

Bond Basics

October 2007

Duration: The Most Common Measure of Bond Risk

Duration is the most commonly used measure of risk in bond investing. Duration incorporates a bond's yield, coupon, final maturity and call features into one number, expressed in years, that indicates how price-sensitive a bond or portfolio is to changes in interest rates.

There are a number of ways to calculate duration, but the generic term generally refers to effective duration, defined as the approximate percentage change in a security's price that will result from a 100-basis-point change in its yield. For example, the price of a bond with an effective duration of two years will rise (fall) two percent for every one percent decrease (increase) in its yield, and the price of a five-year duration bond will rise (fall) five percent for a one percent decrease (increase) in its yield. Because interest rates directly affect bond yields, the longer a bond's duration, the more sensitive its price is to changes in interest rates.

Different Duration Measures

Other methods of calculating duration are applicable in different situations, and PIMCO has developed two proprietary measures – bull duration and bear duration – which we use to enhance our understanding of how bond portfolios will react in different interest-rate scenarios.

- **Bear Duration:** A proprietary measurement developed by PIMCO, Bear Duration estimates the price change in a security or portfolio in the event of a rapid, 50-basis-point rise in interest rates over the entire yield curve. This tool is designed to measure the effect that mortgages and callable bonds will have on the lengthening (or extension) of the portfolio's duration.
- **Bull Duration:** Another proprietary measurement developed by PIMCO, Bull Duration estimates the price change in a security or portfolio in the event of a rapid, 50-basis-point drop in interest rates over the entire yield curve. This tool is designed to measure the effect that mortgages and callable bonds will have on shortening (or contracting) the portfolio's duration.
- **Curve Duration:** This estimates a portfolio's price sensitivity to changes in the shape of the yield curve (i.e., steepening or flattening). A portfolio's curve duration is considered positive if it has more exposure to the 2- to 10-year part of the curve. A portfolio with positive curve duration will perform well as the yield curve steepens, but will perform poorly as the yield curve flattens. A portfolio with negative curve duration has greater exposure to the 10- to 30-year portion of the curve. It will be a poor performer as the yield curve steepens and a strong performer as the yield curve flattens.
- **Spread Duration:** This estimates the price sensitivity of a specific sector or asset class to a 100 basis-point movement (either widening or narrowing) in its

Bond Basics

October 2007

spread relative to Treasuries. For example, corporate spread duration considers the widening or narrowing of the spread over LIBOR in floating-rate notes. The spread duration for fixed-rate corporates is the same as standard duration. Mortgage spread duration considers the widening or narrowing of the option-adjusted spread (OAS) that takes into account the prepayment risk of mortgage-backed securities.

- **Total Curve Duration:** This estimates a portfolio's price sensitivity to changes in the shape of the yield curve relative to its benchmark's sensitivity to those same changes (see Curve Duration above for characteristics of positive vs. negative portfolios).

The Uses of Duration Tools

Duration can be used in response to expected changes in the economic environment. If the outlook on bonds is "bullish," i.e., we expect interest rates to fall, duration is then extended. If the outlook on bonds is "bearish," i.e., we expect interest rates to rise, duration is then reduced. Moreover, fund managers use duration in an attempt to construct the most appropriate portfolio for a given investor.

Low-duration strategies, which maintain average portfolio duration of one to three years under normal market conditions, should be less volatile than longer-duration strategies and are often used as an alternative for traditional cash vehicles such as money market funds. In a low interest rate environment a low-duration portfolio has the potential to be a higher yielding alternative to money market funds for investors willing to accept additional risk in pursuit of greater return.

Moderate-duration strategies, which maintain average portfolio durations ranging from two to five years, could be appropriate for investors seeking the potential for higher returns than money market or short-term investments and are willing to accept some additional interest rate risk in pursuit of greater return.

Long-duration strategies, which maintain average portfolio durations ranging from six to 25 years under normal market conditions, offer a relatively stable alternative to equities. In addition, they may be suitable for an investor looking for a closer match between the duration of its portfolio and its liabilities. Longer-duration strategies tend to benefit from uncertainty in the financial markets that might result in, for example, equity-market volatility or a flight to quality into Treasuries.

Equal Duration Does Not Mean Equal Returns*

Although duration is an important tool in constructing portfolios, portfolios with the same duration do not necessarily provide equal returns. For example, a hypothetical portfolio of 10-year Treasuries returned 15.4% from October 2000 to October 2001. During the same period, a portfolio of two-year and 30-year Treasuries with the same duration as the portfolio of 10-year Treasuries produced a return of 11.8% (a difference of 360 basis points).

Bond Basics

October 2007

Why did the two hypothetical portfolios with equal duration have such different returns? Because yields on Treasuries of different maturities rarely move in unison. In general, the yield curve tends to steepen when interest rates are declining and flatten as interest rates rise. In the example above, the yield on the 10-year Treasury dropped from 5.80% to 4.59% from October 2000 to October 2001, a 121-basis-point decline. The portfolio consisting of two-year and 30-year Treasuries was affected by the movement in the yield curve, which steepened massively over the period in question: the 30-year bond went from yielding 14 basis points less than the two-year note in October 2000 (an inverted yield curve) to yielding 265 basis points more in October 2001, a 279-basis-point steepening.

Conclusion

Duration, the most commonly used measure of bond risk, quantifies the effect of changes in interest rates on the price of a bond or bond portfolio. The longer the duration, the more sensitive the bond or portfolio should be to changes in interest rates.

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Bond Basics

October 2007

Past performance is no guarantee of future results. In an environment where interest rates may trend upward, rising rates will negatively impact most bond funds, and fixed income securities held by a fund are likely to decrease in value. Bond funds and individual bonds with a longer duration (a measure of the expected life of a security) tend to be more sensitive to changes in interest rates, usually making them more volatile than securities with shorter durations.

***Hypothetical example for illustrative purposes only.** No representation is being made that any account, product, or strategy will or is likely to achieve profits, losses, or results similar to those shown. Hypothetical or simulated performance results have several inherent limitations. Unlike an actual performance record, simulated results do not represent actual performance and are generally prepared with the benefit of hindsight. There are frequently sharp differences between simulated performance results and the actual results subsequently achieved by any particular account, product, or strategy. In addition, since trades have not actually been executed, simulated results cannot account for the impact of certain market risks such as lack of liquidity. There are numerous other factors related to the markets in general or the implementation of any specific investment strategy, which cannot be fully accounted for in the preparation of simulated results and all of which can adversely affect actual results.

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