Bond Valuation - value the cash flows

1. coupon payment - interest payment (coupon rate * principal) - usually paid every 6 months.
2. maturity value = principal or par value = $1000

ex. Five year corp. bond pay coupons at 10% rate, market rate (discount rate) (required rate of return) is 10%

Define Terms

\[ \begin{align*}
C &= \text{coupon payment} \\
&= \text{coupon rate} \times \$1000 \\
F &= \text{face amount or maturity value} = \$1000 \\
n &= \text{payments to maturity} = 5 \\
r_d &= \text{required rate of return} = 10\% \\
P_0 &= \text{bond value} = ?
\end{align*} \]

\[
0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5
\]

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>P_0</td>
<td>$100</td>
<td>$100</td>
<td>$100</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td></td>
<td>$1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ P_0 = \text{PV of coupon annuity} + \text{PV of lump sum maturity value} \]

CALCULATOR:

\[ \begin{align*}
PMT &= C = 100 \\
FV &= F = 1000 \\
i &= r_d = 10\% \\
n &= 5
\end{align*} \]

\[ P_0 = \text{PV} = 1,000 \]

In this case coupon = r_d so P_0 = F
This Bonds sells at PAR
**coupon rate > \( r_d \)**

ex. \( C = 100 \) (coupon rate = 10%)

\( n = 5 \)

\( r_d = 8\% \)

\[ V_B = 399.27 + 680.58 = 1,079.85 \]

**Calculator:**

\[ \text{PMT} = C = 100 \]

\[ FV = F = 1000 \]

\[ i = r_d = 8\% \]

\[ n = 5 \]

\[ P_0 = PV = 1,079.85 \]

In this case coupon rate > \( r_d \) so \( P_0 > F \), we are getting more in coupon than we demand through required rate of return.

**Premium = \$79.85**

---

**coupon rate < \( r_d \)**

ex. \( C = 100 \) (coupon rate = 10%)

\( n = 5 \)

\( r_d = 12\% \)

\[ P_0 = 360.47 + 567.43 = 927.90 \]

In this case coupon rate < \( r_d \) so \( P_0 < F \), we are getting less in coupon than we demand through required rate of return.

**Discount = \$72.10**
A Harrah’s Entertainment Incorporated 9 7/8 percent bond matures in ten years. Assume that the interest on these bonds is paid and compounded annually. Determine the value of a $1,000 denomination Harrah’s bond as of today if the required rate of return is

a. 7 percent

b. 9 percent

c. 11 percent

Assume you purchased a Stations Casino, Inc. bond one year ago for $829.73 when the market rate of interest was 10%. This bond matures in 19 years and is contracted to pay a annual coupons at the rate of 8%. If the current market rate of interest is 13%, what would be the percentage change in bond value from the time you purchased this bond until today?

If the current market rate of interest is 7%, what would be the percentage change in bond value from the time you purchased this bond until today?

**RULES:**

1. coupon rate = r_d, Bond sells for PAR
2. coupon rate < r_d, Bond sells for a discount
3. coupon rate > r_d, Bond sells for a premium
4. r_d increases, Value decreases
5. r_d decreases, Value increases

**Semi-Annual Coupons**

**Example:** What is the price of a 10 year bond with a coupon rate of 10%, if it pays coupons semiannually and the market rate of interest is 8%?

\[ P_0 = ?? \]

\[ \text{PMT} = \frac{(\text{coupon rate} \times \text{Maturity Value})}{m} = \frac{10\% \times 1,000}{2} = 50 \]

\[ n = \text{years to maturity} \times m = 10 \times 2 = 20 \]

\[ \text{FV} = 1,000 \]

\[ i = \frac{r_d}{m} = \frac{8\%}{2} = 4\% \]

\[ P_0 = 1,135.90 \]
A MGM-Mirage Corporation bond pays a 14.5% coupon on a semi-annual basis. What is the value of this bond if it matures in 16 years and the market rate is 11%?

What is the value of a Walt Disney Incorporated 30 year zero coupon bond if the required rate of return is 9% and a similar AA-rated Paychex Incorporated bond pays a 10% coupon?

Yield-to-Maturity (YTM)

Calculating the return on a Bond.

Consider a bond with a 10% annual coupon rate, 15 years to maturity, and a par value of $1,000. The current price is $928.09. What is the YTM?

\[
n = 15 \\
PV = -928.09 \\
FV = 1,000.00 \\
PMT = 100 \\
YTM = i = 11\% \\
\]

\[
YTM = (\text{Coupon yield}) \pm (\%\Delta P_0)
\]

Coupon Yield = return from the coupon
= annual \(C / P_0\)
= \(\$100 / \$928.09\) = 10.77%

\[
\%\Delta P_0 = \frac{(P_f - P_0)}{P_0} = \frac{($930.18 - $928.09)}{928.09} = 0.23\%
\]

\[
YTM = 10.77\% + 0.23\% = 11.00\%
\]

Note: These are expected values, assumes interest rates do not change.
A Microsoft, Incorporated bond has a coupon rate of 8.5%, matures in 12 years, and sells for $835.60 (assume coupons are paid on a semi-annual basis). What is the YTM for this Microsoft, Inc. Corporate Bond?

What is the current yield for the first year on this bond?

What is the expected percentage capital gain or loss for the first year on this bond?

---

**Corporate Bond Quotes** (source: FINRA Investor Information)

<table>
<thead>
<tr>
<th>Bond Symbol</th>
<th>Issuer Name</th>
<th>Coupon</th>
<th>Maturity</th>
<th>Callable</th>
<th>Moody’s</th>
<th>S&amp;P</th>
<th>Price</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.GX</td>
<td>Ford Motor Co</td>
<td>6.375</td>
<td>8/1/30</td>
<td>No</td>
<td>Ca</td>
<td>CCC</td>
<td>20.540</td>
<td>31.39</td>
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<tr>
<td>GE.HGU</td>
<td>GE Capital Cor</td>
<td>6.750</td>
<td>6/15/18</td>
<td>No</td>
<td>Aaa</td>
<td>AAA</td>
<td>102.500</td>
<td>6.35</td>
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<tr>
<td>GE.GGM</td>
<td>GE Capital Cor</td>
<td>4.750</td>
<td>12/15/18</td>
<td>Yes</td>
<td>Aaa</td>
<td>AAA</td>
<td>90.500</td>
<td>6.21</td>
</tr>
</tbody>
</table>

**Bond Ratings – Investment Quality**

- **High Grade**
  - Moody’s Aaa and S&P AAA – capacity to pay is extremely strong
  - Moody’s Aa and S&P AA – capacity to pay is very strong

- **Medium Grade**
  - Moody’s A and S&P A – capacity to pay is strong, but more susceptible to changes in circumstances
  - Moody’s Baa and S&P BBB – capacity to pay is adequate, adverse conditions will have more impact on the firm’s ability to pay

**Bond Ratings – Speculative (Junk)**

- **Low Grade**
  - Moody’s Ba, B, Caa and Ca
  - S&P BB, B, CCC, CC
  - Considered speculative with respect to capacity to pay. The “B” ratings are the lowest degree of speculation.

- **Very Low Grade**
  - Moody’s C and S&P C – income bonds with no interest being paid
  - Moody’s D and S&P D – in default with principal and interest in arrears
United States Treasury Quotes

<table>
<thead>
<tr>
<th>Coupon</th>
<th>Maturity</th>
<th>Bid Price</th>
<th>Ask Price</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.625</td>
<td>7/1/28</td>
<td>147.015</td>
<td>147.047</td>
<td>3.17</td>
</tr>
</tbody>
</table>

Yield Calculation:

\[
PV = -1,470.47 \\
PMT = 33.125 \\
FV = 1,000.00 \\
n = 18 \text{ years} \times 2 = 36 \text{ periods} \\
i \approx 3.17\% \\
\]

Answer the following questions based on the WSJ treasury bond quote (assume coupons are paid on a semi-annual basis).

<table>
<thead>
<tr>
<th>Coupon</th>
<th>Maturity</th>
<th>Bid</th>
<th>Ask</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.375</td>
<td>7/1/39</td>
<td>131.359</td>
<td>131.391</td>
<td>???</td>
</tr>
</tbody>
</table>

What is the premium or discount for this bond?

What is the current yield?

What is the yield-to-maturity?

What is the bid-ask spread (in dollar terms)?

**Bond Evaluation**

Use bond rating - yield comparisons

Also, consider maturity, liquidity, call provision, convertibility feature, collateral, other provisions

Credit Rating Companies - Moody’s, Standard and Poors, Fitch

**Websites:**