

**STANDARD
& POOR'S**

S&P 500 VIX FUTURES INDEX

INDEX METHODOLOGY

January 2009

Table of Contents

Introduction	2
Highlights	2
Family	2
Index Construction	3
Approaches	3
Calculation of the VIX Futures Index Excess Return (ER)	3
Contract Rebalancing	4
Calculation of the VIX Futures Index Total Return (TR)	7
Base Date	7
Historical Assumptions	7
Index Governance	9
Index Committee	9
Index Policy	10
Announcements	10
Holiday Schedule	10
Unscheduled Market Closures and New Holidays	10
Index Dissemination	11
Tickers	11
S&P Contact Information	12
Index Management	12
Media Relations	12
Product Management	12
Index Operations & Business Development	12
Disclaimer	13

Introduction

The S&P 500 VIX Futures Index Series seeks to model the outcome of holding a long position in VIX futures contracts.

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 500 VIX Futures Index Series is comprised of the S&P 500 VIX Short-Term Futures Index and the S&P 500 VIX Mid-Term Futures Index.

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

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

A total return version of each index is calculated, which includes interest accrual on the notional value of the index based on the 3-month US Treasury rate and reinvestment into the index.

Index Construction

Approaches

The Indices model returns from a long VIX futures position that is rolled continuously throughout the period between futures expiration 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 3-month US Treasury rate.

The S&P 500 VIX Short-Term Futures Index measures the return from a rolling long position in the first and second month VIX futures contracts. The index rolls continuously throughout each month from the first month VIX futures contract into the second month VIX futures contract.

The S&P 500 VIX Mid-Term Futures Index measures the return from a rolling long position in the fourth, fifth, sixth and seventh month VIX futures contracts. The index rolls continuously throughout each month from the fourth month contract into the seventh month contract while maintaining positions in the fifth month and sixth month contracts.

Calculation of the VIX Futures Index Excess Return (ER)

On any S&P 500 VIX Futures Business Day, 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 = For the S&P 500 VIX Short-Term Futures Index $m = 1$. For the S&P 500 VIX Mid-Term Futures Index $m = 4$.

n = For the S&P 500 VIX Short-Term Futures Index $n = 2$. For the S&P 500 VIX Mid-Term Futures Index $n = 7$.

Contract Rebalancing

The Roll Period starts 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 Indices are 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 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 Futures Index

$$CRW_{1,t} = 100 * \frac{dr}{dt}$$

$$CRW_{2,t} = 100 * \frac{dt - dr}{dt}$$

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 preceding such a holiday.

At the close on the Tuesday, corresponding to the start of the Roll Period, all of the weight is allocated to the first month contract. Then on each subsequent business day a fraction of the first month VIX futures holding is sold and an equal notional amount of the second month VIX futures is bought. The fraction, or quantity, is proportional to the number of first 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 first month contract is progressively moved to the second month one over the course of the month, until the following Roll Period starts when the old second month VIX futures contract becomes the new first month VIX 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 Futures Index

$$CRW_{4,t} = 100 * \frac{dr}{dt}$$

$$CRW_{5,t} = 100$$

$$CRW_{6,t} = 100$$

$$CRW_{7,t} = 100 * \frac{dt - dr}{dt}$$

At the close on the Tuesday, corresponding to the start of the Roll Period, an equal weight is allocated to the fourth, fifth and sixth month contracts. Then on each subsequent business day a fraction of the fourth month VIX futures holding is sold and an equal notional amount of the seventh month VIX futures is bought. The fraction, or quantity, is proportional to the number of fourth 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 fourth month contract is progressively moved to the seventh month contract over the course of the month, until the following Roll Period start when the old fifth month VIX futures contract becomes the new fourth 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.

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 3-month US 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:

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

$Delta_t$ = 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. The Bloomberg ticker is USB3MTA.

Base Date

The base dates of the S&P 500 VIX Short-Term Futures and the S&P 500 VIX Mid-Term Futures Indices are December 20, 2005 at base values 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:

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

where:

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

$BDays$ = Number of Business days between VIX Futures Expiration Days

Index Governance

Index Committee

The S&P 500 VIX Futures Index Committee maintains the S&P 500 VIX Futures Index. The Index Committee meets regularly. At each meeting, the Index Committee reviews any significant market events. In addition, the Index Committee may revise index policy for timing of rebalancings or other matters.

Standard & Poor's considers information about changes to its Indices and related matters to be potentially market moving and material. Therefore, all Index Committee discussions are confidential.

Index Policy

Announcements

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

Holiday Schedule

The index is calculated daily when the CBOE Futures Exchange is open, excluding holidays and weekends.

Unscheduled Market 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, Standard & Poor's will calculate 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 will be carried to the next CBOE business day as described in the Contract Rebalancing section. If an exchange fails to open due to unforeseen circumstances, Standard & Poor's may determine not to publish the index for that day.

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

Delisting of Futures Contracts

If one or more futures contracts included in one of the Indices is no longer listed, Standard & Poor's may choose to cease publication of the effected index at that time.

Index Dissemination

Historical index returns are available through Standard & Poor's index data group for subscription via FTP.

Tickers

	Bloomberg	Reuters
S&P 500 VIX Short-Term Futures Index ER	SPVXSP	.SPVIXSP
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	.SPVIXSTR
S&P 500 VIX Mid-Term Futures Index ER	SPVXMP	.SPVIXMP
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	.SPVIXMTR

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