Today’s Agenda

- Reading Treasury Bond quotes & YTM for semi-annual coupon bonds
- Calculating a bond’s total rate or return & reading a corporate bond quote.
- Bond risk issues
- Other types of bonds

YTM for semiannual coupon bonds: a T-bond quote

<table>
<thead>
<tr>
<th>Rate</th>
<th>Maturity</th>
<th>Bid</th>
<th>Asked</th>
<th>Chg</th>
<th>Yld</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.625</td>
<td>Aug 15</td>
<td>156:21</td>
<td>156:22</td>
<td>-2</td>
<td>4.11</td>
</tr>
</tbody>
</table>

- $1000 par value, semiannual coupons

Verifying the T-bonds YTM (Ask Yld)
**Bond Yields**

Rate of Return - Earnings per period per dollar invested.

Rate of return = \frac{\text{total income}}{\text{investment}}

Rate of return = \frac{\text{Coupon income + price change}}{\text{investment}}

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**Corporate Bond Quote and Rate or Return Example**

<table>
<thead>
<tr>
<th>Company</th>
<th>Coupon</th>
<th>Maturity</th>
<th>Price</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morgan Stanley</td>
<td>4.75</td>
<td>Apr 1, 2014</td>
<td>97.42</td>
<td>5.096</td>
</tr>
</tbody>
</table>

- $1000 par value, semi-annual coupon payments
- Let's assume that we buy this bond today and bond's YTM (Last Yield) will increase by a half of a percentage point a year from today. What will be the bond's rate of return?
Bond Value Changes Over Time

- Returning to the Duff’s Beer original example #1, where $k = 10\%$, $N = 12$, cpn (PMT) = $80$, par (FV) = $1000$, & PV = $863.73$.
- What is bond value one year later when $N = 11$ and $r$ is still $10\%$?
- $80 = $PMT$, 1000 = $FV$, 11 = $N$, 10 = $I/Y$, CPT PV = $870.10$
  \[ PV = 80(PVAF_{10\%,11}) + \frac{1000}{1.10^{11}} = 870.10 \]

What is the bond’s return over this year?

- Rate of Return = (Annual Coupon + Price Change)/Beg. Price
- Annual Coupon = $80$
- Beg. Price = $863.73$, End Price = $870.10$
- Price Change = $870.10 - 863.73 = 6.37$
- Rate of Return = ($80 + 6.37)/863.73 = 10\%$

Bond Prices over time approach par value as maturity date approaches assuming same YTM

![Bond Values Over Time](image)
Interest Rate Risk

- Measures Bond Price Sensitivity to changes in interest rates.
- In general, long-term bonds have more interest rate risk than short-term bonds.

Interest Rate Risk Example

- Recall from our earlier example (#1), the 12-year, 8% annual coupon bond has the following values at $k_d = 6\%, 8\%, & 10\%$. Let's compare with a 2-yr, 8% annual coupon bond.

<table>
<thead>
<tr>
<th>Bond Type</th>
<th>$r=6%$</th>
<th>$r=8%$</th>
<th>$r=10%$</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-year bond</td>
<td>PV = $1,167.68$</td>
<td>PV = $1,000$</td>
<td>PV = $863.73$</td>
</tr>
<tr>
<td>2-year bond</td>
<td>PV = $1,036.67$</td>
<td>PV = $1,000$</td>
<td>PV = $965.29$</td>
</tr>
</tbody>
</table>

Bond Price Sensitivity Graph
### Default Risk

- Credit risk
- Default premium
- Investment grade
- Junk bonds

### Moody's and Standard & Poor's Ratings

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaa/AAA</td>
<td>The strongest rating; ability to repay interest and principal is very strong.</td>
</tr>
<tr>
<td>Aa/AA</td>
<td>Very strong likelihood that interest and principal will be repaid.</td>
</tr>
<tr>
<td>A/A</td>
<td>Strong ability to repay, but some vulnerability to changes in circumstances.</td>
</tr>
<tr>
<td>Baa/BBB</td>
<td>Adequate capacity to repay; more vulnerability to changes in economic circumstances.</td>
</tr>
<tr>
<td>Ba/BB</td>
<td>Considerable uncertainty about ability to repay.</td>
</tr>
<tr>
<td>B/B</td>
<td>Likelihood of interest and principal payments over extended periods is questionable.</td>
</tr>
<tr>
<td>Caa/CCC</td>
<td>Bonds in the Caa/CCC and Ca/CC classes may already be in default or in danger of imminent default.</td>
</tr>
<tr>
<td>C/CC</td>
<td>C-rated bonds offer little prospect for interest or principal on the debt ever to be repaid.</td>
</tr>
</tbody>
</table>

### Callable Bonds

- Callable Bonds: Company can buy back the bonds before maturity for a call price. More likely as interest rates fall.
  - Yield to Call (YTC): calculate like yield to maturity but use time to earliest call date as N, and call price as FV.
YTC Example

- Burns Enterprises annual coupon $1000 par value bonds currently sell for $1,045 and have a coupon rate of 9.5%. These bonds have 25 years to maturity, but can be called in 5 years at a price of $1,050.
- What is the yield to call?

YTC Solution

- Price = PV = 1045, time to call = 5 yrs
- Annual coupon = 9.5%($1000) = $95
- Call Price = $1050
- 1045 = $95(PVAF_{YTC,5})+$1050/(1+YTC)^5
- 1045 = PV, 5 = N, 1050 = FV, 95 = PMT, CPT I/Y = 9.17%

Other Types of Bonds

- Zero Coupon Bonds: no coupon payments, just par value.
- Convertible Bonds: can be converted into (fixed # of) shares of stock.
- Floating Rate (Indexed) Bonds: coupon payments and/or par value indexed to inflation.
- TIPS: Indexed US Treasury coupon bond, fixed coupon rate, face value indexed.