



Evaluating a Municipal Bond's Interest Rate Risk

One of the principal risks facing municipal bond investors is interest rate risk, or the risk posed to a bond as a result of interest rate fluctuations. In general, the longer the maturity of a bond, the greater the risk. If a bond is sold prior to its maturity in any interest rate environment, whether rates are high or low, its price or market value will likely be affected by the prevailing interest rates at the time of the sale. When interest rates rise, investors attempting to sell a fixed rate bond may not receive the full par value. When interest rates fall, the same investors may receive more than the par value in a secondary market sale. "Duration" permits an investor to estimate how much a bond's price may rise or fall depending on movements in interest rates.

Bonds have a "par" or fixed face value, which may differ from the bond's market value — the price at which investors likely will buy or sell the bond in the secondary market. A bond held to maturity will pay the par value plus interest.

Understanding duration, how it affects the price of bonds and what factors affect the duration calculation can assist an investor in making informed investment decisions.

What is Duration?

Duration is a measure of a bond's sensitivity to interest rate changes. It is a numerical value, which corresponds to a number of years. Generally, the bigger the duration number, the more sensitive the bond is to interest rate changes.

More specifically, duration measures the amount by which a bond's price may increase or decrease for each 1 percent change in interest rates. For example, if the duration of a bond is 3, this means that for each 1 percent increase in interest rates, the price of the bond will generally decrease by 3 percent. Similarly, if the duration of a bond is 5, this means that for each 1 percent increase in interest rates, the price of the bond will generally

decrease by 5 percent. The converse is also true, such that if the duration of a bond is 5, for each 1 percent decrease in interest rates, the price of the bond will generally increase by 5 percent.

What are the Components of Duration?

Many factors are involved in determining a bond's duration. Below are some of the most significant components of this evaluation.

- *Coupon Rates* — Generally, bonds with high coupon rates tend to have lower durations than bonds with lower coupon rates.
- *Yield* — Generally, bonds with higher yields tend to have lower durations than bonds with lower yields.
- *Maturity* — Generally, bonds with longer maturities tend to have higher durations than bonds with shorter maturities.



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Duration measures a bond's price fluctuation according to interest rate changes.

- **Call Features** — Generally, bonds with call features have a lower duration when interest rates fall and a higher duration when interest rates increase. As yields rise on a bond, duration tends to shorten.

What is the Relationship between Duration and Bond Price?

The price and yield (the income return on an investment) of a bond generally have an inverse relationship. In other words, as the price of a bond goes down, the yield goes up and vice versa. Thus, when interest rates rise, a bond's price usually declines because an investor can earn a higher yield with another bond. Conversely, when interest rates fall, the bond's price usually rises. Duration is a measure of how much the price changes as a result of this risk.

Changes in interest rates do not affect all bonds equally, however. Generally, the longer the maturity of the bond, the more its price will be affected by interest rate changes. Similarly, a long duration generally means greater potential for short-term gains and losses. This relationship is highly relevant for investors who buy or sell their municipal bonds before the bonds reach maturity. [Learn more about selling municipal bonds before maturity here.](#)

For buy and hold municipal bond investors however, fluctuations in the price of their bonds generally will not affect the investor's bottom line because such investors do not intend to sell their bonds. Instead, these investors derive their income on the bonds from the principal and interest payments made on the bonds as they come due.

How is Duration Calculated?

The duration number is arrived at using a complicated calculation that typically evaluates the present value of the bond, its yield, coupon, final maturity and call features. The duration number may already be calculated and contained in information or documents created by an investor's financial professional. Investors should consult their financial professionals for information on the duration of their bonds. Investors may also calculate a specific bond's duration with the use of calculators available on financial websites.

What is Convexity?

Although duration is a helpful tool in assessing a bond's sensitivity to interest rate changes, duration does not provide a complete perspective of interest rate risk on a bond. This is because duration assumes that the inverse relationship between price and yield is linear. However, this relationship is often convex, or curved. Thus, for small changes in yield, duration is relatively accurate, but for larger changes in yield, duration can be inaccurate and result in an underestimated bond price.

By measuring the convexity, or the curvature of the changes in the price of a bond in relation to changes in interest rates, financial professionals are able to better measure bond duration than by relying on a traditional duration calculation alone. Thus, duration and convexity are evaluated together to assess a bond's interest rate risk.

Convexity measures the curvature of the changes in the price of a bond in relation to interest rate changes.



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Duration and Economic Cycles

Generally, the bond market tends to react negatively to reports of strong and potentially inflationary levels of economic growth. An increase in interest rates will decrease a bond's price or value. The converse is also true: negative economic news may indicate lower inflation and an expected decrease in interest rates, resulting in an increase in bond prices.

Municipal bond investors should be aware of how bond market prices are directly linked to economic cycles and concerns about inflation and deflation. Understanding what duration is and what factors affect duration can assist investors in making informed investment decisions, including whether it is a good time to sell a municipal bond or to hold the bond to maturity or until the interest rate environment is more favorable. Investors should consult their financial professionals for additional information on the duration of their bonds.

