Chapter 7

Interest Rates and Bond Valuation

When corp. need to investment in new plant and equipment, it required money. So' corp. need to raise cash / funds.

- Borrow the cash from bank (or Issue bond / debt securities) (CHP. 7)
- Issue new securities (i.e. sell additional shares of common stock) (CHP. 8)

Differences Between Debt and Equity

- Debt
  - Not an ownership interest
  - Creditors do not have voting rights
  - Interest is considered a cost of doing business and is tax deductible
  - Creditors have legal remedy if interest or principal payments are missed
  - Excess debt can lead to financial distress and bankruptcy
- Equity
  - Ownership interest
  - Common stockholders vote for the board of directors and other issues
  - Dividends are not considered a cost of doing business and are not tax deductible
  - Dividends are not a liability of the firm and stockholders have no legal remedy if dividends are not paid
  - An all equity firm can not go bankrupt

Chapter Outline

- Bonds and Bond Valuation
- Bond Ratings and Some Different Types of Bonds
- The Fisher Effect – the relationship between inflation, nominal interest rates and real interest rates

BOND

- When corp. (or gov.) wishes to borrow money from the public on a L-T basis, it usually does so by issuing or selling debt securities that are generally called BOND.

- In return, they promise to pay series of fixed interest payments and then to repay the debt to the bondholders (lenders).
- **Par value is usually $1000 for corporate bond**

Bond

- Par value (face value)
- Coupon rate
- Coupon payment
- Maturity date
- Yield or Yield to maturity

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- **Face Value (Par Value):** The principal amount of a bond that will be repaid at the end of the loan.
  - Par value is usually $1000 for corporate bond
  - Government bond usually have much larger par value

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- **Bond Coupons:** Regular interest payments that corp. promise to pay every year
- **Coupon Rate:** $\frac{\text{The Annual Coupon Payment}}{\text{The Par Value of a Bond}}$
- **Maturity:** Specific date that the principal amount of a bond is made.
- **Yield to Maturity:** The interest rate required in the market on a bond

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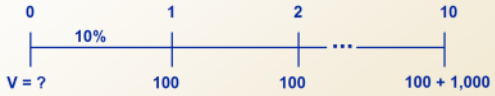
- Valuation is the process that links return and risk to determine the worth of an asset.
- To determine an assets worth at a point in time, a financial manager / investor uses ***Time-Value of Money*** technique.

Bond Valuation

Value of 10-year, 10% coupon bond, if YTM= 10%



$$V = \frac{\$100}{(1+r)^1} + \ldots + \frac{\$100}{(1+r)^{10}} + \frac{\$1{,}000}{(1+r)^{10}}$$

= $90.91 + ... + $38.55 + $385.54
= $1,000

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Present Value of Cash Flows as Rates Change

- Bond Value = PV of coupons + PV of par

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The Bond-Pricing Equation

$$\text{Bond Value} = A\left[\frac{1 - \frac{1}{(1+r)^t}}{r}\right] + F\frac{1}{(1+r)^t}$$

- To determine the value of bond at a particular point in time, we need to know the number of periods remaining until maturity;
  - face value
  - the coupon
  - the market i.r. for bond with similar features (called bonds yield to maturity)

Given all this information, we can calculate the PV of the CFs as an estimates of the BONDS CURRENT MARKET VALUE.

Example 7.1

- Suppose that the X corp. want to borrow $1000 for 30 years, and the coupon rate is 12%.
- (So, buying this bond is like loaning the company $1000 for 30 years.)

- 1000*0.12=$120 Coupon will be paid every year for 30 years
- And at the end of the 30 years corp. will pay the par value of $1000.

THIS SUGGEST THAT A BOND IS A SIMPLE FINANCING ARRANGEMENT.

Example 7.2

- Suppose that the corp. were to issue a bond with 10 years to maturity. The bond has an annual coupon of $80. Similar bond have a yield to maturity of 8%. What would this bond sell for?

Answer 7.2

- In practice, the value of bond in the market place is rarely equal to it's par value.
- Some bonds are value
  - Below par value
  - Others are value above par value
- Because as time pass a variety of forces in the economy tends to affect value, which can not be controlled by bond issuers and investors. (Ec cond'n causing a shift in the basic cost of L-T fund, eg. i.r risk)

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- Discount Bond : The amount that a bond sells at a value that is less than its par value.
- Premium : The amount that a bond sells at a value greater than its par value.

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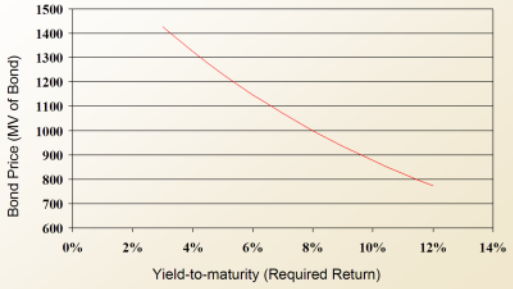
Graphical Relationship Between Price and Yield-to-maturity



7-20

- Price and Yield move in opposite direction
- If interest rate increases, the price of bond will decrease
- If interest rate decrease, the price of bond will increase; hence the bond will worth more.

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Bond Prices: Relationship Between Coupon and Yield

- If YTM = coupon rate, then par value = bond price (Bond sells at par has a YTM equal to the coupon rate)
- If YTM > coupon rate, then par value > bond price
  - Selling at a discount, called a discount bond
- If YTM < coupon rate, then par value < bond price
  - Selling at a premium, called a premium bond

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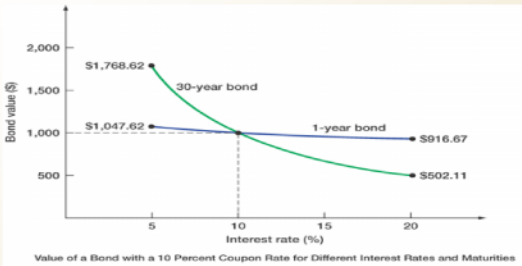
Change in price due to changes in interest rates



Value of a Bond with a 10 Percent Coupon Rate for Different Interest Rates and Maturities

	Time to Maturity	
Interest Rate	1 Year	30 Years
5%	$1,047.62	$1,768.62
10	1,000.00	1,000.00
15	956.52	671.70
20	916.67	502.11

Interest Rate Risk

- Risk arise from fluctuating interest rates
  - Long-term bonds have more interest rate risk (more price risk) than short-term bonds

Example 7.3: Valuing a Discount Bond with Annual Coupons

- Consider a bond with a coupon rate of 10% and annual coupons. The par value is $1000 and the bond has 5 years to maturity. The yield to maturity is 11%. What is the value of the bond?

Answer 7.3

Example 7.4: Valuing a Premium Bond with Annual Coupons

- Suppose you are looking at a bond that has a 10% annual coupon and a face value of $1000. There are 20 years to maturity and the yield to maturity is 8%. What is the price of this bond?

Answer 7.4

Computing Yield-to-maturity

- Yield-to-maturity is the rate implied by the current bond price
  - Required rate of return on a bond
  - Express as nominal annual interest rates
- The coupon rate is a fixed percentage of par over the life of the bond
- If you do not have a financial calculator finding the YTM requires trial and error

Example 7.5: YTM with Annual Coupons

- Consider a bond with a 10% annual coupon rate, 15 years to maturity and a par value of $1000. The current price is $928.09. YTM=?
  - Will the yield be more or less than 10%?

Answer 7.5

Example 7.6

- Most corporate bonds pay interest semiannually, at a stated coupon rate, or a face value, of $1000 that must be repaid at maturity. If investors require a 12% yield, what is the bond's value? What is the effective annual yield on the bond?

Answer 7.6

Example 7.7: Cost of Debt

- Suppose we have a bond issue currently outstanding that has 25 years left to maturity. The coupon rate is 9% and coupons are paid semiannually. The bond is currently selling for $908.72 per $1000 bond. What is the cost of debt?

Answer 7.7

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

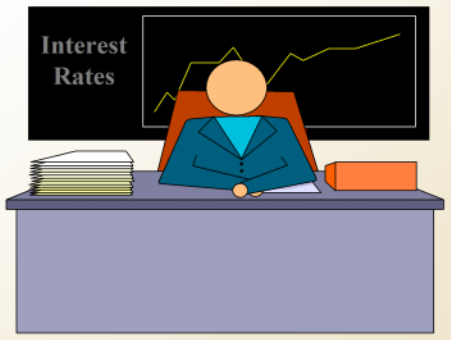
Bond Ratings - Speculative

- 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 (amount overdue)

Government Bonds

- Treasury Securities
  - Federal government debt
  - T-bills – pure discount bonds with original maturity of one year or less
  - T-notes – coupon debt with original maturity between one and ten years
  - T-bonds coupon debt with original maturity greater than ten years

Interest Rates Determination



Inflation and Interest Rates

- Real vs. Nominal Rates
  - Real Interest Rates : rate of return that have been adjusted for inflation.
  - Nominal Interest Rates : rate of return that have not been adjusted for inflation

The Fisher Effect

- The Fisher Effect tells us the relationship between real rates, nominal rates and inflation $(1+R)=(1+r)(1+h)$
- $(1 + R) = (1 + r)(1 + h)$, where
  - R = nominal rate
  - r = real rate
  - h = expected inflation rate
- Approximation $R = r + h$
  - Nom i.r. = Real i.r. + Inflation , Hence;
- **Real IR = Nominal IR - INFLATION**

Example 7.8

- Suppose that prices are currently rising by 5% per year. And investment has a 15.5% rate of return. Then, what is the real rate of return?
- You have to consider the effect of inflation. Rate of inflation is given as 5% per year.

Answer 7.8

Example 7.9

- If we require a 10% real return and we expect inflation to be 8%, what is the nominal rate?

Example 7.10: The relationship between a bonds YTM and coupon interest rate can be used to predict its pricing level.

Bond	Coupon interest rate	YTM	Price
A	6	10	
B	8	8	
C	9	7	
D	7	9	
E	12	10	

Table 7.1

I. Finding the Value of a Bond

Bond value = $C \times [1 - 1/(1 + r)^t]/r + F/(1 + r)^t$

where

C = Coupon paid each period

r = Rate per period

t = Number of periods

F = Bond's face value

II. Finding the Yield on a Bond

Given a bond value, coupon, time to maturity, and face value, it is possible to find the implicit discount rate, or yield to maturity, by trial and error only. To do this, try different discount rates until the calculated bond value equals the given value (or let a financial calculator do it for you). Remember that increasing the rate decreases the bond value.

Sugested Problems

- 1-12, 17, 24.