S&P Dow Jones Indices

A Division of S&P Global

S&P 500 Dynamic VEQTOR Index
Methodology

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Introduction

Index Objective

The S&P 500 Dynamic VEQTOR Indices measure the performance of strategies that allocate between equity, volatility, and cash based on a combination of realized and implied volatility.

Index Family

The S&P 500 Dynamic Veqtor indices are:

- The S&P 500 Dynamic VEQTOR Index (VEQTOR)
- The S&P 500 Dynamic VEQTOR Mid-Term Index (VEQTOR Mid-Term)
- The S&P 500 Dynamic VEQTOR X Index (VEQTOR X)

Highlights

The S&P 500 Dynamic VEQTOR Index allocates between the S&P 500, the S&P 500 VIX Short-Term Futures Index and cash in order to measure broad equity market exposure with an implied volatility hedge.

The S&P 500 Dynamic VEQTOR Mid-Term Index works similarly as the VEQTOR index. However, it uses the S&P 500 VIX Mid-Term Futures Index instead of the S&P 500 VIX Short-Term Futures Index as the implied volatility component.

For more information on the S&P 500, the S&P 500 VIX Short-Term Futures and the S&P 500 VIX Mid-Term Futures Indices, please refer to the S&P US Indices and S&P 500 VIX Futures Index methodology documents, respectively.

The S&P 500 Dynamic VEQTOR X Index is a companion index that is made up of a long allocation in the S&P 500 VIX Short-Term Futures Index and a short allocation in the S&P 500.

The allocations are evaluated daily, though changes in allocation may occur less frequently.

The S&P 500 Dynamic VEQTOR Index series belongs to the family of S&P 500 volatility linked indices which includes, among others, VIX®[1] (Chicago Board Options Exchange Volatility Index), the S&P 500 Volatility Arbitrage Index and the S&P 500 VIX Futures Index Series.

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:

[1] The VIX® methodology is the property of Cboe Options Exchange (Cboe). Cboe has granted S&P Dow Jones Indices a license to use the VIX methodology to create the S&P 500 VIX Futures Index.

Supporting Document	URL
S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology	Equity Indices Policies & Practices
S&P Dow Jones Indices' Index Mathematics Methodology	Index Mathematics Methodology
S&P Dow Jones Indices' Float Adjustment Methodology	Float Adjustment 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

Constituents

The S&P 500 Dynamic VEQTOR Index series is comprised of three components:

1. Equity, represented by the S&P 500.
2. Volatility, represented by the S&P 500 VIX Short-Term or Mid-Term Futures Index.
3. Cash, represented by the Overnight LIBOR.

Allocations

On any business day, *t*, VEQTOR and VEQTOR Mid-Term allocate between equity and volatility based on a combination of realized and implied volatility trend decision variables (*RV and IVT*). While the allocations are reviewed daily, they may change on a less frequent basis.

Realized Volatility (RV_{t-1})	**Target Volatility Allocation (w_t^{Vol})**		
	Implied Volatility Downtrend (IVT_{t-1}) = -1	No Implied Volatility Trend (IVT_{t-1}) = 0	Implied Volatility Uptrend (IVT_{t-1}) = +1
Less than 10%	2.5%	2.5%	10.0%
10% ≤ RV_{t-1} < 20%	2.5%	10.0%	15.0%
20% ≤ RV_{t-1} < 35%	10.0%	15.0%	25.0%
35% ≤ RV_{t-1} ≤ 45%	15.0%	25.0%	40.0%
More than 45%	25.0%	40.0%	40.0%

w_t^{Vol} = Weight of the volatility component, the S&P 500 VIX Short-Term Futures Index for VEQTOR and the S&P 500 VIX Mid-Term Futures Index for VEQTOR Mid-Term

w_t^{Equity} = Weight of the S&P 500
= 100% - w_t^{Vol}

Step 1: Evaluate realized and implied volatility

Let RV and IV denote annualized one-month realized and implied volatility, respectively, where:

$$RV_{t-1} = \sqrt{\frac{252 * \sum_{n=1}^{22}\left(\ln\left(\frac{SPX_{t-n}}{SPX_{t-n-1}}\right)\right)^2}{22}} \quad (1)$$

$$IV_{t-1} = VIX_{t-1} \quad (2)$$

where:

VIX_{t-1} and SPX_t refer to the CBOE Volatility Index (VIX) and the S&P 500 Price Return Index, respectively.

Step 2: Establish implied volatility trend

The implied volatility trend evaluates the presence, or lack, of a trend of expected volatility implied by the options markets. Let the five-day and 20-day implied volatility average be denoted by $5IV_t$ and $20IV_t$, respectively. The Daily Implied Volatility Trend indicator ($DIVT_t$) is up (+1) if the five-day implied volatility average is greater than or equal to the 20-day implied volatility average, and down (-1) if it is less.

$$5IV_{t-1} = \sum_{n=1}^{5} \frac{IV_{t-n}}{5} \tag{3}$$

$$20IV_{t-1} = \sum_{n=1}^{20} \frac{IV_{t-n}}{20} \tag{4}$$

$$DIVT_{t-1} = \begin{cases} +1\text{K } if \text{ K } 5IV_{t-1} \geq 20IV_{t-1} \\ -1\text{K } if \text{ K } 5IV_{t-1} < 20IV_{t-1} \end{cases} \tag{5}$$

The Implied Volatility Trend (IVT_t) is established if the Daily Implied Volatility Trend indicators remain constant for at least 10 business days. Uptrend (+1), Downtrend (-1) and No Trend (0) are given by the following formulae:

$$IVT_{t-1} = \begin{cases} +1 \ldots if \text{ K } \sum_{n=1}^{10} DIVT_{t-n} = +10 \\ -1\text{K } if \text{ K } \sum_{n=1}^{10} DIVT_{t-n} = -10 \\ 0\text{K } if \ -10 < \sum_{n=1}^{10} DIVT_{t-n} < +10 \end{cases} \tag{6}$$

Step 3: Evaluate trailing returns

At the close of any business day, if losses over the prior five business days are greater than or equal to 2%, then the index moves into a 100% cash position.

For the S&P 500 Dynamic VEQTOR Index, weekly return is calculated as:

$$Weekly\ Return_{t-1} = \frac{VEQTORIndexER_{t-1}}{VEQTORIndexER_{t-6}} - 1 \tag{7a}$$

$VEQTORIndexER_t$ is defined under *Excess Return Calculation* below (see formula (9)).

For the S&P 500 Dynamic VEQTOR Mid-Term Index, weekly return is calculated as:

$$Weekly\ Return_{t-1} = \frac{MIndexER_{t-1}}{MIndexER_{t-6}} - 1 \quad (7b)$$

MIndexER$_t$ is defined under *Excess Return Calculation* below (see formula (15)).

If $Weekly\ Return_{t-1}$ ≤ -2.0%, w_t^{Equity} = w_t^{Vol} = 0. (8)

Excess Return (ER) Calculations

On any business day, *t*, the excess return index levels are calculated. The excess return indices assume no accruals from cash.

The S&P 500 Dynamic VEQTOR Index excess return is calculated as follows:

$$VEQTORIndexER_t = VEQTORIndexER_{t-1} * (1 + EquityEDR_t + VolEDR_t) \quad (9)$$

where:

VEQTORIndexER$_{t-1}$ = The S&P 500 Dynamic VEQTOR Index Excess Return on the preceding business day, *t-1*.

EquityEDR$_t$ = Weighted Equity Excess Daily Return, as determined by the following formula:

$$EquityEDR_t = w_{t-1}^{equity} * \left(\frac{SPXE_t}{SPXE_{t-1}} - 1 \right) \quad (10)$$

where:

w_{t-1}^{Equity} = Weight of the S&P 500 on the prior business day, *t-1*.

SPXE$_t$ = The S&P 500 Excess Return Index closing level on business day, *t*. On a daily basis, the returns of the index are the returns of the S&P 500 Total Return index minus the overnight LIBOR. *For more details, please refer to Excess Return Index calculation in the S&P Dow Jones Indices Index Mathematics methodology*.

VolEDR$_t$ = Weighted Volatility Excess Daily Return, as determined by the following formula:

$$VolEDR_t = w_{t-1}^{vol} * \left(\frac{SPVXSP_t}{SPVXSP_{t-1}} - 1 \right) \quad (11)$$

where:

w_{t-1}^{Vol} = Weight of the S&P 500 VIX Short-Term Futures Index on the prior business day, *t-1*.

SPVXSP$_t$ = The S&P 500 VIX Short-Term Futures Excess Return Index closing level on the current business day, *t*.

Given long exposure to VIX and short exposure to the S&P 500, the S&P 500 Dynamic VEQTOR X Index excess return is calculated as follows:

$$XIndexER_t = \begin{cases} XIndexER_{t-1} * (1 + w_{t-1}^{vol} * ER_t^{vol} - w_{t-1}^{vol} * ER_t^{equity}) & \text{K } if \text{ K } w_{t-1}^{vol} > 0 \\ XIndexER_{t-1} & \text{K } if \text{ K } w_{t-1}^{vol} = 0 \end{cases} \quad (12)$$

where:

$XIndexER_{t-1}$ = The S&P 500 Dynamic VEQTOR X Index Excess Return on the preceding business day, *t-1*.

w_{t-1}^{Vol} = Weight of the S&P 500 VIX Short-Term Futures Index on the prior business day, *t-1*.

ER_t^{equity} = Equity Excess Daily Return, as determined by the following formula:

$$ER_t^{equity} = \frac{SPXE_t}{SPXE_{t-1}} - 1 \quad (13)$$

where:

w_{t-1}^{Vol} = Weight of the S&P 500 VIX Short-Term Futures Index on the prior business day, *t-1.*

$SPXE_t$ = The S&P 500 Excess Return Index closing level on business day, *t*. On a daily basis, the returns of the index are the returns of the S&P 500 Total Return index minus overnight LIBOR. *For more details, please refer to Excess Return Index calculation in the S&P Dow Jones Indices Index Mathematics methodology*.

ER_t^{vol} = Volatility Excess Daily Return, as determined by the following formula:

$$ER_t^{vol} = \frac{SPVXSP_t}{SPVXSP_{t-1}} - 1 \quad (14)$$

where:

$SPVXSP_t$ = The S&P 500 VIX Short-Term Futures Excess Return Index closing level on business day, *t.*

The S&P 500 Dynamic VEQTOR Mid-Term Index excess return is calculated as follows:

$$MIndexER_t = MIndexER_{t-1} * (1 + EquityEDR_t + MidVolEDR_t) \quad (15)$$

where:

$MIndexER_{t-1}$ = The S&P 500 Dynamic VEQTOR Mid-Term Index Excess Return on the preceding business day, *t-1*.

$EquityEDR_t$ = Weighted Equity Excess Daily Return, as determined formula (10).

$MidVolEDR_t$ = Weighted Mid-Term Volatility Excess Daily Return, as determined by the following formula:

$$MidVolEDR_t = w_{t-1}^{vol} * \left(\frac{SPVXMP_t}{SPVXMP_{t-1}} - 1 \right) \quad (16)$$

where:

w_{t-1}^{Vol} = Weight of the S&P 500 VIX Mid-Term Futures Index on the prior business day, *t-1*.

$SPVXMP_t$ = The S&P 500 VIX Mid-Term Futures Excess Return Index closing level on the current business day, *t*.

Total Return (TR) Calculations

A total return index is calculated for the S&P 500 Dynamic VEQTOR and VEQTOR Mid-Term Indices, which includes accrual and reinvestment of dividends on the equity allocation, interest based on the three-month U.S. Treasury rate on the allocation to S&P 500 VIX Futures Indices, and interest based on the overnight LIBOR rate on the allocation to cash.

The S&P 500 Dynamic VEQTOR Index total return is calculated as follows:

$$VEQTORIndexTR_t = VEQTORIndexTR_{t-1} * (1 + EquityTDR_t + VolTDR_t + CashDR_t) \quad (17)$$

where:

$VEQTORIndexTR_{t-1}$ = The S&P 500 Dynamic VEQTOR Index Total Return on the preceding business day, *t-1*, defined as any date on which the index is calculated.

$EquityTDR_t$ = Weighted Equity Total Daily Return, as determined by the following formula:

$$EquityTDR_t = w_{t-1}^{equity} * \left(\frac{SPXT_t}{SPXT_{t-1}} - 1 \right) \quad (18)$$

where:

w_{t-1}^{equity} = Weight of the S&P 500 on the prior business day, *t-1*.

$SPXT_t$ = The S&P 500 Total Return Index closing level on business day, *t*.

VolTDR = Weighted Volatility Total Daily Return, as determined by the following formula:

$$VolTDR_t = w_{t-1}^{vol} * \left(\frac{SPVXSTR_t}{SPVXSTR_{t-1}} - 1 \right) \tag{19}$$

where:

w_{t-1}^{vol} = Weight of the S&P 500 VIX Short-Term Futures Index on the prior business day, *t-1*.

$SPVXSTR_t$ = S&P 500 VIX Short-Term Futures Total Return Index closing level on business day, *t*.

$CashDR_t$ = Weighted Cash Daily Return, calculated based on an overnight deposit rate.

$$CashDR_t = (1 - w_{t-1}^{equity} - w_{t-1}^{vol}) * \left(\frac{CashTR_t}{CashTR_{t-1}} - 1 \right) \tag{20}$$

where:

$$CashTR_t = CashTR_{t-1} * \left[1 + \frac{Date_t - Date_{t-1}}{360} * Rate_{t-1} \right] \tag{21}$$

where:

$Date_t$ = the valuation date.

$Date_{t-1}$ = the previous valuation date.

$Rate_{t-1}$ = the previous day value of overnight LIBOR, expressed as a percentage.

The S&P 500 Dynamic VEQTOR Mid-Term Index total return is calculated as follows:

$$MIndexTR_t = MIndexTR_{t-1} * \left(1 + EquityTDR_t + MidVolTDR_t + CashDR_t\right) \quad (22)$$

where:

$MIndexTR_{t-1}$ = The S&P 500 Dynamic VEQTOR Mid-Term Index Total Return on the preceding business day, *t-1*, defined as any date on which the index is calculated.

$EquityTDR_t$ = Weighted Equity Total Daily Return, as determined by formula (18).

$MidVolTDR_t$ = Weighted Mid-Term Volatility Total Daily Return, as determined by the following formula:

$$MidVolTDR_t = w_{t-1}^{vol} * \left(\frac{SPVXMTR_t}{SPVXMTR_{t-1}} - 1\right) \quad (23)$$

where:

w_{t-1}^{vol} = Weight of the S&P 500 VIX Mid-Term Futures Index on the prior business day, *t-1*.

$SPVXMTR_t$ = S&P 500 VIX Mid-Term Futures Total Return Index closing level on business day, *t*.

$CashDR_t$ = Weighted Cash Daily Return, as determined by formula (20).

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

Currency, Currency Hedged, and Risk Control Indices

Additional currency, currency hedged, and risk control versions of the indices may be available. For a list of available currency, currency hedged, and risk control indices, please contact Client Services at index_services@spglobal.com.

For more information on currency, currency hedged, and risk control indices, please refer to S&P Dow Jones Indices' Index Mathematics Methodology.

Base Date and History Availability

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 Dynamic VEQTOR Index, Excess Return, Real-Time	11/18/2009	12/20/2005	12/20/2005	100,000
S&P 500 Dynamic VEQTOR Index, Total Return, Real-Time	11/18/2009	12/20/2005	12/20/2005	100,000
S&P 500 Dynamic VEQTOR X Index, Excess Return, Real-Time	09/13/2010	12/20/2005	12/20/2005	100,000
S&P 500 Dynamic VEQTOR Mid-Term Index, Excess Return, Real-Time	02/17/2011	12/20/2005	12/20/2005	100,000
S&P 500 Dynamic VEQTOR Mid-Term Index, Total Return, Real-Time	02/17/2011	12/20/2005	12/20/2005	100,000

Index Governance

Index Committee

The S&P 500 Dynamic VEQTOR Indices are maintained by the Americas Thematic & Strategy Index Committee. All committee members are full-time professional members of S&P Dow Jones Indices' staff. The committee meets monthly. At each meeting, the Index 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 an index, 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 document.

Index Policy

Announcements

Announcements of the daily index values are made after the close of US equity markets and the CBOE Futures Exchange each day.

For more information on S&P Dow Jones Indices' announcements, please refer to the Announcement Policy.

Holiday Schedule

The index is calculated daily when all of the S&P 500 and S&P 500 Short Term / Mid Term VIX Futures Indices are calculated.

A complete holiday schedule for the year is available at www.spdji.com.

Unexpected Exchange Closures

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

Recalculation Policy

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

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

Contact Information

For any 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.spdji.com*, 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 currency, currency hedged, risk control, and return type versions of the below indices that may exist are also covered by this document. Please contact index_services@spglobal.com for a complete list of indices covered by this document.

Index	Bloomberg	Reuters
S&P 500 Dynamic VEQTOR Index, Excess Return, Real-Time	SPVQDEID	.SPVQDERID
S&P 500 Dynamic VEQTOR Index, Total Return, Real-Time	SPVQDTID	.SPVQDTRID
S&P 500 Dynamic VEQTOR X Index, Excess Return, Real-Time	SPVQXER	.SPVQXERID
S&P 500 Dynamic VEQTOR Mid-Term Index, Excess Return, Real-Time	SPVQMER	.SPVQMERID
S&P 500 Dynamic VEQTOR Mid-Term Index, Total Return, Real-Time	SPVQMTR	.SPVQMTRID

FTP

Daily constituent and index data are available via FTP on subscription.

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

Web site

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

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