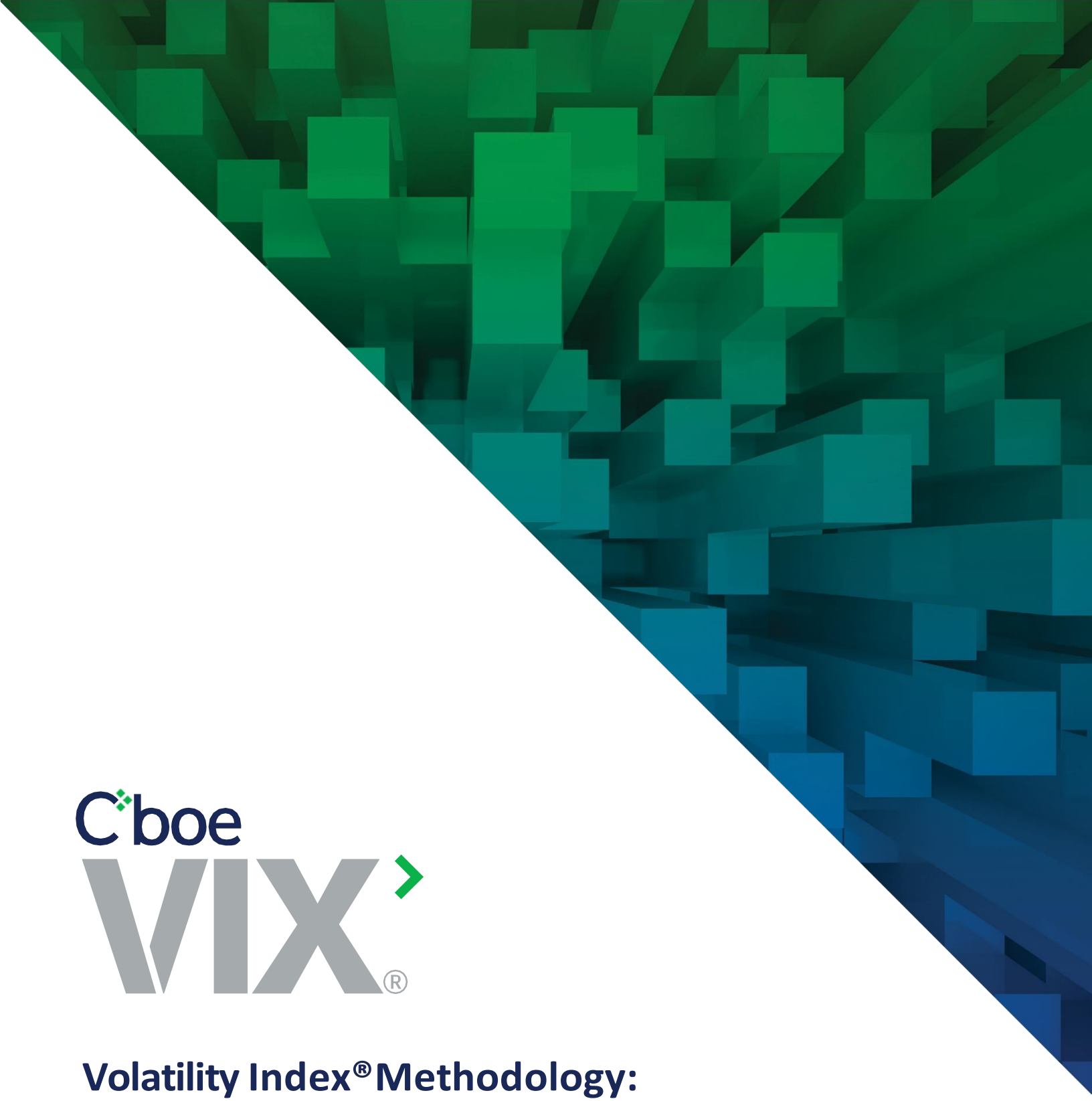

Volatility Index® Methodology:

Selected SPX® Target Expected Volatility Term Indices

Contents

Introduction

In 1993, Cboe Global Markets, Incorporated® (Cboe®) introduced the Cboe Volatility Index® (VIX® Index). Originally designed to measure the market's expectation of 30-day volatility implied by at-the-money S&P 100® Index (OEX® Index) option prices, the VIX Index soon became the premier benchmark for U.S. stock market volatility. It is regularly featured in the Wall Street Journal, Barron's, and other leading financial publications, as well as business news shows on CNBC, Bloomberg TV, and CNN/Money, where the VIX Index is often referred to as the "fear gauge."

Ten years later in 2003, Cboe collaborated with Goldman Sachs to update the VIX Index. The changes reflected a new way to measure expected volatility, a methodology that continues to be widely used by financial theorists, risk managers, and volatility traders alike. The new VIX Index is based on the S&P 500® Index, the core index for U.S. equities, and estimates expected volatility by aggregating the weighted prices of S&P 500 Index puts and calls (SPX™ options) over a wide range of strike prices. By supplying a script for replicating volatility exposure with a portfolio of SPX options, this new methodology transformed the VIX Index from an abstract concept into a practical standard for trading and hedging volatility.

In response to the widespread embracing of the VIX Index by market participants, Cboe Global Indices (CGI) expanded its offering of volatility indices that employ the VIX calculation methodology to other assets. These include exchange-traded funds (ETFs), equities, other broad-based indices. Also, additional target expected volatility timeframes based on SPX options, as well as ancillary volatility indices that support volatility indices, were introduced. While these volatility indices employ the VIX calculation methodology, in many cases they incorporate attributes that differ from the VIX Index.

This white paper is intended to describe the methodology used to calculate volatility indices that are based on the S&P 500® Index, which use a variety or target expected volatility terms. The target expected volatility terms (i.e., constant maturity term) include: 9-day, 30-day (using only monthly SPX options) three-month, six-month and one-year.

- Each volatility index is comprised of two option contracts that each have a different expiration date, and
- Each of the two option contracts is broken down into "near-term" and "next term" expirations.

These attributes, among others, define how the set of the eligible series (for each of the two option contracts and the near-term and far-term expirations of each option contract) is determined for a given volatility index.

This document provides the step-by-step calculation, including, among other things, identification of the constant maturity term and how to select the two option contracts and the near-term and far-term expirations for each option contract, for a given volatility index that is based on the S&P 500® Index, which uses a variety or target expected volatility term.

Supporting Documents

This white paper references and should be read in conjunction with the following document(s):

Cboe Volatility Mathematics Methodology

Volatility Indices

The methodology used for these calculations is the same as that used for the VIX® Index. What differentiates these volatility indices are their respective attributes. Below is a list of the indices and their respective attributes are covered in this document.

Index Symbol	Description
VIXMO	CBOE Standard Monthly Only 30-day Volatility Index

Contracts Used and Exclusion criteria for the Near and Next terms

The table below provides the attributes used for the near and next term selection for a given volatility index.

Index	Constant Maturity	Set of Contracts Used for Constituent Series Selection	Exclusion Criteria
VIXMO	30 days	AM-settled SPX option contracts	Series excluded if Days to Expiration is Less than 7 Days

Table Key

- Constant Maturity: reflects the target expected volatility term
- Set of Contracts Used for Constituent Series Selection: provides the initial set of series that are candidates for the near and next term selection
- Exclusion Criteria: determines rules for excluding terms from the initial set of contracts prior to Constituent Series Selection step

Market Data

The table below provides the source of the market data for all options series used in the volatility index calculation. The market data used can be sourced from a specific exchange, from a subset of exchanges or from among all available exchanges or trading venues reflecting the National Best Bid/Offer (NBBO) quotes.

Index	Market data source
VIXMO	C1 only

Calculation and Dissemination

The calculation and dissemination of volatility index values is determined by trading session, e.g., regular trading hour (RTH), global trading hours (GTH) or both. The trading session(s) and approximate dissemination and calculation time periods are listed below. These times may be modified due to shortened shorted trading sessions, e.g., shortened holiday trading hours. Calculation and dissemination occur approximately four times per minute.

Index	Trading Session(s)	Approximate Calculation and Dissemination Time Period
VIXMO	RTH	Between 9:31 a.m. and 4:15 p.m. ET

The Volatility Index Calculation: Step-by-Step

Stock indices, such as the S&P 500 Index, are calculated using the prices of their component stocks. Each index employs rules that govern the selection of component securities and a formula to calculate index values.

The Volatility Index presented below is an index comprised of options rather than stocks, with the price of each option reflecting the market's expectation of future volatility. Like conventional indexes, the Volatility Index calculation employs rules for selecting component options and a formula to calculate index values.

The generalized formula used in the Volatility Index calculation[§] is:

$$\sigma^2 = \frac{2}{T}\sum_i \frac{\Delta K_i}{K_i^2} e^{RT} Q(K_i) - \frac{1}{T}\left[\frac{F}{K_0} - 1\right]^2 \quad (1)$$

where

σ	$Vol\ index = \sigma \times 100$
T	Time to expiration (in years)
F	Option-implied forward price
K_0	First strike equal to or otherwise immediately below the forward index level, F
K_i	Strike price of the i^{th} out-of-the-money option; a call if $K_i > K_0$ and a put if $K_i < K_0$; both put and call if $K_i = K_0$.
ΔK_i	Interval between strike prices – half the difference between the strike on either side of K_i: $\Delta K_i = \frac{K_{i+1} - K_{i\_1}}{2}$
R	Risk-free interest rate to expiration
$Q(K_i)$	The midpoint of the bid-ask spread for each option with strike K_i.

This volatility Index measures a constant-maturity expected volatility of the S&P 500 Index. The calculation takes as inputs the market prices of SPX options and/or weekly SPX (SPXW) options as well as U.S. Treasury yield curve rates. The constant-maturity volatility Index value can be obtained by following the four steps below:

Step 1. Select the Near- and Next-Term

The inputs required for this step are provided in the subsection "Set of contracts used for near- and next-term selection" within the section "Volatility indices" of this document. This subsection provides the set of contracts used for Constituent Series Selection, the exclusion criteria used in each set of contracts and the constant maturity term for a given volatility index. For each index below, apply the rules for selecting the correct near- and next-terms found in the corresponding section listed below within the Cboe Volatility Index Mathematics Methodology.

Index	Constituent Series Selection
VIXMO	1(b) Nearest Term Method

[§] Please see "More than you ever wanted to know about volatility swaps" by Kresimir Demeterfi, Emanuel Derman, Michael Kamal, and Joseph Zou, Goldman Sachs Quantitative Strategies Research Notes, March 1999.

Step 2. Calculate the Interest Rates

The risk-free interest rates, R_1 and R_2, are based on U.S. Treasury yield curve rates (commonly referred to as "Constant Maturity Treasury" rates, or CMTs), to which a cubic spline is applied to derive yields on the expiration dates of relevant SPX options. As such, the Volatility Index calculation may use different risk-free interest rates for near- and next-term options. The rules for calculating the interest rates for the near- and next-terms can be found in section 2(a) Interest Rate Calculation – Bounded Cubic Spline Interpolation of the Cboe Volatility Index Mathematics Methodology.

Step 3. Calculate the Single Term Variances

The inputs for calculating the variances for both terms are based on the options series defined in Step 1. These include the corresponding bid, ask, and options price for each options series, where options price is defined as the midpoint of the bid / ask quotes, and the corresponding interest rates are defined in Step 2. Given these inputs, the variances for the near and next terms can be calculated by following the steps outlined in section 3(a) Volatility Index Calculation – Single Term of the Cboe Volatility Index Mathematics Methodology.

Step 4. Calculate the Volatility Index

The inputs for calculating the Volatility Index are based on the near and next term expiration dates defined in Step 1, the variances for each term calculation calculated in Step 3, and the corresponding constant maturity term provided in the subsection "Set of contracts used for near- and next-term selection" within the section "Volatility indices" of this document. Given these inputs, the Volatility Index can be calculated by following the steps outlined in section 3(b) Volatility Index Calculation – Constant Maturity Term of the Cboe Volatility Index Mathematics Methodology document.

Sample Calculation for the Volatility Index

In this section, we implement a sample calculation for the VIXMO Index using the process outlined in the section The Volatility Index Calculation: Step-by-Step.

- **Select the Near- and Next-Term Constituent Series**

  In this hypothetical example, assume that the calculation is performed on the trading day of August 2nd, 2022, at 10:45:15 a.m. ET. Given the inputs described in the Step 1 of the The Volatility Index Calculation: Step-by-Step section, and the methodology in the section 1(b) of the Cboe Volatility Index Mathematics Methodology, the selected terms for this calculation are the "standard" SPX options expiring on August 19th, 2022, for the near term and the "standard" SPX options expiring on September 16th, 2022, for the next term. In this example, the near-term SPX constituent series expire in 17 calendar days and the next-term SPX constituent series expire in 45 calendar days.

- **Calculate the Interest Rates**

  Assume that the yield curve rates provided below are available on August 01st, 2022 at the end of the day.

Date	1 Mo	2 Mo	3 Mo	6 Mo	1 Yr	2 Yr	3 Yr	5 Yr	7 Yr	10 Yr	20 Yr	30 Yr
8/1/2022	0.41	0.71	0.9	1.49	2.1	2.73	2.93	3.01	3.04	2.99	3.26	3.07

  Given these yield curve rates, and the rules outlined in the section 1(a) of the Cboe Volatility Index Mathematics Methodology, the results are R_1 = 0.2898% for the near-term options and R_2 = 0.5808% for the next-term options.

Calculate the Single Term Variances

Time to Expiration

Note that "standard" SPX options are deemed to expire at the open of trading (i.e., 9:30 a.m. ET) on SPX settlement day (the third Friday of the month or the day before if Holiday). "Weekly" SPXW options are deemed to expire at the close of trading (i.e., 4:00 p.m. ET).

Following the steps in Time to Expiration of section 3(a) Volatility Index Calculation – Single Term in the Cboe Volatility Index Mathematics Methodology and applying 10:45:15 a.m. ET as the time of the calculation, the time to expiration for the near-term and next-term options, T_1 and T_2, respectively, is:

$$T_1 = 24{,}404 \,/\, 525{,}600 = \ 0.0464307$$

$$T_2 = 64{,}724 \,/\, 525{,}600 = \ 0.1231431$$

Forward Price and K_0

Using the call and put prices for the near-term and next-term options below and following the steps in Forward Price and K_0 in section 3(a) Volatility Index Calculation – Single Term of the Cboe Volatility Index Mathematics Methodology, we can calculate the forward price and K_0.

• Near-Term Options			
Strike Price	**Call**	**Put**	**Difference**
1940	38.45	15.25	23.20
1945	34.70	16.55	18.15
1950	31.10	18.25	12.85
1955	27.60	19.75	7.85
1960	24.25	21.30	2.95
1965	**21.05**	**23.15**	**2.10**
1970	18.10	25.05	6.95
1975	15.25	27.30	12.05
1980	12.75	29.75	17.00

• Next-Term Options			
Strike Price	**Call**	**Put**	**Difference**
1940	41.05	18.80	22.25
1945	37.45	20.20	17.25
1950	34.05	21.60	12.45
1955	30.60	23.20	7.40
1960	**27.30**	**24.90**	**2.40**
1965	24.15	26.90	2.75
1970	21.10	28.95	7.85
1975	18.30	31.05	12.75
1980	15.70	33.50	17.80

The ATM strike for the near-term options is **1965** and the ATM strike for the next-term options is **1960**. Applying their respective call and put prices to the formula

$$F = \text{Strike Price} \ + \ e^{RT} \ \times (\text{Call Price} - \text{Put Price})$$

gives that the forward index prices, F_1 and F_2, for the near- and next-term options, respectively, are:

$$F_1 = 1965 + e^{(0.002898 \times 0.0464307)} \times (21.05 - 23.15) = 1962.89972$$

$$F_2 = 1960 + e^{(0.005808 \times 0.1231431)} \times (27.30 - 24.90) = 1962.40172$$

We have then that K_0, the strike price equal to or immediately below the forward index level F, is **1960** for the near-term options and **1960** for the next-term options.

Strike Selection

To determine the strikes to be included in this calculation, refer to the steps in Strike Selection of section 3(a) Volatility Index Calculation – Single Term in the Cboe Volatility Index Mathematics Methodology.

First, for each term, select out-of-the-money put options with strike prices less than K_0. Start with the put strike immediately lower than K_0 and move to successively lower strike prices. Exclude any put option that has a bid price equal to zero (i.e., no bid). As shown below, once two puts with consecutive strike prices are found to have zero bid prices, exclude the observed put(s) and consider no puts with lower strikes for inclusion. (Note that the 1350 and 1355 put options are not included despite having non-zero bid prices.)

Put Strike	Bid	Ask	Include?
1345	0	0.15	Not considered following two zero bids
1350	**0.05**	**0.15**	
1355	**0.05**	**0.35**	
1360	0	0.35	No
1365	0	0.35	No
1370	0.05	0.35	Yes
1375	0.1	0.15	Yes
1380	0.1	0.2	Yes

Next, select out-of-the-money call options with strike prices greater than K_0. Start with the call strike immediately higher than K_0 and move to successively higher strike prices, excluding call options that have a bid price of zero (i.e., no bid). As with the puts, once two call options with consecutive strike prices are found to have zero bid prices, exclude the observed call(s) and consider no calls with higher strikes for inclusion. (Note that the 2225 call option is not included despite having a non-zero bid price.)

Call Strike	Bid	Ask	Include?
2095	0.05	0.35	Yes
2100	0.05	0.15	Yes
2120	0	0.15	No
2125	0.05	0.15	Yes
2150	0	0.1	No
2175	0	0.05	No
2200	0	0.05	Not considered following two zero bids
2225	**0.05**	**0.1**	
2250	0	0.05	

Finally, select **both** the put and call with strike price K_0. Notice that two options are selected at K_0, while a single option, either a put or a call, is used for every other strike price.

The following tables contain the options used to calculate the VIXMO Index in this example. This calculation uses the midpoint of quoted bid and ask prices for each option selected. The K_0 put and call prices are averaged to produce a single value. The price used for the 1960 strike in the near-term is, therefore, (24.25 + 21.30) / 2 = 22.775. The price used for the 1960 strike in the next term is (27.30 + 24.90) / 2 = 26.10.

Near-Term Strike	Option Type	Midpoint Price
1370	Put	0.2
1375	Put	0.125
1380	Put	0.15
.	.	.
1950	Put	18.25
1955	Put	19.75
1960	**Put/Call Average**	**22.775**
1965	Call	21.05
1970	Call	18.1
.	.	.
2095	Call	0.2
2100	Call	0.1
2125	Call	0.1

Next-Term Strike	Option Type	Midpoint Price
1275	Put	0.075
1325	Put	0.15
1350	Put	0.15
.	.	.
1950	Put	21.60
1955	Put	23.20
1960	**Put/Call Average**	**26.10**
1965	Call	24.15
1970	Call	21.10
.	.	.
2125	Call	0.1
2150	Call	0.1
2200	Call	0.08

Calculating Volatility

The VIXMO Index is an amalgam of the information reflected in the prices of all of the selected options. The contribution of a single option to the VIXMO Index value is proportional to ΔK and the price of that option, and inversely proportional to the square of the option's strike price.

Referring to Calculating Volatility of section 3(a) Volatility Index Calculation – Single Term of the Cboe Volatility Index Mathematics Methodology, we generally have that ΔK_i is half the difference between the strike prices on either side of K_i. For example, the ΔK for the next-term 1325 Put is 37.5: $\Delta K_{1325\ \text{Put}}$ = (1350 – 1275) / 2. At the upper and lower edges of any given strip of options, ΔK_i is simply the difference between K_i and the adjacent strike price. In this example, the 1370 Put is the lowest strike in the strip of near-term options and 1375 is the adjacent strike. Therefore, $\Delta K_{1370\ \text{Put}}$ = 5 (i.e., 1375 – 1370).

The contribution of the near-term 1370 Put is given by:

$$\frac{\Delta K_{1370\ Put}}{K^2_{1370\ Put}}\ e^{R_1 T_1} Q(1370\ Put)$$

$$\frac{\Delta K_{1370\ Put}}{K^2_{1370\ Put}}\ e^{R_1 T_1} Q(1370\ Put) = \frac{5}{(1370)^2}\ e^{0.002898\ (\ 0.0464307)}(0.2) = 0.0000005329$$

A similar calculation is performed for each option. The resulting values for the near-term options are then summed and multiplied by $2/T_1$. Likewise, the resulting values for the next-term options are summed and multiplied by $2/T_2$. The tables below summarize the results for each set of options.

Near-Term Strike	Option Type	Midpoint Price	Contribution by Strike
1370	Put	0.2	0.0000005329
1375	Put	0.125	0.0000003306
1380	Put	0.15	0.0000003939
.	.	.	.
1950	Put	18.25	0.0000240006
1955	Put	19.75	0.0000258406
1960	**Put/Call Average**	**22.775**	**0.0000296466**
1965	Call	21.05	0.0000272619
1970	Call	18.1	0.0000233225
.	.	.	.
2095	Call	0.2	0.0000002279
2100	Call	0.1	0.0000003402
2125	Call	0.1	0.0000005537
$\frac{2}{T_1}\sum_i \frac{K_i}{K_i^2} e^{R_1 T_1} Q(K_i)$			**0.027229**

Next-Term Strike	Option Type	Midpoint Price	Contribution by Strike
1275	Put	0.075	0.0000023085
1325	Put	0.15	0.0000032063
1350	Put	0.15	0.0000020591
.	.	.	.
1950	Put	21.6	0.0000284227
1955	Put	23.2	0.0000303721
1960	**Put/Call Average**	**26.1**	**0.0000339945**
1965	Call	24.15	0.0000312948
1970	Call	21.1	0.0000272039
.	.	.	.
2125	Call	0.1	0.0000005540
2150	Call	0.1	0.0000008118
2200	Call	0.075	0.0000007753
$\frac{2}{T_2}\sum_i \frac{K_i}{K_i^2} e^{R_2 T_2} Q(K_i)$			**0.013512**

Next calculate $^1/_T\left[^F/_{K_0} - 1\right]^2$ for the near-term (T_1) and next-term (T_2):

$$\frac{1}{T_1}\left[\frac{F_1}{K_{0,1}} - 1\right]^2 = \frac{1}{0.0464307}\left[\frac{1962.89972}{1960} - 1\right]^2 = 0.00004714$$

$$\frac{1}{T_2}\left[\frac{F_2}{K_{0,2}} - 1\right]^2 = \frac{1}{0.1231431}\left[\frac{1962.40172}{1960} - 1\right]^2 = 0.00001219$$

Now calculate σ^2_1 and σ^2_2:

$$\sigma_1^2 = \frac{2}{T_1}\sum_i \frac{\Delta K_i}{K_i^2} e^{R_1 T_1} Q(K_i) - \frac{1}{T_1}\left[\frac{F_1}{K_{0,1}} - 1\right]^2 = 0.027229 - 0.00004714 = 0.027181520$$

$$\sigma_2^2 = \frac{2}{T_2}\sum_i \frac{\Delta K_i}{K_i^2} e^{R_2 T_2} Q(K_i) - \frac{1}{T_2}\left[\frac{F_2}{K_{0,2}} - 1\right]^2 = 0.013512 - 0.00001219 = 0.013500154$$

Calculate the VIXMO Index

The VIXMO Index value is now calculated by following section 3(b) Volatility Index Calculation – Constant Maturity Term of the Cboe Volatility Index Mathematics Methodology. First, calculate the 30-day weighted average of σ^2_1 and σ^2_2. Then take the square root of that value and multiply by 100:

$$VIXMO = 100 \times \sqrt{\left\{0.0464307 \times 0.027181520 \times \left[\frac{64,724 - 43,200}{64,724 - 24,404}\right] + 0.1231431 \times 0.013500154 \times \left[\frac{43,200 - 24,404}{64,724 - 24,404}\right]\right\} \times \frac{525,600}{43,200}}$$

VIXMO = 100 × 0.132762809 = 13.28

Volatility Index Filtering Algorithm

As described above, "spot" Volatility Index values are based on the average of SPX/SPXW option bid / ask quotes ("mid-quote" prices), and only options that have a non-zero bid price are included. The bid-ask spread is generally accepted as a current indication of market price, and the average of the bid and ask quotes can be thought of as an indication of "fair" value. Spot Volatility Index values are calculated using mid-quote options prices.

From time to time, options price quotations widen due to changing market conditions, technology failures, or other reasons. When this occurs, options that were previously included in a Volatility Index value calculation might be excluded due to them now having a zero bid price. In other instances, the mid-quote prices of one or more SPX/SPXW options might materially change.This can result in a Volatility Index value that, while accurately reflecting SPX/SPXW options quotes at the time, may not reflect the expected volatility of the S&P 500 Index. Cboe uses a filtering algorithm to address these circumstances.

For the rules that guide this filtering process, refer to the details given in section "4. Index Level Filtering Algorithm" of the Cboe Volatility Index Mathematics Methodology. The inputs itemized below apply to the Volatility Index:

Index	Session	Threshold Level (x)	Threshold Period
VIXMO	RTH	0.50 volatility points	2 minutes

Exception when Volatility Index cannot be calculated

In the even the Volatility index cannot be calculated, the last calculated and disseminated Spot Volatility Index is republished until a new valid spot Volatility Index can be calculated. The conditions that would prevent volatility index from being calculated can be found on section 3(a) Volatility Index Calculation – Single Term of the Cboe Volatility Index Mathematics Methodology. A summary can also be found in the subsection 4(b) The Republication of Last Valid Spot Volatility Index Value - Volatility Index Cannot be Calculated of the Cboe Volatility Index Mathematics Methodology.

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Appendix 1: Complete SPX/SPXW Option Data Used in Sample Volatility Index Calculation

Option series included in the Volatility Index calculation are highlighted.

Near-Term Options				
Strike	Calls		Puts	
	Bid	Ask	Bid	Ask
800	1160.90	1164.40	0.00	0.10
900	1060.90	1064.50	0.00	0.10
1000	961.00	964.50	0.00	0.10
1050	911.00	914.50	0.00	0.10
1100	861.00	864.60	0.00	0.05
1125	836.00	839.60	0.00	0.05
1150	811.00	814.60	0.00	0.05
1175	786.10	789.60	0.00	0.05
1200	761.10	764.60	0.00	0.05
1220	741.10	744.60	0.00	0.10
1225	736.10	739.60	0.00	0.05
1240	721.10	724.60	0.00	0.10
1250	711.10	714.60	0.00	0.05
1260	701.10	704.60	0.00	0.10
1270	691.10	694.60	0.00	0.10
1275	686.10	689.60	0.00	0.10
1280	681.10	684.60	0.00	0.10
1290	671.10	674.70	0.00	0.10
1300	661.10	664.70	0.05	0.10
1305	656.10	659.70	0.00	0.10
1310	651.10	654.70	0.00	0.10
1315	646.10	649.70	0.00	0.10
1320	641.20	644.70	0.00	0.10
1325	636.20	639.70	0.05	0.10
1330	631.20	634.70	0.00	0.10
1335	626.20	629.70	0.00	0.15
1340	621.20	624.70	0.00	0.15
1345	616.20	619.70	0.00	0.15
1350	611.20	614.70	0.05	0.15
1355	606.20	609.70	0.05	0.35
1360	601.20	604.70	0.00	0.35
1365	596.20	599.70	0.00	0.35
1370	591.20	594.70	0.05	0.35
1375	586.20	589.70	0.10	0.15
1380	581.20	584.70	0.10	0.20
1385	576.20	579.70	0.10	0.35
1390	571.20	574.70	0.10	0.35
1395	566.20	569.70	0.10	0.15
1400	561.20	564.80	0.10	0.15
1405	556.20	559.80	0.00	0.35
1410	551.20	554.80	0.05	0.40
1415	546.20	549.80	0.00	0.40
1420	541.20	544.80	0.05	0.40
1425	536.30	539.80	0.15	0.20

Next-Term Options				
Strike	Calls		Puts	
	Bid	Ask	Bid	Ask
1225	735.90	738.80	0.00	0.10
1250	710.80	713.80	0.00	0.10
1275	686.00	688.70	0.05	0.10
1300	660.90	663.80	0.00	0.10
1325	635.90	638.60	0.10	0.20
1350	610.90	613.60	0.10	0.20
1375	585.90	588.70	0.10	0.25
1400	561.00	563.70	0.15	0.25
1425	536.00	538.80	0.20	0.30
1450	511.10	513.80	0.25	0.35
1475	486.10	488.90	0.30	0.40
1500	461.20	464.00	0.35	0.45
1510	451.30	454.00	0.35	0.50
1520	441.30	444.00	0.40	0.50
1525	436.30	439.10	0.40	0.55
1530	431.30	434.10	0.45	0.55
1540	421.40	424.10	0.45	0.60
1550	411.40	414.20	0.50	0.60
1555	406.40	409.20	0.50	0.65
1560	401.40	404.20	0.55	0.65
1565	396.50	399.20	0.55	0.70
1570	391.20	394.00	0.60	0.70
1575	386.50	389.30	0.60	0.75
1580	381.50	384.30	0.60	0.75
1585	376.60	379.30	0.65	0.75
1590	371.30	374.10	0.65	0.80
1595	366.60	369.40	0.70	0.80
1600	361.60	364.40	0.70	0.85
1605	356.70	359.40	0.75	0.85
1610	351.70	354.50	0.75	0.90
1615	346.70	349.50	0.80	0.90
1620	341.80	344.50	0.80	0.95
1625	336.80	339.50	0.85	0.95
1630	331.80	334.60	0.90	1.00

Near-Term Options (cont.)				
Strike	Calls		Puts	
	Bid	Ask	Bid	Ask
1430	531.30	534.80	0.05	0.40
1435	526.30	529.80	0.15	0.40
1440	521.30	524.80	0.05	0.30
1445	516.30	519.80	0.05	0.40
1450	511.30	514.80	0.15	0.25
1455	506.30	509.80	0.05	0.45
1460	501.30	504.80	0.05	0.45
1465	496.30	499.80	0.05	0.45
1470	491.30	494.80	0.05	0.45
1475	486.30	489.90	0.15	0.25
1480	481.30	484.90	0.05	0.45
1485	476.30	479.90	0.20	0.50
1490	471.30	474.90	0.05	0.30
1495	466.40	469.90	0.05	0.50
1500	461.40	464.90	0.25	0.40
1505	456.40	459.90	0.30	0.35
1510	451.40	454.90	0.05	0.55
1515	446.40	449.90	0.05	0.55
1520	441.40	445.00	0.10	0.60
1525	436.40	440.00	0.30	0.40
1530	431.40	435.00	0.05	0.60
1535	426.40	430.00	0.10	0.65
1540	421.40	425.00	0.10	0.65
1545	416.50	420.00	0.10	0.65
1550	411.50	415.00	0.30	0.70
1555	406.50	410.10	0.15	0.70
1560	401.50	405.10	0.15	0.70
1565	396.50	400.10	0.15	0.70
1570	391.50	395.10	0.20	0.75
1575	386.50	390.10	0.35	0.75
1580	381.50	385.10	0.25	0.80
1585	376.60	380.20	0.25	0.80
1590	371.60	375.20	0.25	0.80
1595	366.60	370.20	0.25	0.80
1600	361.60	365.20	0.50	0.85
1605	356.60	360.30	0.30	0.85
1610	351.60	355.30	0.35	0.90
1615	346.70	350.30	0.35	0.90
1620	341.70	345.30	0.35	0.90
1625	336.70	340.40	0.40	0.95
1630	331.70	335.40	0.40	0.95
1635	326.70	330.40	0.45	1.00
1640	321.80	325.40	0.45	1.00
1645	316.80	320.50	0.50	1.05
1650	311.80	315.50	0.50	0.85
1655	306.80	310.50	0.55	1.10
1660	301.90	305.60	0.55	1.10
1665	296.90	300.60	0.60	1.15

Next-Term Options (cont.)				
Strike	Calls		Puts	
	Bid	Ask	Bid	Ask
1635	326.90	329.60	0.90	1.05
1640	321.90	324.70	0.95	1.05
1645	316.90	319.70	0.95	1.10
1650	312.00	314.70	1.00	1.15
1655	307.00	309.80	1.05	1.15
1660	302.10	304.80	1.10	1.20
1665	297.10	299.90	1.15	1.25
1670	292.20	294.90	1.15	1.30
1675	287.20	289.90	1.20	1.35
1680	282.30	285.00	1.25	1.40
1685	277.30	280.10	1.30	1.45
1690	272.40	275.10	1.35	1.50
1695	267.40	270.20	1.40	1.55
1700	262.50	265.20	1.45	1.60
1705	257.50	260.30	1.50	1.70
1710	252.60	255.30	1.60	1.75
1715	247.70	250.40	1.65	1.80
1720	242.70	245.50	1.70	1.90
1725	237.80	240.60	1.75	1.95
1730	232.90	235.60	1.85	2.00
1735	228.00	230.70	1.90	2.10
1740	223.40	225.30	2.00	2.20
1745	218.50	220.40	2.10	2.25
1750	213.60	215.50	2.20	2.35
1755	208.70	210.60	2.30	2.45
1760	203.80	205.70	2.40	2.55
1765	198.90	200.80	2.50	2.65
1770	194.00	195.90	2.65	2.80
1775	189.20	191.10	2.75	2.90
1780	184.30	185.80	2.90	3.10
1785	179.40	180.90	3.00	3.20
1790	174.60	176.10	3.10	3.40
1795	169.70	171.20	3.30	3.60
1800	164.90	166.40	3.50	3.70
1805	160.10	161.60	3.70	3.90
1810	155.30	156.70	3.80	4.10
1815	150.50	152.00	4.10	4.30
1820	145.70	147.20	4.30	4.50
1825	140.90	142.40	4.50	4.80
1830	136.20	137.70	4.80	5.00
1835	131.50	132.90	5.00	5.30
1840	126.80	128.20	5.30	5.60
1845	122.10	123.50	5.60	5.90
1850	117.40	118.80	5.90	6.20
1855	112.80	114.20	6.30	6.60
1860	108.20	109.60	6.60	6.90
1865	103.60	105.00	7.00	7.30

Near-Term Options (cont.)				
Strike	Calls		Puts	
	Bid	Ask	Bid	Ask
1670	291.90	295.70	0.60	1.15
1675	287.00	290.70	0.65	1.20
1680	282.00	285.70	0.70	1.25
1685	277.00	280.80	0.75	1.30
1690	272.10	275.80	0.75	1.30
1695	267.10	270.90	0.80	1.35
1700	262.10	265.90	0.85	1.40
1705	257.20	261.00	0.85	1.40
1710	252.20	256.00	0.90	1.45
1715	247.30	251.10	0.95	1.50
1720	242.30	246.10	1.00	1.55
1725	237.40	241.20	1.05	1.60
1730	232.40	236.30	1.10	1.65
1735	227.50	231.30	1.15	1.70
1740	222.50	226.40	1.20	1.75
1745	217.60	221.50	1.25	1.85
1750	212.60	216.60	1.30	1.90
1755	207.70	211.60	1.40	1.95
1760	202.80	206.70	1.45	2.05
1765	197.80	201.80	1.50	2.15
1770	192.90	196.90	1.60	2.20
1775	188.00	192.00	1.65	2.35
1780	183.10	187.10	1.75	2.40
1785	178.20	182.20	1.85	2.50
1790	173.30	177.30	1.90	2.60
1795	168.40	172.40	2.00	2.75
1800	163.50	167.50	2.15	2.90
1805	158.60	162.60	2.25	3.00
1810	153.80	157.80	2.35	3.20
1815	148.90	152.90	2.50	3.40
1820	144.10	148.10	2.65	3.50
1825	139.20	143.30	3.00	3.60
1830	134.40	138.40	3.00	3.90
1835	129.60	133.60	3.20	4.10
1840	124.80	128.80	3.40	4.40
1845	120.10	124.10	3.60	4.60
1850	115.40	119.30	3.80	4.90
1855	110.60	114.60	4.10	5.20
1860	105.90	109.90	4.40	5.50
1865	101.30	105.20	4.70	5.80
1870	96.60	100.50	5.00	6.20
1875	92.00	95.90	5.40	6.60
1880	87.40	91.30	5.80	7.00
1885	82.90	86.70	6.20	7.50
1890	78.40	82.20	6.70	8.00
1895	74.00	77.70	7.20	8.60
1900	69.60	73.20	7.80	8.80
1905	66.00	68.50	8.50	9.50

Next-Term Options (cont.)				
Strike	Calls		Puts	
	Bid	Ask	Bid	Ask
1875	94.50	95.90	8.00	8.30
1880	90.00	91.40	8.40	8.80
1885	85.50	86.90	9.00	9.40
1890	81.10	82.50	9.50	10.00
1895	76.80	78.10	10.20	10.60
1900	72.40	73.70	10.90	11.30
1905	68.20	69.40	11.60	12.00
1910	64.00	65.20	12.40	12.80
1915	59.80	61.10	13.20	13.70
1920	55.70	57.00	14.20	14.60
1925	51.70	53.00	15.20	15.60
1930	47.80	49.10	16.20	16.60
1935	44.60	45.10	17.40	17.80
1940	40.80	41.30	18.60	19.00
1945	37.20	37.70	20.00	20.40
1950	33.70	34.40	21.40	21.80
1955	30.30	30.90	23.00	23.40
1960	27.00	27.60	24.70	25.10
1965	23.80	24.50	26.50	27.30
1970	20.80	21.40	28.50	29.40
1975	18.00	18.60	30.50	31.60
1980	15.50	15.90	33.00	34.00
1985	13.10	13.50	35.50	36.60
1990	10.90	11.30	38.40	39.50
1995	9.00	9.30	41.30	42.50
2000	7.20	7.60	44.50	45.80
2005	5.70	6.00	48.10	49.30
2010	4.50	4.80	51.70	53.00
2015	3.40	3.70	55.80	57.00
2020	2.60	2.80	59.90	61.70
2025	1.95	2.15	64.10	66.10
2030	1.45	1.65	68.60	70.60
2035	1.05	1.25	73.30	75.20
2040	0.80	0.95	78.00	80.00
2045	0.60	0.75	82.00	84.80
2050	0.50	0.65	86.90	89.60
2060	0.30	0.40	96.60	99.40
2070	0.20	0.30	106.70	109.50
2075	0.15	0.25	111.70	114.50
2100	0.10	0.20	136.30	139.10
2125	0.05	0.15	161.50	164.30
2150	0.05	0.15	186.30	189.00
2175	0.00	0.10	211.30	214.00
2200	0.05	0.10	236.30	239.00
2225	0.00	0.10	261.30	264.00

Near-Term Options (cont.)				
Strike	Calls		Puts	
	Bid	Ask	Bid	Ask
1910	61.60	64.10	9.10	10.20
1915	57.40	59.80	9.90	11.30
1920	53.30	55.60	10.70	12.10
1925	49.10	51.20	11.60	12.60
1930	45.20	47.30	12.50	14.00
1935	41.20	43.40	13.60	14.70
1940	37.40	39.50	14.70	15.80
1945	33.70	35.70	15.90	17.20
1950	30.10	32.10	17.70	18.80
1955	26.70	28.50	19.00	20.50
1960	23.40	25.10	20.60	22.00
1965	20.30	21.80	22.30	24.00
1970	17.40	18.80	24.30	25.80
1975	14.60	15.90	26.50	28.10
1980	12.20	13.30	28.90	30.60
1985	9.90	11.00	31.40	33.20
1990	7.90	9.00	34.30	36.50
1995	6.20	7.10	37.40	39.70
2000	4.70	5.20	40.70	43.20
2005	3.40	4.20	44.00	47.70
2010	2.65	3.10	48.00	51.40
2015	1.75	2.30	52.20	56.00
2020	1.20	1.70	56.60	60.40
2025	1.00	1.25	61.20	65.00
2030	0.45	1.00	65.90	69.70
2035	0.25	0.80	70.70	74.40
2040	0.35	0.65	75.60	79.30
2045	0.20	0.60	80.50	84.10
2050	0.20	0.30	85.40	89.00
2055	0.15	0.50	90.40	94.00
2060	0.15	0.30	95.30	98.90
2065	0.15	0.20	100.30	103.90
2070	0.10	0.20	105.30	108.90
2075	0.10	0.20	110.30	113.80
2080	0.05	0.45	115.30	118.80
2085	0.05	0.40	120.30	123.80
2090	0.05	0.15	125.30	128.80
2095	0.05	0.35	130.30	133.80
2100	0.05	0.15	135.30	138.80
2120	0.00	0.15	155.30	158.80
2125	0.05	0.15	160.30	163.80
2150	0.00	0.10	185.20	188.80
2175	0.00	0.05	210.20	213.70
2200	0.00	0.05	235.20	238.70
2225	0.05	0.10	260.20	263.70
2250	0.00	0.05	285.20	288.70

Appendix 2: Individual Contributions — K_0 = 1960

Near-Term Strike	Option Type	Midpoint Price	Delta-K	Contribution by Strike
1370	Put	0.2	5	0.0000005329
1375	Put	0.125	5	0.0000003306
1380	Put	0.15	5	0.0000003939
1385	Put	0.225	5	0.0000005866
1390	Put	0.225	5	0.0000005823
1395	Put	0.125	5	0.0000003212
1400	Put	0.125	7.5	0.0000004784
1410	Put	0.225	10	0.0000011319
1420	Put	0.225	7.5	0.0000008370
1425	Put	0.175	5	0.0000004310
1430	Put	0.225	5	0.0000005502
1435	Put	0.275	5	0.0000006678
1440	Put	0.175	5	0.0000004220
1445	Put	0.225	5	0.0000005389
1450	Put	0.2	5	0.0000004757
1455	Put	0.25	5	0.0000005905
1460	Put	0.25	5	0.0000005865
1465	Put	0.25	5	0.0000005825
1470	Put	0.25	5	0.0000005785
1475	Put	0.2	5	0.0000004597
1480	Put	0.25	5	0.0000005707
1485	Put	0.35	5	0.0000007937
1490	Put	0.175	5	0.0000003942
1495	Put	0.275	5	0.0000006153
1500	Put	0.325	5	0.0000007223
1505	Put	0.325	5	0.0000007175
1510	Put	0.3	5	0.0000006580
1515	Put	0.3	5	0.0000006536
1520	Put	0.35	5	0.0000007575
1525	Put	0.35	5	0.0000007526
1530	Put	0.325	5	0.0000006943
1535	Put	0.375	5	0.0000007959
1540	Put	0.375	5	0.0000007907
1545	Put	0.375	5	0.0000007856
1550	Put	0.5	5	0.0000010407
1555	Put	0.425	5	0.0000008789
1560	Put	0.425	5	0.0000008733
1565	Put	0.425	5	0.0000008677
1570	Put	0.475	5	0.0000009637
1575	Put	0.55	5	0.0000011087
1580	Put	0.525	5	0.0000010517
1585	Put	0.525	5	0.0000010450
1590	Put	0.525	5	0.0000010385
1595	Put	0.525	5	0.0000010320
1600	Put	0.675	5	0.0000013185
1605	Put	0.575	5	0.0000011162
1610	Put	0.625	5	0.0000012057
1615	Put	0.625	5	0.0000011983

Next-Term Strike	Option Type	Midpoint Price	Delta-K	Contribution by Strike
1275	Put	0.075	50	0.0000023085
1325	Put	0.15	37.5	0.0000032063
1350	Put	0.15	25	0.0000020591
1375	Put	0.175	25	0.0000023157
1400	Put	0.2	25	0.0000025528
1425	Put	0.25	25	0.0000030801
1450	Put	0.3	25	0.0000035697
1475	Put	0.35	25	0.0000040247
1500	Put	0.4	17.5	0.0000031133
1510	Put	0.425	10	0.0000018653
1520	Put	0.45	7.5	0.0000014618
1525	Put	0.475	5	0.0000010220
1530	Put	0.5	7.5	0.0000016031
1540	Put	0.525	10	0.0000022153
1550	Put	0.55	7.5	0.0000017182
1555	Put	0.575	5	0.0000011898
1560	Put	0.6	5	0.0000012336
1565	Put	0.625	5	0.0000012768
1570	Put	0.65	5	0.0000013195
1575	Put	0.675	5	0.0000013615
1580	Put	0.675	5	0.0000013529
1585	Put	0.7	5	0.0000013942
1590	Put	0.725	5	0.0000014349
1595	Put	0.75	5	0.0000014751
1600	Put	0.775	5	0.0000015148
1605	Put	0.8	5	0.0000015539
1610	Put	0.825	5	0.0000015925
1615	Put	0.85	5	0.0000016306
1620	Put	0.875	5	0.0000016682
1625	Put	0.9	5	0.0000017054
1630	Put	0.95	5	0.0000017891
1635	Put	0.975	5	0.0000018249
1640	Put	1	5	0.0000018603
1645	Put	1.025	5	0.0000018953
1650	Put	1.075	5	0.0000019757
1655	Put	1.1	5	0.0000020095
1660	Put	1.15	5	0.0000020882
1665	Put	1.2	5	0.0000021659
1670	Put	1.225	5	0.0000021978
1675	Put	1.275	5	0.0000022738
1680	Put	1.325	5	0.0000023490
1685	Put	1.375	5	0.0000024232
1690	Put	1.425	5	0.0000024964
1695	Put	1.475	5	0.0000025688
1700	Put	1.525	5	0.0000026403
1705	Put	1.6	5	0.0000027539
1710	Put	1.675	5	0.0000028662
1715	Put	1.725	5	0.0000029345

Individual Contributions (Cont.)				
Near-Term Strike	Option Type	Midpoint Price	Delta-K	Contribution by Strike
1620	Put	0.625	5	0.0000011909
1625	Put	0.675	5	0.0000012783
1630	Put	0.675	5	0.0000012704
1635	Put	0.725	5	0.0000013562
1640	Put	0.725	5	0.0000013480
1645	Put	0.775	5	0.0000014322
1650	Put	0.675	5	0.0000012398
1655	Put	0.825	5	0.0000015062
1660	Put	0.825	5	0.0000014972
1665	Put	0.875	5	0.0000015784
1670	Put	0.875	5	0.0000015689
1675	Put	0.925	5	0.0000016487
1680	Put	0.975	5	0.0000017275
1685	Put	1.025	5	0.0000018053
1690	Put	1.025	5	0.0000017946
1695	Put	1.075	5	0.0000018711
1700	Put	1.125	5	0.0000019466
1705	Put	1.125	5	0.0000019352
1710	Put	1.175	5	0.0000020094
1715	Put	1.225	5	0.0000020827
1720	Put	1.275	5	0.0000021552
1725	Put	1.325	5	0.0000022267
1730	Put	1.375	5	0.0000022974
1735	Put	1.425	5	0.0000023673
1740	Put	1.475	5	0.0000024363
1745	Put	1.55	5	0.0000025455
1750	Put	1.6	5	0.0000026126
1755	Put	1.675	5	0.0000027195
1760	Put	1.75	5	0.0000028251
1765	Put	1.825	5	0.0000029296
1770	Put	1.9	5	0.0000030327
1775	Put	2	5	0.0000031744
1780	Put	2.075	5	0.0000032750
1785	Put	2.175	5	0.0000034136
1790	Put	2.25	5	0.0000035116
1795	Put	2.375	5	0.0000036861
1800	Put	2.525	5	0.0000038971
1805	Put	2.625	5	0.0000040291
1810	Put	2.775	5	0.0000042358
1815	Put	2.95	5	0.0000044781
1820	Put	3.075	5	0.0000046423
1825	Put	3.3	5	0.0000049547
1830	Put	3.45	5	0.0000051516
1835	Put	3.65	5	0.0000054206
1840	Put	3.9	5	0.0000057605
1845	Put	4.1	5	0.0000060231
1850	Put	4.35	5	0.0000063559

Individual Contributions (Cont.)				
Next-Term Strike	Option Type	Midpoint Price	Delta-K	Contribution by Strike
1720	Put	1.8	5	0.0000030444
1725	Put	1.85	5	0.0000031108
1730	Put	1.925	5	0.0000032182
1735	Put	2	5	0.0000033244
1740	Put	2.1	5	0.0000034706
1745	Put	2.175	5	0.0000035740
1750	Put	2.275	5	0.0000037169
1755	Put	2.375	5	0.0000038582
1760	Put	2.475	5	0.0000039979
1765	Put	2.575	5	0.0000041359
1770	Put	2.725	5	0.0000043521
1775	Put	2.825	5	0.0000044864
1780	Put	3	5	0.0000047376
1785	Put	3.1	5	0.0000048682
1790	Put	3.25	5	0.0000050753
1795	Put	3.45	5	0.0000053576
1800	Put	3.6	5	0.0000055595
1805	Put	3.8	5	0.0000058359
1810	Put	3.95	5	0.0000060328
1815	Put	4.2	5	0.0000063794
1820	Put	4.4	5	0.0000066465
1825	Put	4.65	5	0.0000069857
1830	Put	4.9	5	0.0000073211
1835	Put	5.15	5	0.0000076527
1840	Put	5.45	5	0.0000080546
1845	Put	5.75	5	0.0000084519
1850	Put	6.05	5	0.0000088449
1855	Put	6.45	5	0.0000093789
1860	Put	6.75	5	0.0000097624
1865	Put	7.15	5	0.0000102856
1870	Put	7.65	5	0.0000109461
1875	Put	8.15	5	0.0000115994
1880	Put	8.6	5	0.0000121748
1885	Put	9.2	5	0.0000129552
1890	Put	9.75	5	0.0000136572
1895	Put	10.4	5	0.0000144909
1900	Put	11.1	5	0.0000153850
1905	Put	11.8	5	0.0000162694
1910	Put	12.6	5	0.0000172816
1915	Put	13.45	5	0.0000183512
1920	Put	14.4	5	0.0000195452
1925	Put	15.4	5	0.0000207941
1930	Put	16.4	5	0.0000220298
1935	Put	17.6	5	0.0000235197
1940	Put	18.8	5	0.0000249940
1945	Put	20.2	5	0.0000267173
1950	Put	21.6	5	0.0000284227

Individual Contributions (Cont.)				
Near-Term Strike	Option Type	Midpoint Price	Delta-K	Contribution by Strike
1855	Put	4.65	5	0.0000067576
1860	Put	4.95	5	0.0000071550
1865	Put	5.25	5	0.0000075480
1870	Put	5.6	5	0.0000080082
1875	Put	6	5	0.0000085345
1880	Put	6.4	5	0.0000090551
1885	Put	6.85	5	0.0000096404
1890	Put	7.35	5	0.0000102895
1895	Put	7.9	5	0.0000110011
1900	Put	8.3	5	0.0000114974
1905	Put	9	5	0.0000124017
1910	Put	9.65	5	0.0000132278
1915	Put	10.6	5	0.0000144543
1920	Put	11.4	5	0.0000154643
1925	Put	12.1	5	0.0000163287
1930	Put	13.25	5	0.0000177881
1935	Put	14.15	5	0.0000188983
1940	Put	15.25	5	0.0000202626
1945	Put	16.55	5	0.0000218770
1950	Put	18.25	5	0.0000240006
1955	Put	19.75	5	0.0000258406
1960	Put/Call Average	22.775	5	0.0000296466
1965	Call	21.05	5	0.0000272619
1970	Call	18.1	5	0.0000233225
1975	Call	15.25	5	0.0000195508
1980	Call	12.75	5	0.0000162633
1985	Call	10.45	5	0.0000132624
1990	Call	8.45	5	0.0000106704
1995	Call	6.65	5	0.0000083553
2000	Call	4.95	5	0.0000061883
2005	Call	3.8	5	0.0000047270
2010	Call	2.875	5	0.0000035586
2015	Call	2.025	5	0.0000024940
2020	Call	1.45	5	0.0000017770
2025	Call	1.125	5	0.0000013719
2030	Call	0.725	5	0.0000008798
2035	Call	0.525	5	0.0000006340
2040	Call	0.5	5	0.0000006008
2045	Call	0.4	5	0.0000004783
2050	Call	0.25	5	0.0000002975
2055	Call	0.325	5	0.0000003848
2060	Call	0.225	5	0.0000002651
2065	Call	0.175	5	0.0000002052
2070	Call	0.15	5	0.0000001751
2075	Call	0.15	5	0.0000001742
2080	Call	0.25	5	0.0000002890
2085	Call	0.225	5	0.0000002588

Individual Contributions (Cont.)				
Next-Term Strike	Option Type	Midpoint Price	Delta-K	Contribution by Strike
1955	Put	23.2	5	0.0000303721
1960	Put/Call Average	26.1	5	0.0000339945
1965	Call	24.15	5	0.0000312948
1970	Call	21.1	5	0.0000272039
1975	Call	18.3	5	0.0000234746
1980	Call	15.7	5	0.0000200378
1985	Call	13.3	5	0.0000168893
1990	Call	11.1	5	0.0000140248
1995	Call	9.15	5	0.0000115031
2000	Call	7.4	5	0.0000092566
2005	Call	5.85	5	0.0000072813
2010	Call	4.65	5	0.0000057589
2015	Call	3.55	5	0.0000043748
2020	Call	2.7	5	0.0000033109
2025	Call	2.05	5	0.0000025014
2030	Call	1.55	5	0.0000018820
2035	Call	1.15	5	0.0000013895
2040	Call	0.875	5	0.0000010520
2045	Call	0.675	5	0.0000008076
2050	Call	0.575	7.5	0.0000010269
2060	Call	0.35	10	0.0000008254
2070	Call	0.25	7.5	0.0000004379
2075	Call	0.2	15	0.0000006973
2100	Call	0.15	25	0.0000008509
2125	Call	0.1	25	0.0000005540
2150	Call	0.1	37.5	0.0000008118
2200	Call	0.075	50	0.0000007753

Individual Contributions (Cont.)				
Near-Term Strike	Option Type	Midpoint Price	Delta-K	Contribution by Strike
2090	Call	0.1	5	0.0000001145
2095	Call	0.2	5	0.0000002279
2100	Call	0.1	15	0.0000003402
2125	Call	0.1	25	0.0000005537

Sum of Individual Contributions for near term: 0.0006321235

$$\frac{2}{T_1}\sum_i \frac{\Delta K_i}{K_i^2}\, e^{R_1 T_1} Q(K_i) = \ 0.027229$$

Sum of Individual Contributions for next term: 0.0008319760

$$\frac{2}{T_2}\sum_i \frac{\Delta K_i}{K_i^2}\, e^{R_2 T_2} Q(K_i) = \ 0.013512$$

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