

What You Need to Know About Bond Yields to Determine Your Returns

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Article Highlights

- Bond professionals have come up with an array of bond yield meanings in an attempt to create comparisons among bonds with different characteristics.
- Current yield is the simplest calculation, dividing the bond's coupon rate by its price, but it can cause you to misinterpret the value of an investment.
- Yield-to-maturity is widely used because it is a unifying standard for all bond pricing, while yield-to-call and yield-to-worst are more useful for callable bonds.

Advisers and the media talk about yield on different investment products, without necessarily clarifying what the word 'yield' actually means.

This article seeks to provide a simplified understanding of the meaning of the different yields that are stated on bonds.

When we refer to "bonds" in this article, we mean individual bonds, either taxable or tax-free, and not bond funds. Mortgage-backed securities and Treasury inflation-protected securities (TIPS) are viewed as bond investments but do not meet the criteria of a traditional bond, which has a fixed coupon and a predictable interest rate. These products are not discussed in this article.

Understanding Bond Pricing and Yield

A bond coupon rate determines the amount of interest that you receive annually, usually expressed as an annual percentage. For our purpose, a bond's coupon is a fixed rate.

Bond prices, however, fluctuate continuously. As the yields change, the prices of the bonds also change. The coupon rate acts as a fulcrum, with yields on one side of the seesaw and price on the other side.

Bonds can be sold at their face value, at more than their face value or at less than their face value. Because the market cannot change the fixed coupon rate—which is set in stone when the bond is issued—the market affects the price at which



the bond is sold. As the interest rate changes in the market, so does the price. The following are some useful definitions in understanding yield and pricing in bond-speak.

- **Par:** This is the face value of a bond, which is usually \$1,000 for one bond. The price of a bond is generally noted as a number proportionate to 100.
- **Discount bond:** A bond that is sold at a price less than its face value, or par.
- **Premium bond:** A bond that is sold for more than its face value, or par.

While most new issue corporate bonds are generally issued at par, new issue municipal bonds may be sold at par, at a discount or at a premium. The coupon rate of the bond sets the interest payments. The amount of interest that you receive is the coupon rate multiplied by the face value of the bonds that you hold. Thus, if you own a bond with a face value of \$5,000 and the coupon is 4%, you will receive \$200 each year with respect to this bond. The actual price that you pay for the bonds and the yield that you receive are based on market conditions.

The connection between yield and price is important to grasp. For example, when a bond carries a 4% coupon rate and the prevailing interest rates are 3%, buyers will pay more than the face value of the bond to receive the benefit of the higher coupon rate. In this case, the bond sells at a premium (an increase over) face value. For example, on June 21, 2016, a 4% coupon District of Columbia bond that comes due on June 1, 2041, was selling at 123.775.

On the other hand, also on June 21, 2016, a 3% coupon Pittsburg Unified School District, Contra Costa County, California, bond coming due on August 1, 2040, was selling at a discount to its face value at 98.875.

Occasionally, a bond will sell at its face value, and at such times it is said to sell at par. It is often thought that newly issued bonds are priced at par, but this need not be the case. Price changes during the life of a bond reflect changes in the bond's yield. These changes affect you only if you choose to sell a bond you already own prior to its due date or seek to purchase a bond on the open market.

A Bond's Cost and Measures of Yield

One bond generally equals \$1,000. Corporate bonds, Treasury bonds and U.S. government agency bonds are sold in units of \$1,000, or one bond. Municipal bonds are sold in units of \$5,000, or five bonds. Bonds with a face value of \$25,000 are equivalent to 25 bonds.

Bond costs are always quoted in "points," not in dollars. One bond selling at 101 will cost \$1,010. Simply move the decimal point one place to the right to find the dollar equivalent. Thus, a par bond quoted at 100 has a face value of \$1,000. To find out what your total cost would be, multiply the dollar amount by the number of bonds. Thus, 10 bonds at the 101 price would cost \$10,100 ($\$1,010 \times 10$).

Determining a Bond's Yield

As suggested, imagine a bond coupon as a fulcrum that creates the equilibrium between bonds sold at different prices, just like a seesaw. The coupon is the interest rate of a bond stated as a percentage of its face value.

The value of bonds declines when interest rates rise, and the value of bonds increases when interest rates decline. In short, we say that yield moves inversely to price.

This concept is so important that we highlight it here: *Bonds are bought and sold*

based on yield, not on price. This represents a key distinction between bonds and stocks. Stocks are always bought and sold in terms of price.

Yield is the general term for the percentage return on a bond investment, taking into account the price of the bond. It is often called the rate of return. In bond language, the yield is very different from the stated coupon rate. It is critical to understand these concepts in order to understand how bonds are valued, bought and sold.

Alternative Measures of Yield

Sellers of individual bonds use a variety of yield terms. Bond professionals in particular have come up with a bewildering array of meanings. Each term, in its own way, seeks to create comparability among bonds with different financial characteristics.

Understanding the different measures of yield will enable you to buy bonds and invest wisely. We explain the different measures of yield that you should ask about in order to understand and compare the returns available on different bonds. The most important measures are current yield, yield-to-maturity and yield-to-call. Most of the yields require a financial calculator for you to compute them accurately. However, your broker or adviser will provide you with all of the relevant measures of yield if you so request before you buy a bond.

Current yield (CY) is the only simple calculation among the lot and it is used as a measure of cash flows. It is the cash on cash return. It is simply the bond's coupon divided by the price you pay for the bond:

$$\text{Current yield} = \text{Coupon} \div \text{Price}$$

Thus, if the coupon is 5% and you pay 120 for the bond, the current yield is 4.17%, or 5 divided by 120. Be sure to omit the percentage sign from the coupon rate (the numerator), otherwise the equation will not work.

If you are looking solely at cash flow, then current yield is a useful tool

to compare cash flows from taxable and tax-exempt municipal bonds. However, to look at bonds this way may lead you to misinterpret the value of an investment. Unlike current yield, all other bond yield calculations take compound interest into account.

Compound Interest Yields

Compound interest is complex because it adds the interest to your principal and then compounds the new total; in effect, interest is being earned on interest.

Municipal bonds compute yield on a 360-day calendar. Other investment products may compute yield on the 365-day calendar. Minor differences in yield calculations of different investment products may result in their compound interest yields not being directly comparable.

Compounded interest is based on the premise that money is constantly reinvested to generate further income. Yield-to-maturity and yield-to-call are based on the concept of compound interest.

Yield-to-maturity (YTM) is a common measure of return on which individual bonds are traded and quoted. In the bond world, calculations assume that money never lies fallow or is hidden away in a mattress. Rather, it is constantly reinvested to generate further income. Although YTM is not a perfect measure of return, it is widely used because it is a unifying standard for all bond pricing. For example, it enables you to compare a premium bond to a discount bond or to compare a bond coming due in five years to a bond coming due in 20 years.

YTM makes the following assumptions: (1) You retain ownership until the bond comes due and (2) all interest payments are reinvested at the quoted YTM rate. However, since interest rates change over time, your actual YTM on a bond will change as well. Keep in mind that the cash flow will not vary. If rates rise, for example, and you are able to reinvest the semiannual interest payments at a higher rate, your actual return will be higher than the quoted YTM. If interest rates decline over the

life of the bond and you reinvest the interest payments at a lower rate, your actual YTM will be lower. Note that the key concept underpinning all this is compound interest. The YTM calculation assumes reinvestment of every interest payment at the YTM rate, because the calculation could not otherwise be made. One exception to the variation just mentioned is a zero-coupon bond. In this case, since there is no cash coupon, the stated YTM is precisely correct.

If a bond is callable, you should be quoted two rates, the yield-to-maturity and the **yield-to-call (YTC)**. YTC is particularly important when interest rates have been falling because there is a good possibility that the issuer may decide to exercise its right to call the bond before its due date. In this case the issuer buys your bond back from you, generally at its face value. This is especially likely if the coupon rate of the bond is higher than the prevailing rate of interest.

Yield-to-worst (YTW) is the lowest possible yield you could receive for the bond. Consider the following complex but logical concept:

If a bond is sold at a premium and there are multiple calls, the YTW is the yield to the first call date. When a bond becomes callable, it may be called at the first call date or any date thereafter. The later a bond is called after the first call date, the higher the yield-to-worst will actually be if there is only a par call.

If a bond is sold at a discount and the bond is callable, the yield-to-worst is the yield-to-maturity. The yield-to-worst is defined as the lower of the yield-to-call or yield-to-maturity. When a bond is sold at a discount and is called prior to maturity, the discount is earned quicker so that the yield-to-maturity is lower than the yield-to-call.

If a bond is sold at par, the current yield, the yield-to-maturity and the yield-to-call will all be the same.

Always request yield-to-maturity, yield-to-call and yield-to-worst calculations from your broker because you

Calculating Bond Yields in Microsoft Excel

Most bond yields require a financial calculator to be calculated correctly. Individual investors who are familiar with Microsoft Excel can use a spreadsheet to calculate yields as well. AAI's Wayne Thorp listed several of the formulas for doing so in *Computerized Investing* ("Bond Prices, Returns and Volatility," First Quarter 2013). A summary of the calculations is included in the online version of this article. For those who are interested, Wayne's article contains more detailed instructions and a downloadable spreadsheet. It can be found in on the *Computerized Investing* website (www.aai.com/computerized-investing/article/bond-prices-returns-and-volatility).

don't know what direction interest rates will take or whether a bond will be called. That way you are not surprised by the possibility that you will get a lower yield.

Examples of Various Bond Yields

Let's look at some real-life examples of high-quality tax-free municipal bonds that were available for sale on June 21, 2016, to better understand the yield concepts discussed above.

Example 1: Premium Bond With a 5% Coupon

District of Columbia bond with a 5% coupon coming due June 1, 2041, a first call on June 1, 2026, and a price of 123.775. For this bond:

- The current yield is 4.04% ($5 \div 123.775$); and
- The yield-to-maturity is 3.554%;
- The yield-to-call is 2.308%; and
- The yield-to-worst is 2.308%, the same as the yield-to-call.

Though this example has the highest coupon and the highest price, this still may be the best investment depending upon how you see the future.

The 5% coupon bond may be viewed as a bet that bond yields will be higher in the future. Note that this bond has 10-year call protection and the current yield is a very nice 4.04%, despite the high price of 123.775.

So is this the best alternative? The clear answer is maybe.

If interest rates are rising, you could reinvest the cash flow from the coupon payments at higher rates over

time, resulting in a better-than-expected return. If interest rates are substantially higher in 10 years, the bond may not be called. If it is called, you may get a higher yield at that time. However, if interest rates in 10 years are lower than they are today, it is likely that the 5% coupon bond will be called. If so, you would actually get a not-so-nice yield-to-call and yield-to-worst of 2.308%.

However, you may decide that you want a high current cash flow, knowing that a piece of the principal is returned with each interest payment. At the end of the day, you will get back the face value of the bonds. You also have the option of reinvesting or consuming the premium.

Example 2: Discount Bond With a 3% Coupon

Pittsburg Unified School District, Contra Costa County, California, bond with a 3% coupon coming due August 1, 2040, a first call August 1, 2026, and a price of 98.875. For this bond:

- The current yield is 3.03% ($3 \div 98.875$);
- The yield-to-maturity is 3.066%;
- The yield-to-call is 3.131%; and
- The yield-to-worst is 3.066%.

The lowest price bond offers different trade-offs. You are paying below par for the bond. The cash flow from this bond reflects only interest paid, no return of principal. The current yield is only 3.03% and the yield-to-maturity is only 3.066%. However, if yields stay low, this may be the best alternative because it has the highest yield-to-call at 3.131%, which compares well with

the 5% coupon in Example 1.

Many individual investors prefer par and discount bonds because they want to be sure that they do not consume any principal. The difference between the discounted selling price and the price at maturity of 100 is a forced savings. By choosing this option, you are betting that interest rates and inflation will stay down.

Example 3: Premium Bond With a 4% Coupon

District of Columbia bond with a 4% coupon coming due June 1, 2041, a first call of June 1, 2016, and a price of 113.423. For this bond:

- The current yield is 3.53% ($4 \div 113.423$);
- The yield-to-maturity is 3.213%;
- The yield-to-call is 2.468%; and
- The yield-to-worst is 2.468%.

The middle ground between these three bonds is the 4% coupon. The price premium is lower and the cash flow is less than the bond with the 5% coupon, but more than the discounted bond. Each interest payment returns some principal, in case interest rates do rise, yet the exposure to falling interest rates is not as extreme as with the 5% coupon.

In our practice, we suggest that clients buy some high and some low coupons since we don't know the direction of interest rates. If the client has a firm view of what interest rates will be in the future, we follow their lead.

Taxes Matter: Benefit of Tax-Exempt Muni Bonds

While you can know what the stated yield is on a bond, you would not be able to tell what the real value of the investment is from it. Why? Tax-exempt municipal bonds have a not-so-secret feature. They are free of

federal income tax and the new federal surtax on unearned income. They may also be subject to favorable local and state rules as well.

For example, the highest federal income tax bracket is 39.6%. Add to this the 3.8% surtax on unearned income for high-earner taxpayers and the federal bracket rises to 43.4%, before taking into account certain deduction phaseouts. Add to this state and local income taxes of possibly more than 10% in places like California, and returns on muni bonds are hard to beat.

A way to figure your pretax-equivalent return is to divide your tax-free muni yield by one minus your tax bracket expressed as a decimal. For example, if you are in the highest federal income tax bracket of 43.4%, then use $1 - 0.434$, or 0.566, for the denominator. If your yield on a muni bond is 3% and you are in the highest tax bracket (43.4%), divide the muni bond yield of 0.03 by 0.566. Thus, the pretax-equivalent return is 5.3% ($0.03 \div 0.566$) compared to a return on ordinary income. This is a handsome return on a high-quality investment, and don't forget the possible state tax savings as well.

Because your tax situation is unique to you, the standard yield projections that are offered by many investment products may not be accurate. To decide how beneficial tax-exempt bonds are for you, you must understand what your tax situation is. Your returns must be tax-affected. The only way you cannot benefit is if you pay no taxes!

Caveat Emptor

Muni bonds sometimes sell at a discount to their face value. If you buy a discount bond, this might have adverse tax consequences because Uncle Sam wants to participate in your good fortune.

For example, if you buy a bond

at 90 that comes due at 100, some, or all, of the discount might be taxed as capital gain or ordinary income. In some cases, the discount is not taxed at all if the bond is purchased at the original issue discount (the discounted price at which it was newly issued). If you buy a discount bond, ask your broker and tax adviser whether the discount will result in adverse tax consequences to you. You might ask your broker to give you the Bloomberg tax analysis on the bond.

Mark-to-Market Versus Cash Flow

All bonds are subject to interest rate risk. It does not matter what the quality of your bonds is, they will always fluctuate with the rise and fall of interest rates. If you understand that all bonds are subject to interest rate risk, then what matters is the mindset you bring to this investment.

Your monthly brokerage statement reflects the market valuation of your bonds. This is called marking to market. If your mindset is that your bond investment has to provide total return, then this is an ever-present attention grabber. If you are considering selling, be sure to add taxes and commissions into the equation.

We suggest that the proper mindset is that individual bonds should be purchased for cash flow, not trading. Unless you are planning to sell your bonds before they come due (or are called), we believe that the most relevant measure of return on your bonds is the cash flow produced by your bonds rather than looking at the gains or losses provided in your brokerage statement. Cash flow will help you work up a budget of how much you can spend without invading your principal. ▲

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