

Dow Jones CBOT Treasury Index

Methodology Overview

The Dow Jones CBOT Treasury Index is calculated as the weighted-average price of the nearest, non-spot month contracts for CBOT 5-Year Note Futures, 10-Year Note Futures, and T-Bond Futures contracts.

The three futures contracts are weighted by their respective modified Macaulay durations, which allow coupon and maturity to be considered simultaneously. Macaulay duration statistics are calculated as the present value of a bond's cash flows weighted by length of time to receipt, divided by the present value (the current market price) of the bond.

$$D = \frac{\sum_{t=1}^n \frac{C_t(t)}{(1+i)^t}}{\sum_{t=1}^n \frac{C_t}{(1+i)^t}}$$

where:

D = duration

t = time period in which coupon or principal payment occurs

n = number of time periods

C = interest or principal paid in each period t

i = market yield to maturity for the bond

Macaulay duration statistics are expressed in years. Because a zero-coupon bond has the same duration as its remaining time to maturity, its duration and maturity are always identical. A coupon-paying bond will have a shorter duration than its maturity, because some of its cash flow occurs before its maturity date. For example, if a 10-year bond has a duration of 7.75, the statistic means the bond has the same price sensitivity to interest rate changes (at the margin) that a zero-coupon bond maturing in seven-and three-quarter years would have.

Modified duration is a statistic that measures how much a bond's duration changes in response to a 100-basis-point change in interest rates, assuming that the bond's expected cash flows do not change when the yield changes. That condition holds for noncallable Treasury securities such as those that underlie the CBOT futures contracts. Because bond prices and interest rates are inversely related, modified duration is an appropriate tool for investors seeking to measure the volatility of a particular bond. Modified duration is calculated by dividing a bond's Macaulay duration by $1 + (\text{yield to maturity}/\text{number of coupon periods per year})$.

Modified Duration = Macauley Duration / $(1 + \text{yield} / k)$

where:

k = the number of periods, or payments, per year

Because Treasuries pay interest semi-annually, the denominator for their modified duration will always be $(1 + \text{YTM}/2)$.

Base Date and Base Value

The base date for the Dow Jones CBOT Treasury Index is November 30, 1999, and the base value was set at 100. This date corresponds to the change in the underlying futures contract to a 6% coupon paid semiannually.

Calculation

The index calculation formula is: $[\Sigma(\text{Bond Price} * \text{Weight}) / \Sigma(\text{Weights})] / \text{Divisor}$

The calculation makes the following three assumptions about the underlying contracts:

1. The five-year futures contract specifies delivery of a 6.00% semiannual coupon note maturing in five years.
2. The 10-year futures contract specifies delivery of a 6.00% semiannual coupon bond maturing in 10 years.
3. The Bond futures contract specifies delivery of a 6% semiannual coupon bond maturing in 20 years.

The index is recalibrated quarterly after the close of trading on the last business day of February, May, August, and November. New divisors and index weights are developed using the official closing futures prices (2:00 p.m. Chicago time).

The Dow Jones CBOT Treasury Index is calculated and disseminated on a real-time basis whenever the Treasury futures contracts are open for trading on the CBOT's electronic trading system. The index is updated every 15 seconds, based on the latest reported trades in each of the underlying futures.