

Chapter 5: Valuing Bonds

What is a bond?

- A long-term debt instrument
- A contract where a borrower agrees to make interest and principal payments on specific dates

Corporate Bond Quotations

- Coupon rate (on annual basis). Coupon payments are interest paid on the bond usually semiannually. Coupon payments = Coupon rate*face value
- Maturity date : in that date the firm pay the principal or the face amount plus the last interest payment due
- Face amount (usually \$1000)
- Volume of trading (in 1000s dollars of the face amount of debts)
- last price (in % of the face value) (100.614% → last price = $1.00614 * 1000 = 1,006.14$)
- Yield to maturity (the return investor will get if she hold the bond until maturity)

Features of Long-Term Bonds

1- Par Value: The stated face value of the bond. It is the amount borrowed and the amount repaid at maturity. Usually par value = \$1000

2- Coupon Rate : stated interest rate (generally fixed) paid by the issuer every period. Coupon payment each period= Coupon Rate * par value.

- Floating rate bonds have interest rates that are reset periodically to match the general level of interest rates.
- Zero coupon bonds pay no coupon interest, but they are sold at a deep discount below par.

3- Maturity: The number of years until the par value is paid off.

4- **Yield to Maturity:** Rate of return earned on a bond held until maturity.

It also can be called the required rate of return by the lender.

- When a coupon bond is issued, the coupon rate is usually set to equal the required market rate of return (k_d). A bond's coupon rate never changes. However, the market rate can fluctuate over time, and this can greatly affect the bond price
- If coupon rate = yield to maturity then bond is sold at par
- If coupon rate > yield to maturity then bond is sold at premium (bond price > par value).
- If coupon rate < yield to maturity then bond is sold at discount (bond price < par value).

5- **Call Features:** This is an option given to the issuer (borrower) by which the borrower can redeem the bond before maturity at specified price.

- If the bond is paid off early, the company must pay a little more than par value. That extra amount is a *call premium*.
- Usually firms have to wait some time before they are able to call bonds (deferred call).
- A call provision is an advantage for the bond issuer and a disadvantage for the bondholder.
- The return on callable bonds is higher than the return on noncallable bonds (why?).
- Bonds are most likely to be called when interest rates in the market drop significantly. (why?) bond refunding (refinancing).

7- **Put Feature:** Puttable bonds are bonds that allow the bondholder (lender) the option to sell the bond back to the issuer before maturity at a predetermined price.

- A put feature is an advantage for the bondholder and a disadvantage for the bond issuer.
- The return on puttable bonds is lower than the return on nonputtable bonds (why?).
- Bonds are most likely to be put when interest rates in the market rise significantly. (why?) (reinvestment).

8- **Convertible bonds :** Allow the bondholder to exchange her bonds (priced at par) for common stock at pre-specified conversion price.

Bond Ratings

Investment grade bonds

<i>Quality</i>	<i>S & P's</i>	<i>Moody's</i>
Highest	AAA	Aaa
High	AA	Aa
Upper Medium	A	A
Medium	BBB	Baa
Junk	BB,B,CCC,CC,C	Ba,B,Caa,Ca,C
Default	D	

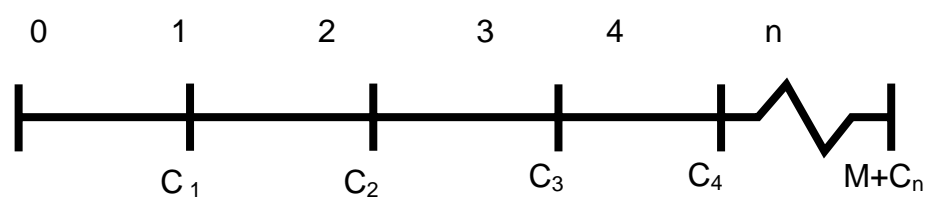
- Bond ratings measure default risk, so they affect the bond's interest rate and the firm's

cost of debt.

- Higher rated bonds generally carry lower market yields.
- Interest rate spread between ratings is less during prosperity than during recessions.
- Junk bonds typically yield 3% more than investment grade bonds.
- Junk bond is of companies with weak financial positions
 - Highly leveraged
 - Low earnings

Bond Valuation: Value of an Asset

- Based on the expected future benefits over the life of the asset
- Future benefits = cash flows (CF's)
- Capitalization of cash flow method
 - PV of the stream of future benefits discounted at an appropriate required rate of return



$$\text{Value} = \frac{C_1}{(1+k_d)^1} + \frac{C_2}{(1+k_d)^2} + \dots + \frac{C_n + M}{(1+k_d)^n}$$

$$P_0 = \sum_{t=1}^n \frac{C}{(1+k_d)^t} + \frac{M}{(1+k_d)^n}$$

The Value of a Bond is the Present value of its Cash Flows

All we have to do is find the PV of all cash flows produced by the bond.

Using Calculator:

i= is the market interest rate that is offered on the bond or it is yield to maturity of the bond (Kd) (not necessarily the coupon rate!)

N=# of years until maturity

PMT= Coupon payment =(Coupon rate) × (Par value) →

FV= par value (maturity value)

PV0=?

Problem: Find the value of a \$1,000, 8% coupon bond with a maturity of 15 years.
(Market int. rate = 10%.)

Solution:

List inputs:

$i = 10\%$

$N = 15$

$PMT = \text{Coupon payment} = 0.08 * 1000 = \80

$FV = \text{par value} = \1000

Price of the bond = $PV_0 = ?$

$$P_0 = 80(PVIFA_{10,15}) + 1000(PVIF_{10,15}) = \$847.88$$

Remember, i and n are adjusted for more frequent discounting

For example if coupon payments are paid semiannual, then ($m=2$)

New $n \rightarrow n * m$

New $i \rightarrow i / m$

New Coupon rate \rightarrow coupon rate / m

Semiannual Interest Payments

Problem: Find the price of a 8% coupon bond (semi-annual payments) with a par value of \$1,000 and a 15-year maturity if the market rate on similar bonds is 10%.

Periods are half-years!

Semiannual payments $\rightarrow m=2$

$I = 10\% / 2 = 5\%$

$N = 15 * 2 = 30$

Coupon rate = $8\% / 2 = 4\%$

List inputs:

$i = 5\%$

$N = 30$

$PMT = 0.04 * 1000 = \$40$

$FV = \text{par value} = \1000

Price of the bond = $PV_0 = ?$

$$P_0 = 80(PVIFA_{5,30}) + 1000(PVIF_{5,30}) = \$846.28$$

Yield to Maturity (YTM): The rate of return earned on a bond if it is held to maturity.

Problem: Suppose you have the following about a bond:

Price = \$1,494.96 → (PV₀)

Par Value = \$1,000.00 → (FV)

Coupon Rate = 10% → $PMT = 0.1 * 1000 = \$100$

N = 14 → (n)

Find the YTM → find(i)

Use financial calculator:

14	-1,494.96	100	1,000	Compute	
<input type="text" value="N"/>	<input type="text" value="PV"/>	<input type="text" value="PMT"/>	<input type="text" value="FV"/>	↓ 5%	<input type="text" value="i"/>

Yield to Maturity is The discount rate k_d that equates the PV of all expected interest payments and the repayment of principal from a bond to the present bond price. In other words: it is the return that you are going to get if you hold the bond until maturity.

Key Determinants of Bond Yields

1-Risk-free rate of return

Nominal risk-free rate r_f is a function of:

- Inflation premium i_n : compensation for inflation and lower purchasing power.
- Real risk-free rate r'_f : compensation for postponing consumption.

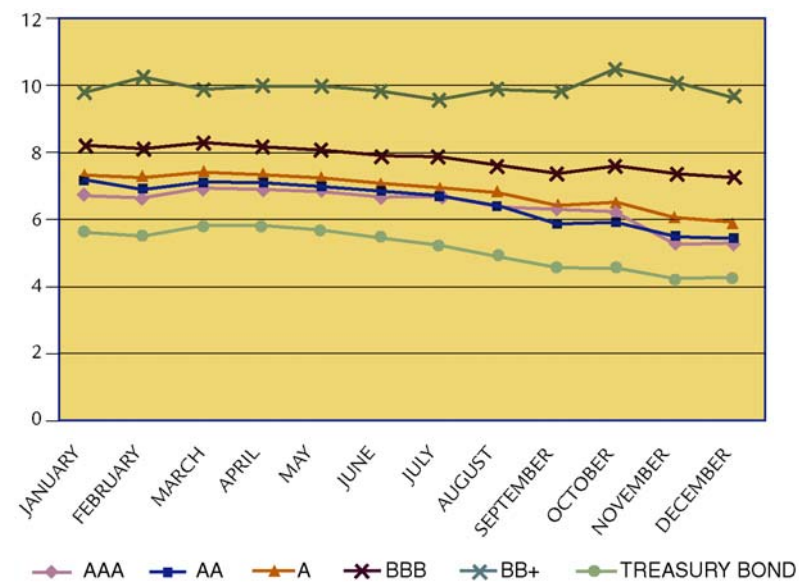
$$(1 + r_f) = (1 + r'_f)(1 + i_n)$$

$$r_f = r'_f + i_n + r'_f i_n$$

$$r_f \approx r'_f + i_n$$

2-Risk premium

- Maturity (term structure of interest rate)
- Default
- Interest rate risk



Current Yield

Takes into account only the interest payment portion of the return

$$\text{Current yield (CY)} = \frac{\text{Annual coupon payment}}{\text{Current price}}$$

Bond Pricing Principles

1. Bond values are inversely related to the required rate of return
2. Bonds trade at a discount, par, or premium
3. The sensitivity of bond prices to a given change in the required rate of return
 - Increases with the maturity of the bond
- 4- The sensitivity of bond prices to a given change in the required rate of return decreases the higher the coupon rate.

