



INTERNATIONAL  
BUSINESS SCHOOL

# Valuing Bonds

Principles and Practices of  
Business Finance

Dr. Sam Mohamad

# Agenda

1. What is a Bond
2. Bond Pricing
3. Premium and Discount Bonds
4. Bond pricing with annuity
5. Bond Yields
6. Bond Rates of Return
7. Special Types of Corporate Bonds

# What is a Bond

**Bond** - **Security** that **obligates** the issuer to make regular interest payments ('coupon') until the end of the loan ('maturity'), and to repay the amount borrowed (the 'principal') payment to the bondholder upon maturity.

- A **security** is a tradable financial asset.
- Bond is basically a loan:
  - Borrower: **bond issuer** (*the one who sells the bond*)
  - Lender: **bondholder** (*the one who buys the bond*)
  - Interest payment: **coupon** (special name of interest in case of bonds)

Companies and governments are typical bond issuers (borrowers).

## Terminology:

- Face Value (Par Value or Principal Value) - Payment at the maturity of the bond
- Coupon - The interest payments made to the bondholder
- Coupon Rate - Annual interest payment, as a percentage of face value

Issuing  
Company  
(The Borrower)

Annual Stated  
Interest Rate  
9%

Maturity Date  
January 1, 2019

Face Value



<b>Bond Term</b>	<b>Meaning</b>
Issuer	Borrower
Investor	Lender or Creditor
Principal, Face Value, Par Value	Amount Borrowed
Coupon Rate	Interest Rate
Coupon	Interest Payment
Maturity	Due Date
Term	Time until Maturity
Yield to Maturity	Annualized Return on Bond Investment
Market Value	Current Price

# Bonds

## WARNING

The coupon rate IS NOT the discount rate used in the Present Value calculations

- The coupon rate merely tells us what cash flow the bond will produce
- Since the coupon rate is listed as a %, this misconception is quite common

# Bond Pricing

The price of a bond is the present value of all cash flows generated by the bond (i.e. coupons and face value) discounted at the required rate of return

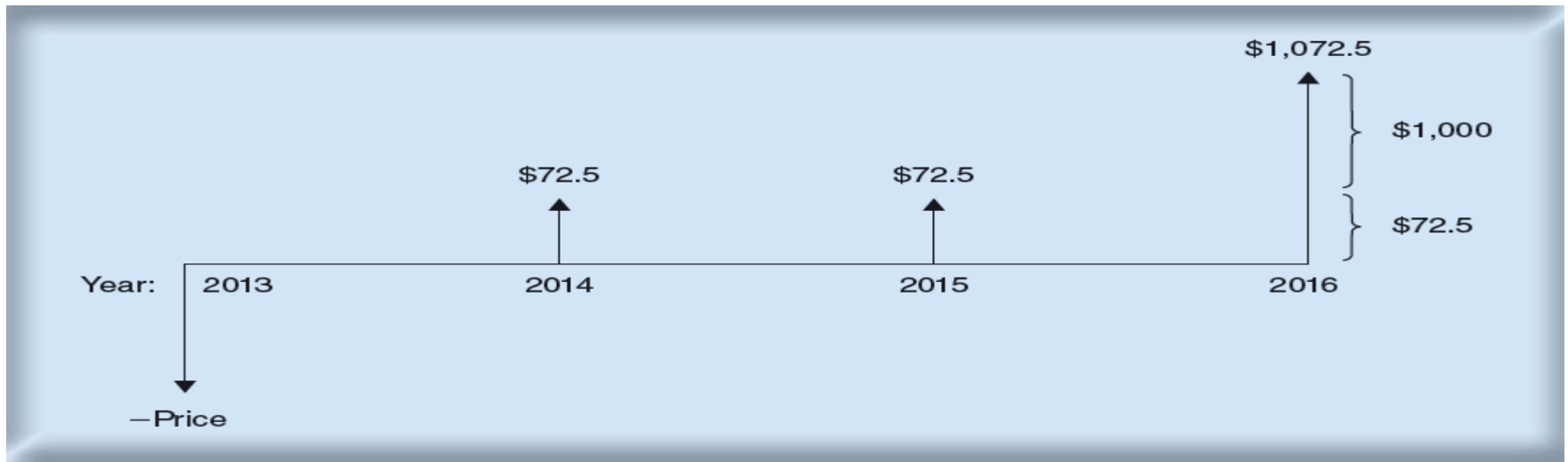
$$PV = \frac{cpn}{(1+r)^1} + \frac{cpn}{(1+r)^2} + \dots + \frac{(cpn + par)}{(1+r)^t}$$

*cpn* is commonly used as an abbreviation for *coupon*

# Bond Pricing

## Example

*What is the price of a 7.25 % annual coupon bond, with a \$1,000 face value, which matures in 3 years? Assume a required return of 0.35%.*



$$PV = \frac{72.50}{(1.0035)^1} + \frac{72.50}{(1.0035)^2} + \frac{1,072.50}{(1.0035)^3}$$

$$PV = \$1,205.56$$



# Bond Pricing

## ***Example (continued)***

*What is the price of a 7.25 % annual coupon bond, with a \$1,000 face value, which matures in 3 years? Assume a required return of 0.35%, 7.25% and 10%.*

$$PV = \frac{72.50}{(1.0035)^1} + \frac{72.50}{(1.0035)^2} + \frac{1,072.50}{(1.0035)^3} = \$ 1,205.56$$

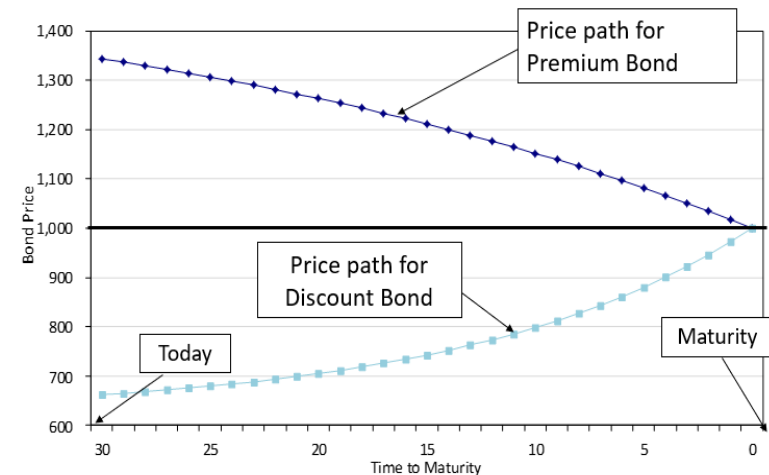
$$PV = \frac{72.50}{(1.0725)^1} + \frac{72.50}{(1.0725)^2} + \frac{1,072.50}{(1.0725)^3} = \$ 1,000$$

$$PV = \frac{72.50}{(1.10)^1} + \frac{72.50}{(1.10)^2} + \frac{1,072.50}{(1.10)^3} = \$ 931.61$$

The upper mentioned required return is used as a discount rate in the calculation of the bond price, it is called **Yield To Maturity (we also call it the Market rate)** defined as the Interest rate for which the present value of the bond's payments equals the price.

# Premium and Discount Bonds

- Premium Bond
  - Coupon rate exceeds yield to maturity
  - Bond price will decline to par over its maturity
- Discount Bond
  - Yield to maturity exceeds coupon rate
  - Bond price will increase to par over its maturity



## Three options

The price is at Face value: coupon rate = market rate

The price is at Discount: coupon rate < market rate

The price is at Premium: coupon rate > market rate

# Bond pricing with annuity

$$Price = PV \text{ of coupons} + PV \text{ of FaceValue}$$

The coupons behave like an annuity.

$$Price = \left[ cpn \times \left( \frac{1}{r} - \frac{1}{r(1+r)^t} \right) \right] + \frac{FaceValue}{(1+r)^t}$$

**Problem:**

- ❖ Why is it not possible to discount face value on annuity basis?

# Bond pricing with annuity

- What is the price of a 5% coupon bond , \$1000 Face Value that has 20 years until maturity if the yield to maturity is equal to 3%?

$$PV_{Cpn} = 50 \times \left( \frac{1}{0,03} - \frac{1}{0,03 \times (1 + 0,03)^{20}} \right) = 50 \times 14,877 = 743.87$$

$$P = 743,87 + \frac{1000}{(1 + 0,03)^{20}} = 743.87 + 553.67 = \$1297.54$$

$$P = 50 \times \left( \frac{1}{0,03} - \frac{1}{0,03 \times (1 + 0,03)^{20}} \right) + \frac{1000}{(1 + 0,03)^{20}} = \$1297.54$$

# Bond Yields

**Yield To Maturity** - Interest rate for which the present value of the bond's payments equals the price.

(The calculation of YTM is not required in this module - a *financial calculator or excel is needed to calculate it.*)

**Current Yield** - Annual coupon payments divided by bond price.

## **Example**

*What is the current yield of a 10.0 % annual coupon bond, with a \$1,000 face value, which matures in 3 years? The market price of the bond is \$1,136.16.*

$$\text{Current yield} = \frac{100}{\$1,136.16} = .088 \text{ or } 8.8\%$$

# Bond Rates of Return

Rate of Return – Total income per period per dollar invested

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

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

# Bond Rates of Return

## Example

*A bond increases in price from \$963.80 to \$1,380.50 and pays a coupon of \$21.875 during the same period. What is the rate of return?*

$$\text{Rate of return} = \frac{21.875 + (1380.50 - 963.80)}{963.80} = .455$$

$$\text{ROR} = 45.5\%$$

# Special Types of Corporate Bonds

- Zero coupon
  - No coupon
  - Price is below face value, return: face value paid at maturity - purchase price
- Floating rate bonds
  - Coupon periodically adjusted
  - Coupon rate: reset once year to current short-term Treasury rate + 2%
- Convertible bonds
  - Can be exchanged against other financial securities (shares)