Madison INVESTMENTS

BOND CONCEPTS

Interest Rate Risk

Most people look at the maturity of a bond to gauge the security's risk. Maturity, however, only looks at the time until repayment of principal. To accurately measure a security's risk, both principal and coupon payments must be considered. The use of two metrics better defines a security's risk: **Duration** and **Convexity**.

What is Duration?

Duration is a measure of a bond's sensitivity to changes in interest rates, which takes into consideration all cash flows of a bond— both principal and interest payments. All cash flows are discounted to their present value.

Duration can quantify the change in a bond's price for changes in its yield. For a 1% change in interest rates, a bond's price will change (inversely) by an amount roughly equal to its duration. For example, a 5-year bond with a coupon of 4.0% matures in 5 years and has a duration of 4.5 years. If interest rates fell 1%, that bond would rise approximately 4.5% in value, for a total return of 9.5% (4% coupon plus 4.5% price appreciation). Conversely, if interest rates rose by 1%, the total return would be -0.5%.

All things equal, the larger a bond's coupon, the shorter its duration because a greater proportion of the cash payments are received earlier. A zero-coupon bond's duration is equal to its maturity, as nothing is paid until maturity.

An illustration of how duration affects returns is as follows:

— $100,000 4.0% Treasury Bond (at par)
— 5 Year Maturity
— 4.5 Year Duration
— Change in rates over 1 year period

RATES REMAIN UNCHANGED	RATES RISE 1%	RATES FALL 1%
Interest Earned: $4,000	**Interest Earned:** $4,000	**Interest Earned:** $4,000
Price Change: $0	**Price Change:** $(4,500)	**Price Change:** $4,500
Total Return: $4,000 4.00%	**Total Return:** $(500) (0.50%)	**Total Return:** $8,500 8.50%

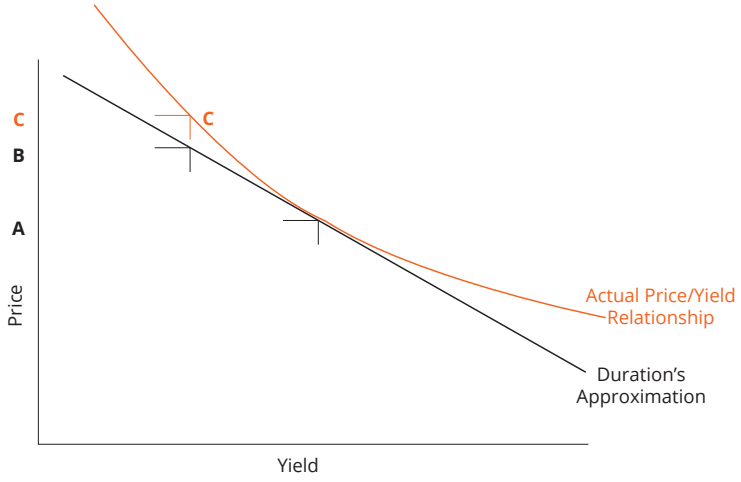
These examples illustrate that during periods of rising interest rates, principal risk or price change risk is amplified, which can significantly affect the total return of a bond portfolio. When rates fall, principal gains can enhance and add to the overall return of the portfolio. In an environment of ultra-low interest rates, where coupon income represents a very small portion of the overall total return, getting the duration decision correct can have a significant impact on overall bond portfolio returns.

What is Convexity?

Convexity is the change in a bond's price that is not accounted for by duration. Duration alone can accurately estimate price changes for a bond resulting from relatively small changes in rates (<50 basis points). The bigger the change in rates and the longer the change takes, the less accurate duration becomes. In the above example, duration assumes a linear relationship. In practice, the bond would rise more than indicated by duration alone, the additional amount attributable to convexity.

Here is an example of how the price of a bond reacts to a decline in yields. The starting price, before the change in Yield, is A. While duration would indicate a price of B when rates fall by 1%, the market price would be C, due to the convexity of the bond.

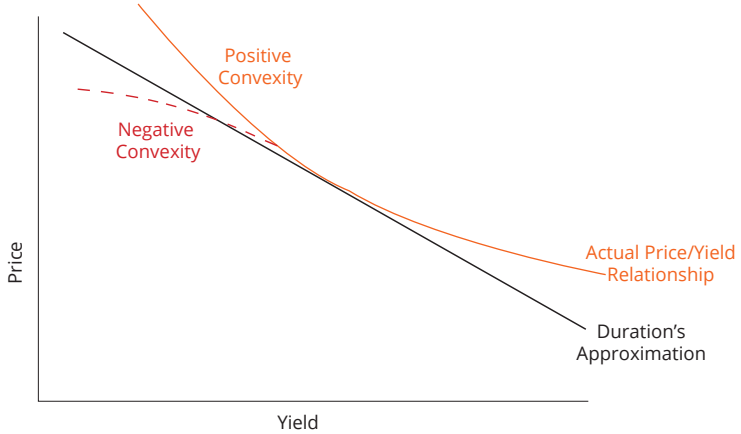
Similarly, should rates rise, duration alone would predict a loss greater than would actually occur. For a bond or portfolio of bonds, duration will always underestimate performance over large changes in yields.



What is Negative Convexity and why does it matter?

Some bonds will diminish in value as interest rates decline. This often occurs because of a bond's callability features. Think mortgage-backed securities (MBS) – when interest rates fall, mortgages are refinanced and MBS will pay back par value a lot earlier than at maturity. When interest rates rise, homeowners are less likely to refinance their mortgage, leading to a longer duration of cash flows for the MBS. In this case, the fixed cash flows become less valuable, and investors would demand a higher yield to compensate them for the risk of owning the security. This results in the price of the security falling.

When interest rates are volatile, negative convexity securities may be riskier than similar securities with positive convexity and can potentially result in a larger loss or limited gain for the investor. Convexity – both positive and negative – is another lever an active manager can pull to navigate risk and influence income and total return.



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A basis point is one hundredth of a percent.

Par value is the amount owed to the bond holder at maturity.

In addition to the ongoing market risk applicable to portfolio securities, bonds are subject to interest rate risk, credit risk and inflation risk. When interest rates rise, bond prices fall; generally, the longer a bond's maturity, the more sensitive it is to this risk. Credit risk is the possibility that the issuer of a security will be unable to make interest payments and repay the principal on its debt. Bonds may also be subject to call risk, which allows the issuer to retain the right to redeem the debt, fully or partially, before the scheduled maturity date. Proceeds from sales prior to maturity may be more or less than originally invested due to changes in market conditions or changes in the credit quality of the issuer.