S&P Dow Jones Indices

A Division of S&P Global

S&P 500 Futures Edge Volatility Indices
Methodology

June 2024

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Introduction

Index Objective

The S&P 500 Futures Edge Volatility Indices measure the performance of leveraged strategies applied to the S&P 500 Futures Index ER (the "underlying index") based on a forward-looking volatility estimate. The index comprises five sub-indices, with each subindex rebalancing respectively on one day of the week. Each subindex floors at 25% of the prior week's rebalancing level and applies a leverage cap. The overall index level targets equal weight exposure by rebalancing each sub-index on its corresponding rebalancing day.

For information on the underlying index, please refer to the S&P Futures Indices Methodology, available at www.spglobal.com/spdji.

For information on the historical data used for calculating the indices, please refer to Appendix I.

Index Family

The index family includes the following:

Index	Target Volatility	Leverage Cap	Decrement Factor
S&P 500 Futures 35% Edge Volatility Index (USD) ER	35%	5	0%
S&P 500 Futures 35% Edge Volatility 6% Decrement Index (USD) ER	35%	5	6%
S&P 500 Futures 40% Edge Volatility Index (USD) ER	40%	5	0%
S&P 500 Futures 40% Edge Volatility 6% Decrement Index (USD) ER	40%	5	6%

Note that the target volatilities used to determine index leverage are based on the one-week implied volatilities. The actual index realized volatility may deviate from the target volatilities.

Supporting Documents

This methodology is meant to be read in conjunction with supporting documents providing greater detail with respect to the policies, procedures and calculations described herein. References throughout the methodology direct the reader to the relevant supporting document for further information on a specific topic. The list of the main supplemental documents for this methodology and the hyperlinks to those documents is as follows:

Supporting Document	URL
S&P Dow Jones Indices' Commodities Indices Policies & Practices Methodology	Commodities Indices Policies & Practices
S&P Dow Jones Indices' Options Indices Policies and Practices Methodology	Options Indices Policies & Practices Methodology
S&P Dow Jones Indices' Index Mathematics Methodology	Index Mathematics Methodology

This methodology was created by S&P Dow Jones Indices to achieve the aforementioned objective of measuring the underlying interest of each index governed by this methodology document. Any changes to or deviations from this methodology are made in the sole judgment and discretion of S&P Dow Jones Indices so that the index continues to achieve its objective.

Index Construction

Subindex Calculation

Unless otherwise specified, the time-weighted average prices (TWAPs) below calculate between 12:50 - 13:00 ET.

For more information on TWAPs, please refer to the Pricing Types section in S&P Dow Jones Indices' Options Indices Policies & Practices Methodology.

On each day t, the new TWAP level calculates based on the change from the prior rebalancing day's TWAP level.

$$SubIndex_t^{i,twap} = \max\left\{\begin{matrix} 0.25 \times SubIndex_{rb-1}^{i,twap}, \\ SubIndex_{rb-1}^{i,twap} + n_{rb-1}^{i} \times \left[Underlying_t^{twap} - Underlying_{rb-1}^{i,twap}\right] - SubIndex_{rb-1}^{i,twap} \times DF\frac{Days_{rb-1,t}^{i}}{360} \end{matrix}\right\}$$

If the day t is a subindex i rebalancing day, then the leverage level for the next week calculates and applies to the subindex as follows:

$$Leverage_t^i = \min\left(maxL, \frac{TV}{IV_t}\right)$$

$$n_t^i = Leverage_t^i \times \frac{SubIndex_t^{i,fixing}}{Underlying_t^{fixing}}$$

For more information on the implied volatility calculation, please refer to Appendix I.

The subindex level calculates as the change from the new TWAP level to the end of day level, utilizing the newly applied leverage.

$$SubIndex_t^i = \max\left\{\begin{matrix} 0.25 \times SubIndex_t^{i,twap}, \\ SubIndex_t^{i,twap} + n_t^i \times \left[Underlying_t - Underlying_t^{twap}\right] \end{matrix}\right\}$$

where:

$SubIndex_t^i$	= Closing level of the subindex i on day t
$SubIndex_t^{i,twap}$	= TWAP of subindex i on day t
$SubIndex_{rb-1}^{i,twap}$	= TWAP of subindex i on its prior rebalancing day
$Underlying_t$	= Closing level of the underlying index for day t
$Underlying_t^{twap}$	= TWAP of the underlying index for day t
$Underlying_{rb-1}^{i,twap}$	= TWAP of the underlying index on the prior subindex i rebalancing day
$Days_{rb-1,t}^{i}$	= Number of calendar days between the previous rebalancing day of subindex i and day t, including the previous rebalancing day of subindex i and excluding day t

DF = Decrement factor

TV = Target volatility

IV_t = Weekly implied volatility, as calculated on day t

$maxL$ = Leverage cap

If day t is not a subindex i rebalancing day, then the subindex level calculates as the leveraged change from the subindex's prior rebalancing day's TWAP level.

$$SubIndex_t^i = \max\left\{\begin{array}{c} 0.25 \times SubIndex_{rb-1}^{i,twap}, \\ SubIndex_{rb-1}^{i,twap} + n_{rb-1}^i \times \left[Underlying_t - Underlying_{rb-1}^{i,twap}\right] - SubIndex_{rb-1}^{i,twap} \times DF\,\frac{Days_{rb-1,t}^i}{360} \end{array}\right\}$$

On the first rebalancing day for each subindex, the initial fixing and TWAP values are the underlying futures index's TWAP level on that day.

Index Calculation

The fixing level (intraday level) for each subindex calculates as follows:

$$SubIndex_t^{i,fixing} = \max\left\{\begin{array}{c} 0.25 \times SubIndex_{rb-1}^{i,twap}, \\ SubIndex_{rb-1}^{i,twap} + n_{rb-1}^i \times \left[Underlying_t^{fixing} - Underlying_{rb-1}^{i,twap}\right] - SubIndex_{rb-1}^{i,twap} \times DF\,\frac{Days_{rb-1,t}^i}{360} \end{array}\right\}$$

The overall index level targets equal weight exposure to each subindex i that corresponds to a day of the week (Mon, Tue, Wed, Thu, Fri).

$$Index_t^{fixing} = Index_{t-1} + \sum_{i=1}^{5} N_{t-1}^i \left(SubIndex_t^{i,fixing} - SubIndex_{t-1}^i\right)$$

The target quantity of each subindex calculates at the fixing time as follows:

$$N_t^i = \begin{cases} \dfrac{0.2 \times Index_t^{fixing}}{SubIndex_t^{i,fixing}} & if\ SubIndex_t^i\ is\ rebalanced\ on\ date\ t \\ N_{t-1}^i & otherwise \end{cases}$$

Finally, the index level calculates as follows:

$$Index_t^{twap} = Index_{t-1} + \sum_{i=1}^{5} N_{t-1}^i \left(SubIndex_t^{i,twap} - SubIndex_{t-1}^i\right)$$

$$Index_t = Index_t^{twap} + \sum_{i=1}^{5} N_t^i \left(SubIndex_t^i - SubIndex_t^{i,twap}\right)$$

where:

$SubIndex_t^{i,fixing}$ = Fixing level of the subindex i on day t

$Underlying_t^{fixing}$ = Fixing of the underlying index for day t, taken as a snapshot at 11:35 ET

$Index_t^{fixing}$ = Fixing of the index on day t

$Index_t^{twap}$ = TWAP level of the index on day t

$Index_t$ = Closing level of the index on day t

On the base date of the index, the target quantity of each subindex is 20% of the base level divided by the closing level of the corresponding subindex.

Index Maintenance

Rebalancing

The five sub-indices that comprise the S&P 500 Futures Edge Volatility Index each rebalance respectively based on the weekday that the PM-settled SPXW options expire.

For scheduled or unscheduled full-day market closures or intraday closures, the corresponding sub-index rebalances on the next business day when all necessary data is available. In such cases, the index level calculates using each sub-index's target quantity from the previous rebalance date.

Currency of Calculation and Additional Index Return Series

The indices calculate in U.S. dollars.

In addition to the indices detailed in this methodology, additional return series versions of the indices may be available, including, but not limited to the following: currency, currency hedged, decrement, fair value, inverse, leveraged, and risk control versions. For a list of available indices, please refer to the *S&P DJI Methodology & Regulatory Status Database*.

For information on index calculation, please refer to S&P Dow Jones Indices' Index Mathematics Methodology.

For the inputs necessary to calculate certain types of indices, including decrement, dynamic hedged, fair value, and risk control indices, please refer to the Parameters documents available at www.spglobal.com/spdji.

Base Date and History Availability

The index history availability, base dates, and base values are shown in the table below.

Index	Launch Date	First Value Date	Base Date	Base Value
S&P 500 Futures 35% Edge Volatility Index (USD) ER	05/10/2024	07/05/2013	07/05/2013	100
S&P 500 Futures 35% Edge Volatility 6% Decrement Index (USD) ER	05/10/2024	07/05/2013	07/05/2013	100
S&P 500 Futures 40% Edge Volatility Index (USD) ER	05/10/2024	07/05/2013	07/05/2013	100
S&P 500 Futures 40% Edge Volatility 6% Decrement Index (USD) ER	05/10/2024	07/05/2013	07/05/2013	100

Index Governance

Index Committee

An Index Committee maintains the index. All committee members are full-time professional members of S&P Dow Jones Indices' staff. The Index Committee meets regularly. At each meeting, the Committee reviews pending corporate actions that may affect index constituents, statistics comparing the composition of the indices to the market, companies that are being considered as candidates for addition to the indices, and any significant market events. In addition, the Index Committee may revise index policy covering rules for selecting companies, treatment of dividends, share counts or other matters.

S&P Dow Jones Indices considers information about changes to its indices and related matters to be potentially market moving and material. Therefore, all Index Committee discussions are confidential.

S&P Dow Jones Indices' Index Committees reserve the right to make exceptions when applying the methodology if the need arises. In any scenario where the treatment differs from the general rules stated in this document or supplemental documents, clients will receive sufficient notice, whenever possible.

In addition to the daily governance of indices and maintenance of index methodologies, at least once within any 12-month period, the Index Committee reviews the methodology to ensure the indices continue to achieve the stated objectives, and that the data and methodology remain effective. In certain instances, S&P Dow Jones Indices may publish a consultation inviting comments from external parties.

For information on Quality Assurance and Internal Reviews of Methodology, please refer to S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.

Index Policy

Announcements

Announcements of the daily index values are made after the market close each day.

Holiday Schedule

The index calculates daily, throughout the calendar year, when the U.S. equity markets are open.

A complete holiday schedule for the year is available on S&P Dow Jones Indices' Web site at www.spglobal.com/spdji.

Rebalancing

The Index Committee may change the date of a given rebalancing for reasons including market holidays occurring on or around the scheduled rebalancing date. Any such change will be announced with proper advance notice where possible.

Unexpected Exchange Closures

For information on Unexpected Exchange Closures, please refer to S&P Dow Jones Indices' Commodities Indices Policies & Practices Methodology.

Recalculation Policy

For information on the recalculation policy, please refer to S&P Dow Jones Indices' Options Indices Policies & Practices Methodology.

For information on Calculations and Pricing Disruptions, Expert Judgment and Data Hierarchy, please refer to S&P Dow Jones Indices' Commodities Indices Policies & Practices and Options Indices Policies & Practices Methodology documents.

Contact Information

For questions regarding an index, please contact: index_services@spglobal.com.

Index Dissemination

Index levels are available through S&P Dow Jones Indices' Web site at *www.spglobal.com/spdji,* major quote vendors (see codes below), numerous investment-oriented Web sites, and various print and electronic media.

Tickers

The table below lists headline indices covered by this document. All versions of the below indices that may exist are also covered by this document. Please refer to the *S&P DJI Methodology & Regulatory Status Database* for a complete list of indices covered by this document.

Index	BBG	RIC
S&P 500 Futures 35% Edge Volatility Index (USD) ER	SPXF3EVE	.SPXF3EVE
S&P 500 Futures 35% Edge Volatility 6% Decrement Index (USD) ER	SPXF3EV6	.SPXF3EV6
S&P 500 Futures 40% Edge Volatility Index (USD) ER	SPXF4EVE	.SPXF4EVE
S&P 500 Futures 40% Edge Volatility 6% Decrement Index (USD) ER	SPXF4EV6	.SPXF4EV6

Index Data

Daily constituent and index level data are available via subscription.

For product information, please contact S&P Dow Jones Indices, www.spglobal.com/spdji/en/contact-us.

Web Site

For further information, please refer to S&P Dow Jones Indices' Web site at www.spglobal.com/spdji.

Appendix I

Determination of Maturity Date

On each weekday, the index selects PM-settled SPXW options expiring in one week (seven calendar days). If the weekday is a holiday, the corresponding subindex rebalances on the next business day. At any calculation time t, the time to expiry calculates as the total time from t to the selected option expiry time (4:00 p.m. on the maturity date), expressed as a fraction of the number of annual calendar days (365).

Calculation of Forward Price and Delta

The risk-free interest rate *R* is based on U.S. Treasury yield curve rates[1], applying linear interpolation to derive the yield on maturity date *T*.

At each minute from 11:30 – 11:35 ET, the forward price calculates by applying put-call parity. The delta calculation uses the same forward price (ATM forward) for all strikes with the same expiration, using the same forward price for the calculation of implied volatility:

$$F = Ka + e^{rT}(Call_K - Put_K)$$

where:

Ka = Strike at which the difference between the call and the put mid-prices is the smallest, also referred to as the at-the-money (ATM) strike Ka. If there are multiple put-call pairs with the same minimum absolute difference, then select the lowest strike among them.

T = Time to expiry, defined in accordance with *Determination of Maturity Date* above

$r = \log\left(1 + \frac{R}{2}\right)^2$ = Continuously compounded interest rate

$Call_K$ = Mid price for call option, calculated as the average of its bid and ask prices

Put_K = Mid price for put option, calculated as the average of its bid and ask prices

Calculate implied volatility σ using *F* using the Black model with F as underlier.

Calculate Δ_{call} and Δ_{put} using the Black model (with F and σ):

$$\Delta_{call} = e^{-rT} N\left(\frac{\log\left(\frac{F}{K}\right) + \frac{\sigma^2 T}{2}}{\sigma\sqrt{T}}\right)$$

$$\Delta_{put} = e^{-rT}\left(N\left(\frac{\log\left(\frac{F}{K}\right) + \frac{\sigma^2 T}{2}}{\sigma\sqrt{T}}\right) - 1\right)$$

Calculation of Implied Volatility

The implied volatility calculates every minute during the 11:30 – 11:35 ET calculation window, using the last snapshot of bid/ask prices for each option at the end of each minute, as follows:

[1] Source: Government Treasury Website | US Department of the Treasury. The rates are captured around 18:00 New York time every day and used for the following business day.

1. Find the strike at which the difference between the call and the put mid-prices is the smallest, also referred to as the at-the-money (ATM) strike Ka. If there are multiple put-call pairs with the same minimum absolute difference, then select the lowest strike among them.
2. Calculate forward price using put-call parity:

   $$F = Ka + e^{rT}(Call_{Ka} - Put_{Ka})$$

3. Select K_0 as the strike price equal to or immediately below *F*.
4. Select out-of-the-money call options with delta > 0.01. Start at the call with strike K immediately greater than K_0 and move to successively higher strike prices. After encountering two consecutive calls with a bid price of 0, no calls with higher strikes are considered.
5. Select out-of-the-money put options with delta < -0.01. Start at the put with strike K immediately less than K_0 and move to successively lower strike prices. After encountering two consecutive puts with a bid price of 0, no puts with lower strikes are considered.
6. At strike K_0, take the average of put and call prices.
7. Calculate implied volatility at the given minute:

   $$\sqrt{\frac{2}{T}\sum_i \frac{\Delta K_i}{K_i^2} e^{rT} Q(K_i) - \frac{1}{T}\left(\frac{F}{K_0} - 1\right)^2}$$

Calculation of Average Implied Volatility

The average implied volatility over the specified window calculates on each business day and is used to rebalance that day's subindex.

As previously mentioned, the target expiration on each weekday *d* is seven calendar days away, i.e. *d* + 7. If a given weekday *d* is a holiday, then the subindex corresponding to it rebalances on the next business day. Therefore, effectively, on *d*+1, the index calculates two implied volatilities: one for day *d* (with target expiration *d*+7) and one for day *d*+1 (with target expiration *d*+8).

If the target expiration is a business day but not a valid expiry date, the implied volatility for the preceding and following expiration dates interpolate using the exact time to expiry for each, as follows:

$$IV = \sqrt{\frac{T_L IV_L^2 (T_U - T) + T_U IV_U^2 (T - T_L)}{T(T_U - T_L)}}$$

where:

IV_L = Implied volatility (IV) calculated for the preceding expiration date L

T_L = Time from the end of IV calculation to the expiry-time on day L

IV_U = Implied volatility (IV) calculated for the following expiration date U

T_U = Time from the end of IV calculation to the expiry-time on day U

T = Expiration time (4:00 pm ET) on the target expiration date

If the target expiration is a holiday, then the next day is the target if it is a valid expiry date. Otherwise, interpolation applies as shown above.

Appendix II

Historical Data Used for Calculating Index Levels

Start Date	End Date	Underlying Index	Rebalancing Timing	Implied Volatility Calculation
07/01/2013	Present	S&P 500 Futures Index ER	12:50 – 13:00 PM ET TWAP	11:30 - 11:35 ET TWAP

On 09/30/2016, due to data availability, the 12:50-13:00 PM ET TWAP calculated using the EOD level of the S&P 500 Futures Index ER.

Prior to 05/06/2022, the index only includes SPXW options listed on some weekdays. Beginning on 05/06/2022, the index includes SPXW options listed to expire on each business weekday. For each weekday *d*, the index identifies the nearest day preceding its target expiration (< *d*+7) on which a SPXW option is listed to expire. The index also identifies the nearest day following its target expiration (> *d*+7) that corresponds to a listed SPXW option expiry.

Disclaimer

Performance Disclosure/Back-Tested Data

Where applicable, S&P Dow Jones Indices and its index-related affiliates ("S&P DJI") defines various dates to assist our clients by providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the index is set to a fixed value for calculation purposes. The Launch Date designates the date when the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P DJI defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its data feed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Please refer to the methodology for the Index for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

Information presented prior to an index's launch date is hypothetical back-tested performance, not actual performance, and is based on the index methodology in effect on the launch date. However, when creating back-tested history for periods of market anomalies or other periods that do not reflect the general current market environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. In addition, forks have not been factored into the back-test data with respect to the S&P Cryptocurrency Indices. For the S&P Cryptocurrency Top 5 & 10 Equal Weight Indices, the custody element of the methodology was not considered; the back-test history is based on the index constituents that meet the custody element as of the Launch Date. Also, the treatment of corporate actions in back-tested performance may differ from treatment for live indices due to limitations in replicating index management decisions. Back-tested performance reflects application of an index methodology and selection of index constituents with the benefit of hindsight and knowledge of factors that may have positively affected its performance, cannot account for all financial risk that may affect results and may be considered to reflect survivor/look ahead bias. Actual returns may differ significantly from, and be lower than, back-tested returns. Past performance is not an indication or guarantee of future results.

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