S&P VIX Futures Indices

Methodology

March 2018
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Introduction

Index Objective

The S&P VIX® Futures Index Series seeks to model the outcome of holding long and/or short positions in \( \text{VIX}^1 \) futures contracts or other volatility indices, as defined below.

Highlights

Historically, the VIX Index has a negative correlation to the S&P 500 and is considered a useful tool to hedge against the potential downside of the broad equity market. While the spot VIX is difficult to replicate as a practical matter, there is a market in VIX futures and options, and investors trade them to express their view on the S&P 500’s implied volatility.

Family

The S&P VIX Futures Index Series is comprised of the following indices:

- **S&P 500 VIX Short-Term Futures Index.** The index measures the return from a daily rolling long position in the first and second month VIX futures contracts.

- **S&P 500 VIX 2M Futures Index.** The index measures the return from a daily rolling long position in the second and third month VIX futures contracts.

- **S&P 500 VIX 3M Futures Index.** The index measures the return from a daily rolling long position in the third and fourth month VIX futures contracts.

- **S&P 500 VIX 4M Futures Index.** The index measures the return from a daily rolling long position in the fourth and fifth month VIX futures contracts.

- **S&P 500 VIX Mid-Term Futures Index.** The index measures the return from a daily rolling long position in the fourth, fifth, sixth and seventh month VIX futures contracts.

- **S&P 500 VIX 6M Futures Index.** The index measures the return from a daily rolling long position in the fifth, sixth, seventh and eighth month VIX futures contracts.

- **S&P 500 VIX Futures Term-Structure Index.** The index measures the return from a long position, with 100% weight, in the S&P 500 VIX Mid-Term Futures Index and a short position, with 50% weight, in the S&P 500 VIX Short-Term Futures Index. The weights are rebalanced daily.

- **S&P 500 VIX Short Term Futures Daily Inverse Index.** The index measures the performance of the inverse of the S&P 500 VIX Short-Term Futures Index.

- **S&P 500 VIX Mid Term Futures Daily Inverse Index.** The index measures the performance of the inverse of the S&P 500 VIX Mid-Term Futures Index.

- **S&P Emerging Markets Volatility Short-Term Futures Index.** The index measures the return from a daily rolling long position in the first and second month CBOE Emerging Markets ETF Volatility Index (VXEEM) futures contracts.

- **S&P 500 VIX Front Month Futures Index.** The index measures the return from a long position in the first VIX futures contract that rolls to the second month contract three days prior to the expiration day.

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1 The VIX® methodology is the property of the Chicago Board Options Exchange ("CBOE"). CBOE has granted Standard & Poor's Financial Services LLC ("S&P"), a license to use the VIX methodology to create the S&P 500 VIX Futures Index.
• **S&P 500 Constant Vega (3%) and (6%) VIX Short Term Futures Indices.** Each index measures the return from a daily rolling long position in the first and second month VIX futures contracts and provides a constant preset vega exposure of 3% and 6%, respectively.

For certain indices, a total return version is calculated which includes interest accrual on the notional value of the index based on the three-month U.S. Treasury rate and reinvestment into the index. For a list of total return indices, please refer to *Index Dissemination*.

**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:

<table>
<thead>
<tr>
<th>Supporting Document</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P Dow Jones Indices’ Index Mathematics Methodology</td>
<td><a href="#">Index Mathematics Methodology</a></td>
</tr>
</tbody>
</table>

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

Approaches

The indices model returns from long VIX futures positions (and/or short positions in other indices, as described in the Introduction) that are rolled continuously throughout the period between futures last trade dates. The total return version of the indices incorporates interest accrual on the notional value of the indices and reinvestment into the indices. Interest accrues based on the three-month U.S. Treasury rate.

- **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 continuously throughout each month from the shorter-term VIX futures contract into the longer-term VIX futures contract. Please refer to Table 1 below.

- **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 continuously 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 Short Term Futures Daily Inverse Index.** The index measures the performance of the inverse of the S&P 500 VIX Short-Term Futures Index.

- **S&P 500 VIX Mid Term Futures Daily Inverse Index.** The index measures the performance of the inverse of the S&P 500 VIX Mid-Term Futures Index.

- **S&P Emerging Markets Volatility Short-Term Futures Index.** The index measures the return from a daily rolling long position in the first and second month VXEEM futures contracts. The index rolls continuously throughout each month from the first month VXEEM futures contract into the second month VXEEM futures contract.

- **S&P 500 VIX Front Month Futures Index.** The index measures the return from a long position in the first VIX futures contract. In the three trading days prior to the futures expiration day, the index rolls to the second month contract, with 1/3 of the portfolio being rolled each day.

- **S&P 500 Constant Vega (3%) and (6%) VIX Short Term Futures Indices.** Each index measures the return from a daily rolling long position in the first and second month VIX futures contracts and provides a constant preset vega exposure of 3% and 6%, respectively. Each index rolls continuously throughout the month to maintain a constant maturity and adjusts its holdings of VIX futures to maintain a constant vega exposure.
Table 1: Underlying contracts and rolling contracts

<table>
<thead>
<tr>
<th>Index</th>
<th>Underlying Contracts</th>
<th>Roll Out (m)</th>
<th>Roll In (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P 500 VIX Short-Term Futures Index</td>
<td>1st, 2nd</td>
<td>1st</td>
<td>2nd</td>
</tr>
<tr>
<td>S&amp;P 500 VIX 2M Futures Index</td>
<td>2nd, 3rd</td>
<td>2nd</td>
<td>3rd</td>
</tr>
<tr>
<td>S&amp;P 500 VIX 3M Futures Index</td>
<td>3rd, 4th</td>
<td>3rd</td>
<td>4th</td>
</tr>
<tr>
<td>S&amp;P 500 VIX 4M Futures Index</td>
<td>4th, 5th</td>
<td>4th</td>
<td>5th</td>
</tr>
<tr>
<td>S&amp;P 500 VIX Mid-Term Futures Index</td>
<td>4th, 5th, 6th, 7th</td>
<td>4th</td>
<td>7th</td>
</tr>
<tr>
<td>S&amp;P 500 VIX 6M Futures Index</td>
<td>5th, 6th, 7th, 8th</td>
<td>5th</td>
<td>8th</td>
</tr>
<tr>
<td>S&amp;P Emerging Markets Volatility Short-Term Futures Index</td>
<td>1st, 2nd</td>
<td>1st</td>
<td>2nd</td>
</tr>
<tr>
<td>S&amp;P 500 VIX Front Month Futures Index</td>
<td>1st</td>
<td>1st</td>
<td>2nd</td>
</tr>
<tr>
<td>S&amp;P 500 Constant Vega (3%) and (6%) VIX Short-Term Futures Indices</td>
<td>1st, 2nd</td>
<td>1st</td>
<td>2nd</td>
</tr>
</tbody>
</table>

Calculation of the VIX/VXEEM Futures Index Excess Return (ER)

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

\[
IndexER_t = IndexER_{t-1} \times (1 + CDR_t) \tag{1}
\]

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:

\[
CDR_t = \frac{TDWO_t}{TDWI_{t-1}} - 1 \tag{2}
\]

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:

\[
TDWO_t = \sum_{i=m}^{n} CRW_{i,t-1} \times DCRP_{i,t} \tag{3}
\]

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

\[
TDWI_{t-1} = \sum_{i=m}^{n} CRW_{i,t-1} \times DCRP_{i,t-1} \tag{4}
\]

where:

\(CRW_{i,t}\) = Contract Roll Weight of the $i^{th}$ VIX/VXEEM Futures Contract on date $t$.

\(DCRP_{i,t}\) = Daily Contract Reference Price of the $i^{th}$ VIX/VXEEM 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 CBOE VIX/VXEEM 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/VXEEM 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 \( (CRW_{it}) \) 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, S&P Emerging Markets Volatility Short-Term Futures Index**

\[
CRW_{mt} = 100 \cdot \frac{dr}{dt}
\]

\[
CRW_{nt} = 100 \cdot \frac{dt - dr}{dt}
\]

where:

\( dt \) = The total number of business days in the current Roll Period beginning with, and including, the starting CBOE VIX/VXEEM Futures Settlement Date and ending with, but excluding, the following CBOE VIX/VXEEM 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/VXEEM 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/VXEEM futures holding is sold and an equal notional amount of the longer-term (\( n^{th} \) month) VIX/VXEEM 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/VXEEM futures contract becomes the new \( m^{th} \) month VIX/VXEEM futures contract and gets sold every day afterward 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.

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

\[
CRW_{mt} = 100 \cdot \frac{dr}{dt}
\]

\[
CRW_{nt} = 100
\]

\[
CRW_{jt} = 100
\]

\[
CRW_{nt} = 100 \cdot \frac{dt - dr}{dt}
\]
After the close on the Tuesday, corresponding to the start of the Roll Period, an equal weight is allocated to the mth, jth, i th and nth month contracts. Then on each subsequent business day a fraction of the shortest term (i.e. mth month) VIX futures holding is sold and an equal notional amount of the longest-term (i.e. nth month) VIX futures is bought. The fraction, or quantity, is proportional to the number of mth 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 mth month contract is progressively moved to the nth 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 mth 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/VXEEM 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:

\[
IndexTR_t = IndexTR_{t-1} \times (1 + CDR_t + TBR_t)
\]  

(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:

\[
TBR_t = \left[ \frac{1}{1 - \frac{91}{360} \times TBAR_{t-1}} \right]^{-1}
\]  

(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:

\[
IndexER_t = IndexER_{t-1} \times (1 + ExcessReturn_t)
\]  

(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

\[ \text{ExcessReturn}_t = (W_{\text{Long}} \times \text{ExcessReturn}_{\text{Long}} - W_{\text{Short}} \times \text{ExcessReturn}_{\text{Short}}) \]  \tag{8} 

where:

- \( W_{\text{Long}} = 100\% \), is the weight of the long position.
- \( \text{ExcessReturn}_{\text{Long}} \) = Excess Return of the long position in S&P 500 VIX Mid-term Futures Index.
- \( W_{\text{Short}} = 50\% \), is the weight of the short position.
- \( \text{ExcessReturn}_{\text{Short}} \) = 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:

\[ \text{IndexTR}_t = \text{IndexTR}_{t-1} \times (1 + \text{ExcessReturn}_t + TBR_t) \]  \tag{9} 

where:

- \( \text{IndexTR}_{t-1} \) = The index's total return on the preceding business day.
- \( \text{ExcessReturn}_t \) = Excess Return, as defined in equation (8).
- \( TBR_t \) = Treasury Bill Return, as defined in equation (6).

Calculation of the VIX Short Term Futures Daily Inverse Excess Return (ER)

The S&P 500 VIX Short Term Futures Daily Inverse Index measures the performance of the inverse of the S&P 500 VIX Short-Term Futures Index. On any S&P 500 VIX Futures Business Day, \( t \), the index ER is calculated as follows:

\[ \text{IndexER}_t = \text{IndexER}_{t-1} \times (1 + \text{ExcessReturn}_t) \]  \tag{10} 

where:

- \( \text{IndexER}_{t-1} \) = The Index Excess Return on the preceding business day, defined as any date on which the index is calculated,

and

\[ \text{ExcessReturn}_t = -1 \times \text{VIXShortTermFuturesCDR}_t \]  \tag{11} 

where:

- \( \text{VIXShortTermFuturesCDR}_t \) = Excess Return of the long position on the S&P 500 VIX Short-term Futures Index, as calculated in (2).

Calculation of the VIX Short Term Futures Daily Inverse 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:

\[ \text{IndexTR}_t = \text{IndexTR}_{t-1} \times (1 + \text{ExcessReturn}_t + TBR_t) \]  \tag{12} 

where:

- \( \text{IndexTR}_{t-1} \) = The index's total return on the preceding business day.
- \( \text{ExcessReturn}_t \) = Excess Return, as defined in equation (11).
- \( TBR_t \) = Treasury Bill Return, as defined in equation (6).
Calculation of the VIX Mid Term Futures Daily Inverse Excess Return (ER)

The S&P 500 VIX Mid Term Futures Daily Inverse Index measures the performance of the inverse of the S&P 500 VIX Mid-Term Futures Index. On any S&P 500 VIX Futures Business Day, \( t \), the index ER is calculated as follows:

\[
IndexER_t = \text{IndexER}_{t-1} \times (1 + \text{ExcessReturn}_t)
\]  
(13)

where:

\( \text{IndexER}_{t-1} \) = The Index Excess Return on the preceding business day, defined as any date on which the index is calculated,

and

\( \text{ExcessReturn}_t = -1 \times VIX\text{MidTermFuturesCDR}_t \)  
(14)

where:

\( VIX\text{MidTermFuturesCDR}_t \) = Excess Return of the long position on the S&P 500 VIX Mid-term Futures Index, as calculated in (2).

Calculation of the VIX Mid Term Futures Daily Inverse 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:

\[
\text{IndexTR}_t = \text{IndexTR}_{t-1} \times (1 + \text{ExcessReturn}_t + \text{TBR}_t)
\]  
(15)

where:

\( \text{IndexTR}_{t-1} \) = The index’s total return on the preceding business day.

\( \text{ExcessReturn}_t \) = Excess Return, as defined in equation (14).

\( \text{TBR}_t \) = Treasury Bill Return, as defined in equation (6).

Calculation of the Constant Vega (3%) and (6%) VIX Short Term Futures Excess Return (ER)

The S&P 500 Constant Vega (3%) and (6%) VIX Short Term Futures Indices ER are calculated as follows:

\[
\text{IndexER}_t = \text{IndexER}_{t-1} + L_{t-1} \times (TDWO_t - TDWI_{t-1})
\]  
(16)

where:

\( TDWO_t \) = Total Dollar Weight Obtained on \( t \), as defined in equation (3)

\( TDWI_t \) = Total Dollar Weight Invested on \( t \), as defined in equation (4)

\( L \) = Weight of the long VIX futures position, calculated as:

\[
L_t = \frac{m}{100} \times \text{IndexER}_t
\]  
(17)

where:

\( m = \text{Constant vega} \)

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.

**Base Date**

The base dates of the S&P 500 VIX Futures indices are December 20, 2005 at base values of 100,000. The base date of the S&P Emerging Markets Volatility Short Term Futures Index is January 17, 2012 at a base value of 100,000.

**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 interpolation has been assumed:

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

where:

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

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

**Currency, Currency Hedged, and Risk Control Indices**

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.*
Index Governance

Index Committee

The Commodities Index Committee maintains the S&P VIX Futures Indices. All members of the Committee are full-time professionals at S&P Dow Jones Indices. The Committee meets quarterly. 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 document.
Index Policy

Announcements

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

Holiday Schedule

The index is calculated daily from 3:00 AM to 4:25 PM New York Time, excluding holidays and weekends.

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

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.

Unscheduled 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 portion 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 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 example provided below:

<table>
<thead>
<tr>
<th>Normal Roll Schedule</th>
<th>ER Calculated Weights</th>
<th>Unscheduled Market Closure</th>
<th>ER Calculated Weights</th>
</tr>
</thead>
<tbody>
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**Delisting of Futures Contracts**

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