The yield of a bond is the rate at which an investor earns income on that bond each year. The income earned is, in most cases, different from the interest payments received, which are based on the coupon rate. While the coupon rate is expressed as a percentage of the principal amount due at maturity, the yield is expressed as a percentage of the amount invested. A difference between the yield and the coupon rate occurs whenever a bond is bought at a price other than par (i.e. the principal amount of $100 due at maturity).

**Simple Cases: Coupon Rate Equals Yield or Coupon Rate Equals Zero**

In the simplest case, a bond due in two years with a coupon rate of 3.00% and a yield of 3.00% will have a dollar price of 100. Zero coupon bonds, however, do not pay any interest until maturity. In that case, the interest earned on the bond will consist entirely of the difference between the price paid and the principal amount received at maturity. If a zero coupon bond due in two years has a yield of 3.00%, and interest is compounded annually, the bond will sell for 94.260 (which is $100 / 1.03^2). However, the convention in most bond markets (including the municipal market), is for interest to compound semiannually, which involves reducing the yield by half and doubling the number of compounding periods, in which case the zero coupon bond would have a dollar price of 94.218 (which is $100 / 1.015^4).

**Complex Case 1: Coupon Rate Is Less Than Yield**

Most bonds make periodic interest payments, but are currently valued at a price other than par. In the case of a bond with a coupon rate that is less than the yield, the price will be less than par (i.e. at a discount to par), and the interest earned will be a combination of the interest payments and the appreciation in the value of the security as it reaches maturity. The interest earned will be equal to the yield of the bond multiplied by its beginning value, and the excess of the interest earned over the coupon payment...
received will be the amount by which the value of the bond must increase in order to equal par at maturity (assuming interest is earned at a constant rate equal to the yield). The new value is referred to as “amortized cost” for tax purposes. Table 1 illustrates how a constant yield will cause the book value of a discount bond to appreciate to equal par by maturity (in a process known as “accretion of discount”).

Table 1: Constant Yield Causes the Book Value of a Discount Bond to Appreciate to Par

<table>
<thead>
<tr>
<th>Period</th>
<th>Beginning Value</th>
<th>Interest Earned</th>
<th>Interest Paid</th>
<th>Ending Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/1/14</td>
<td>98.073</td>
<td>1.471</td>
<td>1.000</td>
<td>98.544</td>
</tr>
<tr>
<td>3/1/15</td>
<td>98.544</td>
<td>1.478</td>
<td>1.000</td>
<td>99.022</td>
</tr>
<tr>
<td>9/1/15</td>
<td>99.022</td>
<td>1.485</td>
<td>1.000</td>
<td>99.507</td>
</tr>
<tr>
<td>3/1/16</td>
<td>99.507</td>
<td>1.493</td>
<td>1.000</td>
<td>100.000</td>
</tr>
</tbody>
</table>

Hypothetical examples are shown for illustrative and educational purposes only and do not reflect the actual performance results of any Nuveen product and should not be relied upon as investment advice.

Complex Case 2: Coupon Rate Is Greater Than Yield

On the other hand, if a bond’s coupon rate is greater than its yield, the bond will be worth more than par, and its premium will be amortized over time, as illustrated in Table 2.

Table 2: The Book Value of a Premium Bond Amortizes to Par

<table>
<thead>
<tr>
<th>Period</th>
<th>Beginning Value</th>
<th>Interest Earned</th>
<th>Interest Paid</th>
<th>Ending Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/1/14</td>
<td>101.951</td>
<td>1.020</td>
<td>1.500</td>
<td>101.470</td>
</tr>
<tr>
<td>3/1/15</td>
<td>101.470</td>
<td>1.015</td>
<td>1.500</td>
<td>100.985</td>
</tr>
<tr>
<td>9/1/15</td>
<td>100.985</td>
<td>1.010</td>
<td>1.500</td>
<td>100.495</td>
</tr>
<tr>
<td>3/1/16</td>
<td>100.495</td>
<td>1.005</td>
<td>1.500</td>
<td>100.000</td>
</tr>
</tbody>
</table>

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Yield to Maturity, Yield to Call and Yield to Worst

If the bond can be redeemed prior to maturity at a price of par or higher, and the coupon rate is greater than the yield, then the call date will be used in pricing the bond, and the premium will be amortized to the call date. The general principle is that the price of a bond will be the lower of the price to call or the price to maturity. For example, if a 3.00% bond that matures in 20 years can be called in 10 years, and if it is priced with a yield of 2.00%, the price to maturity would be 116.417, while the price to call would be 109.023. In this case the yield to call is the yield to worst. However, if interest rates rise to the point that early redemption is not economical and the bond remains outstanding to maturity, the yield to the investor who bought at a price of 109.023 would be 2.43%. The yield to maturity is higher because the premium would be amortized over a longer period, resulting in a smaller reduction in return per year. Table 3 illustrates how prices and yields change as the priced-to date changes.

Table 3: Prices and Yields Change as Priced-To Date Changes

<table>
<thead>
<tr>
<th>Settle</th>
<th>Maturity</th>
<th>Coupon</th>
<th>Yield</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/1/14</td>
<td>9/1/2024</td>
<td>3.00%</td>
<td>2.00%</td>
<td>116.417</td>
</tr>
<tr>
<td>9/1/14</td>
<td>9/1/2034</td>
<td>3.00%</td>
<td>2.00%</td>
<td>109.023</td>
</tr>
<tr>
<td>9/1/14</td>
<td>9/1/2034</td>
<td>3.00%</td>
<td>2.43%</td>
<td>109.023</td>
</tr>
</tbody>
</table>

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For this bond not to be called, its yield would have to rise to 3.00% or higher, which would be higher than the return the investor would receive from holding to maturity (see below for discussion of the relationship between yield and total return), but the return would be higher than the 2.00% yield at which the bond was priced when purchased. That boost in return from holding to maturity a bond that was originally priced to a call date helps to soften the effects of rising interest rates, which is why such bonds are referred to as “cushion bonds.” In addition, for a given change in interest rates, the decline in price of a bond priced to a call date will be less than it would be if priced to a longer maturity date.
Yield and Total Return

The yield of a bond is an indication of the total return that one would receive if one were to hold the bond to maturity and if any coupon payments are reinvested at the yield of the bond. In the case of a zero coupon bond, the equivalence of yield and subsequent total return is clear. If one pays $94.218 for a bond and gets $100 for that bond two years later, the semiannual rate of total return would be 1.5%, which implies a return of 3.00% per year \( [(100/94.218)^{0.25} = 1.015] \).

The relationship between yield and total return is less obvious in the case of a bond that pays a coupon and is priced at a premium or discount. Regarding the discount bond in Table 1, the investor bought the bond for $98.073 and received 4 semiannual payments of $1 each, and a principal payment of $100 at maturity. The compounded value of those semiannual coupon payments would have been $4.091 at a semiannual yield of 1.5%. The total return then would have been:

\[
(104.091 / 98.073)^{0.25} - 1 = 1.015 - 1 = 1.50\% \text{ semiannually}
\]

Of course, if one sells the bond before it matures, the total return will depend on the price received, and the realized return will depend on the rate at which coupon payments can be reinvested, which is likely to be different from the yield at time of purchase. Other things being equal, the yield used to price a bond typically declines as the bond gets closer to maturity because investors usually demand higher yields for longer bonds. Rolling down the yield curve in this way can cause the bond to appreciate in value in one phase of a bond’s life cycle.

Current Return

Sometimes people just compute the rate at which their investments are generating cash flow. For this purpose, they simply divide the coupon rate by the current price in order to calculate the current return. On the date our discount bond was purchased, the current return would be:

\[
2/98.073 = 2.04\%
\]

This rate is far below the yield of the security since it gives no credit for the accretion of the discount.

Likewise, the current return of the premium bond would be far above its yield:

\[
3/101.951 = 2.94\%
\]

Yields of Portfolios

It is easy to see how the current return of a bond provides a misleading impression of its rate of return. However, when investors compare bond funds, they sometimes look at the dividend yield, which is similar to current return in that it divides cash payments received by current market value.

The amount of dividends that a bond fund can pay is based on the amount of interest it earns, which includes coupon payments plus any allowable accretion of discount and minus any amortization of premium. Once a bond is bought, the schedule of interest to be earned on that bond is fixed.

For example, suppose a portfolio only held the premium bond in Table 2 with a 3.00% coupon, a yield of 2.00%, and a par value of $1,000,000, and a purchase price of $1,019,510. In the next six months, it would receive coupon payments of $15,000, but it would only report interest earnings of $10,200, as it would write down the book value of that bond by $4,800. Ignoring expenses, the semiannual dividend yield of 1.00% ($10,200 / $1,019,510) would be almost identical to the yield of the bond. However, if the fund had previously bought the bond at par with a yield of 3.00%, and the bond now yielded 2.00% with a dollar price of 101.951, the fund would recognize the full coupon as income, and its semiannual dividend yield of 1.47% ($15,000 / $1,019,510) would overstate the rate at which the fund was earning income, since it would ignore the expected decline in value by the time the bond matures and is worth $1,000,000.

The effect that a discount bond has on the dividend yield of a tax-exempt bond fund is a bit more complicated because it depends on whether the discount was created when the bond was originally issued (“original issue discount,” or “OID”), or was created by a decline in the value of the bond after it was issued (“market discount”). OID is treated as tax-exempt income, and its accretion is included in the dividend that a tax-exempt fund pays. Market discount, on the other hand, is considered to be either capital gain (if the amount of the discount is small) or ordinary income, and, as such, it is not included in the dividend.
Two Common Mistakes

Recognizing the distinction between OID and market discount is important for avoiding two mistakes that investors sometimes make when evaluating a municipal bond fund. On the one hand, investors may look at the average dollar price of a fund (sum of market values divided by sum of par values), and, if it is at a substantial discount to par, they may think that the dividend yield is understating the expected rate of return because the bonds will eventually be worth par. The problem is that such imprecise calculations fail to allow for the extent to which OID is already incorporated into the dividend that a fund pays, and thus will not result in additional appreciation. (Essentially, the fund pays out more cash than it receives in coupon payments since it uses proceeds from bond sales and retirements to distribute cash equal to the accretion of OID that has occurred.)

This assumption is particularly common in the case of high yield funds following a rise in interest rates and a widening of credit spreads. High yield funds also tend to have a higher percentage of zero coupon bonds. In part, this reflects the issuance patterns of stressed obligors that find it necessary to postpone interest payments as far as possible into the future. For example, the average dollar price of the Standard & Poor’s Municipal High Yield Index was 57.054 as of 6/3/2014. However, if we exclude zero coupon bonds from that index, the average dollar price would be 87.859. In other words, around 30 points of expected accretion is attributable to zero coupon bonds, most of whose accretion would be included in the tax-exempt income recognized by funds holding those bonds and therefore available for distribution as tax-exempt dividends.

Some of the discount of the zero coupon bonds could be market discount, which occurs when the yield of an OID bond is greater than its original issue yield. In a bear market where the average dollar price has fallen sharply, the drop in value is likely to consist largely of market discount, which is not distributable as income, and therefore will tend to increase the net asset value of the fund as it acrretes.

The opposite mistake is to assume that the dividend is all the investor can expect to receive from a fund even though the fund has a significant amount of market discount incorporated into its price. While the accretion of market discount will result in some form of tax liability, it is still part of the return that the fund is generating.

A final problem with using average dollar price to anticipate future returns is that the fund may invest in inverse floating rate securities, which have high dollar prices and thus skew the fund’s average dollar price higher.

The SEC Yield

Failure to recognize the potential benefit from the accretion of market discount is not just a problem with the dividend yield; it is also a limitation of the Securities and Exchange Commission’s mandated yield formula for mutual funds (the “SEC yield”). When the SEC yield is calculated for a tax-exempt fund, the formula only gives credit for tax-exempt income earned by the fund. Therefore, the SEC yield for a tax-exempt fund will not recognize any appreciation that results from a decline in value that occurred since the bonds were originally issued.

The SEC yield also lowers the yield to reflect fees and expenses of the fund and the maximum sales charge paid by investors when purchasing shares of the fund. (The Appendix contains a more detailed description of the SEC yield.)

Theoretically, the taxable equivalent yield of a fund could include the effect of the accretion of taxable market discount. Indeed, the SEC rules permit a fund to add taxable yield to the taxable equivalent of the tax-exempt yield when computing a fund’s taxable equivalent yield, but the practice in the industry is just to divide the tax-exempt SEC yield by 1 minus the tax rate to compute the taxable equivalent yield without adding the return attributable to such accretion.

Conclusion

In order to have an accurate perception of the yield generated by an investment, it is necessary to understand how the calculation of yield treats the amortization of premium and the accretion of OID and market discount. These distinctions are particularly important when evaluating bond funds since estimates derived from the averages can be misleading.
Appendix: The SEC Yield Formula

\[
\text{Yield} = 2 \left[ \left( \frac{a-b}{c \cdot d} + 1 \right)^{1/3} - 1 \right]
\]

Where:
\(a\) = dividends and interest earned during the 30-day period.
\(b\) = expenses accrued during the 30-day period.
\(c\) = average daily number of shares outstanding.
\(d\) = maximum offering price per share on the last day of the period.

For calculating interest earned by a tax-exempt fund for factor “a” the following rules apply:

<table>
<thead>
<tr>
<th>Type of bond</th>
<th>Tax-exempt income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium or par bond</td>
<td>Market value times yield to worst (YTW)</td>
</tr>
<tr>
<td>Market discount bond (originally sold at par or a premium)</td>
<td>Coupon rate times par value</td>
</tr>
<tr>
<td>Original issue discount bond</td>
<td>Lower of (a) market value times YTW or (b) accreted OID price times OID yield</td>
</tr>
</tbody>
</table>

The dollar amount thus calculated for each bond is then divided by 360 and the result is multiplied by the number of days that the security was held within the last 30 days.

For example, on a 2% bond, due in 2 years, yielding 3.00%, with a par value of $1,000,000, and a dollar price of 98.073, where all the discount is market discount, the monthly return would be coupon rate * par * 30/360 or 2.00% * $1,000,000 * 30/360 = $1,666.67 which is less than yield * market value * 36/360 3.00% * $980,730 * 30/360 = $2,451.83

On the other hand, for a premium 3% bond, due in 2 years, yielding 2.00%, with a par value of $1,000,000 and a dollar price of 101.951, the monthly return would be yield * market value * 36/360 or 2.00% * 1,019,510 * 30/360 = $1,699.18, which is less than coupon rate * par * 30/360 3.00% * $1,000,000 * 30/360 = $2,500.
For more information, please consult with your financial advisor and visit nuveen.com.

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