



**Tennessee**  
**TECH**

# Stocks: Overview



# Primary Markets

- Primary markets: financial markets in which firms and governments issue new securities
- Initial Public Offering (IPO): sale of stock when a firm becomes public
  - IPOs are usually underwritten by investment banks. The IPO is announced in a formal document called a prospectus, which describes the stock being offered, its price, and detailed information on the company issuing the stock.



# Common Stock

- Essential characteristics of Stockholders
  - Stockholders own shares of the firm
  - Stockholders are residual claimants. Only receive proceeds after creditors are paid.
  - Stockholders have limited liability.
  - Individual stock holders represent a small fraction of the firm's ownership
  - Because they are owners of the firm, have the right to elect the corporation's directors and they can replace managers who do a bad job





# Secondary Markets

- Secondary markets: financial markets in which existing securities are traded. This is what is referred to as “the stock market.” This is where the market determines prices.
- After securities are issued in primary markets, their buyers often resell them in secondary markets. Then the securities are traded repeatedly among institutions and individuals.



# Measuring the overall stock market

- Stock market indexes
  - The Dow Jones Industrial Average (DJIA, the “Dow”): price-weighted index of 30 large, well-respected companies with long operating histories
  - The S&P 500 (Standard & Poor’s): value-weighted index of 500 large companies, not necessarily the 500 largest.)
  - NASDAQ: value-weighted index composed of over 2,000 companies. Tech is weighted at approximately 42%.



# **Stocks**

## **Risk & Return Overview**



# About Stock Returns

- Returns (%): capture the money you make from owning the stock relative to the price you paid for it. For stocks, cash flow is generated by dividends and/or through the sale of the stock.
- $\text{Return}(\$) = \text{dividend income} + \text{capital gain(or loss)}$
- $\text{Return}(\%) = \frac{\text{dividend income} + \text{capital gain(or loss)}}{\text{purchase price}}$





# Example

Assuming you purchased a share of stock for \$50 one year ago, sold it today for \$60 and during the year received 3 dividend payments totaling \$2.70, calculate the following:

- A) Return (\$):

- B) Return (%):



# Independent Practice

- You bought shares in Mattel Corp. (MAT) for a price of \$32.70 per share. During the year, the firm made 4 dividend payments of \$0.38 each. If you sold the stock one year later for \$25.70 per share, what was your realized return on this investment?



# Independent Practice Solution



# About Stock Returns

## When you are deciding whether to invest, consider:

- **Required return:** the minimum return the investor is willing to accept to purchase a stock considering its risk and the returns available on other investments
- **Expected Return:** the return that the investor expects will happen in the future. It may higher or lower than the required return but a rational investor will only invest in a stock if the expected return is greater or equal to the required return

If **expected return** > **required return**, invest.

If **expected return** < **required return**, DO NOT invest

## If you choose to invest, you may still lose money!

- **Actual/Realized Return:** the actual, observable return on the stock

Expectations do not always materialize! Just because you expect to make \$ doesn't mean you actually will!!





# About Stock Risk

- Risk is the chance that some unfavorable event will occur. For us, that means actual returns are lower than expected return.
  - We will work with the premise that investors like return and dislike risk. To invest in risky assets, those risky assets must offer higher expected returns



# About Stock Risk

- Risk is the chance that some unfavorable event will occur. For us, that means actual returns are lower than expected return.
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# **Stocks**

## **Stand-Alone Risk & Return: The Probabilistic Approach**



# Stand Alone Risk: Probabilistic Approach

- Probabilistic Approach
  - Involves a listing of possible outcomes or events with a probability assigned to each outcome

Expected return:  $\hat{r} = \sum_{i=1}^N P_i r_i$

Standard Deviation:  $\sigma = \sqrt{\sum_{i=1}^N (r_i - \hat{r})^2 P_i}$





# Example

- You have the following information on a stock. What is return expected from this stock? What is the standard deviation of returns?

| Demand Conditions | Probability | Rate of Return |
|-------------------|-------------|----------------|
| Weak              | 0.3         | -30%           |
| Average           | 0.5         | 16%            |
| Strong            | 0.2         | 60%            |





# Independent Practice

- A stock's return has the following probability distribution. Calculate the expected return and standard deviation of returns.

| Demand for the Company's Products | Probability of this Demand Occurring | Rate of Return if this Demand Occurs (%) |
|-----------------------------------|--------------------------------------|--|
| Weak                              | 0.1                                  | -50%                                     |
| Below Average                     | 0.2                                  | -5%                                      |
| Average                           | 0.4                                  | 16%                                      |
| Above Average                     | 0.2                                  | 25%                                      |
| Strong                            | 0.1                                  | 60%                                      |



# Independent Practice Solution





# **Stocks**

## **Stand-Alone Risk & Return: The Historical Approach**



# Stand-Alone analysis: Historical approach

- Historical Approach
  - Use historical data for the stock--expect past to be consistent with future performance.

- Average Return  $r_{avg} = \sum_{i=1}^N \frac{r_i}{N}$

- Standard Deviation:  $\sigma = \sqrt{\frac{\sum_{i=1}^N (r_i - \bar{r}_{avg})^2}{N-1}}$



# Example-Historical Approach

- You have the following information on a stock. What is average return from this stock? What is the standard deviation of returns?

| Junu Enterprises |         |
|------------------|---------|
| YEAR             | Returns |
| 2016             | -5%     |
| 2017             | 10%     |
| 2018             | 5%      |
| 2019             | 14%     |







# Independent Practice

- You have the following information on a stock. What is average return from this stock? What is the standard deviation of returns?

|      | Soca Inc. |
|------|-----------|
| YEAR | Returns   |
| 2016 | 6%        |
| 2017 | 3%        |
| 2018 | 10%       |
| 2019 | -7%       |



# Independent Practice Solution

|      | Soca Inc. |
|------|-----------|
| YEAR | Returns   |
| 2015 | 6%        |
| 2016 | 3%        |
| 2017 | 10%       |
| 2018 | -7%       |



# **Stocks**

## **Stand-Alone Risk & Return: Coefficient of Variation**



# Which stock would you choose?

| Stock A |          | Stock B |          | Which is better? Why? |
|---------|----------|---------|----------|-----------------------|
| r       | $\sigma$ | r       | $\sigma$ |                       |
| 10%     | 12%      | 10%     | 20%      |                       |
| 1%      | 10%      | 5%      | 10%      |                       |
| 5%      | 15%      | 15%     | 25%      |                       |

- Coefficient of variation-the standardized measure of the risk per unit of return: calculated as the standard deviation divided by the expected return (or the average return when using the historical approach).

$$CV = \frac{\sigma}{\hat{r}}$$





# Independent Practice

- Suppose you are a risk-averse investor. Which of the following two stocks is better to hold on a stand-alone basis?

| Stock                     | Expected Return | Standard Deviation of Returns |
|---------------------------|-----------------|-------------------------------|
| Safe Flight Airlines      | 10%             | 25%                           |
| Innovative Tech Solutions | 25%             | 50%                           |



# Independent Practice Solution

- Suppose you are a risk-averse investor. Which of the following two stocks is better to hold on a stand-alone basis?

| Stock                     | Expected Return | Standard Deviation of Returns |
|---------------------------|-----------------|-------------------------------|
| Safe Flight Airlines      | 10%             | 25%                           |
| Innovative Tech Solutions | 25%             | 50%                           |



# **Stock Risk & Return: Portfolio Measures**



# Portfolios-Example

In general investors do not hold only one stock. Instead, they hold a portfolio—a combination of various stocks. Think of a simple portfolio AB

**Portfolio AB: 50% A, 50%B**

|      | A   | B   | AB |
|------|-----|-----|----|
| 2016 | 30  | -10 |    |
| 2017 | 10  | 0   |    |
| 2018 | 0   | 15  |    |
| 2019 | -15 | 30  |    |





# Portfolios-Independent Practice

**Portfolio XY: 50% X, 50%Y**

|      | X   | Y  | XY |
|------|-----|----|----|
| 2016 | 20  | 15 |    |
| 2017 | 10  | 5  |    |
| 2018 | 0   | 2  |    |
| 2019 | -10 | -3 |    |



# Independent Practice Solution

**Portfolio XY: 50% X, 50%Y**

|      | X   | Y  | XY |
|------|-----|----|----|
| 2016 | 20  | 15 |    |
| 2017 | 10  | 5  |    |
| 2018 | 0   | 2  |    |
| 2019 | -10 | -3 |    |



# **Stock Risk & Return: Portfolio Risk & Expected Return**



# Portfolio Average (expected) return

**Portfolio AB: 50% A, 50%B**

|                | A    | B    | AB |
|----------------|------|------|----|
| average return | 6.25 | 8.75 |    |

**Portfolio XY: 50% X, 50%Y**

|                | X | Y    | XY |
|----------------|---|------|----|
| average return | 5 | 4.75 |    |

The expected return on a portfolio is the weighted average of the expected returns of the individual assets in the portfolio, with the weights being the percentage of the total portfolio invested in each asset.

$$\sum_{i=1}^N w_i \hat{r}_i = w_1 \hat{r}_1 + w_2 \hat{r}_2 + w_3 \hat{r}_3 + \dots + w_N \hat{r}_N$$





# Portfolio standard deviation

**Portfolio AB: 50% A, 50%B**

|                    | A     | B    | AB |
|--------------------|-------|------|----|
| standard deviation | 18.87 | 17.5 |    |

**Portfolio XY: 50% X, 50%Y**

|                    | X     | Y    | XY |
|--------------------|-------|------|----|
| standard deviation | 12.91 | 7.59 |    |

The portfolio standard deviation is **NOT** the weighted average of the individual stocks' standard deviations.



# Portfolio Risk and Diversification

- The portfolio's standard deviation is generally smaller than the average of the stocks' standard deviations because diversification lowers the portfolio's risk. This effect is a result of **correlation** between the expected returns of the individual stocks.
  - **Correlation** is the tendency of two variables to move together. It is measured by the **correlation coefficient**,  $\rho$  which varies from -1 to 1.
    - If  $\rho=1$  then two stocks are perfectly correlated. Thus diversification is completely useless for reducing risk.
      - From our example, Stocks X and Y have a  $\rho=0.97$
    - If  $\rho= -1$  then two stocks are perfectly negatively correlated so all risk can be diversified away.
      - From our example, Stocks A and B have a  $\rho=-0.98$



# Portfolio Risk

- In reality, most stocks are positively correlated but not perfectly so. Portfolio risk generally declines as the number of stocks in a portfolio increases. Diversification reduces risk but does not eliminate it.
- The portfolio's risk can be divided into 2 parts: diversifiable risk and market risk.
  - **Diversifiable risk:** risk associated with random events; it can be eliminated by proper diversification. This risk is also known as **company specific** or **unsystematic** risk.
  - **Market risk:** the risk that remains in a portfolio after diversification has eliminated all company-specific risk. This risk is also known as **non-diversifiable** or **systematic** or beta risk. This cannot be eliminated via diversification.





# Portfolio Risk

- In a portfolio context, the risk of an individual stock depends on how that stock impacts the overall risk of the portfolio. The risk that investors are primarily concerned with is market/beta risk because company-specific risk can be diversified away.
- That risk can be measured by the extent to which the stock moves up or down with the market. This can be measured by **beta** ( $\beta$ ).
  - If  $\beta=1$ , the stock moves up and down with the market. If the market rises 5% so does the stock.
  - If  $\beta>1$ , the stock is more volatile than the market. If the market rises by 5% the stock rises by more than 5%.
  - If  $\beta<1$ , the stock is less volatile than the market. If the market rises by 5%, the stock rises by less than 5%.





# **Stock Risk & Return: The Capital Asset Pricing Model**



# The CAPM

- The Capital Asset Pricing Model (CAPM)-a model based on the proposition that any stock's **required** rate of return is equal to the risk-free rate of return plus a risk premium that reflects only the risk remaining after diversification.
- In other words, the required return on any stock=the risk-free return + premium for the stock's risk.

$$r_i = r_{rf} + \beta_i (r_m - r_{rf})$$

$r_i$ =the required return on Stock i

$r_{rf}$ =the risk-free rate

$\beta_i$ =the beta of stock i

$r_m$ =the return on the market

Whole equation is known as  
Security Market Line

$r_m - r_{rf}$ : known as the  
**market risk premium:**  
(MRP), reflects how  
much return over the  
risk-free rate investors  
demand to assume an  
average amount of  
risk.



# Example

- Assume that the risk-free rate is 6% and the required return on the market is 13%. What is the required rate of return on a stock with a beta of 0.7?



# Independent Practice

- Wu Industries has a beta of 1.4. If the **market risk premium** is 5% and the risk-free rate is 2%, what should be the required rate of return on Wu Industries' stock?





# Independent Practice Solution

- Wu Industries has a beta of 1.4. If the market risk premium is 5% and the risk-free rate is 2%, what should be the required rate of return on Wu Industries' stock?



# **Stock Risk & Return: CAPM-The Security Market Line**



# The security market line



# Changes to the SML





# **PORTFOLIO RISK & RETURN: PUTTING IT ALL TOGETHER**



# Measuring Portfolio Risk: Beta ( $\beta$ )

- Beta of a portfolio can be calculated as the weighted average of its individual securities' betas.

$$\beta_p = w_1\beta_1 + w_2\beta_2 + \dots + w_n\beta_n$$



# Example:

- Suppose the portfolio below is well-diversified. The risk-free rate is 2% and the return on the market is 8%. Should you invest in this portfolio? Why or why not?

| Stock | Investment | Expected Return | Beta |
|-------|------------|-----------------|------|
| A     | \$100,000  | 4%              | 0.4  |
| B     | \$200,000  | 6%              | 0.8  |
| C     | \$100,000  | 9%              | 0.9  |
| D     | \$100,000  | 12%             | 1.8  |











# Independent Practice

•Your favorite aunt just won \$200,000 in the state lottery and is considering investing her winnings in the portfolio shown below. She asks for your advice. Should she invest in this portfolio? Why or why not? Assume the following:

- 1.The portfolio is well-diversified.
- 2.The Treasury bill yield is 3% and the return on the S&P 500 is 12%.

| Stock | Amount   | Expected Return | Standard deviation | Beta |
|-------|----------|-----------------|--------------------|------|
| A     | \$60,000 | 11%             | 6%                 | 0.8  |
| B     | \$50,000 | 14%             | 10%                | 1.1  |
| C     | \$40,000 | 20%             | 22%                | 1.2  |
| D     | \$50,000 | 80%             | 120%               | 2.5  |



# Independent Practice Solution





# Things to Keep in Mind

- Since investors are risk averse, a stock with a high market risk must offer a high expected rate of return.
- If investors believe that a stock's expected return is too low to compensate for its risk, they will sell it, driving down its price and boosting up its expected return. If they believe that its expected return is too high, they will buy it driving up its price and driving down its expected return. The stock will be in equilibrium when its expected return is exactly enough to compensate for its risk.



# Risk & Return

## Additional Practice

1. Suppose you have purchased Stock A. If you have the following expectations about the future, how much risk do you expect to bear for every unit of expected return?

| State of the economy | Probability | Stock A's Return |
|----------------------|-------------|------------------|
| Expansionary         | 0.3         | 12%              |
| Stable               | 0.5         | 4%               |
| Contractionary       | 0.2         | -5%              |

2. Which of the following would a risk averse investor prefer to hold on a stand-alone basis?

| Stock              | Average Return | Standard Deviation of Returns |
|--------------------|----------------|-------------------------------|
| JP Construction    | 12%            | 12%                           |
| Averill Financials | 5%             | 6%                            |

3. What is the stand-alone risk of the following stock?

| Year | Return |
|------|--------|
| 2016 | -6%    |
| 2017 | 2%     |
| 2018 | 4%     |
| 2019 | 8%     |



# Risk & Return

## Additional Practice

4. On January 27, you purchased stock in Facebook (FB) for a price of \$214.87 per share. On October 26, you sold your shares for \$278.92. What was your realized return for this investment? Facebook does not currently pay dividends.
5. All else the same, the higher the correlation coefficient between two stocks, the \_\_\_\_\_ are the diversification benefits from combining them.
6. What is the expected return of the following portfolio of stocks?

| Stock   | Amount Invested | Expected Return |
|---------|-----------------|-----------------|
| Stock A | \$20,000        | 6%              |
| Stock B | \$40,000        | 8%              |
| Stock C | \$10,000        | 10%             |
| Stock D | \$30,000        | 4%              |

7. The decline in stock prices in Wells Fargo (WFC) that resulted from the 2008 financial crisis is an example of \_\_\_\_\_ risk. This risk is measured by \_\_\_\_\_.
8. Suppose the risk-free rate is 2% and the return on the market is 12%. If HiTech Firm has a beta of 1.75, what should be its required return?
9. Suppose you were offered the possibility to invest in the following well-diversified portfolio? If the risk-free rate is 1% and the market risk premium is 8%, should you invest? Why or why not?

| Stock | Amount    | Expected Return | Beta |
|-------|-----------|-----------------|------|
| A     | \$200,000 | 6%              | 0.75 |
| B     | \$100,000 | 8%              | 0.9  |
| C     | \$100,000 | 12%             | 1.1  |
| D     | \$100,000 | 14%             | 1.4  |





# **Stock Valuation: Discounted Dividend Models**







# Stock Valuation:

## The Discounted Dividend Model

- The value of a share of common stock is the present value of the cash flows it is expected to provide. These cash flows are composed of 2 parts:
  1. Dividends the investor receives while he/she holds the stock
  2. the price received when the stock is sold



# The Discounted Dividend Model

$$P_0 = \frac{D_1}{(1+r_s)} + \frac{D_2}{(1+r_s)^2} + \dots + \frac{D_N}{(1+r_s)^N} + \frac{P_{sell}}{(1+r_s)^N}$$

$P_{sell}$  should also be a function of the future discounted dividends so in the end...

$$P_0 = \frac{D_1}{(1+r_s)} + \frac{D_2}{(1+r_s)^2} + \dots + \frac{D_N}{(1+r_s)^N} + \frac{D_{N+1}}{(1+r_s)^{N+1}} + \frac{D_{N+2}}{(1+r_s)^{N+2}} + \dots + \frac{D_\infty}{(1+r_s)^\infty}$$



# **Stock Valuation: The Gordon Model for Constant Growth Stocks**





# The Discounted Dividend Model

$$P_0 = \frac{D_1}{(1+r_s)} + \frac{D_2}{(1+r_s)^2} + \dots + \frac{D_N}{(1+r_s)^N} + \frac{D_{N+1}}{(1+r_s)^{N+1}} + \frac{D_{N+2}}{(1+r_s)^{N+2}} + \dots + \frac{D_\infty}{(1+r_s)^\infty}$$

We cannot calculate dividends until infinity. To contend with that problem, we assume that dividends grow at a constant rate (**g**)—this is not unrealistic for mature firms. Then

$$D_1 = D_0(1+g)$$

$$D_2 = D_1(1+g) = D_0(1+g)(1+g) = D_0(1+g)^2$$

$$D_3 = D_2(1+g) = D_1(1+g)^2 = D_0(1+g)^3$$

$$D_N = D_0(1+g)^N$$



# Discounted Dividend Model With Constant Growth

- The stock price formula becomes

$$P_0 = \frac{D_0(1+g)}{(1+r_s)} + \frac{D_0(1+g)^2}{(1+r_s)^2} + \dots + \frac{D_0(1+g)^N}{(1+r_s)^N} + \dots$$

- This formula simplifies to the following:

$$P_0 = \frac{D_1}{r_s - g} = \frac{D_0(1+g)}{r_s - g}$$

- This is the Gordon model for constant growth stocks.
  - only works if the required rate of return on the stock is greater than the growth rate of dividends ( $r_s > g$ ). Otherwise, prices are undefined or negative which makes no economic sense.





# Example 1

A stock is expected to pay a dividend of \$0.75 at the end of the year. The required rate of return is 10.5% and the expected constant growth rate is 6.4% forever. What is the stock's current price?





# Independent practice

Boehm Incorporated recently paid a dividend of \$1.50 per share dividend. The dividend is expected to grow at a constant rate of 6% a year. The required rate of return on the stock is 13%. What is the estimated value per share of Boehm's stock?



# Independent practice Solution



# **Stock Valuation: Variable Growth Stocks**



# Valuing Variable Growth Stocks

- Supernormal/variable/nonconstant growth: the part of the firm's life cycle in which it grows much faster than the economy as a whole.
- We assume that the dividend will grow at a variable rate,  $g_s$ , for  $N$  periods, after which it will grow at a constant rate,  $g_n$ .  $N$  is often called the terminal or horizon date (the date when the growth rate becomes constant).
  - First, we calculate the present value of the dividends during the variable rate period.
  - Second, we use the constant growth formula to determine the stock's horizon/terminal value (the value at the horizon date of all dividends expected thereafter).





# Discounted Dividend Model with Variable Growth

$$P_0 = \frac{D_1}{(1+r_s)} + \frac{D_2}{(1+r_s)^2} + \dots + \frac{D_N}{(1+r_s)^N} + \frac{D_{N+1}}{(1+r_s)^{N+1}} \dots \frac{D_\infty}{(1+r_s)^\infty}$$

N represents the time period at which high growth ends and constant growth begins

PV of dividends during initial (supernormal) growth phase

PV of all dividends during constant growth phase

$$P_0 = \frac{D_1}{(1+r_s)} + \frac{D_2}{(1+r_s)^2} + \dots + \frac{D_N}{(1+r_s)^N} + \frac{D_{N+1}}{(1+r_s)^N} \frac{r_s - g_n}{r_s - g_n}$$

We can find this price using the Gordon model



# Example

Huang Company's last dividend was \$1.25. The dividend growth rate is expected to be constant at 15% for 3 years, after which dividends are expected to grow at a rate of 6% forever. If the firm's required return is 11%, what is its current stock price?









# Independent Practice

- Helen's Pottery Co.'s is expected to pay a \$1.50 dividend at the end of the year. The dividend is expected to grow by 20% in the two years after that, by 12% in the 2 years after that and then grow forever at a constant rate of 5%. If the required rate of return on the stock is 10%, what is the stock's current price?



# Independent Practice Solution



# **Stock Valuation: Preferred Stock**



# Preferred Stock

- Hybrid between a bond and a stock.
  - Like bonds: have par value and a fixed dividend that must be paid before dividends are paid on common stock.
  - Like stock: preferred dividends can be omitted without constituting default.
  - Preferred stock typically offers a fixed payment stream with no maturity, so it behaves like a perpetuity.

$$P_p = \frac{D_p}{r_p}$$





# Example

Ezzell Corporation issued perpetual preferred stock with a 10% annual dividend. The stock currently yields 8%, and its par value is \$100. What is the stock's value?



# Independent practice

- Several years ago, Rolen Riders issued preferred stock with a stated annual dividend of 8% of its \$100 par value. Preferred stock of this type currently yields 11%. Assume dividends are paid annually. What is the value of Rolen's preferred stock?



# Independent practice Solution



# Stock Valuation

## Additional Practice

1. DMH Enterprises recently paid a dividend of \$2. The company is mature, has a beta of 1.2 and is expected to grow at a rate of 4% forever. If the yield on T-bills is 1.5 and the expected return on the S&P 500 is 9%, how much should you pay for one common share of DMH Enterprises?
2. You are charged with the valuation of Fell Enterprises given the following information: Fell recently paid a dividend of \$1.30 and dividend growth is expected to be 15% for the next three years, after which growth will taper to a constant rate of 6%. If the required return on Fell's stock is 8%, what should be the stock's current price?
3. A friend recommends that you purchase stock in NewEnergy Inc. because at a price of \$25, it is significantly undervalued in the market. Given the recommendation, you investigate for yourself you find that: Due to a high rate of earnings growth, NewEnergy dividends are expected to grow at a rate of 20% a year for the next 4 years and then level out to a permanent 5% a year. The stock has a beta of 1.4, the risk-free rate of return is 3%, and the expected return on the market is 12%. If NewEnergy Inc is expected to pay a dividend of \$1.50 at the end of the year, do you agree with your friend that it is undervalued?

