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# UNDERSTANDING BOND CONVEXITY

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## Key Takeaways

- Bond yields and prices do not move in lock step with one another.
- As yields rise or fall, the pace and size of any change in one bond's prices can be different than another bond.
- Visualizing price changes as yields change looks more like a curved line than a straight line, and the curved line illustrates a bond's convexity.

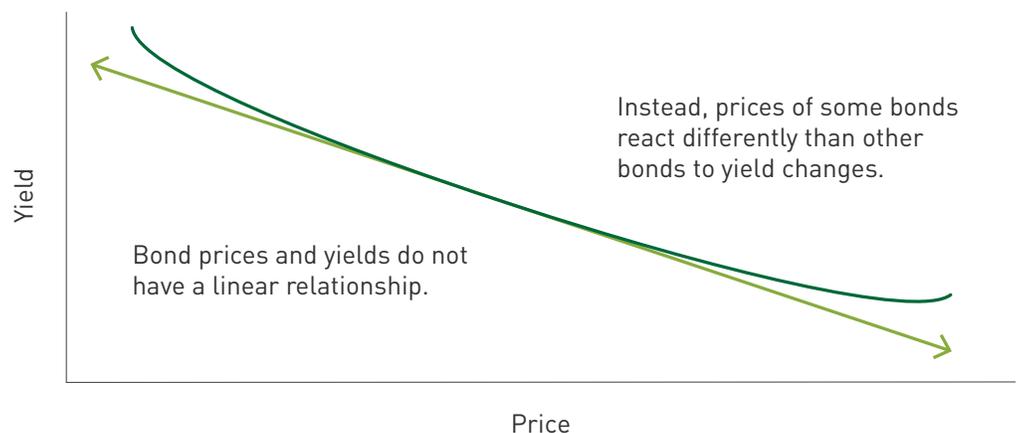


One of the essential rules of investing is that when interest rates rise, bond prices fall. It makes sense. If bonds coming to market offer higher interest rate yields, prices will fall for comparable bonds already in circulation: those bonds, for instance, with the same maturity or yield. Based on the logic of that relationship, we can understand the opposite of that to be true as well: when interest rates fall, prices rise for comparable bonds.

A less evident investment rule is that bond yields and prices do not move in lock step with one another. In other words, a bond's price does not change in a straight line in response to changes in interest rates.

Instead, as yields rise or fall, the pace and size of any change in one bond's prices can be different than another bond. That is duration and it can apply to all types of bonds including taxable, tax-exempt, and securitized bonds. Duration can be used to measure how sensitive the price of a bond is for a given change in interest rates. Visualizing price changes as yields change looks more like a curved line than a straight line (See Figure 1). The curved line illustrates a bond's convexity, which can be thought of as a second derivative of the relationship between a bond's price and its yield.

**FIGURE 1: PRICES & YIELDS DON'T MOVE IN A STRAIGHT LINE**



## DEFINING CONVEXITY

A bond's convexity relates to the duration of a bond—the sensitivity of its price to interest rate changes—as interest rates rise and fall. The rate of change in duration with respect to changing interest rates is referred to as the bonds convexity.

Positive convexity means that the bond's price increases more when interest rates fall than it decreases when interest rates rise by the same amount. By providing a potential cushion against price declines when rates rise, positive convexity can help partially offset interest rate risk.

Even bonds with equal durations and yields can have differing convexities attributable to characteristics that can affect the degree of a bond's positive or higher convexity, as well as its negative or lower convexity. Characteristics causing variation in convexities may include price, coupon rate, maturity, yield to maturity, credit quality, and bond provisions like puts and calls. Even market liquidity at any point in time can affect convexity because of its implications for the ease or difficulty of selling a bond.



**FIGURE 2: POSITIVE & NEGATIVE CONVEXITY DESCRIBE RESPONSES TO INTEREST RATE CHANGES**



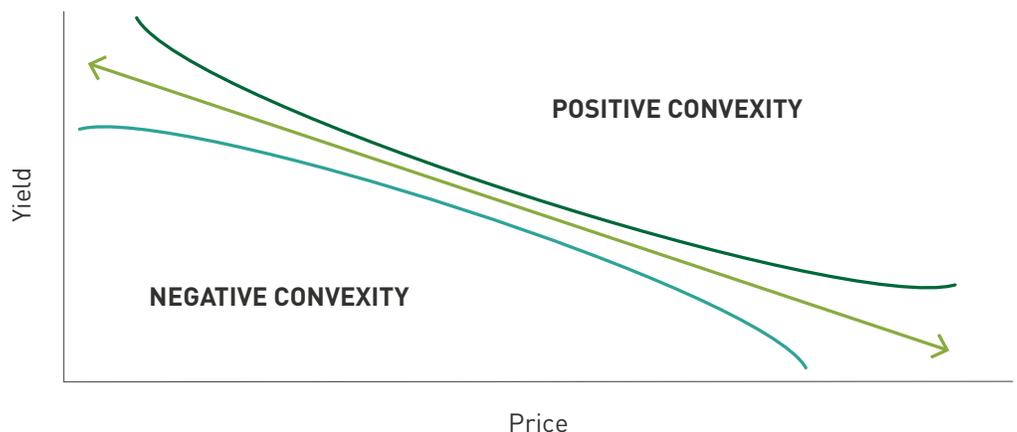
### WHAT CAUSES CONVEXITY?

Knowing that bonds with equal durations and yield can have differing convexities, investors need to consider the specific causes of convexity. For example, the convexity of mortgaged-backed securities (MBS) is typically negative because, as interest rates fall, homeowners tend to refinance their mortgages, which pushes duration lower. Ultimately, mortgage prices go up by a lesser amount when rates drop, as they decrease when rates increase. MBS yields can be higher than taxable or tax-exempt bonds, which compensates investors for the bond's negative convexity.

Call features can be another common influence on a bond's convexity. The Investment Company Institute reported that, on average during the 10-year period from January 1, 2013, through December 31, 2023, roughly 89 percent of all municipal bonds issued had featured call options. Corporate bonds also are issued with call features, although less frequently than municipal bonds.

Callable bonds provide the issuer with the ability to recall and retire the bond's debt before the stated maturity date. Call features can allow an issuer to retire higher-interest debt, for example, and reissue bonds at a time when interest rates are lower. Call provisions may cause lower convexity because issuers can redeem bonds before maturity, adding uncertainty and affecting a bond's sensitivity to rate changes.

**FIGURE 3: POSITIVE & NEGATIVE CONVEXITY & RISK**





## CONVEXITY CONCLUSIONS

Considering bond characteristics and how they individually and in combination can affect convexity offers portfolio managers a more comprehensive view to a bond's potential price behavior and relative value across interest rate regimes.

Effectively managing convexity's influence on the performance of individual bonds as well as fixed income portfolios requires insight and experience supported by information systems and trading platforms that offer portfolio managers a real-time view of shifting interest rate and market conditions.

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