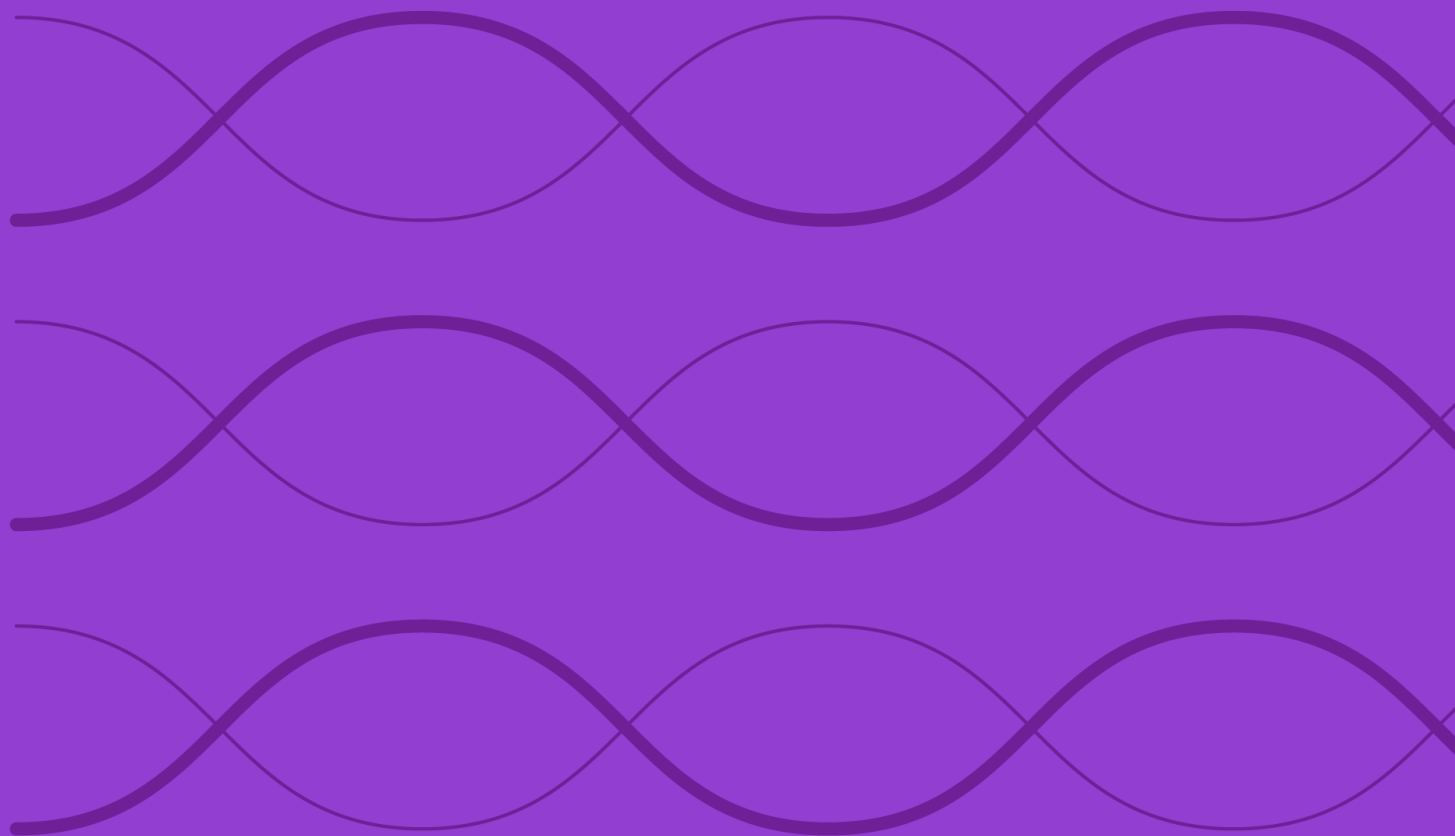


# Morningstar Indexes Real-Time Calculation Methodology



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## Overview

The Real-Time (“RT”) Calculation Guide provides a general overview of the Morningstar Indexes real-time calculations methodology and dissemination.

Morningstar currently calculates price, net, and total index values for equity-based indexes in real-time. All Morningstar Real-time Indexes are calculated based on the corresponding end-of-day methodologies listed under the section “Index Calculation Methodology.”

## Real-time Index Data Points

### Open Quote

Stock prices are converted using the currency rate valid at the time of the opening stock price—that is, opening stock prices are converted using real-time currency rates.

### Intraday Snapshot

An intraday snapshot can be calculated at any given time during the dissemination start and end time of the index.

### Real-time Ticks

Real-time index levels calculated and distributed at 15-second intervals, using real-time security prices and foreign exchange rates. Calculation windows are set to reflect official market exchange hours of all the securities within the index.

### End of Day Index Levels

The end of day (“EOD”) data for the Morningstar indexes are calculated by the EOD indexes calculator, distinct from the closing quote calculated by the RT calculator. The official EOD values are disseminated as an “EOD” index summary message, after the closing EOD files are published for the relevant index.

## Input Data

### Sources

The input data sources for the real-time calculation include:

- Securities in the investable stock universe
- Real-time ticks as provided by exchange
- End of day and open index levels as calculated by the Morningstar equity index calculator
- Currency exchange rates provided by RT currency exchange rate and WM London 4 p.m. close
- Dividend data

### Stock Prices

The data hierarchy is used to process stock prices and calculate the Morningstar equity indexes as follows:

- Open price: the first traded price during the official trading hours of the stock's trading system. Until this is available, the previous day's closing/adjusted price is used.
- Intraday price: the currently traded price during the official trading hours of the stock trading system. When the stock is not traded, the last available stock price is used, this can either be the last available intraday stock price (e.g., if the stock is suspended) or the last available closing /adjusted price (e.g., if the stock exchange is closed)
- Closing price: the last traded price or auction price during the official trading hours of the stock's trading system is used. If the stock has not traded all day, then the previous day's closing/adjusted price is used.
- Adjusted price: the closing price is adjusted to reflect a stock's corporate action that will be effective the next trading day. This would become the Open price of the security until the first traded price is available.

### Close Price

The real-time closing index value could be different from the official end-of-day index value due to validations and manual updates made during the end-of-day calculation process. The official closing index value is the value provided in Morningstar's EOD product files and will be used as the starting value for real-time the following business day.

### Foreign Exchange Rates

For indexes where the currency of all the securities within the index matches the index currency, no foreign exchange conversion of the stock prices is required.

For indexes where there are multiple currencies represented in the index, individual stock prices in the local currency are first converted into USD for calculation, before being converted to the index currency.

RT forex exchange rates are used in the real-time calculation when converting stock prices in local currency into USD (US Dollar) before converting to the index currency, if required.

WM 4PM Exchange Rates are used in the EOD calculation when converting stock prices in local currency to USD before converting to the index currency.

### Data Usage

Input data (e.g., pricing and currency rates) and other underlying data are taken as provided by the input sources, no rounding logic applied. Index values are rounded to 4 decimal places for dissemination.

## Real-time Index Value Calculation Methodology

$$\text{Price Return} = \frac{\sum_i^n P_i(t) * Q_i(t) * FX_i(t)}{\text{Open Price Return Index Divisor}(t)}$$

$$\text{Total or Gross Return} = \frac{\sum_i^n (P_i(t) * Q_i(t) * FX(t) + \text{Gross Div}_i(t) * Q_i(t) * FX(t))}{\text{Open Total Return Index Divisor}(t)}$$

$$\text{Net Return} = \frac{\sum_i^n (P_i(t) * Q_i(t) * FX(t) + \text{Net Div}_i(t) * Q_i(t) * FX(t))}{\text{Open Net Return Index Divisor}(t)}$$

Where:

$P_i$	=	Intra-day Price of security i
$Q_i$	=	Index Shares of security i
$FX_i$	=	Exchange rate from local currency into index currency for security i
t	=	Current date

## Special Opening Quotation

The special opening quotation ("SOQ") follows the same general methodology as the standard index calculations, the only difference is that it uses the opening prices for each constituent, as well as the FX rates as of the time of the SOQ calculation. If a stock has not traded during regular market hours, the previous day's closing/adjusted price is used for the SOQ calculation. The SOQ is only posted when all the stocks in the index are open or after the market has closed, whichever occurs first. This may occur at any time during the day.

In the event of a market disruption, the last closing price adjusted for corporate actions is used for the SOQ calculation.

The last closing price will also be used for securities where trading is suspended unless the suspension is due to a merger or acquisition. In those instances, the follow terms will be used:

### All-Stock Deal

Merger Ratio \* Acquirer Company closing price on the previous day

### All-Cash Deal

Lower of last traded price or deal price

### Cash + Stock Deal

(Merger Ratio \* Acquirer Company closing price on the previous day) + Cash

## Data Correction and Precision

### Intraday Index Data Corrections

Commercially reasonable efforts are made to ensure the accuracy of data used in real-time index calculations. If incorrect price or corporate action data affects index calculations, corrections are applied prospectively.

## Dissemination

### Dissemination Calendars

The Morningstar Indexes RT calculation and dissemination schedule is dictated by the calculation calendar that an index follows. For an index that follows a Global calendar, the RT ticks are typically calculated and disseminated Monday through Friday between stated start time and end time. For an index that follows a market-specific calendar, the RT ticks are calculated and disseminated every business day, except for local market holidays.

In exceptional cases, the Morningstar Indexes Operations team can make changes to the dissemination calendar.

### Dissemination Period

Each index has a defined dissemination start and end time, that is aligned with the calculation window. The actual dissemination of each index is triggered when the first opening stock price for that index is received within these time frames. The index dissemination period ends when the last exchange in the regional universe closes.

### Real-time and End of Day Indexes

The indexes are calculated and disseminated at different frequency standards:

Real-time indexes: Morningstar calculates and disseminates real-time indexes at set interval, depending on the index type during the index dissemination period. Most indexes are disseminated every 15 seconds, though the interval may vary based on index and exchange.

End-of-day indexes: Calculated and disseminated once a day after the EOD files are published.

### Dissemination Channels

The RT index values are disseminated over the Chicago Board of Exchange (CBOE) and Stuttgart, and may also be accessed via third party platforms such as Refinitiv and Bloomberg. CBOE is the Morningstar Indexes preferred RT dissemination channel, and clients must be licensed with CBOE to access the Morningstar Indexes RT data.

Appendixes

Appendix 1: Modifications to the Rulebook

Version	Description of Change	Update Date
1	First published version	April 5, 2023
2	Special Opening Quotation section added	February 2024

## About Morningstar Indexes

Morningstar Indexes was built to keep up with the evolving needs of investors—and to be a leading-edge advocate for them. Our rich heritage as a transparent, investor-focused leader in data and research uniquely equips us to support individuals, institutions, wealth managers, and advisors in navigating investment opportunities across major asset classes, styles, and strategies. From traditional benchmarks and unique IP-driven indexes to index design, calculation, and distribution services, our solutions span an investment landscape as diverse as investors themselves.

## Morningstar Indexes Methodology Committee

The Morningstar Indexes Methodology Committee oversees all new index development, index methodology changes, and cessation of indexes for any indexes where Morningstar owns the intellectual property. This committee is also charged with ensuring that indexes align with Morningstar Research principles and values. The group comprises members of the index team with index research, product development, product management, client service, index implementation, and operation expertise who provide the first layer of governance over index design and methodology.

## Morningstar Indexes Operations Committee

The Morningstar Indexes Operations Committee governs the processes, systems, and exception handling of the day-to-day management of all live indexes, including index rebalancing and reconstitution, restatements, market classification, and contingency management. The committee oversees the annual review of index methodology (as required by U.K. and EU benchmark regulations, or BMR), ensuring that methodologies remain fit for purpose and continue to achieve their stated investment objectives. The group comprises members of the index team with data, operations, corporate actions, product development, index launch, client service, and index management experience who provide the first layer of governance over index operations.

## Morningstar Indexes Oversight Committee

The Morningstar Indexes Oversight Committee is responsible for the index oversight function as per the requirements of the U.K. and European BMR, providing independent oversight of all aspects of the governance of benchmark administration as required by the relevant BMR. Its remit extends to all calculation and administration-related business activities of Morningstar Indexes, including administration of Morningstar-owned benchmarks as well as client-owned benchmarks and index calculation. The oversight function is part of the organizational structure of Morningstar but is separate and independent from the index business, index management, and the other index committees.

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