Special Opening Quotation Overview

Various Cboe equity index options and futures products are based on U.S. equity indices (Cboe Equity Indices) administered and distributed by Cboe Global Indices, LLC (CGI) and have A.M. settlement based upon a special opening quotation (SOQ) of the underlying index. This piece provides an overview of the settlement calculation for these Cboe Equity Indices.

How are Intraday Cboe Equity Indices Calculated?

Cboe's equity index values are calculated pursuant to their respective methodologies[1] and are based on the last trade price for each constituent. These intraday or "spot" values are calculated and disseminated on a real-time basis throughout the trading day. The dissemination of intraday Cboe Equity Index values typically begins at 8:30 a.m. (CT).

The constituents of Cboe Equity Indices often do not open on all exchanges at the same time and each individual constituent may not open for trading on the relevant exchange immediately at the open of that exchange. As result, the last trade price *from the prior trading day* is used in the Index value for that constituent until it begins trading for a given day. Therefore, there are times (especially during the beginning of a trading session) when Cboe Equity Indices calculations reflect an amalgam of current trade prices and end-of-day prices from the prior day. When each constituent has opened on the relevant exchange, intraday Cboe Equity Index calculations use the last trade price of that constituent.

How is the Final Settlement Value[2] for A.M.-Settled Cboe Equity Index Futures and Options Determined?

The final settlement values for A.M.-settled Cboe Equity Index futures and options overlying Cboe Equity Indices are based on SOQs of their respective equity indices on their Final Settlement Dates (typically the third Friday of the expiration month). The SOQ is based on the opening trade price of each constituent in these indices on a given Final Settlement Date (3rd) Friday. The calculation of the SOQ of Cboe Equity Indices is set forth in Cboe Global Indices Special Opening Quotation Mathematics Methodology.

When is the SOQ Calculated on Expiration Days for Cboe Equity Index Futures and Futures and Options?

[1] See Cboe Global Indices Special Opening Quotation Mathematics Methodology.

[2] Final Settlement Value is the term that CFE uses for cash-settled index futures contracts as the final marking value of a future on its expiration date, whereas the analogous term used for Cboe's cash-settled index options is Exercise Settlement Value. In the case where cash-settled index futures with A.M. settlement and cash-settled index options with A.M. settlement overlie the same index and settle on the same date, the SOQ used for the future's Final Settlement Value and the index option's Exercise Settlement Value are the same. This document uses Final Settlement Value to encompass both Final Settlement Values and Exercise Settlement Values that use SOQs.

The SOQ is not calculated until all the constituents of the relevant Cboe Equity Index have opened for trading and their corresponding official opening prices are established. Because official opening prices are rarely disseminated immediately at the opening of the exchange, the SOQ (by construction) is not anchored to a specific time of day. As a result, the SOQ is typically calculated after *intraday* Cboe Equity Indices have started disseminating and these intraday index calculations typically include some constituent prices from the prior trading day (especially during the beginning of a trading session.)

Similarly, the SOQ is not associated with any particular Cboe Equity Index value. Also, when the SOQ is calculated, the current intraday value of Cboe Equity Indices disseminated at the same time as the respective SOQ will typically be different. This is because SOQs reflect opening trade prices, which may differ from the current trade prices of the constituents of Cboe Equity Indices at the time that the SOQs are calculated.

Where and How Are the Official Opening Prices Established?

The SOQ is calculated pursuant to the **Cboe Global Indices Special Opening Quotation Mathematics Methodology**, and it uses the trading day's official opening trade prices of the Cboe Equity Index constituents as set on the corresponding primary listing exchange.

As of date of this piece, the primary listing exchanges conduct auctions at the open to start trading. While procedural details vary from one exchange to another, the goal of an opening auction is to open trading in a constituent at the price that maximizes the quantity of shares transacted between buy and sell orders submitted for participation in the auction.

Why Are There Differences Between Cboe's Spot Equity Index Values and the Final Settlement Values for these Indices?

The prices of the constituents used in these calculations are different and that difference can yield different values for the calculations. As noted above, the SOQ uses official opening trade prices and it cannot be calculated until all the constituents of the Cboe Equity Index have opened on the final settlement date. In contrast, the calculation of intraday values of Cboe Equity Indices begin at the open (at the times stated within their methodology) and start with a blend of current trade and end-of-day prices from the prior trading day. When all constituents have opened, the intraday equity index values are calculated using their current trade prices.

These distinctions set the SOQ apart from more familiar daily index milestones, such as the open, high, low or closing values, all of which are continuous calculations. A natural and recognized consequence of these differences is that the indices' SOQs used to determine the final settlement value for Cboe Equity Index futures and options may be higher or lower than their intraday index values. For example, if a significant market event is in process, the SOQ can be higher than the index high value or lower than the index low value for the relevant trading session.

The SOQ Enables a Tradeable Settlement for Cboe Equity Index Futures and Options

On the days that the Final Settlement Value for Cboe Equity Index A.M.-settled index futures are determined, Cboe Global Indices (CGI) calculates the respective index's SOQ using the opening trade prices of the constituents on each constituent's primary exchange.[3] Traders can replicate the exposure of their settling futures and expiring options by entering orders to buy and sell the constituents of the equity index at their opening trade prices. If they are successful, traders can effectively construct a portfolio that matches the value of the SOQ. At this point, the derivatives and cash markets converge.

Why Is the SOQ Used for Settlement?

The SOQ is intended to be executable for derivative settlement. As described above, the use of an SOQ to settle Cboe Equity Index futures and options allows for convergence of the derivatives and cash markets because the SOQ is calculated using actual opening trade prices. Conversely, as described above, because not all constituents have an opening trade price at the time the opening Cboe Equity Index value is calculated, the SOQ is used in place of an opening index value. The SOQ is designed to measure a replicable market-on-open valuation, in order to minimize the impact of days when share prices have gapped higher or lower from the prior close to the open.

Because the SOQ is calculated strictly using the official opening trade prices of the constituents of Cboe Equity Indices, it is a comparatively direct reflection of the balance of actionable orders submitted on the primary listing exchanges for participation in opening auctions.

[3] The primary listing exchange means the national securities exchange on which the constituent security is listed. If the constituent security is listed on more than one national securities exchange, the primary listing exchange means the exchange on which the security has been listed the longest.