S&P Dow Jones Indices

A Division of S&P Global

S&P VIX Futures Indices
Methodology

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Introduction

Index Objective

The S&P VIX[1] Futures Indices measure the performance of futures contracts with varying expiry terms.

Index Family and Highlights

S&P VIX® Futures Indices. The indices measure the performance of holding long and/or short positions in VIX futures contracts and include the following indices:

- **S&P 500 VIX Short-Term Futures Index, S&P 500 VIX 2M Futures Index, S&P 500 VIX 3M Futures Index, and S&P 500 VIX 4M Futures Index.** The indices measure the return from a rolling long position in two VIX futures contracts with adjacent maturities. Each index rolls daily throughout each month from the shorter-term VIX futures contract into the longer-term VIX futures contract. Please refer to Table 1 in *Index Construction & Maintenance*.
- **S&P 500 VIX Short-Term Futures Index (0930-1600 ET) (USD) ER.** This index follows the same methodology as the S&P 500 VIX Short Term Futures Index ER, with the exception of real-time calculation hours. For real-time calculation, the index follows the U.S. equity trading schedule, opening at 9:30am ET. The official final closing index levels will be the same as the S&P 500 VIX Short Term Futures Index ER.
- **S&P 500 VIX Mid-Term Futures Index and S&P 500 VIX 6M Futures Index.** The indices measure the return from a rolling long position in four VIX futures contracts with adjacent maturities. Each index rolls daily throughout each month from the shortest-term contract into the longest-term contract while maintaining positions in the other two contracts.
- **S&P 500 VIX Futures Term-Structure Index.** The index measures the return from taking a 100% long position in the S&P 500 VIX Mid-Term Futures Index, and a 50% short position in the S&P 500 VIX Short-Term Futures Index. The weights of long and short positions are rebalanced daily.
- **S&P 500 VIX Front Month Futures Index.** The index measures the return from a long position in the first-month VIX futures contract. In the three trading days prior to the futures expiration day, the index rolls to the second month contract, with one-third of the index rolled each day.
- **S&P 500 VIX Short-Term Futures Points-Change Inverse Daily Index.** The index measures the return from a rolling short position in the front-month and second-month VIX futures contracts. The daily index return calculates based on the change in points (or units) of the VIX futures price rather than the percentage change.

S&P 500 Dynamic VIX Futures Indices. The indices measure the steepness of the implied volatility curve to provide information about future expectations of market volatility and the expected roll cost of VIX futures investments. The index dynamically allocates between the short-term and mid-term VIX futures indices excess return – represented by the S&P 500 VIX Short-Term Futures Index Excess Return and S&P 500 VIX Short-Term Futures Index Excess Return indices – to provide a cost-efficient exposure to forward implied volatility. The allocations are evaluated daily, though changes in allocation may occur less frequently.

[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.

S&P 500 VIX Futures Enhanced Roll Indices. The indices dynamically switch between a short-term VIX futures portfolio and a mid-term VIX futures portfolio in order to model a cost-efficient exposure to volatility in the broad equity market. The short-term VIX futures portfolio is represented by the S&P 500 VIX Short-Term Futures Index. The mid-term VIX futures portfolio models a daily rolling position in the third-, fourth-, and fifth-month VIX futures contracts. The indices hold positions in the first through fifth expirations of VIX futures contracts with the relative weights determined from the levels of VIX and a 15 day moving average of VIX. The allocations are evaluated daily, though changes in allocation may occur less frequently.

The family includes the following indices:

- **S&P 500 VIX Futures Enhanced Roll Index ER**
- **S&P 500 VIX Futures Enhanced Roll Index TR**

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' 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 & Maintenance

Underlying Contracts and Rolling Contracts

Table 1:

Index	Underlying Contracts	Roll Out (m)	Roll In (n)
S&P 500 VIX Short-Term Futures Index	1st, 2nd	1st	2nd
S&P 500 VIX 2M Futures Index	2nd, 3rd	2nd	3rd
S&P 500 VIX 3M Futures Index	3rd, 4th	3rd	4th
S&P 500 VIX 4M Futures Index	4th, 5th	4th	5th
S&P 500 VIX Mid-Term Futures Index	4th, 5th, 6th, 7th	4th	7th
S&P 500 VIX 6M Futures Index	5th, 6th, 7th, 8th	5th	8th
S&P 500 VIX Front Month Futures Index	1st	1st	2nd
S&P 500 VIX Short-Term Futures Points-Change Inverse Daily Index	1st, 2nd	1st	2nd

S&P VIX Futures Indices

Calculation of the VIX Futures Index Excess Return (ER)

On any business day of the underlying futures, *t*, the index ER is calculated as follows:

$$IndexER_t = IndexER_{t-1} * (1 + CDR_t) \quad (1)$$

where:

$IndexER_{t-1}$ = The Index Excess Return on the preceding business day, defined as any date on which the index is calculated.

CDR_t = Contract Daily Return, as determined by the following formula:

$$CDR_t = \frac{TDWO_t}{TDWI_{t-1}} - 1 \quad (2)$$

where:

t-1 = The preceding business day.

$TDWO_t$ = Total Dollar Weight Obtained on *t*, as determined by the following formula for each of the indices:

$$TDWO_t = \sum_{i=m}^{n} CRW_{i,t-1} * DCRP_{i,t} \quad (3)$$

$TDWI_{t-1}$ = Total Dollar Weight Invested on *t-1*, as determined by the following formula for each of the indices:

$$TDWI_{t-1} = \sum_{i=m}^{n} CRW_{i,t-1} * DCRP_{i,t-1} \quad (4)$$

where:

$CRW_{i,t}$ = Contract Roll Weight of the i^{th} VIX Futures Contract on date *t*.

$DCRP_{i,t}$ = Daily Contract Reference Price of the i^{th} VIX Futures Contract on date *t*.

m = The term of the futures contract that is rolled out on date *t*. Please refer to Table 1.

n = The term of the futures contract that is rolled in on date *t*. Please refer to Table 1.

Contract Rebalancing

For all the indices except for the S&P 500 VIX Front Month Futures Index, the Roll Period starts after the close on the Tuesday prior to the monthly Chicago Board Options Exchange (Cboe) VIX Futures Settlement Date (the Wednesday falling 30 calendar days before the S&P 500 option expiration for the following month) and runs through the Tuesday prior to the subsequent month's Cboe VIX Futures Settlement Date. Thus, the indices are rolling on a continual basis. On the business date after the current Roll Period ends the following Roll Period begins.

In calculating the Excess Return of each of the indices, the Contract Roll Weights ($CRW_{i,t}$) of each of the contracts in the index, on a given day, *t*, are determined as follows:

S&P 500 VIX Short-Term / 2M / 3M / 4M Futures Index Short-Term Futures Index

$$CRW_{m,t} = 100 * \frac{dr}{dt}$$

$$CRW_{n,t} = 100 * \frac{dt - dr}{dt}$$

where:

dt = The total number of business days in the current Roll Period beginning with, and including, the starting Cboe VIX Futures Settlement Date and ending with, but excluding, the following Cboe VIX Futures Settlement Date. The number of business days stays constant in cases of a new holiday introduced intra-month or an unscheduled market closure.

dr = The total number of business days within a Roll Period beginning with, and including, the following business day and ending with, but excluding, the following Cboe VIX Futures Settlement Date. The number of business days includes a new holiday introduced intra-month up to the business day proceeding such a holiday.

After the close on the Tuesday, corresponding to the start of the Roll Period, all of the weight is allocated to the shorter-term (i.e., m^{th} month) contract. Then on each subsequent business day a fraction of the m^{th} month VIX futures holding is sold and an equal notional amount of the longer-term (n^{th} month) VIX futures is bought. The fraction, or quantity, is proportional to the number of m^{th} month VIX futures contracts as of the previous index roll day, and inversely proportional to the length of the current Roll Period. In this way the initial position in the m^{th} month contract is progressively moved to the n^{th} month one over the course of the month, until the following Roll Period starts when the old n^{th} month VIX futures contract becomes the new m^{th} month VIX futures contract and gets sold every day afterward as the process begins again.

In addition to the transactions described above, the percentage dollar weight of each index component is calculated daily to ensure that the change in total dollar weight for the index is only due to the price change of each contract and not due to using a different weight for a contract trading at a higher price.

S&P 500 VIX Mid-Term / 6M Futures Index

$$CRW_{m,t} = 100 * \frac{dr}{dt}$$

$$CRW_{i,t} = 100$$

$$CRW_{j,t} = 100$$

$$CRW_{n,t} = 100 * \frac{dt - dr}{dt}$$

After the close on the Tuesday, corresponding to the start of the Roll Period, an equal weight is allocated to the m^{th}, i^{th}, j^{th} and n^{th} month contracts. Then on each subsequent business day a fraction of the shortest term (i.e., m^{th} month) VIX futures holding is sold and an equal notional amount of the longest-term (i.e., n^{th} month) VIX futures is bought. The fraction, or quantity, is proportional to the number of m^{th} month VIX futures contracts as of the previous index roll day, and inversely proportional to the length of the current Roll Period. In this way the initial position in the m^{th} month contract is progressively moved to the n^{th} month contract over the course of the month, until the following Roll Period start when the old i^{th} month VIX futures contract becomes the new m^{th} month VIX futures contract and gets sold every day afterwards as the process begins again.

In addition to the transactions described above, the weight of each index component is also adjusted every day to ensure that the change in total dollar exposure for the index is only due to the price change of each contract and not due to using a different weight for a contract trading at a higher price.

For the S&P 500 VIX Front Month Futures Index, the long position in the first month VIX futures is rolled to the second month VIX futures contract during the three business days prior to the first month expiration day, with 1/3 of the portfolio being rolled on each day.

Calculation of the VIX Futures Index Total Return (TR)

A total return version of each of the indices is calculated, which includes interest accrual on the notional value of the index based on the three-month U.S. Treasury rate, as follows:

$$IndexTR_t = IndexTR_{t-1} * (1 + CDR_t + TBR_t) \quad (5)$$

where:

$IndexTR_{t-1}$ = The index TR on the preceding business day.

CDR_t = Contract Daily Return as defined in equation (2).

TBR_t = Treasury Bill Return, as determined by the following formula:

$$TBR_t = \left[\frac{1}{1-\frac{91}{360}*TBAR_{t-1}}\right]^{\frac{Delta_t}{91}} - 1 \quad (6)$$

where:

$Delta_t$ = The number of calendar days between the current and previous business days.

$TBAR_{t-1}$ = The most recent weekly high discount rate for 91-day U.S. Treasury bills effective on the preceding business day. Generally, the rates are announced by the U.S. Treasury on each Monday. On Mondays that are bank holidays, Friday's rates apply.

Calculation of the VIX Futures Term-Structure Excess Return (ER)

The Term-Structure Index is a composite index that consists of taking a long position on the S&P 500 VIX Mid-Term Futures Index with 100% weight, and a short position on the S&P 500 VIX Short-Term Futures Index with 50% weight. On any S&P 500 VIX Futures Business Day, *t*, the index ER is calculated as follows:

$$IndexER_t = IndexER_{t-1} * (1 + Excess\text{Return}_t) \quad (7)$$

where:

$IndexER_{t-1}$ = The Index Excess Return on the preceding business day, defined as any date on which the index is calculated,

and

$$ExcessReturn_t = (W_{Long} * ExcessReturn_{Long} - W_{Short} * ExcessReturn_{Short}) \quad (8)$$

where:

W_{Long} = 100%, is the weight of the long position.

$ExcessReturn_{Long}$ = Excess Return of the long position in S&P 500 VIX Mid-term Futures Index.

W_{Short} = 50%, is the weight of the short position.

$ExcessReturn_{Short}$ = Excess Return of the short position in S&P 500 VIX Short-term Futures Index.

Calculation of the VIX Futures Term-Structure Total Return (TR)

A total return version of the index is calculated, which includes interest accrual on the notional value of the index based on the three-month U.S. Treasury rate, as follows:

$$IndexTR_t = IndexTR_{t-1} * (1 + Excess\text{Return}_t + TBR_t) \quad (9)$$

where:

$IndexTR_{t-1}$ = The index's total return on the preceding business day.

$ExcessReturn_t$ = Excess Return, as defined in equation (8).

TBR_t = Treasury Bill Return, as defined in equation (6).

Calculation of the S&P 500 VIX Short-Term Futures Points-Change Inverse Daily Index

The index measures the return from maintaining a rolling short position in the front-month and second-month VIX futures contracts. The index calculates as follows:

$$Index_t = Index_{t-1} + \sum_{i=1}^{2} Unit_{i,\,t-1}\,(DCRP_{i,\,t} - DCRP_{i,t-1})$$

where:

$Index_t$ = S&P 500 VIX Short-Term Futures Points-Change Inverse Daily Index on date *t*

$DCRP_{1,t}$ = Daily Contract Reference Price of the front-month VIX Futures Contract on date *t*

$DCRP_{2,t}$ = Daily Contract Reference Price of the second-month VIX Futures Contract on date *t*

$Unit_{i,t}$ = Units held of the i^{th} VIX Futures Contract on date *t*

For each index calculation day, the number of units held calculates as follows:

$$Unit_{i,t} = max\left(Scaling\ Factor * CRW_{i,t} * Index_t\ ,\ -\left(\frac{CRW_{i,t} * Index_t * Leverage\ Limit}{DCRP_{i,t}} \right) \right)$$

where:

Scaling Factor = Equal to -1.00%

$CRW_{i,\,t}$ = Contract Roll weight of the i^{th} VIX Futures Contract on date *t*

Leverage Limit = Equal to 2

For each index calculation day, the Contract Roll Weight calculates as follows:

$$CRW_{1,\,t} = \frac{dr}{dt}$$

$$CRW_{2,\,t} = \frac{dt\text{-}dr}{dt}$$

dt = The total number of business days in the current Roll Period beginning with, and including, the business day prior to the monthly Chicago Board Options Exchange (Cboe) VIX Futures Settlement Date and ending with, but excluding, the business day prior to the following Cboe VIX Futures Settlement Date. The number of business days stays constant in cases of a new holiday introduced intra-month or an unscheduled market closure.

dr = The total number of business days within a Roll Period beginning with, and including, the current business day and ending with, but excluding, the following Cboe VIX Futures Settlement Date minus 1.

The Roll Period starts after the close on the business day prior to the monthly Chicago Board Options Exchange (Cboe) VIX Futures Settlement Date and runs through the business day prior to the subsequent month's Cboe VIX Futures Settlement Date.

Calculation of the S&P 500 VIX Short-Term Futures Points-Change Inverse Daily Index Total Return. The total return calculation follows the same calculation as the other total return indices, but uses the SOFR Overnight Rate.

Calculation of the Asian End-of-Day VIX Futures Indices

Asian end-of-day versions of the S&P 500 VIX Short Term Futures Index, the S&P 500 VIX Short Term Futures Daily Inverse Index, the S&P 500 VIX Front Month Futures Index, and the S&P 500 VIX Front Month Futures Daily Inverse Index are calculated using the following index values as of 4:00 PM Hong Kong time:

1. Cboe Near-Term VIX Futures Contract 2 Minute VWAP, and
2. Cboe Second-Term VIX Futures Contract 2 Minute VWAP.

S&P 500 Dynamic VIX Futures Index

Constituents

The S&P 500 Dynamic VIX Futures Index is comprised of two components:

1. Short-term volatility, represented by the S&P 500 VIX Short-Term Futures Index Excess Return
2. Mid-term volatility, represented by the S&P 500 VIX Mid-Term Futures Index Excess Return

Allocations

On any business day, *t*, the S&P 500 Dynamic VIX Futures Index allocates between the short-term and mid-term volatility based on of the implied volatility term structure variable (*IVTS*). While the allocations are reviewed daily, they may change on a less frequent basis.

The target allocations to the short-term volatility (*TS*) and the mid-term volatility (*TM*) are determined by the implied volatility term structure (*IVTS*) and implied volatility trend (*IVT*) as follows:

Implied Volatility Term Structure ($IVTS_{t-1}$)	Target Short-Term Volatility Allocation (TS_t)	Target Mid-Term Volatility Allocation (TM_t)
Less than 90%	-0.30	0.70
90% ≤ $IVTS_{t-1}$ < 100%	-0.20	0.80
100% ≤ $IVTS_{t-1}$ < 105%	0	1.00
105% ≤ $IVTS_{t-1}$ ≤ 115%	0.25	0.75
More than 115%	0.50	0.50

The S&P 500 Dynamic VIX Futures Index limits the size of changes to its daily allocation rebalancing. The Short-Term and Mid-Term Volatility Allocations (S_t and M_t, respectively) are determined as follows:

$$S_t = \begin{cases} S_{t-1} \dots if \dots S_{t-1} = TS_t \\ min(S_{t-1} + 0.125,\ TS_t) \dots if \dots S_{t-1} < TS_t \\ max(S_{t-1} - 0.125,\ TS_t) \dots if \dots S_{t-1} > TS_t \end{cases}$$

$$M_t = \begin{cases} M_{t-1} \dots if \dots M_{t-1} = TM_t \\ min(M_{t-1} + 0.125,\ TM_t) \dots if \dots M_{t-1} < TM_t \\ max(M_{t-1} - 0.125,\ TM_t) \dots if \dots M_{t-1} > TM_t \end{cases} \quad (1)$$

Evaluating implied volatility term structure

The implied volatility term structure measures the slope of the VIX futures curve. Let $IVTS$ denote the implied volatility term structure, where:

$$IVTS_{t-1} = \frac{VIX_{t-1}}{VXV_{t-1}} \quad (2)$$

where:

VIX_{t-1} and VXV_{t-1} refer to the Cboe Volatility Index (*VIX*) and the Cboe S&P 500 3-Month Volatility Index (*VXV*), respectively.

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 VIX Futures Index excess return is calculated as follows:

$$IndexER_t = IndexER_{t-1} * (1 + S_{t-1} * SEDR_r + M_{t-1} * MEDR_t)$$
(3)

where:

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

S_{t-1} = Allocation to the S&P 500 VIX Short-Term Futures Index on the prior business day, *t-1*

SEDR$_t$ = Short-Term Volatility Daily Excess Return, as determined by the following formula:

$$SEDR_t = \frac{SPVXSP_t}{SPVXSP_{t-1}} - 1 \quad (4)$$

where:

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

M_{t-1} = Allocation to the S&P 500 VIX Mid-Term Futures Index on the prior business day, *t-1*

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

$$MEDR_t = \frac{SPVXMP_t}{SPVXMP_{t-1}} - 1 \quad (5)$$

where:

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 VIX Futures Index, which includes interest based on the three-month U.S. Treasury rate.

$$IndexTR_t = IndexTR_{t-1} * (1 + S_{t-1} * SEDR_r + M_{t-1} * MEDR_t + TBR_t) \quad (6)$$

where:

IndexTR$_{t-1}$ = The S&P 500 Dynamic VIX Futures Index Total Return on the preceding business day, *t-1*

S_{t-1} = Allocation to the S&P 500 VIX Short-Term Futures Index on the prior business day, *t-1*

SEDR$_t$ = Short-Term Volatility Daily Excess Return, as determined by formula (4)

M_{t-1} = Allocation to the S&P 500 VIX Mid-Term Futures Index on the prior business day, *t-1*

MEDR$_t$ = Mid-Term Volatility Daily Excess Return, as determined by formula (5)

TBR$_t$ = Treasury Bill Return, as determined by the following formula:

$$TBR_t = \left[\frac{1}{1-\frac{91}{360}*TBAR_{t-1}}\right]^{\frac{Delta_t}{91}} - 1 \qquad (7)$$

$Delta_t$ = the number of calendar days between the current and previous business days.

$TBAR_{t-1}$ = the most recent weekly high discount rate for 91-day US Treasury bills effective on the preceding business day. Generally, the rates are announced by the US Treasury on each Monday. On Mondays that are bank holidays, Friday's rates will apply.

S&P 500 VIX Futures Enhanced Roll Indices

The S&P 500 VIX Futures Enhanced Roll Index dynamically switches between two long portfolios of VIX futures:

1. Short-term portfolio, represented by the S&P 500 VIX Short-Term Futures Index
2. Mid-term portfolio, illustrated below

Short-Term Portfolio

The short-term portfolio assumes a long position in the S&P 500 VIX Short-Term Futures Index, which models a rolling long position in the first and second month VIX futures contracts. It rolls continuously throughout each month from the first month VIX futures contract into the second month VIX futures contract.

On any business day, the excess return of the short-term portfolio is calculated as illustrated in the *S&P 500 VIX Futures Index Methodology* document.

Mid-Term Portfolio

The mid-term portfolio assumes a rolling long position in the third, fourth and fifth month VIX futures contracts. It rolls continuously throughout each month from the third month contract into the fifth month contract, while maintaining positions in the fourth month contracts.

On any business day, *t,* the excess return of the mid-term portfolio (*MidER*$_t$) is calculated as follows:

$$MidER_t = MidER_{t-1} * (1 + CDR_t) \quad (1)$$

where:

MidER$_{t-1}$ = The Excess Return of the Mid-Term Portfolio on the preceding business day, defined as any date on which the index is calculated.

CDR$_t$ = Contract Daily Return, as determined by the following formula:

$$CDR_t = \frac{TDWO_t}{TDWI_{t-1}} - 1 \quad (2)$$

where:

t-1 = the preceding business day.

TDWO$_t$ = Total Dollar Weight Obtained on *t*, as determined by the following formula:

$$TDWO_t = \sum_{i=3}^{5} CRW_{i,t-1} * DCRP_{i,t} \quad (3)$$

TDWI$_{t-1}$ = Total Dollar Weight Invested on *t-1*, as determined by the following formula:

$$TDWI_{t-1} = \sum_{i=3}^{5} CRW_{i,t-1} * DCRP_{i,t-1} \quad (4)$$

where:

CRW$_{i,t}$ = Contract Roll Weight of the *i*th VIX Futures Contract on date *t*.

DCRP$_{i,t}$ = Daily Contract Reference Price of the *i*th VIX Futures Contract on date *t*.

The Roll Period starts after the close on the Tuesday prior to the monthly Cboe VIX Futures Settlement Date (the Wednesday falling 30 calendar days before the S&P 500 option expiration for the following month) and runs through the Tuesday prior to the subsequent month's Cboe VIX Futures Settlement

Date. Thus, the mid-term portfolio is rolling on a continual basis. On the business date after the current Roll Period ends the following Roll Period will begin.

In calculating the Excess Return of the mid-term portfolio, the Contract Roll Weights ($CRW_{i,t}$) of each of the contracts in the portfolio, on a given day, *t*, are determined as follows:

$$CRW_{3,t} = 50\% * \frac{dr}{dt}$$

$$CRW_{4,t} = 50\%$$

$$CRW_{5,t} = 50\% * \frac{dt - dr}{dt}$$

where:

dt = The total number of business days in the current Roll Period beginning with, and including, the starting Cboe VIX Futures Settlement Date and ending with, but excluding, the following Cboe VIX Futures Settlement Date. The number of business days stays constant in cases of a new holiday introduced intra-month or an unscheduled market closure.

dr =The total number of business days within a Roll Period beginning with, and including, the following business day and ending with, but excluding, the following Cboe VIX Futures Settlement Date. The number of business days includes a new holiday introduced intra-month up to the business day preceding such a holiday.

After the close on the Tuesday, corresponding to the start of the Roll Period, an equal weight is allocated to the third and fourth month contracts. Then on each subsequent business day a fraction of the third month VIX futures holding is sold and an equal notional amount of the fifth month VIX futures is bought. The fraction, or quantity, is proportional to the number of third month VIX futures contracts as of the previous index roll day, and inversely proportional to the length of the current Roll Period. In this way the initial position in the third month contract is progressively moved to the fifth month contract over the course of the month, until the following Roll Period start when the old fourth month VIX futures contract becomes the new third month VIX futures contract and gets sold every day afterwards as the process begins again.

In addition to the transactions described above, the weight of each index component is also adjusted every day to ensure that the change in total dollar exposure for the index is only due to the price change of each contract and not due to using a different weight for a contract trading at a higher price.

For the purpose of the historical mid-term portfolio calculations, when the i^{th} future was not listed on day *t*, the closing price on the previous day, *t-1,* was used.

Dynamic Switch

Let w_t^{short} and w_t^{mid} denote the weight of the short-term portfolio and mid-term portfolio in the VIX futures contracts, respectively.

w_t^{short} = Weight of the S&P 500 VIX Short-Term Futures Index
w_t^{mid} = Weight of the mid-term portfolio in VIX futures
= 100% - w_t^{short}

At the inception of the index history (*t* = 1), the index is fully invested in the mid-term VIX futures portfolio.

w_1^{short} = 0
w_1^{mid} = 100%

On any business day, *t*, the index dynamically switches between the short-term portfolio and the mid-term portfolio based on the implied volatility signal.

The implied volatility signal evaluates whether the current implied volatility, represented by the spot VIX, is relatively high or low. Let the 15-day implied volatility average be denoted by $AvgIV_t$. The Daily Implied Volatility Signal ($DIVS_t$) is high (+1) if the current implied volatility is greater than 1.35 times $AvgIV_t$, and low (-1) if it is less than $AvgIV_t$.

$$IV_{t-1} = VIX_{t-1} \quad (5)$$

$$AvgIV_{t-1} = \sum_{n=1}^{15} \frac{\mathrm{IV}_{t-n}}{15} \quad (6)$$

$$DIVS_{t-1} = \begin{cases} +1 \ldots if \ldots IV_{t-1} > 1.35 * AvgIV_{t-1} \\ -1 \ldots if \ldots IV_{t-1} < AvgIV_{t-1} \\ 0 \ldots otherwise \end{cases} \quad (7)$$

where:

VIX$_{t-1}$ refers to the Cboe Volatility Index (VIX).

On any business day, *t*, if $DIVS_{t-1}$ is high (+1) and the index is not fully invested in the short-term portfolio, roll the entire mid-term portfolio into the short-term portfolio. Twenty percent (20%) of the portfolio will be rolled into the short-term portfolio per business day.

On any business day, *t*, if $DIVS_{t-1}$ is low (-1) and the index is not fully invested in the mid-term portfolio, roll the entire short-term portfolio into the mid-term portfolio. Twenty percent (20%) of the portfolio will be rolled into the mid-term portfolio per business day.

Note the following:

- The index rolls from one VIX futures portfolio to the other gradually. A 20% portion of the old portfolio is rolled into the new portfolio every day.
- Once $DIVS_{t-1}$ triggers a roll from one VIX futures portfolio to the other, the roll will complete unless the implied volatility signal changes sign during the roll. If the implied volatility signal becomes 0, the roll will continue at 20% per business day. If the implied volatility signal changes sign during the roll, the original roll will stop and roll back 20% per business day.

20% Staged Roll Example #1

If DIVS does not change sign, the roll will complete.

Date	Implied Volatility Signal ($DIVS_t$)	Weight of Short-term Portfolio (w_t^{short})	Weight of Mid-term Portfolio (w_t^{mid})
2/27/2007	1	0%	100%
2/28/2007	1	20%	80%
3/1/2007	0	40%	60%
3/2/2007	1	60%	40%
3/5/2007	1	80%	20%
3/6/2007	0	100%	0%

20% Staged Roll Example #2

If DIVS changes sign during the roll, the roll will stop and reverse.

Date	Implied Volatility Signal ($DIVS_t$)	Weight of Short-term Portfolio (w_t^{short})	Weight of Mid-term Portfolio (w_t^{mid})
2/27/2007	1	0%	100%
2/28/2007	1	20%	80%
3/1/2007	0	40%	60%
3/2/2007	-1	60%	40%
3/5/2007	0	40%	60%
3/6/2007	0	20%	80%
3/7/2007	-1	0%	100%

Excess Return (ER) Calculations

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

The S&P 500 VIX Futures Enhanced Roll Index excess return is calculated as follows:

$$IndexER_t = IndexER_{t-1} * \left(1 + w_{t-1}^{short} * ShortEDR_t + w_{t-1}^{mid} * MidEDR_t\right) \quad (8)$$

where:

$IndexER_{t-1}$ = The S&P 500 VIX Futures Enhanced Roll Index Excess Return on the preceding business day, *t-1*

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

w_{t-1}^{mid} = Weight of the mid-term portfolio in VIX futures on the preceding business day, *t-1*

$ShortEDR_t$ = Excess daily return of the short-term portfolio, as determined by the following formula:

$$ShortEDR_t = \frac{SPVXSP_t}{SPVXSP_{t-1}} - 1 \quad (9)$$

where:

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

$MidEDR_t$ = Excess daily return of the mid-term portfolio, as determined by the following formula:

$$MidEDR_t = \frac{MidER_t}{MidER_{t-1}} - 1 \quad (10)$$

where:

$MidER_t$ = The excess return of the mid-term portfolio on the current business day, *t*, as calculated in formula (1).

Total Return (TR) Calculations

A total return index is calculated for the S&P 500 VIX Futures Enhanced Roll Index, which includes interest based on the three-month U.S. Treasury rate.

$$IndexTR_t = IndexTR_{t-1} * \left(1 + w_{t-1}^{short} * ShortEDR_t + w_{t-1}^{mid} * MidEDR_t + TBR_t\right) \quad (11)$$

where:

$IndexTR_{t-1}$ = The S&P 500 VIX Futures Enhanced Roll Index Total Return on the preceding business day, *t-1*

TBR_t = Treasury Bill Return, as determined by the following formula:

$$TBR_t = \left[\frac{1}{1-\frac{91}{360}*TBAR_{t-1}}\right]^{\frac{Delta_t}{91}} - 1 \quad (12)$$

$Delta_t$ = the number of calendar days between the current and previous business days.

$TBAR_{t-1}$ = the most recent weekly high discount rate for 91-day US Treasury bills effective on the preceding business day. Generally, the rates are announced by the US Treasury on each Monday. On Mondays that are bank holidays, Friday's rates will apply.

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

w_{t-1}^{mid} = Weight of the mid-term portfolio in VIX futures on the preceding business day, *t-1*

$ShortEDR_t$ = Excess daily return of the short-term portfolio, as defined in (9).

$MidEDR_t$ = Excess daily return of the mid-term portfolio, defined in (10).

Base Dates and History Availability

Index history availability, base dates and base value are shown in the table below.

Index	Launch Date	First Value Date	Base Date	Base Value
S&P 500 Dynamic VIX Futures ER	01/19/2011	12/20/2005	12/07/2010	3585.289969
S&P 500 Dynamic VIX Futures TR	08/17/2011	12/20/2005	12/07/2010	4010.856143
S&P 500 VIX 2M Futures Index	08/29/2011	04/19/2011	04/20/2011	159977.7264
S&P 500 VIX 3M Futures Index	08/29/2011	04/19/2011	04/20/2011	169175.8786
S&P 500 VIX 4M Futures Index	08/29/2011	04/19/2011	04/20/2011	174703.0193
S&P 500 VIX Enhanced Mid-Term Index ER	03/29/2011	10/23/2006	12/21/2010	149258.7536
S&P 500 VIX Enhanced Mid-Term Index TR	03/29/2011	12/20/2005	12/21/2010	160468.4648
S&P 500 VIX Front Month Futures Index ER	09/21/2015	11/10/2005	12/20/2005	10000000000
S&P 500 VIX Front Month Futures Index TR	09/21/2015	11/10/2005	12/20/2005	10000000000
S&P 500 VIX Front Month Futures Index ER (Asian End of Day)	3/23/2018	11/19/2013	11/19/2013	34897057.741
S&P 500 VIX Front Month Futures Index TR (Asian End of Day)	3/23/2018	11/19/2013	11/19/2013	39132883.831
S&P 500 VIX Futures 2-Month Index ER	08/29/2011	12/20/2005	04/20/2011	45895.31833
S&P 500 VIX Futures 2-Month Index TR	08/29/2011	12/20/2005	04/20/2011	51370.85105
S&P 500 VIX Futures 3-Month Index ER	08/29/2011	12/20/2005	04/20/2011	89385.439
S&P 500 VIX Futures 3-Month Index TR	08/29/2011	12/20/2005	04/20/2011	100050.3148
S&P 500 VIX Futures 4-Month Index ER	08/29/2011	12/20/2005	04/20/2011	100051.543
S&P 500 VIX Futures 4-Month Index TR	08/29/2011	12/20/2005	04/20/2011	111987.533
S&P 500 VIX Futures 6-Month Index	08/29/2011	12/20/2005	04/20/2011	151642.3469
S&P 500 VIX Futures 6-Month Index ER	08/29/2011	12/20/2005	04/20/2011	121182.0497
S&P 500 VIX Futures 6-Month Index TR	08/25/2011	12/20/2005	04/20/2011	135636.2028
S&P 500 VIX Futures Enhanced Roll Index ER	03/29/2011	10/23/2006	12/21/2010	273.5558833
S&P 500 VIX Futures Enhanced Roll Index TR	03/17/2011	10/23/2006	12/21/2010	294.0902709
S&P 500 VIX Futures Term-Structure Index ER	12/09/2010	12/20/2005	03/19/2010	204035.6554
S&P 500 VIX Futures Term-Structure Index TR	11/24/2010	12/20/2005	03/19/2010	228017.9437
S&P 500 VIX Mid-Term Futures Index	12/23/2008	12/20/2005	12/20/2005	100000
S&P 500 VIX Mid-Term Futures Index ER	05/10/2010	12/20/2005	12/20/2005	100000
S&P 500 VIX Mid-Term Futures Index TR	05/10/2010	12/20/2005	12/20/2005	100000
S&P 500 VIX Mid-Term Index ER MCAP	05/10/2010	12/20/2005	03/16/2010	138581.7425
S&P 500 VIX Mid-Term Index MCAP	01/22/2009	12/20/2005	11/18/2009	185227.4316
S&P 500 VIX Short-Term Futures Index	12/23/2008	12/20/2005	12/20/2005	100000
S&P 500 VIX Short-Term Futures Index (0930-1600 ET) (USD) ER	04/27/2020	12/31/2019	12/31/2019	21.67823832
S&P 500 VIX Short-Term Futures Index ER	05/10/2010	12/20/2005	12/20/2005	100000
S&P 500 VIX Short-Term Futures Index TR	05/10/2010	12/20/2005	12/20/2005	100000
S&P 500 VIX Short-Term Index ER MCAP	05/10/2010	12/20/2005	03/16/2010	33264.94972
S&P 500 VIX Short-Term Index MCAP	01/22/2009	12/20/2005	11/18/2009	65756.47906
S&P 500 VIX Short-Term Futures Points-Change Inverse Daily Index	11/11/2024	08/21/2006	08/21/2006	100

Index Governance

Index Committee

An Index Committee maintains the families of S&P VIX Futures Indices. All members of the Committee are full-time professionals at S&P Dow Jones Indices. The Committee meets regularly. At each meeting, the Committee reviews any significant market events. In addition, the Committee may revise index policy for timing of rebalancings 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' Commodities Indices Policies & Practices Methodology.

Index Policy

Announcements

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

Holiday Schedule

The indices are calculated daily from 7:00 PM (day prior) to 4:00 PM New York Time, excluding holidays and weekends.

A complete holiday schedule for the year is available 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 and New Holidays

In situations where an exchange is forced to close early due to unforeseen events, such as computer or electric power failures, weather conditions or other events, S&P Dow Jones Indices calculates the value of the index based on the most recent prior closing futures price published by the Cboe Futures Exchange and the roll for that day is carried to the next Cboe business day as described in the Contract Rebalancing section. If an exchange fails to open due to unforeseen circumstances, S&P Dow Jones Indices may determine not to publish the index for that day. The daily roll percentage is determined on the day when the index is fully rolled from the first month contract to the second month contract and stays constant throughout the month. If the index is not calculated or published due to unforeseen circumstances during the month, the unrolled potion for that day is carried to the next Cboe business day. It does not change the daily roll percentage on the remaining days of the month.

In situations where an exchange introduces a holiday during the month of the index calculation the index is not to be published and the roll for that day is carried to the next Cboe business day as described in the Contract Rebalancing section.

Please see the example provided below:

Normal Roll Schedule	ER Calculated Weights	
	% Current	% Next
10/25/2012	0.76	0.24
10/26/2012	0.72	0.28
10/29/2012	0.68	0.32
10/30/2012	0.64	0.36
10/31/2012	0.60	0.40
11/01/2012	0.56	0.44
11/02/2012	0.52	0.48

Unscheduled Market Closure	ER Calculated Weights	
	% Current	% Next
10/25/2012	0.76	0.24
10/26/2012	0.72	0.28
10/29/2012	**Unscheduled Market Closure**	
10/30/2012	**Unscheduled Market Closure**	
10/31/2012	0.68	0.32
11/01/2012	0.56	0.44
11/02/2012	0.52	0.48

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

Delisting of Futures Contracts

If one or more futures contracts included in one of the indices is no longer listed, S&P Dow Jones Indices may choose to cease publication of the effected index at that time.

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

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 *S&P DJI Methodology & Regulatory Status Database* for a complete list of indices covered by this document.

Index	BBG	RIC
S&P 500 VIX Short-Term Futures Index ER (Real-Time)	SPVXSPID	.SPVXSPID
S&P 500 VIX Short-Term Futures Index ER (End-of-Day)	SPVXSP	--
S&P 500 VIX Short-Term Futures Index ER (Asian End-of-Day)	SPVSTFAP	--
S&P 500 VIX Short-Term Futures Index TR (Real-Time)	SPVIXSTR	.SPVIXSTR
S&P 500 VIX Short-Term Futures Index TR (End-of-Day)	SPVXSTR	--
S&P 500 VIX Mid-Term Futures Index ER	SPVXMP	.SPVXMP
S&P 500 VIX Mid-Term Futures Index TR (Real-Time)	SPVIXMTR	.SPVIXMTR
S&P 500 VIX Mid-Term Futures Index TR (End-of-Day)	SPVXMTR	--
S&P 500 VIX Futures Term-Structure Index ER	SPVXTSER	.SPXVXTSER
S&P 500 VIX Futures Term-Structure Index TR	SPVXTSTR	--
S&P 500 VIX 2M Futures Index ER	SPVIX2ME	.SPVIX2ME
S&P 500 VIX 2M Futures Index TR	SPVIX2MT	.SPVIX2MT
S&P 500 VIX 3M Futures Index ER	SPVIX3ME	.SPVIX3ME
S&P 500 VIX 3M Futures Index TR	SPVIX3MT	.SPVIX3MT
S&P 500 VIX 4M Futures Index ER	SPVIX4ME	.SPVIX4ME
S&P 500 VIX 4M Futures Index TR	SPVIX4MT	.SPVIX4MT
S&P 500 VIX 6M Futures Index ER	SPVIX6ME	.SPVIX6ME
S&P 500 VIX 6M Futures Index TR	SPVIX6MT	.SPVIX6MT
S&P 500 VIX Front Month Futures Index ER	SPVXFME	.SPVXFME
S&P 500 VIX Front Month Futures Index TR	SPVXFMT	.SPVXFMT
S&P 500 VIX Front Month Futures Index ER (Asian End-of-Day)	SPVFMFAP	--
S&P 500 VIX Front Month Futures Inverse Index ER (Asian End of Day)	SPVFMIAP	--
S&P 500 Dynamic VIX Futures Index ER	SPDVIXE	
S&P 500 Dynamic VIX Futures Index TR	SPDVIXT	
S&P 500 Dynamic VIX Futures Index ER (Official Close)	SPDVIXP	
S&P 500 Dynamic VIX Futures Index TR (Official Close)	SPDVIXTR	
S&P 500 VIX Futures Enhanced Roll Index ER	SPVIXEP	.SPVIXEP
S&P 500 VIX Futures Enhanced Roll Index TR	SPVIXETR	.SPVIXETR
S&P 500 VIX Short-Term Futures Index (0930-1600 ET) (USD) ER	VXXIDSPE	
S&P 500 VIX Short-Term Futures Points-Change Inverse Daily Index ER	SPVXSTI	.SPVXSTI
S&P 500 VIX Short-Term Futures Points-Change Inverse Daily Index TR	SPVXSTIT	.SPVXSTIT

Index Data

Index level data is 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

Methodology Changes

Methodology changes since January 1, 2015, are as follows:

Change	Effective Date (After Close)	Methodology	
		Previous	Updated
Index Name	10/23/2020	S&P 500 VIX Short-Term Futures Index (0930-1615 ET) (USD) ER	S&P 500 VIX Short-Term Futures Index (0930-1600 ET) (USD) ER
Change in VIX Settlement Times	10/23/2020	4:15 PM ET stop time	4:00 PM ET stop time

Appendix II

ESG Disclosures

EXPLANATION OF HOW ENVIRONMENTAL, SOCIAL & GOVERNANCE (ESG) FACTORS ARE REFLECTED IN THE KEY ELEMENTS OF THE BENCHMARK METHODOLOGY[2]		
1.	**Name of the benchmark administrator.**	S&P Dow Jones Indices LLC.
2.	**Underlying asset class of the ESG benchmark.[3]**	N/A
3.	**Name of the S&P Dow Jones Indices benchmark or family of benchmarks.**	S&P DJI Futures Indices Benchmark Statement
4.	**Do any of the indices maintained by this methodology take into account ESG factors?**	No
Appendix latest update:		January 2021

[2] The information contained in this Appendix is intended to meet the requirements of the European Union Commission Delegated Regulation (EU) 2020/1817 supplementing Regulation (EU) 2016/1011 of the European Parliament and of the Council as regards the minimum content of the explanation of how environmental, social and governance factors are reflected in the benchmark methodology and the retained EU law in the UK [The Benchmarks (amendment and Transitional Provision) (EU Exit) Regulations 2019].

[3] The 'underlying assets' are defined in European Union Commission Delegated Regulation (EU) 2020/1816 supplementing Regulation (EU) 2016/1011 of the European Parliament and of the Council as regards the explanation in the benchmark statement of how environmental, social and governance factors are reflected in each benchmark provided and published.

Appendix III

Historical Assumptions

Prior to April 2008, not all consecutive first to seventh month VIX futures were listed. For the purpose of the historical S&P 500 VIX Futures Index series calculations, the following assumptions have been made in interpolating VIX futures contract prices from near-by listed contracts.

When the i^{th} future was not listed, but $i^{th}+1$ and $i^{th}-1$ futures were listed, the following interpolation has been assumed:

$$DCRP_{i,t}{}^2 = DCRP_{i-1,t}{}^2 + \frac{BDays(T_i - T_{i-1})}{BDays(T_{i+1} - T_{i-1})}(DCRP_{i+1,t}{}^2 - DCRP_{i-1,t}{}^2)$$

When i^{th} and $i^{th}+1$ futures were not listed, but $i^{th}+2$ and $i^{th}-1$ futures were listed, the following interpolation has been assumed:

$$DCRP_{i,t}{}^2 = DCRP_{i-1,t}{}^2 + \frac{BDays(T_i - T_{i-1})}{BDays(T_{i+2} - T_{i-1})}(DCRP_{i+2,t}{}^2 - DCRP_{i-1,t}{}^2)$$

When i^{th}, $i^{th}+1$ and $i^{th}+2$ futures were not listed, the following extrapolation has been assumed:

$$DCRP_{i,t}{}^2 = DCRP_{i-1,t}{}^2 + \frac{BDays(T_i - T_{i-1})}{BDays(T_{i-1} - T_{i-2})}(DCRP_{i-1,t}{}^2 - DCRP_{i-2,t}{}^2)$$

where:

T_i = Last Trade Day of the i^{th} VIX Futures contract

BDays = Number of Business days between VIX Futures Last Trade Days

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.

Typically, when S&P DJI creates back-tested index data, S&P DJI uses actual historical constituent-level data (e.g., historical price, market capitalization, and corporate action data) in its calculations. As ESG investing is still in early stages of development, certain datapoints used to calculate certain ESG indices may not be available for the entire desired period of back-tested history. The same data availability issue could be true for other indices as well. In cases when actual data is not available for all relevant historical periods, S&P DJI may employ a process of using "Backward Data Assumption" (or pulling back) of ESG data for the calculation of back-tested historical performance. "Backward Data Assumption" is a process that applies the earliest actual live data point available for an index constituent company to all prior historical instances in the index performance. For example, Backward Data Assumption inherently assumes that companies currently not involved in a specific business activity (also known as "product involvement") were never involved historically and similarly also assumes that companies currently involved in a specific business activity were involved historically too. The Backward Data Assumption allows the hypothetical back-test to be extended over more historical years than would be feasible using only actual data. For more information on "Backward Data Assumption" please refer to the FAQ. The methodology and factsheets of any index that employs backward assumption in the back-tested history

will explicitly state so. The methodology will include an Appendix with a table setting forth the specific data points and relevant time period for which backward projected data was used. Index returns shown do not represent the results of actual trading of investable assets/securities. S&P DJI maintains the index and calculates the index levels and performance shown or discussed but does not manage any assets.

Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the Index or investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. As a simple example, if an index returned 10% on a US $100,000 investment for a 12-month period (or US $10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US $1,650), the net return would be 8.35% (or US $8,350) for the year. Over a three-year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US $5,375, and a cumulative net return of 27.2% (or US $27,200).

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