CHAPTER 8
Debt Instruments and Markets

Key Characteristics
Bond Valuation
Bond Yields and Risk
Bond Markets

Impact on value

Value = \sum_{t=0}^{N} \frac{CF_t}{(1+r)^t}

- Bond features like coupon rates, provisions, and sinking funds affect the cash flows (numerator) a bondholder (issuer) receives (pays).
- Ratings, market interest rates, and interest rate and reinvestment rate risk affect the expected yield \( r \) in the denominator.

What is a bond?

- A bond is a long-term contract in which a borrower promises to make payments of interest and principal on specific dates to the bondholder.
- Bonds can be issued by different entities (either domestic or foreign), including:
  - National governments
  - State or municipal governments
  - Corporations
- Bonds have some common characteristics but often do have some different contractual features.

Key bond characteristics and terminology

- Par value
- Coupon interest rate
- Maturity date
- Original maturity
- Call provision
  - Call premium
- Put provision
- Sinking fund provision
- Floating rate bond
- Zero coupon bond

Types of bonds

- Treasury bonds
- Corporate bonds
- Municipal bonds
- International bonds

Bond valuation

- The value of any financial asset is the PV of the cash flows the asset is expected to produce.
- The CFs of a semiannual coupon bond (paying INT every 6 months) with \( N \) years to maturity is shown below. \( M \) represents the bond’s maturity value.
- The chapter model also shows how to value bonds when you are between coupon dates.
Yield to maturity

- YTM is usually the same as the market rate of interest ($r_d$).
- If the bond is held to maturity and there is no default on payments, investors earn the YTM.
- Calculated from the bond’s price, face value, and promised payments.
- Two components of the YTM
  - Current yield
  - Capital gains yield

Yield to call

- The rate of return on a bond if it is called before its maturity.
- If the bond has a call provision that is likely to be exercised, the YTC becomes relevant.
- If the bond is not likely to be called, investors will likely earn the YTM.
- Calculated exactly the same as the YTM, but now there are fewer periods to the call date and instead of the bond’s face value, a call price (which includes a call premium) is used.

Bond risk

- Interest rate (or price) risk
  - Risk of a decline in a bond’s price due to an increase in interest rates.
- Reinvestment rate risk
  - Risk that a decline in interest rates leads to a decline in income for the investor.
- Default risk
  - Risk that an investor receives less than the promised return on a bond because the issuer fails to make all promised payments.

Calculating bond prices and yields

<table>
<thead>
<tr>
<th>Bond</th>
<th>Issue date</th>
<th>First interest date</th>
<th>Settlement date (today)</th>
<th>Maturity date</th>
<th>First call date</th>
<th>Coupon rate</th>
<th>Likely yield</th>
<th>Maturity value (% of par)</th>
<th>Price (% of par)</th>
<th>Call price (% of par)</th>
<th>Payments per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/1/04</td>
<td>7/1/04</td>
<td>11/15/04</td>
<td>1/1/24</td>
<td>1/1/09</td>
<td>7.00%</td>
<td>9.50%</td>
<td>100%</td>
<td>90.3%</td>
<td>108.8%</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1/1/04</td>
<td>7/1/04</td>
<td>11/15/04</td>
<td>1/1/24</td>
<td>1/1/09</td>
<td>7.00%</td>
<td>9.50%</td>
<td>100%</td>
<td>90.3%</td>
<td>108.8%</td>
<td>2</td>
</tr>
</tbody>
</table>

Calculating bond prices and yields

- When you are between coupon payments, Excel’s YIELD function must be used.
- If Bonds 1 and 2’s prices changed to $1,075 and $1,165.50, their YTC and most likely yields would change to 6.00%.
Calculating bond prices and yields

<table>
<thead>
<tr>
<th>Bond 3</th>
<th>Bond 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price to maturity $67.85</td>
<td>$112.12</td>
</tr>
<tr>
<td>Price to call $94.44</td>
<td>$110.42</td>
</tr>
<tr>
<td>Most likely price $87.85</td>
<td>$110.42</td>
</tr>
</tbody>
</table>

- When you are between coupon payments, Excel's PRICE function must be used.
- According to the data, Bond 4 is likely to be called.

When the bond is priced on a coupon date, a financial calculator or Excel can be used.

The data suggests that the price of Bond 7 would be $1,079.30, and hence its probable life is 3 years.

<table>
<thead>
<tr>
<th>Bond 5</th>
<th>Bond 6</th>
<th>Bond 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue date 11/15/03</td>
<td>11/15/00</td>
<td>11/15/00</td>
</tr>
<tr>
<td>First interest date 5/15/04</td>
<td>5/15/01</td>
<td>5/15/01</td>
</tr>
<tr>
<td>Settlement date (today) 11/15/04</td>
<td>11/15/04</td>
<td>11/15/04</td>
</tr>
<tr>
<td>Maturity date 11/15/05</td>
<td>11/15/25</td>
<td>11/15/25</td>
</tr>
<tr>
<td>First call date Not callable</td>
<td>11/15/07</td>
<td>Not callable</td>
</tr>
<tr>
<td>Coupon rate 8.00%</td>
<td>8.00%</td>
<td>8.00%</td>
</tr>
<tr>
<td>Likely yield 6.00%</td>
<td>6.00%</td>
<td>6.00%</td>
</tr>
<tr>
<td>Maturity value (% of par) 100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Price (% of par) To be calculated</td>
<td>To be calculated</td>
<td>To be calculated</td>
</tr>
<tr>
<td>Call price (% of par) N/A</td>
<td>N/A</td>
<td>103%</td>
</tr>
<tr>
<td>Payments per year 2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Conclusions about risk and bonds

- Bond 5 has very little price risk, but a lot of reinvestment rate risk because the income a series of one-year securities would produce declines greatly.
- Bond 6 has price risk, but its income stream is not strongly affected by changing rates.
- Bond 7 is exposed to both types of risk.
  - If rates rise, the bond will not be called and the price will decline.
  - If rates fall, the bond will be called; it will not gain in price like noncallable bonds; and principal must be reinvested at lower rates.

Zero coupon bonds

- There are no intermediate cash flows.
- Zero coupon bonds are priced at a discount and pay their face value at maturity.
- If a zero coupon bond is issued and the lender is in the 35% tax bracket while the firm is in the 40% tax bracket, …
  - The investor pays taxes on imputed interest (interest earned, but not yet received).
  - Corporations like this feature, but taxable lenders do not.

Floating rate debt

- The vast majority of corporate debt has floating rates, including nearly all bank debt.
- Floating rate debt is usually indexed to LIBOR, the London Interbank Offer Rate. A risk premium is added to the index rate, and the actual interest rate is reset periodically.
- If inflation increases, the index rate will also increase, raising the return on the floating rate security and providing the investor with inflation protection.
- Floating rate securities have relatively little interest rate risk, either price or reinvestment risk. Their income does change, but the change is related to inflation, so its real income is stable.
MRI’s bonds

- MRI has two bonds outstanding, one sells at a discount and the other at a premium.

<table>
<thead>
<tr>
<th></th>
<th>MRI – 1</th>
<th>MRI – 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years to maturity</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Maturity value</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Price</td>
<td>$926.29</td>
<td>$1,121.00</td>
</tr>
<tr>
<td>Coupon rate</td>
<td>6.00%</td>
<td>8.50%</td>
</tr>
<tr>
<td>Call price</td>
<td>$1,075</td>
<td>$1,075</td>
</tr>
<tr>
<td>Years to call</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Payments / year</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

MRI – 1 will be held to maturity, while MRI – 2 is likely to be called, since its YTC < YTM.

If it calls MRI – 2, it will save $85 – $66.67 = $18.33 per year in interest payments. However, MRI needs to be aware of any flotation costs that may be incurred.

Credit markets

- In the U.S., commercial paper is an alternative to bank loans for large, financially stable borrowers and takes the form of short-term (usually 90 days or less) unsecured promissory notes.
- Commercial paper is the primary source of working capital financing in the U.S.
- In the international marketplace, there are three major types of credit markets:
  - Floating-rate bank loans
  - Eurobonds
  - Foreign bonds