanges.

MIAX, MIAX PEARL and MIAX Emerald leverage the MIAX Exchange Group's industry-leading technology and infrastructure to provide their member firms with traditional pricing and pro rata allocation (MIAX), maker-taker pricing and price-time allocation (MIAX PEARL) market structures, and a hybrid market structure with maker-taker pricing and pro rata allocation (MIAX Emerald). MIAX Options serves as the exclusive exchange venue for cash-settled options on the SPIKES Volatility Index (Ticker: SPIKE), a measure of the expected 30-day volatility in the SPDR® S&P 500® ETF (SPY).

The MIAX Exchange Group's executive offices and National Operations Center are located in Princeton, NJ, with a Miami Operations Center and additional offices located in Miami, FL.

To learn more about MIH and the MIAX Exchange Group visit www.miaxoptions.com.

About MGEX

MGEX, a Designated Contract Market (DCM) and Derivatives Clearing Organization (DCO), was established in 1881 and is the only market for Hard Red Spring Wheat (HRSW), SPIKES Futures, National Corn Index (NCI), National Soybean Index (NSI), Hard Red Winter Wheat Index (HRWI), Hard Red Spring Wheat Index (HRSI), and Soft Red Winter Wheat Index (SRWI) futures and options, as well as for HRSW calendar spread options (CSOs). In addition, MGEX provides DCM, DCO and cash market services to business partners in an array of asset classes. To learn more about MGEX visit www.mgex.com.

About T3 Index

SPIKES has been developed by T3 Index, 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.

For more information on T3 Index and their range of indices, visit www.t3index.com.

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Disclaimer

Futures trading is not suitable for all investors, and involves the risk of loss. The risk of loss in futures can be substantial. You should, therefore, carefully consider whether such trading is suitable for you in light of your circumstances and financial resources. For additional information regarding futures trading risks, see the Risk Disclosure Statement set forth in CFTC Regulation §1.55(b). The information contained herein is provided for general education and information purposes only. No statement contained herein should be construed as a recommendation to buy or sell a security or future or to provide investment advice. SPIKES® is a registered trademark of T3 Index. Certain aspects of the methodology and related functionality of SPIKES® is owned by MIH and may be covered by one or more patents or pending patent applications.

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