BOND VALUATION

- Bonds are debt instruments issued by corporations, as well as state, local, and foreign governments to raise funds for growth and financing of public projects.
- Since bonds are long-term debt instruments, their prices can be calculated by using present value techniques i.e. discounting of future interest and principal payments.
- Most corporate and government bonds pay coupons on a semiannual basis.
- Additionally, some companies issue zero-coupon bonds by selling them at a deep discount.

Key Bond Terms

- *Par value*: The principal or face value of a bond on which interest is paid, typically $1000;
- *Coupon rate*: Annual rate of interest paid by issuing (borrowing) company.
- *Coupon:* The regular interest payment received by buyer. It is calculated as the product of the coupon rate and the par value (and divided by 2, if semi-annual)
- *Maturity date:* The expiration date of the bond on which the final coupon and the principal value is paid by the issuer.
- *Yield to maturity:* The discount rate or expected rate of return on a bond (it is the bondholders' rate of return) which is used to determine its price.
- The coupon rate is set by the company at the time of issue and is fixed, while the YTM is a variable rate that depends on market, economic, and company-specific factors *Bond ratings:*

Pricing a Bond in Steps

Since a bond pays periodic coupon payments and a lump sum (par value) at maturity, its price is best calculated by using the following steps:

- Step 1. Lay out the cash flows on a time line;
- Step 2. Determine an appropriate discount rate (yield to maturity);
- Step 3. Calculate the present value of the coupons and the par value;
- Step 4. Add up the two present values to calculate the bond price.

Zero-Coupon Bonds

Also known as "pure" discount bonds, zero-coupon bonds are sold at a discount from face value and do not pay any interest over the life of the bond. At maturity, the investor receives the par value, usually $1000.

Bond Ratings

- Rating agencies such as Moody's, Standard and Poor's, and Fitch produce bond ratings ranging from AAA *(top-rated)* to C (*lowest-rated*) or D *(default).*
- These ratings, which are based on the issuing firm's riskiness, can help investors assess the likelihood of default and assist issuing companies establish a yield on their newly-issued bonds.
- *Junk bonds*: is the label given to bonds that are rated below BBB. These bonds are considered to be speculative in nature and carry higher yields than those rated BBB or above (investment grade).
- *Fallen angels:* is the label given to bonds that have had their ratings lowered from investment to speculative grade.

More Bond Information

- *Indenture* or *deed of trust*: a written contract between the bond issuer and the bondholder which spells out the terms of the bond, the number of bonds to be issued, a description of any collateral supporting the bond, any special repayment provisions or call options, and details of protective covenants.
- *Collateral*, or *security of a bond*: refers to the physical and/or financial assets which support the bond in case of issuer default.
- *Mortgage security:* is a security which is backed by real estate.
- *Debentures*: are bonds which are not supported by any assets of the issuing firm.
- *Senior debt*: is unsecured debt which was issued earlier than *junior debt* and has refunding priority in case of liquidation.
- *Sinking fund:* is a reserve fund set up by some bond issuing companies in which regular payments are made so as to retire the bonds at maturity.
- *Protective covenants:* are actions which bond issuers are prohibited from doing to protect the interest of the bondholder.
- *Callable bond:* allows issuer to retire (call back) the bond prior to its maturity.
    - It is issued when the issuing company thinks interest rate in the future will fall, so that it can call back the bond, and issue new bond at a lower rate.
- *Yield to call*: is the yield that an investor can expect to earn on a callable bond based on the call period.
- *Putable bond:* allows the bondholder the right to sell the bond back to the issuing firm at a pre-determined price at any time prior to maturity.
    - It is especially valuable to the bondholder when the bond's price is dropping due to rising interest rates or increased riskiness of the issuing firm.
- *Convertible bond:* is one which can be exchanged by the holder for other securities, usually common stock, of the issuer at a pre-determined conversion ratio.
- *Floating-rate bond:* is one that has a variable coupon rate which adjusts to some interest rate benchmark such as the prime rate.
- *Prime rate* is the rate that big money-center banks charge their most credit-worthy customers.

U.S. Government Bonds

- U.S. treasury securities include bills, notes, and bonds sold by the Department of the Treasury
    - Treasury bills, are zero-coupon, pure discount securities with maturities ranging from 1-, 3-, and 6-months up to 1-year,
    - Treasury notes have between two to 10 year maturities, and
    - Treasury bonds have greater than 10-year maturities, when first issued.
- Municipal securities are issued by issued by state governments, county, city, or local government agencies.
    - Interest income on the municipal securities are not taxed by the federal government

Questions

1. **What is a bond? What determines the price of this financial asset?**
   A bond is a promised set of future payments from the issuer to the buyer of the bond where a formal agreement states the timing and amount of the future cash flow. The price of this financial asset is determined by the timing and amount of the future cash flow and the

appropriate discount rate of these payments. The discount rate reflects the market's assessment of the required return for investments similar to the bond in terms of risk (default), inflation, maturity, and the current real interest rate.

2. **What is the primary difference between an annual bond and a semiannual bond? What changes do you need to make in finding the price of a semiannual bond versus an annual bond?**
   The primary difference is the timing and the amount of the cash flow of the interest payments. An annual bond pays the annual interest in one payment while a semi-annual bond splits the annual interest into two equal payments paid six-months apart. When using the bond pricing equation you need to change the discount rate from the annual yield to the semi-annual or six-month rate by dividing the annual yield by 2. You need to increase the number of periods for n from the number of years to the number of semi-annual periods by multiplying the number of years by 2.

3. **When we talk about the yield of a bond, we usually mean the yield to maturity of the bond. Why?**
   In order to price a bond we need to know how long we will hold the bond and thus the number of coupon payments we will receive. Because each bondholder has potentially a different time horizon we could get many different prices for the same bond. Therefore, it is generally agreed that the price of the bond reflects all remaining coupon payments and the repayment of the principal at maturity. Thus we state the yield on the bond based on holding the bond to maturity and that yield is the yield-to-maturity.

4. **Does a zero-coupon bond pay interest?**
   No, it just does not pay annual coupon payments. The price appreciation of the bond is the interest earned on the bond.

5. **If a zero-coupon bond does not pay coupons each year, why buy it?**
   The value of owning a zero-coupon bond is the appreciation in price from period to period. The bond sells for a discount but at maturity pays the par value and therefore a gain is realized on the bond.

6. **How does the potential for default of a bond affect the yield of the bond?**
   The greater is the potential for default, the higher the yield. Investors want to be compensated for taking on more risk and default is one type of risk. So for bonds with higher potential for default the yield goes up and the price goes down.

7. **Why are some bonds sold with a premium, some at par value, and some at a discount?**
   Bonds promise a coupon payment based on the coupon rate of the bond. When this coupon rate is above the yield that the market requires for this type of investment, the potential buyers bid the price above par value. For example, if a company is promising a coupon rate of 10% on a new bond, but similar bonds are paying 7% in the market, the 10% coupon rate provides interest well above the required level. Buyers will compete for the right to purchase the limited supply of these bonds, bidding the price above par value. That is, they will pay a premium to own this 10% coupon bond. The market will bid the price up until the actual

yield on the investment falls to the current market rate of 7%. The opposite is true for bonds with coupon rates below the current market yield. Bond buyers will discount the price until the yield on the bond rises to the current market yield for similar investments. Finally, if the coupon rate is equal to the current yield on similar investments the bond buyer gets the required yield by paying the par value of the bond.

8. **How does collateral impact the price of a bond?**
   Collateral reduces the potential loss for a bondholder if the company defaults on the promised bond payment. Because the collateral can be seized as partial or full repayment of the bond if a default should take place, bondholders will pay more for a bond with collateral versus a bond without collateral (a debenture bond).

9. **What role do Moody's, Standard & Poor's, and Fitch's bond ratings play in the pricing of a bond?**
   Moody's and Standard & Poor's provide reliable information to potential bond buyers about the riskiness of the bond. That is, these rating agencies analyze the firm's ability to make the future promised payments (potential for default) and therefore provide the appropriate default premium for pricing the bond. The higher the bond rating the lower the required yield (higher the selling price).

10. **What must happen for a bond to be called a "fallen angel"?**
    A bond must have been an investment grade bond prior to a downgrade to a speculative bond in order to it to be called a "fallen angel."

STOCK VALUATION

Characteristics of Common Stock

- Common stock, like bonds, represents a major financing vehicle for corporations and provides holders with an opportunity to share in the future cash flows of the company.
- Unlike bonds, however, holding common stock signifies ownership in the company, with no maturity date, and variable periodic income.

Ownership:

- As part owners of the company, common shareholders are entitled to share the *profits* of the company, and have a claim to all its assets and cash flow once the creditors, employees, suppliers, and taxes are paid off.
- Ownership via common stock also confers *voting rights* to the shareholders.

Maturity Date:

- Common stock is considered to have an infinite life since unlike bond-holders.

Dividends and Their Tax Effect:

- Companies pay cash dividends periodically (usually every quarter) to their shareholders out of net income.
- Unlike coupon interest paid on bonds, dividends cannot be treated as a tax-deductible expense by the company.
- For the recipient, however, dividends are considered to be taxable income.

Treasury Stock

- Shares that are being held by the issuing firm

Preemptive Rights

- Allow current shareholders to buy shares before they are offered to the general public.

Stock Valuation

- Theoretically speaking, the value of a share of stock is the present value of its expected future cash flow, which would include the cash dividends paid by the company (if any) and the future selling price of the stock, when sold to another buyer.
- The problem is that common stocks do not specify fixed dividend payments in the future.
- Thus, we make assumptions about future dividend payments, such as
    - Constant dividend growth (i.e., using a constant growth model)
    - $\text{Price}_0 = \frac{\text{Div}_1}{(r-g)}$

Efficient Markets

- In an efficient market, security prices are current and fair to all traders.
    - **Operational Efficiency:** trades are processed quickly and accurately
    - **Informational Efficiency:** securities trade at their fair value.
        - *Weak-form efficient markets* - current prices reflect the price history and trading volume of the stock. Thus, charting and other technical strategies would be useless if markets are truly weak-form efficient.
        - *Semi-strong-form efficient markets* - current prices already reflect all available public information including history.

- *Strong-form efficient markets* - current prices reflect all publicly available information, including history and private information.