# Regulatory Circular RG17-002

**Date:** **February 6, 2017**

**To:**     Volatility Index Derivatives Market Participants
**From:**   Regulatory Division
            Research and Product Development Department
**Re:**     Modified HOSS Opening Procedures and Special Opening Quotation; Settlement Methodology for All Volatility Index Contracts and Risk Inherent in Settlement Procedure

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### This circular replaces CFE Regulatory Circular RG15-022

CBOE Futures Exchange, LLC (CFE) is reissuing this circular in connection with a change to the strategy order cut-off time being made by Chicago Board Options Exchange, Incorporated (CBOE). The strategy order cut-off time is changing from 8:15 a.m. to 8:20 a.m. (Chicago time) beginning on February 8, 2017. This change will apply to all expirations for all volatility index derivatives going forward. This change is reflected in the reissued circular. In addition, other changes have been made throughout this circular.

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CFE lists futures on different volatility indexes that are calculated using option series traded on CBOE.[1] This circular describes the current modified Hybrid Opening System (HOSS) opening procedures utilized on CBOE for all option series that are used to calculate the final settlement value for expiring volatility index futures contracts. These option series are referred to in this circular as "constituent option series." In addition this circular describes the calculation of the final settlement value for all volatility index futures traded on CFE and discusses a risk inherent in the settlement procedures for volatility index futures.

### Modified HOSS Opening Procedures and Special Opening Quotation

The final settlement value for volatility index futures is a Special Opening Quotation (SOQ) of the respective volatility index calculated from the sequence of opening prices, as traded on CBOE, of a single strip of the constituent option series used to calculate the volatility index on the final settlement date. The opening price for any constituent option series in which there is no trade on CBOE will be the average of that option's bid price and ask price as determined at the opening of trading.

The opening prices for the constituent option series used in calculating the SOQ are determined through an automated auction mechanism (modified HOSS opening procedures) that matches buy and sell orders residing on the electronic order book immediately prior to the opening of trading. The first market disseminated by CBOE after the opening may differ from the bid/ask quote used in the calculation of the SOQ of the respective volatility index. This is because, immediately after the series is opened but prior to dissemination of an opening bid/ask quote, the auction mechanism automatically cancels all un-executed "OPG" (Opening) contingency orders. However, OPG orders (as well as the other orders existing in the electronic book immediately before the series opens) will be considered in calculating the SOQ, but OPG orders will not be disseminated upon the series opening. For example, assume a

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[1] This circular does not apply to futures on volatility indexes that are calculated using option series that do not trade on CBOE, such as the CBOE/CBOT 10-Year U.S. Treasury Note Volatility Index futures contract.

constituent option series has only 1 order to buy, and that order is priced at $.05 (OPG), and the best offer is $0.15. The first market disseminated to OPRA by CBOE would be $0 - $0.15, but the bid/ask quote used to calculate the SOQ would be $.05 - $0.15.

## Final Settlement Date for Volatility Index Futures

### Standard 30-Day Volatility Index Futures that Expire Monthly

The final settlement date for standard 30-day volatility index futures that expire once a month is on the Wednesday that is 30 days prior to the third Friday of the calendar month immediately following the month in which the contract expires. If that Wednesday or that third Friday is a CBOE holiday, the final settlement date for the contract shall be on the business day immediately preceding that Wednesday.[2]

### Weekly (Non-Standard) 30-Day Index CBOE Volatility Index VIX Futures

The final settlement date for weekly (non-standard) 30-day CBOE Volatility Index (VIX) futures is on the Wednesday of the week specifically denoted in the ticker symbol. For symbology purposes, the first week of a calendar year is the first week of that year with a Wednesday on which a weekly VIX futures contract could expire. If that Wednesday or the Friday that is 30 days following that Wednesday is a CBOE holiday, the final settlement date for the contract shall be on the business day immediately preceding that Wednesday.[2]

## Order Submission Deadlines for Participation in Modified HOSS Opening Procedures

### Strategy Orders

On the days that the modified HOSS opening procedures are utilized on CBOE, all option orders for participation in the modified HOSS opening procedures that are related to positions in, or a trading strategy involving, volatility index options or futures ("strategy order"), and any change to or cancellation of any such strategy order:

1) Must be received prior to 8:20 a.m. (Chicago time) for all constituent option series; and

2) May not be cancelled or changed after 8:20 a.m. (Chicago time), unless the strategy order is not executed in the modified HOSS opening procedures and the cancellation or change is submitted after the modified HOSS opening procedures are concluded. Strategy orders may be changed or cancelled after 8:20 a.m. (Chicago time) and prior to the opening of trading in order to correct a legitimate error. In this event, the Trading Permit Holder shall send an email (by no later than the next business day) setting forth the circumstances that resulted in the change or cancellation to the Regulatory Services Division at Strat_Order_Cancels@cboe.com.

### Non-Strategy Orders

In order to be considered for participation in the modified HOSS opening procedures, all other option orders, and any change or cancellation to any such order, must be received prior to the opening of the series.

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[2] When CBOE is closed on Wednesday due to a CBOE holiday, the amount of time until expiration for the constituent option series used to calculate the final settlement value would be increased to reflect the extra day of trading in the constituent option series.

### Strategy Order Characteristics

In general, CBOE shall consider option orders to be related to positions in, or a trading strategy involving, volatility index options or futures for purposes of CBOE Rule 6.2B.01 if the orders possess the following three characteristics:

1) The orders are for option series with the expiration that will be used to calculate the exercise settlement or final settlement value of the applicable volatility index option or futures contract. For example, in the case of VIX futures, the orders would be in standard SPX option series that expire one month following the expiration date of the expiring VIX futures contract.

2) The orders are for option series spanning the full range of strike prices in the appropriate expiration for option series that will be used to calculate the exercise or final settlement value of the applicable volatility index option or future contract, but not necessarily every available strike price.

3) The orders are for put options with strike prices less than the "at-the-money" strike price and for call options with strike prices greater than the "at-the-money" strike price. The orders may also be for put and call options with "at-the-money" strike prices.

Whether option orders are strategy orders for purposes of CBOE Rule 6.2B.01 depends upon the specific facts and circumstances. Other types of orders may also be deemed by CBOE to fall within this category of orders if CBOE determines that to be the case based upon the applicable facts and circumstances.

### Order Eligibility for Modified HOSS Opening Procedures

All orders for participation in the modified HOSS opening procedures on CBOE must be submitted electronically into the book and orders with any valid origin code are eligible to participate.

**Hybrid 3.0 Option Series**

Non-customer orders in Hybrid 3.0 option series must include an "OPG" contingency to be accepted into the book and to participate in the modified HOSS opening procedures. Examples of Hybrid 3.0 option series used to calculate volatility indexes include standard SPX option series.

**Hybrid Option Series**

Non-customer orders in Hybrid option series may (but are not required to) include an "OPG" contingency to be accepted into the book and to participate in the modified HOSS opening procedures. Examples of Hybrid option series used to calculate volatility indexes include End-of-Week (weekly) expirations on the S&P 500 Index (SPXW).

**Both Hybrid 3.0 and Hybrid Option Series**

For Hybrid 3.0 and Hybrid option series, CBOE's trading systems will automatically cancel any unexecuted remainder of OPG orders immediately after the opening of the series.

## Certain LMM or DPM Requirements in Connection with Modified HOSS Opening Procedures

Market-Maker, including LMM and DPM, opening quote obligations on SOQ settlement days are the same as any other trade day.

### Hybrid 3.0 Option Series

For Hybrid 3.0 series (e.g., series trading under symbol SPX), LMMs with an appointment in the constituent option series are required to enter opening quotes as required by CBOE Rule 8.15.[3]  Both the orders and quotes of LMMs are eligible to participate in the opening.  All other market participants may participate in the opening only through orders and not through quotes.

### Hybrid Option Series

For Hybrid series where there is an appointed DPM (e.g., RUT), a DPM with an appointment in the constituent option series is required to enter opening quotes as required by CBOE Rule 8.85.[4]  For Hybrid series whether or not there is an appointed DPM, both opening orders and quotes of Market-Makers with an appointment in the constituent option series are eligible for participation in CBOE's modified HOSS opening procedures.  All other market participants may participate in the opening only through orders and not through quotes.

### Both Hybrid 3.0 and Hybrid Option Series

On days when the CBOE modified HOSS opening procedures are in use, the applicable Opening Exchange Prescribed Width (OEPW) and Acceptable Price Range (APR) parameters are narrowed.

For there to be an opening trade in Hybrid 3.0 and Hybrid series the best composite quote must be within the published OEPW.

For Hybrid 3.0 and Hybrid series, a series with no opening trade will be allowed to open as long as the width of the best CBOE quote bid-ask is no wider than the APR parameter.

## Publication of Certain Information in Connection with Modified HOSS Opening Procedures

Prior to the opening of certain constituent option series, the CBOE system will generate "Expected Opening Price/Size" (EOP/S) messages for those series which have quantity to trade, have buy or sell imbalances or do not have a best composite Market-Maker quote that is within an acceptable width.

EOP/S messages are disseminated via CBOE's proprietary market data feed, called CBOE Streaming Markets (CSM).  EOP/S messages are also published periodically for certain constituent series at: http://cfe.cboe.com/data/VolatilitySettlements/ on final settlement days.

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[3] In relevant part, CBOE Rule 8.15(b)(v) provides that an LMM is required to enter opening quotes within one minute of the initiation of an opening rotation in any series that is not open due to the lack of a quote (see Rule 6.2B(d)(i)(A)) and participate in other rotations described in CBOE Rule 6.2B (including the modified opening rotation set forth in Interpretation and Policy .01).

[4] In relevant part, CBOE Rule 8.85(a)(xi), provides that a DPM is required to enter opening quotes within one minute of the initiation of an opening rotation in any series that is not open due to the lack of a quote (see CBOE Rule 6.2B(d)(i)(A)) and participate in other rotations described in CBOE Rule 6.2B (including the modified opening rotation set forth in Interpretation and Policy .01).

**Prohibition Against Submission of Orders or Quotes with Improper Purpose**

TPHs and market participants may be subject to disciplinary action if, when they submit orders or quotes during CBOE's modified HOSS opening procedures, they do so for a purpose inconsistent with CBOE's rules. Investigations may include, but are not limited to, a review of whether orders or quotes were entered for the purpose of: (1) creating or inducing a false, misleading or artificial appearance of activity; or (2) unduly or improperly influencing the opening price or settlement value; or (3) making a price which does not reflect the true state of the market.

**Settlement Methodology for Volatility Index Contracts**

The CBOE Research Department calculates the SOQ for volatility index contracts using the following procedure:

   A. Collect the following information for each eligible option series of the applicable volatility index:

      1. The opening traded price, if any; and

      2. The first bid and offer disseminated to OPRA by CBOE. If the first bid disseminated to OPRA by CBOE is 0, the limit price of the best OPG buy order(s) with quantity remaining, if any, will be used as the opening bid.

   B. Determine the applicable forward index level, $(F)$, for each eligible contract expiration based on at-the-money put and call option prices. Please refer to the VIX White Paper for more information. The at-the-money strike is the strike price at which the difference between the call and put mid-quote prices is smallest.

   C. Determine $K_0$ - the strike price immediately below the forward index level.

   D. Select the constituent option series - Sort all of the options in ascending order by strike price. Select call options that have strike prices greater than $K_0$ and have bid prices greater than zero, beginning with the strike price closest to $K_0$ and moving to the next higher strike prices in succession. After encountering two consecutive calls with a bid price of zero, do not select any other calls. Next, select put options that have strike prices less than $K_0$ and have bid prices greater than zero, beginning with the strike price closest to $K_0$ and then moving to the next lower strike prices in succession. After encountering two consecutive puts with a bid price of zero, do not select any other puts. Select both the put and call with strike price $K_0$.

   E. Calculate the volatility index SOQ using the options selected.[5] The price of each option used in the calculation is the opening traded price of that option. For volatility indexes that are composed of multiply listed constituent option series, **the volatility index SOQ uses only the opening prices of the constituent option series traded on CBOE.** In the event that there is no opening traded price for an option, the price used in the SOQ calculation is the average of the first bid and offer disseminated to OPRA by CBOE for that option. If the first bid disseminated to OPRA by CBOE in a particular series is zero, the best unexecuted OPG bid, if any, is used as the opening bid.

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[5] All volatility indexes are calculated in the same manner as VIX. A more detailed description of the VIX formula and methodology is available on the CBOE's website at: http://www.cboe.com/micro/vix/vixwhite.pdf.

F. The "time to expiration" used to calculate the SOQ for volatility indexes varies depending on the settlement type (A.M.-settlement, P.M.-settlement) of the constituent option series and the trading hours of the constituent option series. For example, the "time to expiration" used to calculate the SOQ for standard 30-day VIX contracts, which are based on A.M.-settled standard SPX option series, is exactly 30 days.[6] Another example is the "time to expiration" used to calculate the SOQ for weekly (non-standard) 30-day VIX contracts based on P.M.-settled SPXW options, which is exactly 30 days, *plus* 390 minutes in order to reflect the extra time to trade the constituent SPXW option series until 3:00 p.m. (Chicago time).[7]

The "time to expiration" used to calculate the SOQ accounts for the actual number of days and minutes from the opening of trading in the constituent option series on the final settlement day until expiration for the constituent option series. For example, if CBOE announces that the opening of trading in the constituent option series is delayed, the amount of time until expiration for the constituent option series used to calculate the final settlement value would be reduced to reflect the actual opening time of the constituent option series. Another example would be when the CBOE is closed on a Wednesday due to a CBOE holiday. The amount of time until expiration for the constituent option series used to calculate the final settlement value would be increased to reflect the extra day of trading in the constituent option series.

G. The final settlement value for the applicable volatility index contract is equal to the respective volatility index SOQ.

The final settlement value is rounded to the nearest $0.01. If the final settlement value is not available or the normal settlement procedure cannot be utilized due to a trading disruption or other unusual circumstance, the final settlement value will be determined in accordance with the rules and bylaws of The Options Clearing Corporation.

## Risk Inherent in Settlement Procedure

The final settlement value of each volatility index futures contract is calculated from the actual opening premium trade prices on CBOE of the constituent option series on the final settlement date, unless there is no opening trade in a series. In contrast, all other volatility index values disseminated during the life of a volatility index futures contract are "indicative" values – namely, values that are calculated using the mid-point of the disseminated bid and offer premium quotations on CBOE of each of the constituent option series at a particular time.

Because actual trade prices are used to compute the final settlement value of volatility index futures while mid-market options quotes are used to compute indicative (spot or cash) volatility index values, there is an inherent risk of a significant disparity between the final settlement value of an expiring volatility index futures contract and the opening indicative volatility index value on the final settlement date or the closing indicative volatility index value on the day before settlement. It is to be expected that there will be at least some divergence between the final settlement value for an expiring volatility index futures contract and the opening indicative volatility index value on the final settlement date or the closing indicative value on the previous day's close, because the opening trade price for each of the option series that is used to calculate the final settlement value will typically be at or near either the bid or the ask quotation, depending on the forces of supply and demand for that series, and not at the mid-point between the bid and ask quotations. In fact, such disparities have occurred in the past with respect

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[6] The final settlement value for a VIX futures contract with the ticker symbol "VX" is calculated using A.M.-settled SPX options.

[7] The final settlement value for a VIX futures contract with the ticker symbol "VX" followed by a number denoting the specific week of a calendar year is calculated using P.M.-settled SPX options.

to VIX and other volatility index futures contracts. Accordingly, because volatility index futures settle based on the traded prices of the constituent option series established during the opening, rather than on quotes, **investors should be aware that the possibility exists, as occurred in the past, that there could be a significant difference between the final settlement value for a volatility index futures contract and the previous day's closing indicative volatility index value, or the opening indicative volatility index value on the final settlement date.**

For example, traders who want to replicate the volatility exposure represented by an expiring VIX futures position might trade the SPX options expected to be used to calculate the final settlement value for the expiring VIX futures, in order to seek convergence with the VIX final settlement value. To the extent (1) the traders who are seeking to replicate an expiring VIX position are on one side of the market (e.g., seek to buy the particular SPX options) and (2) those traders' orders predominate over other orders during the SPX opening on the final settlement date for the VIX futures contract, those trades may contribute to an order imbalance during the SPX opening on that date. If the order imbalances are significantly weighted on the same side of the market in a predominant number of SPX option series used in the final settlement, there will be a disparity between the final settlement value and the VIX index values that are reported after the SPX opening. In fact, these circumstances do occur, and have led to this type of imbalance and disparity during previous SPX openings for VIX futures settlement days. The same is equally applicable with respect to other volatility index futures.

In order to avoid exposure to such disparities, investors in volatility index futures holding speculative or un-hedged volatility index futures may wish to close out their positions prior to settlement.

Market participants should also be aware that the daily settlement price of a volatility index future is calculated in a different manner from both the final settlement value of the future and the spot value of the volatility index. The daily settlement price of a volatility index future is calculated from the average of the final bid and final offer for the future on CFE during the applicable business day. The other two values are calculations of the volatility index itself. Additionally, the daily settlement price from the day before the final settlement date and the final spot value prior to the final settlement do not reflect overnight trading prior to final settlement. Accordingly, disparities can and do exist between the daily settlement price of a volatility index future on the day before its final settlement date, the final settlement value of the volatility index future, and the final and opening spot volatility index value prior to and after final settlement.

**Additional Information**

For questions, please contact the Regulatory Interpretations team at RegInterps@cboe.com or (312) 786-8141 for additional information.