Business Finance

Lecture Notes

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Section 1

Introduction to Finance

- Finance is a broad term that is used regarding the management, creation, and study of money and investment
    - **Public Finance** – study of tax systems, government expenditures, budget procedures, and government debt
    - **Personal Finance** – individual and household budgeting, mortgage planning, savings, and retirement planning
    - **Corporate Finance** – Managing assets, liabilities, revenues, and debt
- This course will focus mostly on topics in corporate finance, but will touch on some extensions to personal finance

1.1 What is Finance?

- Economics tells us the goal of a firm is to maximize profits
    - How do firms measure these profits?
        - We will look at different metrics to evaluate profits
    - How do firms account for risk?
        - We will discuss how firms evaluate risk in decision making
    - How do firms compare money they will receive today compared to money they will get in the future?
- How do managers and investors evaluate the success of a company?
    - This is not as simple as just looking at profit

1.2 Accounting vs Finance

1.2.1 Accounting

- Accounting is the recording, maintaining, and reporting of a companies financial records

- Companies prepare financial statements
  - Balance Sheet
  - Income Statement
  - Statement of Cash Flows
- Accounting statements are just bookkeeping and can be misleading
  - Inventory valuation (e.g., FIFO, LIFO, etc.)
  - Depreciation methodology
- Some companies play games with accounting – ENRON

1.2.2 Finance

- Finance uses the information accounting provides to determine the impact of managerial decisions on the market value of a company and the wealth of the owners
- Finance provides the skills managers need to:
  - Identify and select the corporate strategies and individual projects that add value to their firm
  - Forecast the funding requirements of their company and devise strategies for acquiring those funds
- Finance evaluates a companies ability to generate cash
  - Amount of expect cash flows (bigger is better)
  - Timing of the cash flow stream (sooner is better)
  - Risk of the cash flows (less risk is better)

1.3 Types of Businesses

1.3.1 Proprietorship

- This is an incorporated business owned by one person.
- Easy to start, must obtain a license form the city and/or state
- **Advantages**
  - Easy and cheap to form
  - Subject to few government regulations
  - Taxed as personal income instead of corporate income
- **Disadvantages**

    - Hard to obtain capital to expand operations
    - Owner has unlimited liability for business debts
        - Can lose house, car, etc. in bankruptcy
    - Limited to the lifespan of the owners
- 80% of all US companies are proprietorships
- They only make up 13% of total sales in the US

1.3.2 Partnership

- Some companies start with multiple owners
- Some proprietorships add more people over time
- Partnership agreements define the ways in which profits and losses are shared between partners
- Partnerships can be very risky, so partners often try to limit the liability
- **Limited Liability Partnership (LLP)**
    - At least one partner is the general partner that has operational and financial control
        - Maintains unlimited liability
    - Limited partners typically only contribute capital and have limited liability
    - Partners are responsible for their own actions, but are not responsible for actions of other partners
    - Often seen in firms that offer professional services (accounting and law firms)
- **Limited Liability Company (LLC)**
    - A form of partnership where liability for general partners does not extend past the assets of the business
        - Partners may not have to lose personal assets due to cover business losses

1.3.3 Corporations

- Partnerships and proprietorships often have difficulty raising lots of capital
- This makes it difficult to raise money to take advantage of new opportunities
- A corporation is a legal entity that is created under state laws that is separate from its owners and managers
- **Advantages**

- Unlimited lifespan
- Can easily transfer ownership
  - Ownership interests are divided into shares of stock, which can be easily transferred
- Liability is limited only to funds invested

- **Disadvantages**
  - Complex and expensive to form
  - Subject to corporate tax rates
  - High level of regulatory oversight
    - Must have charter, bylaws, and file many state and federal reports

1.4 Financial Institutions

- Financial institutions serve as an intermediary between people who want to lend and invest, and people who want to borrow or need capital
  - **Commercial Banks**
    - Banks that offer interest bearing accounts to its customers
      - Checking accounts
      - Savings accounts
      - Certificates of deposit
    - They make money from the interest on loans
      - Mortgages
      - Auto loans
      - Credit cards
      - Personal loans
      - Business loans
  - **Investment Banks**
    - Advisors to companies and help them raise capital through the process of underwriting
    - They then purchase securities from a company at an agreed upon price and sells them to the public, hopefully at a higher price
  - **Credit Unions**
    - Serve the same function of commercial banks but require membership to be able to join
    - Credit unions are not-for-profit and usually offer higher returns on deposits and charge a lower rate to borrowers
  - **Mortgage Firms**

    - Exist to finance real estate
    - Mortgage firms originate a mortgage, making funds available to borrowers to purchase real-estate
    - Mortgage firm then sells the mortgage to investors
    - Mortgage firms make money from collecting monthly payments
  - **Asset Management Firms**
    - Take money from investors and promise to invest their money in accordance with some guidelines
    - Do not guarantee a positive return
    - Charges a management, advertisement, and sales
  - **Brokerage Firms**
    - Provide investors an avenue to purchase stocks, bonds, commodities, and other assets
    - When a client places an order to purchase, the brokerage firm executes the transaction and charges a fee

1.5 Financial Markets and Securities

- A security is a certificate or financial instrument that has monetary value and can be traded
  - Debt securities
    - Bonds
  - Equity securities
    - Common stock
  - Derivatives
    - Futures
    - Options
    - Swaps
    - Forwards

1.5.1 Stocks

- A share of stock represents partial ownership of a company
- There are two types of stock:
  - **Common Stock**
    - Owners of common stock own a percentage of the company equal to the proportion of the total common stock that has been issues

        - Owners of common stock are entitled to voting rights within the company
            * Major changed to corporate structure
            * Leadership
            * Other items established in corporation's by-laws
    - **Preferred Stock**
        - Represents partial ownership in a company
        - Does not have any voting rights
        - Dividend structure varies from common stock
        - Greater claim to company assets than common stockholders
            * If company goes bankrupt, preferred stockholders are paid off before common stockholders

- Some companies pay a dividend associated with stock
    - A dividend is a distribution of a portion of a companies earnings
        - Different classes of shareholders can have different dividends
        - Can be issued as cash payments, shares of stock, or other property

1.5.2 Markets and Exchanges

Issuing stock

- The primary market is the initial transaction between a company and its investors
    - Private Market
        - Corporations do not need to be large to issue stock
        - A small incorporated business can issue shares of stock to company owners and not available for purchase by the general public
    - Public Market
        - Securities that are for sale to any investor in the general public
        - The first time a company sells stock to the public is called an Initial Public Offering
- The secondary market is where security transactions take place between investors
    - Most transactions (or trades) occur on the secondary market
    - These trades are usually facilitated by a brokerage firm

Bonds

- A bond is a security that represents a contractual obligation between a lender and a borrower
- The borrower can be a company, a municipality, or a government
- The lender provides the borrower with money and the borrower agrees to pay back the full value of the bond at a specified date while making regular interest payments

Derivatives

- Derivatives are securities that do not have any inherent value but derive value from an underlying asset
- A derivative is a contract to purchase the underlying item at a predefined price at a specific time
- These contracts are speculative in nature and can carry a lot of risk
    - Options on a stock
        - A contract giving the buyer the right to buy or sell a stock at a specific price on or before a given date
            - A call option is the right to buy a stock at a specific price
            - A put option is the right to sell at a specific price
    - Futures on commodities
        - An agreement to buy or sell a commodity at a predetermined price at a specified time in the future
    - Forward contracts
        - A customized derivatives contract between two parties to buy or sell an asset at a specified price on a future date

Mutual Funds and ETF's

- **Mutual Funds**
    - A type of investment consisting of a portfolio of stocks, bonds, and other securities
    - Mutual funds give investors access to a diversified and professionally manged portfolio
    - A professional manages takes money from an investor an manages it for a fee
- **Exchange Traded Funds (ETF)**
    - A mutual fund that trades like a stock that can be bought or sold throughout the day

Stock Exchanges

- A stock exchange is a venue where investors can buy or sell shares of publicly traded stock
- Historically, these were operated in-person, but today they are mostly operated electronically
- Two major stock exchanges in the United States:
    - New York Stock Exchange (NYSE)
    - Nasdaq

Section 2

Time Value of Money

- So far we have been talking about analyzing money in the present
  - What is a company's Net Income
  - What is a company's Free Cash Flow
- But there is also a time component to money
  - Example: You have $100 and are at the bar where you can buy drinks and food today
  - I come along and say you should hold your $100 and save it for the summer where you can use it for something else
  - You likely would say no, you are going to spend it now because that is what is most fun and "valuable" to you in the present
  - From your economics classes, there is an "opportunity cost" associated with waiting to spend your money → If you wait to spend it, you are forgoing current utility ("satisfaction")
  - That $100 is worth more to you today than it would be in the future
- If I wanted you to hold your money for the future, I would need to compensate your for the opportunity cost or lost utility
  - I could offer you the opportunity to put your money in an investment that earns interest with the promise that you will have more money in the future than you do today
- **Present Value (PV)** is stating a future dollar value in today's terms when accounting for the interest you could earn
- **Future Value (FV)** is stating today's dollar value in terms of a future date when accounting for the interest you could earn

2.1 Future Value

- If we were to state dollars today in terms of a future period, we call this future value
- Money in an interest bearing account will accumulate interest for the length of time that it is stored in the account

2.1.1 Simple Interest

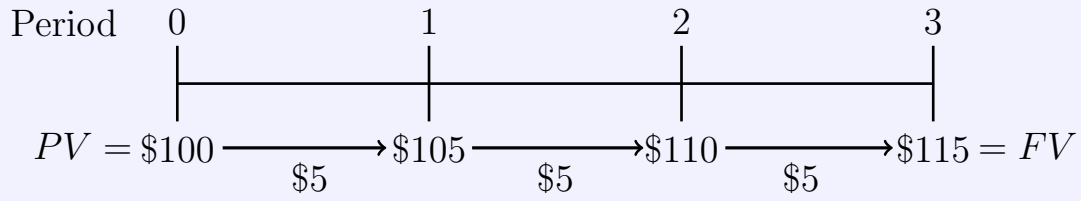
Simple interest is where the interest payment is calculated on the PV and then applied each period and does not consider that the amount in the account is changing as a result of the interest

$$Interest = PV \times interest\ rate \tag{2.1}$$

Example

Suppose you put \$100 in a bank account today that will earn 5% interest annually, how much money will you have after three years?

$$Interest = (\$100)(.05) = \$5$$



The total value of interest paid with simple interest can be calculated using:

$$Simple\ Interest = PV_0 \times i \times n \tag{2.2}$$

Where,

i = the interest rate

n = the number of years

From the example:

$$Simple\ Interest = (\$100)(.05)(3) = \$15$$

From this, we can derive the future value equation for a lump-sum payment with simple interest:

$$FV_n = PV_0 + Simple\ Interest \tag{2.3}$$

$$FV_n = PV_0 + PV_0 in \tag{2.4}$$

$$FV_n = PV_0(1 + in) \tag{2.5}$$

We can apply this formula to our example:

$$FV_3 = \$100[1 + (.05)(3)] = \$115$$

Simple interest is most commonly used in auto loans

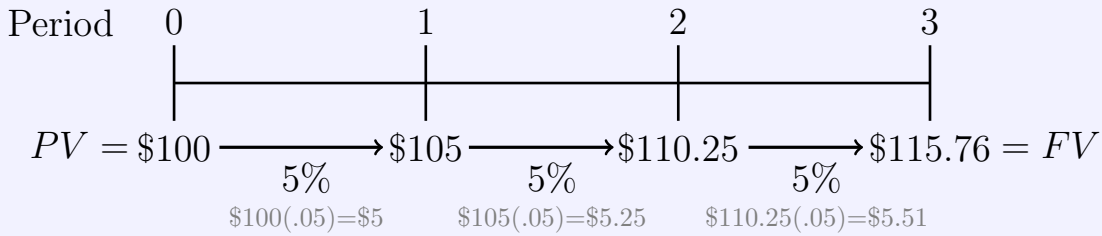
2.1.2 Compound Interest

Compound interest is when the interest payment is updated to consider that the money stored in the account changes each period

Example: Suppose I put \$100 in a bank account today that will earn 5% interest compounded annually, how much money will I have after three years?

Example

Suppose you put \$100 in a bank account today that will earn 5% interest compounded annually, how much money will you have after three years?



$$FV_1 = \$100 + \$100(.05) = \$100(1 + .05) = \$105$$

$$FV_2 = \$105(1 + .05) = \$110.25$$

$$FV_3 = \$110.25(1 + .05) = \$115.76$$

From the example, we can see that:

$$FV_1 = PV_0(1 + i) \tag{2.6}$$

$$FV_2 = FV_1(1 + i) \tag{2.7}$$

$$FV_3 = FV_2(1 + i) \tag{2.8}$$

If we substitute in FV_2 into Equation (8), we get:

$$FV_3 = FV_1(1 + i)(1 + i) \tag{2.9}$$

Then if we substitute FV_1 into Equation (9), we get:

$$FV_3 = PV_0(1 + i)(1 + i)(1 + i) \tag{2.10}$$

From this, we get derive an equation that we can use to calculate Future Value when interest is compounded:

$$FV_n = PV_0(1+i)^n \tag{2.11}$$

From out example:

$$FV_3 = \$100(1+.05)^3 = \$115.76$$

2.2 Present Value

- Now that we have established how to calculate the future value of a present dollar amount, what if we are discussing a dollar amount in the future?
- Suppose you are asked the question would you prefer \$500 in 4 years or \$400 today?
  - We cannot directly compare money in the future to money today
  - So we must find the present value of the future dollar amount
    - This is called discounting a future value into toady's terms
- We can get the Present Value formula by rearranging the Future Value formula:

$$PV = \frac{FV_n}{(1+i)^n} \tag{2.12}$$

Example 1

Would you rather have \$500 in 4 years or \$400 today if the interest rate is 5% compounded annually?

We cannot compare dollar values in two different time period, so we need to discount \$500 to the present.

$$PV = \frac{\$500}{(1+.05)^4} = \$411.35$$

This means that \$500 in 4 years is worth \$411.35 today, so that means we would be better of taking the \$411.35 in 4 years than \$400 today.

Why? Because if we were to take the \$400 and invest it at 5% compounded annually for 4 years, we would only have:

$$FV_4 = \$400(1.05)^4 = \$486.20$$

Example 2

Suppose you want to buy a car in 3 years that costs \$12,000. If you had an account that paid 7% interest compounded annually, how much would you need to put in that

account today to have $12,000 in 3 years?

$$PV = \frac{\$12,000}{(1+.07)^3} = \$9,795.57$$

This means that if you were to put $9,795.57 in an account today at 7% interest compounded annually, you would have $12,000 in 3 years.

2.3 Finding the Interest Rate

- Suppose we know the PV, FV, and n and we want to know the interest rate:

$$FV_n = PV(1+i)^n \tag{2.13}$$

$$\frac{FV_n}{PV} = (1+i)^n \tag{2.14}$$

$$\left(\frac{FV_n}{PV}\right)^{\frac{1}{n}} = (1+i) \tag{2.15}$$

$$i = \left(\frac{FV_n}{PV}\right)^{\frac{1}{n}} - 1 \tag{2.16}$$

Example

What is the average compounded rate of growth if sales were $100 at the end of period 0 and $150 at the end of period 5?

$$PV = 100 \quad FV_5 = 150 \quad n = 5$$

$$i = \left(\frac{150}{100}\right)^{\frac{1}{5}} - 1 = 0.0845 = 8.45\%$$

2.4 Finding the Number of Periods

- Suppose you have PV, FV, and i and you need to find n?

$$\frac{FV_n}{PV} = (1+i)^n \tag{2.17}$$

$$\ln\left(\frac{FV_n}{PV}\right) = \ln\left((1+i)^n\right) \tag{2.18}$$

Using the properties of natural logs, we get:

$$\ln(FV_n) - \ln(PV) = n\ln(1+i) \tag{2.19}$$

$$n = \frac{\ln(FV_n) - \ln(PV)}{\ln(1+i)} \tag{2.20}$$

Example

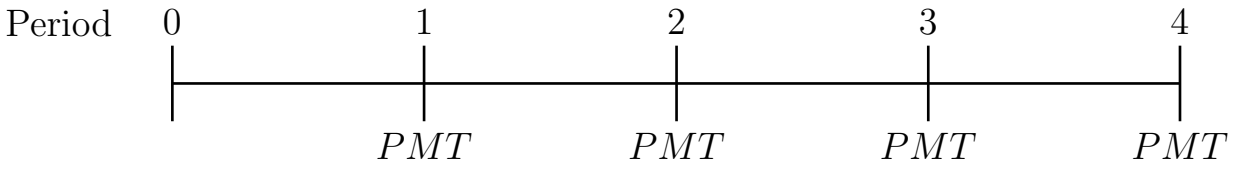
What is the average compounded rate of growth if sales were \$100 at the end of period 0 and \$150 at the end of period 5? If I have \$150 and the current interest rate is 3% compounded annually, how long will it take to triple my investment?

$$PV = 150 \quad FV_5 = 150(3) = 450 \quad i = 0.03$$

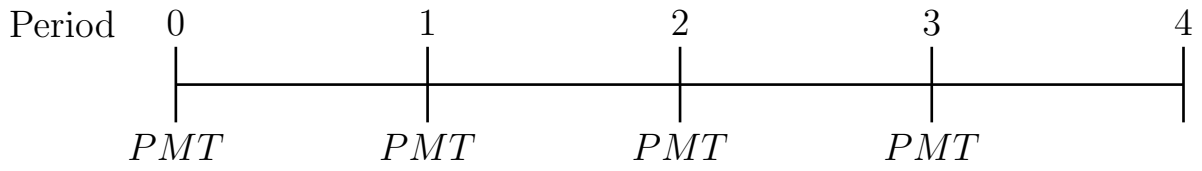
$$n = \frac{\ln(450) - \ln(150)}{\ln(1.03)} = 37.1 \text{ years} \tag{2.21}$$

2.5 Annuities

- The previous section focus on lump-sum payments
- While these are interesting problems and sometimes encountered in the real-world, it is more common where payments are made over time while collecting compound interest
- If the payments made are identical, equal dollar amounts, each period, this is called an annuity
- There are two types of annuities:
  - An **ordinary annuity** is an annuity where the payment is made at the end of each period
    - Examples: mortgages, student loans

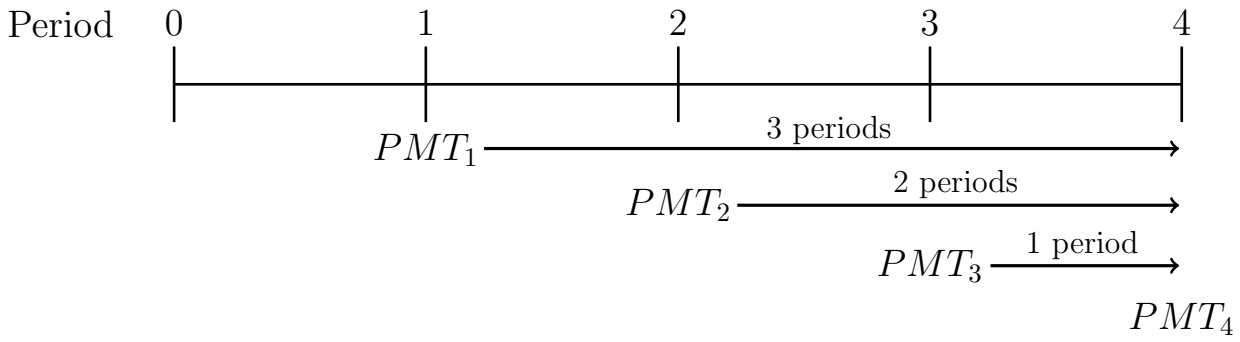


- An **annuity due** is an annuity where the payment is made at the end of each month
  - Examples: rent, insurance premiums
- Why these matter is because an annuity due collects interest for one more period than an ordinary annuity



2.5.1 Future Value of an Ordinary Annuity

- Each deposit will collect interest that is compounded



- PMT_1 collects interest for 3 periods

  $FV = PMT_1(1+i)^3$

- PMT_2 collects interest for 2 periods

  $FV = PMT_2(1+i)^2$

- PMT_3 collects interest for 1 periods

  $FV = PMT_1(1+i)$

- PMT_4 collects interest for 0 periods

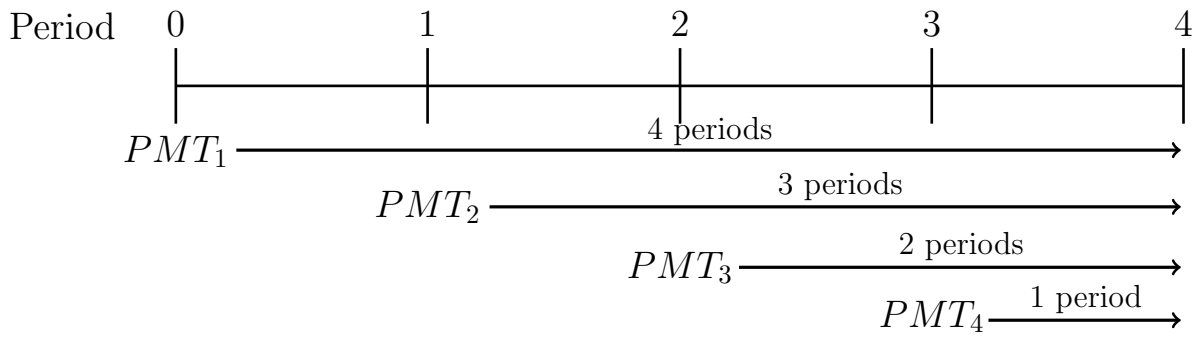
  $FV = PMT_4$

$$FVA_{ord} = PMT(1+i)^3 + PMT(1+i)^2 + PMT(1+i) + PMT \tag{2.22}$$

Fortunately for us, there is a simplified equation to calculate the future value on an ordinary annuity:

$$FVA_{ord} = \frac{PMT}{i}[(1+i)^n - 1] \tag{2.23}$$

2.5.2 Future Value of an Annuity Due



- Each payment for an annuity due collects interest for one additional period compared to an ordinary annuity

$$FVA_{due} = FVA_{ord}(1+i) \tag{2.24}$$

$$FVA_{due} = \frac{PMT}{i}[(1+i)^n - 1](1+i) \tag{2.25}$$

2.5.3 Present Value of an Ordinary Annuity

$$PVA_{ord} = \frac{PMT}{1+i} + \frac{PMT}{(1+i)^2} + \frac{PMT}{(1+i)^3} + ... + \frac{PMT}{(1+i)^n} \tag{2.26}$$

Fortunatley, this simplifies into a nice expression:

$$PVA_{ord} = \frac{PMT}{i}\left[1 - \frac{1}{(1+i)^n}\right] \tag{2.27}$$

Example

Suppose you win the Powerball lottery worth $500,000,000. The $500,000,000 payment assumes that you will take payments over time as an annuity worth $7,525,717 per year for 30 years with an annual interest rate of $i = .05$.

You could also choose a lump sum payment today of $110,500,000. Which would you prefer?

If we want to compare the two, we will need to discount the value of the annuity back to today (e.g., calculate the present value of the annuity)

$$PVA_{ord} = \frac{7,525,717}{.05}\left[1 - \frac{1}{(1.05)^{30}}\right] = \$115,688,716$$

This means that the annuity is worth more than the lump sum, and you should choose the annuity.

2.5.4 Present Value of an Annuity Due

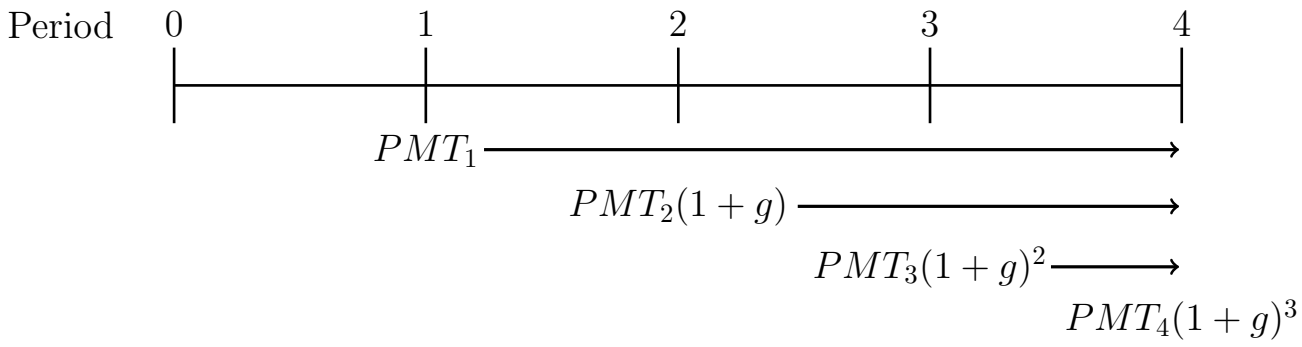
- As with calculating future value, each payment collects interest for an extra period relative to ordinary annuities

$$PVA_{due} = PVA_{ord}(1+i) \tag{2.28}$$

2.5.5 Growing Annuities

Present Value of a Growing Annuity

- When we defined annuities, we said that they have a fixed, identical, payment over a specified number of years
- There is a special case where the the payment changes each period, but it does so by a specified growth rate



$$PVGA_{ord} = \frac{PMT}{1+i} + \frac{PMT(1+g)}{(1+i)^2} + \frac{PMT(1+g)^2}{(1+i)^3} + ... + \frac{PMT(1+g)^{n-1}}{(1+i)^n} \tag{2.29}$$

This simplifies into a nice equation:

$$PVGA_{ord} = \frac{PMT}{i-g}\left[1 - \left(\frac{1+g}{1+i}\right)^n\right] \tag{2.30}$$

Future Value of a Growing Annuity

$$FVGA_{ord} = \frac{PMT}{i-g}[(1+i)^n - (1+g)^n] \tag{2.31}$$

Example

You start work at a company making \$60,000 per year and contribute 10% of your salary towards a retirement account. Each year, your employer gives you a 2% cost of living raise. How much money will be in your retirement account in 35 years if the average interest rate s 3%?

The initial payment towards retirement would be $\$60,000(.10) = \$6,000$

$$FVGA_{ord} = \frac{6,000}{.03 - .02}\left[(1.03)^{35} - (1.02)^{35}\right] = \$488,383.74$$

2.5.6 Perpetual Annuities (Perpetuity)

- A **perpetuity** is a stream of cash flows that never ends
- An example of this is a dividend that is paid by preferred stock
- As n gets really large, $(1+i)^n$ becomes really big, making $\frac{1}{(1+i)^n}$ essentially zero

$$\lim_{n\to\infty} \frac{PMT}{i}\left[1 - \frac{1}{(1+i)^n}\right] = \frac{PMT}{i} \tag{2.32}$$

$$PV_{perpetuity} = \frac{PMT}{i} \tag{2.33}$$

2.6 Amortized Loans

- When you borrow money (e.g., student loans, mortgages, business loans, etc.), you pay it back in installments over time
- We can use the concept of annuities to understand how your monthly payment is calculated
- When you borrow money, the initial amount you borrow is called the principal balance
- As you make regular loan payments, you are paying down the principal and paying interest
    - Interest is usually expressed as an Annual Percentage Rate (APR)
- To find out what the regular payment is, we use the PVA_{ord} formula where the PVA = Principal, n = number of years, and i = the APR. We then solve for PMT
- We can identify how much of each regular payment goes towards the principal and to interest by constructing an amortization schedule

- We can use this as a "what-if" analysis to determine what happens if you want to pay back your loan early

Example

Suppose you want to borrow \$15,000 to build an addition on your house. The loan is going to be repaid in three equal payments at the end of the next three years. The bank is offering you an APR of 8%.

To find the payment:

$$15,000 = \frac{PMT}{.08}\left[1 - \frac{1}{(1.08)^3}\right]$$

$$PMT = \frac{15,000}{2.5771} = \$5,820.50$$

Once we have the payment, we can construct the amortization schedule. For each payment, the interest gets paid first, then the remaining amount goes towards the principal.

Year	Payment	Interest	Principal Repayment	Ending Balance
0				\$15,000
1	\$5,280.50	$15,000(.08) = 1,200$	$5280.50 - 1,200 = \$4,620.50$	$15,000 - 4,620.50 = \$10,379.50$
2	\$5820.50	$10,379.50(.08) = 830.36$	$5,820.50 - 830.36 = \$4,990.14$	$10,379.50 - 4,990.14 = \$5,389.36$
3	\$5,820.40	$5,389.36(0.8) = 431.15$	$5,820.50 - 431.15 = 5,389.36$	$5,389.36 - 5,389.36 = 0.00$

2.7 More Frequent Compounding Periods

- So far we have discussed annual compounding of interest
- However, interest is often compounded more frequently than annually
  - Semi-annually
  - Quarterly
  - Monthly
  - Daily

2.7.1 Lump Sum Payments

We can express FV and PV as follows:

$$FV_n = PV\left(1+\frac{i}{m}\right)^{n\times m} \tag{2.34}$$

$$PV = \frac{FV_n}{\left(1+\frac{i}{m}\right)^{n\times m}} \tag{2.35}$$

Where m is the number of compounding periods each year. If interest is compounded annually, then $m = 1$ and we have the equations we have already discussed.

2.7.2 Annuities

We can express FVA_{ord} and PVA_{ord} as follows:

$$FVA_{ord} = \frac{PMT}{{}^{i}/_{m}}\left[\left((1+{}^{i}/_{m}\right)^{n\times m}-1\right] \tag{2.36}$$

$$PVA_{ord} = \frac{PMT}{{}^{i}/_{m}}\left[1-\frac{1}{\left(1+{}^{i}/_{m}\right)^{n\times m}}\right] \tag{2.37}$$

- ${}^{i}/_{m}$ is called the periodic interest rate
    - When completing an amortization schedule with multiple compounding periods, you need to use the periodic interest rate when determining how much of each payment goes to interest
- When annuities are compounded more frequently, the payment in these formulas corresponds to a payment that is made at the same frequency as interest is compounded
- If we want to determine the PVA of FVA of an annual payment with non-annual compounding periods, we need to use the effective annual rate

2.8 Effective Annual Rate (EAR)

- The EAR takes any interest rate of any compounding period and converts it to an annual rate that produces the equivalent rate of compounding or discounting

$$EAR = \left(1+\frac{i}{m}\right)^{m}-1 \tag{2.38}$$

where i is the annual interest rate and m is the number of compounding periods

Example

Suppose you have a lump-sum payment of \$100 that is going to sit in the bank for 3 years with an APR if 3% compounded quarterly and we want to know what the value will be at the end.

$$FV = 100(1 + {}^{.03}/_{4})^{3\times 4} = \$109.38$$

We could also use the EAR:

$$EAR = (1 + {}^{.03}/_{4})^{4} - 1 = 0.030339$$

$$FV = 100(1 + .030339)^{3} = \$109.38$$

- We can use the EAR to compare interest rates that have different compounding periods:

Example

You can borrow money from a bank with an interest rate of 12% compounded quarterly or you could use a credit card that charges 1% interest per month (or 12% interest compounded monthly)

Bank Loan: $EAR = (1 + {}^{.12}/_{4})^{4} - 1 = .125509 = 12.5509\%$

Credit Card: $EAR = (1 + {}^{.12}/_{12})^{12} - 1 = .126825 = 12.6825\%$

The result is logical, while both loans have a 12% annual rate, you would "effectivley" pay more in interest with the credit card because the first payment you would have to make comes after 1 month compared to the bank loan after 3 months

- Another use of the EAR is to calculate the value of an annuity that has an annual payment but more frequent compounding periods
  - In our equations, if interest is compounded quarterly, then the payments are assumed to also be quarterly
  - What if you wanted to make an annual payment where interest was compounded quarterly?
  - We could convert the periodic rate to the EAR and use that in our annuity formula

Example

Suppose you want to make annual payments of \$1000 into an account at the end of each year that receives 6% interest compounded quarterly. What would the value of this account be in 10 years?

Because the payment and compounding periods are not the same, we need to first calculate the EAR:

$$EAR = (1 + {}^{.06}/_{4})^{4} - 1 = 0.06136355$$

$$FVA_{ord} = \frac{1,000}{.06136355}[(1 + .06136355)^{10} - 1] = \$13,265.50$$

- Similarly, we would need to use the EAR to calculate an annual payment if interest is compounded non-annually

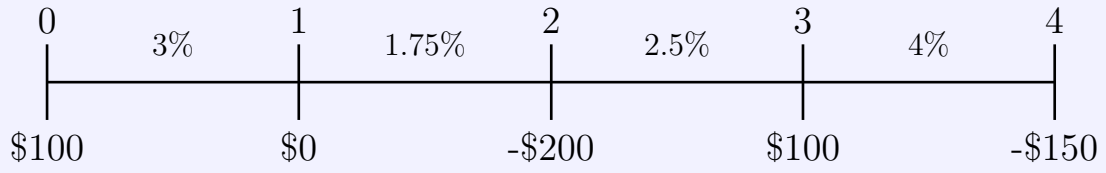
2.9 Uneven and Irregular Cash Flows

- Annuities are a unique type of cash flow that have the same regular payment
- However, it can also be the case that:
  - Interest rates are not constant
    - In practice, interest rates are constantly fluctuating
  - Cash flows can be positive, negative, or zero
    - Think of a savings account, one month you my deposit money, the next month you might not deposit money, then the following month you withdraw money
- Unfortunately, there is no easy formula to calculate the PV and FV of uneven cash flows, they must be calculated the long way
  - We will see this again when we look at project valuation

$$FV_n = CF_0(1+i)^n + CF_1(1+i)^{n-1} + CF_2(1+i)^{n-2} + ... + CF_{n-1}(1+i) + CF_n \quad (2.39)$$

$$PV = CF_0 + \frac{CF_1}{1+i} + \frac{CF_2}{(1+i)^2} + ... + \frac{CF_n}{(1+i)^n} \quad (2.40)$$

Example



What is the PV of this stream of cash flow's?

$$PV = \$100 + \frac{\$0}{1.03} + \frac{-\$200}{(1.0175)^2} + \frac{\$100}{(1.025)^3} + \frac{-\$150}{(1.04)^4} = -\$128.54$$

Section 3

Interest Rates

- Interest rates can be thought of as the cost of borrowing money
- If you took out student loans, or you want to buy a house or a car, you will need to borrow money
    - For most people, these will be there three largest expenditures in their life
- When companies want to expand their operations or to replace equipment, they usually need to borrow money
- For investors, interest rates can provide insights into future changes in the market
- There are a variety of interest rates though
    - Domestic rates
    - Foreign rates
    - Short-term rates
    - Long-term rates
    - Commercial loans
    - Private loans
    - Mortgages
    - Credit cards
    - And many others
- We will use the term "interest rates" more broadly to capture interest rates in general

3.1 The Federal Funds Rate

- The Federal Reserve (the Fed) sets the Federal Funds Rate
- The Federal Funds Rate is the rate that banks use to borrow between each other to meet the reserve requirement

  - The reserve requirement is set by the Fed, and is the amount of money that a bank holds in reserve to ensure that it is able to meet liabilities in case of sudden withdrawals

- The Fed sets the Federal Funds rate by controlling the supply of money in the economy
- To control the money supply, the Fed uses Open Market Operations
  - The Fed buys and sells US Treasury bonds on the secondary market from US banks
  - If the Fed buys US Treasury bonds, it increases the money supply
  - IF the Fed sells US Treasury bonds, it decreases the money supply
- The Federal Funds Rate is one of the most important interest rates in the US economy because it affects monetary and financial conditions, which in turn have a bearing on critical aspects of the broader economy including employment, growth, and inflation
  - When the Fed wants to lower interest rates, it increases the money supply. It typically does this during an economic downturn because it wants to stimulate the economy
  - When the Fed wants to increase interest rates, it decreases the money supply. It typically does this to slow the growth rate of the economy to prevent high inflation
- The Federal Funds Rate also influences short-term interest rates indirectly, for everything from home and auto loans to credit cards, as lenders often set their rates based on the prime lending rate
- The prime rate is the rate banks charge their most creditworthy borrowers—a rate that is also influenced by the federal funds rate

3.2 Other Determinants of Interest Rates

3.2.1 Inflation Premium

- Inflation is the average change in prices from one year to the next
- Inflation can have a major effect on interest rates because it erodes the purchasing power of the dollar, thus lowering the "real" rate of return
  - Remember from Principles of Macroeconomics that the "real" rate is the rate of return adjusted for inflation
- **Example**
  - Suppose you invest $3,000 in a default free zero-coupon bond that matured in 1 year and pays a 5% interest rate
  - At the end of the year you will get $3,150

- Suppose the inflation rate is 10%
  - This means the average price level would rise by 10%
- So if gasoline costs $3.00 per gallon at the beginning of the year, then at the end of the year it would cost $3.30
  - At the beginning of the year, with our $3,000 we could buy $\frac{\$3,000}{\$3.00} = 1,000$ gallons of gas
  - At the end of the year, you have $3,150 which could buy $\frac{\$3,150}{\$3.30} = 955$ gallons of gas
- In "real" terms, you are worse off in this situation because they $150 you make in the bond does not offset the loss in purchasing power from inflation

- The **interest premium** is the average expected inflation over the length of the loan and and investors account for this into the interest rate when they lend money

3.2.2 Default Risk Premium

- US Treasury bonds are the closest thing to a risk-free interest rate, because it is unlikely the US government is going to cease to exist
- For any other investment, there is a risk of default that is associated with it
- The Default Risk Premium is the amount investors must be compensated for the risk of default
- The higher the risk of default for an investment, the higher the Discount Risk Premium
  - Default Risk Premium (DR_P) = Interest Rate on Investment − Yield on US Treasury Bond

3.3 Short-Term Interest Rates

- Short-term interest rates can be approximated using the Fisher Equation:

$$i = r^* + \pi^e + DR_P \tag{3.1}$$

Where,

i is the interest rate

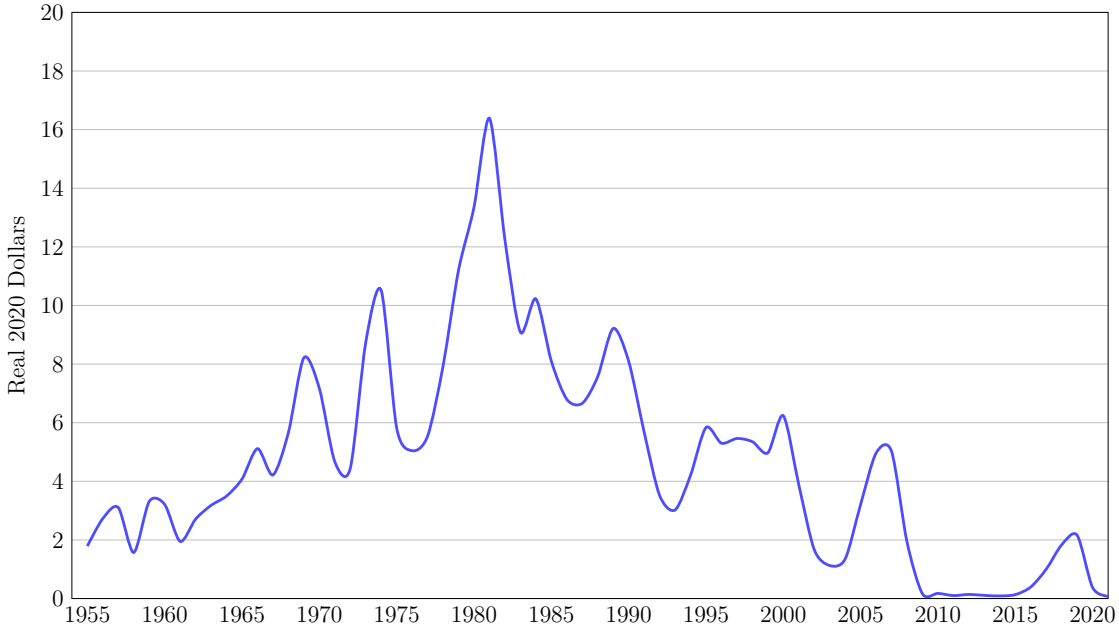
r^* is the risk-free interest rate (∼the rate on a 3-month US Treasury Bill)

π^e is the average expected inflation until maturity

DR_P is the default risk premium

- The longer until maturity, investors must be compensated for not being able to spend that money today

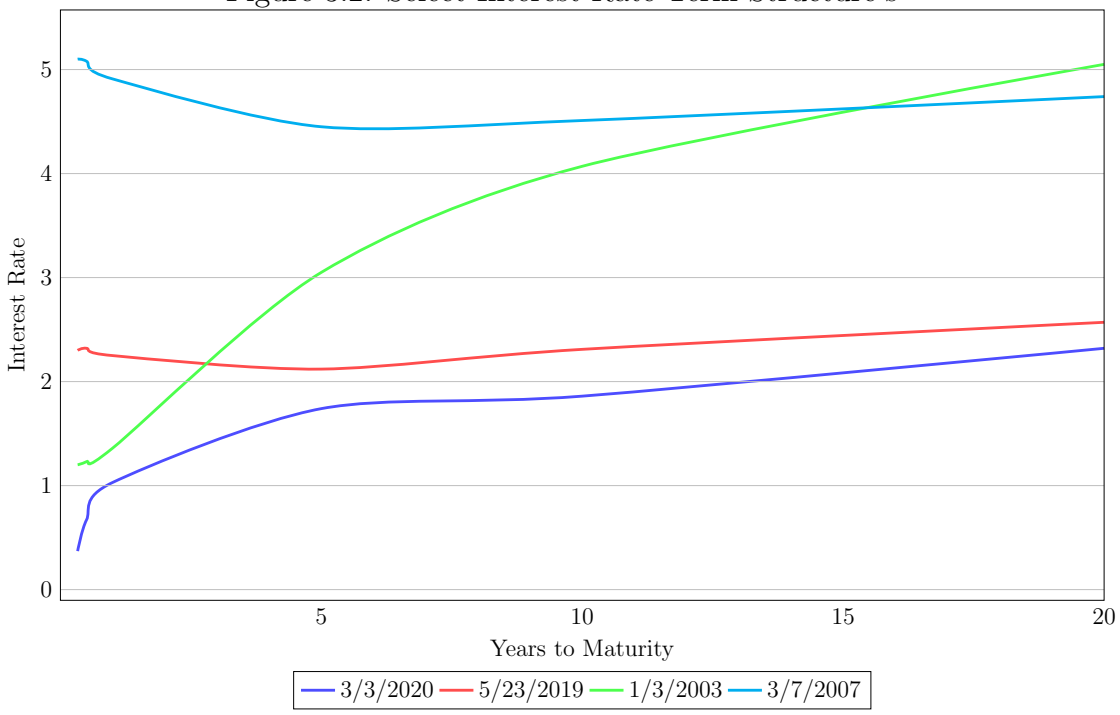
Figure 3.1: Effective Federal Funds Rate, 1954-2021



Source: Federal Reserve Board of Governors via FRED, Tim Murray.

- This is captured in the **term structure** of interest rates
  - The longer until maturity (the term), the higher the interest rate
  - This can visually be captured using the **yield curve**
    - When interest rates increase as the term gets longer, we have a normal yield curve
    - When interest rates decrease as the term gets longer, we have an inverted yield curve
      - The yield curve inverts because investors expect interest rates to decline and they try to lock in a fixed interest rate with longer-term investments
      - Every recession has been preceded by an inverted yield curve, though there has not always been a recession every time the yield curve inverts

Figure 3.2: Select Interest Rate Term Structure's



Source: Federal Reserve Board of Governors via FRED, Tim Murray.

Section 4

Bonds

- A bond is a long-term contract where a borrower agrees to make payments of interest and principal on specific dates
- A bond is sold at a fixed price, interest payments are made on a regular basis, at the end of the contract, the full price of the bond is repaid
- Bonds are a way for a company or government to borrow money and raise capital where companies without having to give up some ownership of the company
    - **Types of Bonds**
        - Treasury bonds
            - No risk of default
        - Corporate bonds
            - There is a risk that a company could default on its payments
            - The higher the default risk, the higher the interest they must pay
        - Municipal bonds
            - Bonds issued by state and local governments
            - Exempt from paying federal income taxes on interest
        - Foreign bonds
            - Foreign governments issue bonds to finance their debt
            - Foreign corporations issue bonds to finance their debt
- Bond Terminology
    - The **primary bond market** is where investors buy bonds directly from the company
    - The **maturity date** is the end date of the bond contract
    - **Par value** is the face value of the bond *or* the amount of money a company borrows and promises to pay back on the maturity date

- The **coupon payment** is the dollar value of the regular interest payments that are made

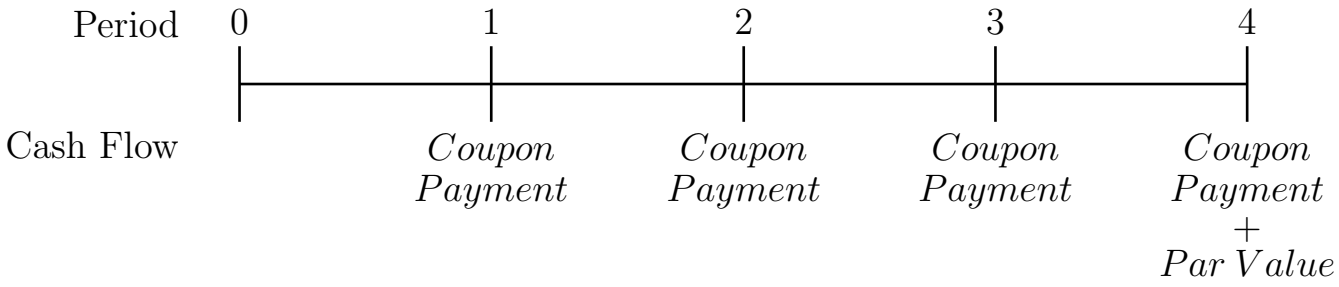
$$\frac{Coupon\ Payment}{Par\ Value} = Coupon\ Interest\ Rate \tag{4.1}$$

  - In the United States, coupon payments are usually made semi-annually (twice a year), whereas in Europe, they are made annually
  - Some bonds do no have a coupon payment and they are called **zero-coupon bonds**

- Some bonds have a **call provision**, where a company can redeem the bond early
  - Usually if this happens, the company will pay a value greater than the par value, which is called the **call premium**
- Bonds that do not have a call provision can be bought and sold on the secondary market
  - Owners of a bond can buy and sell the bond to other investors as the value of a bond can change as current interest rates change
- The **yield to maturity** (YTM) is the yield promised to investors if they buy a bond at the current price and hold it until maturity

4.1 Bond Valuation

- Let's look at the timeline for a four-year bond with an annual coupon payment
  - In period 0, you purchase the bond at whatever the current price is in the market



- We want to know what is the present value of the expected cash flows of a bond, discounted at the appropriate rate of return

$$v_b = \frac{C}{r}\left[1 - \frac{1}{(1+r)^n}\right] + \frac{M}{(1+r)^n} \tag{4.2}$$

Where,

C is the coupon payment

r is the market rate of interest

n is the number of years until the bond matures

M is the par value of the bond

- When bonds are issued, the coupon rate is usually set to the market rate
- The company will continue to pay the coupon rate throughout the life of the bond, but the market rate may change over time
  - One of the appealing features of bonds is they pay a fixed rate of return, regardless of what is going on in the market
  - An increase in r will cause the price of a bond to decrease
  - A decrease in r will cause the price of a bond to increase
- When interest rates fall, investors can try to lock in the a higher interest rate with bonds, which increases their value
- When interest rates rise, then bonds with a lower coupon rate become less valuable as investors could earn a higher rate of return elsewhere
- Whenever $r > Coupon\ Rate$, then the value of a bond will fall below its par value
  - When this is the case, this is called a **discount bond**
- Whenever $r < Coupon\ Rate$, then the value of a bond will increase above its par value
  - When this is the case, this is called a **premium bond**

Example

Suppose a bond has a par value of \$1000 with a coupon rate of 9%. The current market rate is 4% and the bond will mature in 14 years. What is the value of the bond?

$$Coupon\ Payment(C) = \$1,000(.09) = \$90$$

$$v_b = \frac{90}{0.04}\left[1 - \frac{1}{(1.04)^{14}}\right] + \frac{1,000}{(1.04)^{14}} = \$1,528.16$$

Because the value of this bond is greater than its par value, this bond could be sold at a **premium**.

4.1.1 Understanding Premium and Discount Bonds

- This bond is sold at a premium because the current market rate is 4%
- This means that any company issuing a bond today would do so at 4%, and if the par value is \$1,000, then the coupon payment would be \$40
- Since this bond pays a coupon payment of \$90, it makes this bond more valuable
- The opposite is true of the market rate were higher than 9%, then new bonds would have higher coupon payments than \$90, so that would decrease the value of this bond

4.2 Bond Yields

- As a bond gets closer to maturity, the value will approach its par value if the market rate remains unchanged
  - Lets look at our example, what would this bond be worth if we held it for 1 year and the market rate, r, did not change. This means $n = 13$ now:

$$v_b = \frac{90}{0.04}\left[1 - \frac{1}{(1.04)^{13}}\right] + \frac{1,000}{(1.04)^{13}} = \$1,499.28$$

  - The value of this bond fell by \$28.88
- So if I purchased this bond today at \$1,528.16 and sold it next year at \$1,499.28, I would lose \$28.88
  - This is called a capital loss
  - If I sold a bond and made money, this would be called a capital gain
- However, because I held the bond for 1 year, I would collect the coupon payment of \$90
  - Even though I suffered a capital loss, my dollar return is not actually negative

$$Total\ Dollar\ Return = \$90 - \$28.00 = \$61.12$$

- We can use this information to calculate several yields for the bond
  - A yield is the earnings generated by a particular investment expressed as a percent
- **Current Yield** - The income for a bond derived from is coupon payment

$$Current\ Yield = \frac{Coupon\ Payment}{v_B} = \frac{\$90}{1,528.16} = 5.98\%$$

- **Capital Gains Yield** - The income derived from the sale of a bond

$$Capital\ Gains\ Yield = \frac{\text{Capital Gain or Loss}}{v_B} = \frac{-\$28.88}{1,528.16} = -1.89\%$$

- **Total Yield** - The total income derived from the sale of a bond plus the coupon payment

$$Total\ Yield = \frac{Total\ Dollar\ Return}{v_B} = \frac{\$61.12}{1,528.16} = 4.00\%$$

4.3 Yield to Maturity

- The Yield to Maturity (YTM) is the yield "promised" to investors if they buy a bond at its current price and hold the bond until maturity

- To solve for the YTM, we can use the bond value formula and solve for the rate, r_d

Example

Consider a bond that matures in 4 years that pays an 8% annual coupon rate, and is currently selling for \$950 with a par value of \$1,000. What is the yield to maturity for this bond?

$$\$950 = \frac{80}{r_d}\left[1 - \frac{1}{(1+r_d)^4}\right] + \frac{1,000}{(1+r_d)^4}$$

To solve for r_d, you could plug in numbers until the left hand side equals the right hand side, but, these problems are typically solved using a financial calculator or graphing calculator. Using a calculator, we can find that the YTM, or $r_d = 0.0956$ or 9,56%.

4.4 Bonds with Semi-Annual Coupon Rates

- As mentioned earlier, most bonds in the United States pay semi-annual coupon payments

- We can modify our formula for this case:

$$v_b = \frac{C}{r}\left[1 - \frac{1}{(1+r/2)^{2n}}\right] + \frac{M}{(1+r/2)^{2n}} \tag{4.3}$$

4.5 Bond Yields and Default Risk

- If the issuer of a bond defaults on a payment, the investor gets less money than they were promised
- The quoted rate of interest has a **default risk premium** built in
    - The more likely a company is to default on a payment, the higher the interest rate
- Risk of default is assessed using Bond Ratings

	Standard & Poors	Moody's	Meaning
Investment Grade Bonds	AAA	Aaa	Risk is almost zero
	AA	Aa	Low risk
	A	A	Risk if economy declines
	BBB	Baa	Some risk, increases if economy declines
Junk Bonds	BB	Ba	Risky
	B	B	Risky, expected to get worse
	CCC	Caa	Probable bankruptcy
	CC	Ca	Probable bankruptcy
	C	C	In bankruptcy or default
	D		In bankruptcy or default

- The **credit spread** is the difference between a bonds yield and the yield on a US treasury bond of the same maturity
    - Default Risk Premium (DR_P) = Yield on Corporate Bond − Yield on US Treasury Bond
- **Junk Bonds**
    - Usually a sign that the company may have fallen on hard times
    - Companies are usually not allowed to invest in junk bonds, making them harder to sell

Section 5

Bankruptcy and Reoganization

- Bankruptcy is a legal process through which people or entities who cannot repay their debts can seek relief from some or all of their debt
- Business can "fail" or become unable to pay their debts for a variety of reasons
  - Poor economic conditions
  - Poor industry trends
  - Obsolete technology
  - Changing demographics
  - Company specific problems
- Most bankruptcies come from smaller companies

5.1 Settlement without Formal Bankruptcy

- Sometimes the inability to make a payment is temporary and companies can negotiate with creditors to pay their debts
- **Informal Reorganization**
  - This is a process where a company restructures its debt
    - Extension is when creditors agree to postpone payment dates
    - Composition is when creditors accept a lower principal repayment of reduce the interest rate
  - This happens by a bargaining process that involves all of the creditors and is conducted by an adjustment bureau run by a local credit managers association
- **Informal Liquidation**
  - Liquidation is the process of bringing a business to an end and selling/distributing all of its assets to creditors who have a claim on debt

- Sometimes a company can generate greater value from liquidation than from continuing to operate
- The process to liquidate a company is called assignment
- The assets of a company are sold through private sales or auctions

5.2 Formal Bankruptcy

5.2.1 Federal Bankruptcy Laws

- **Chapter 11** – Deals with business reorganization
- **Chapter 7** – Procedures to be followed when liquidating a firm
  - Rule under Chapter 7 does not come into play unless reorganization is not possible under Chapter 11
- **Chapter 9** – For financially distressed local governments
- **Chapter 12** – For family owned farms
- **Chapter 13** – Adjustment of debt for individuals with regular income

- A company is officially "bankrupt" when it files for bankruptcy in federal court
- When you hear in the news about a company filing for Chapter 11, this is trying to reorganize under the supervision of bankruptcy court
- While many companies would love to be able to informally negotiate bankruptcy with their creditors, it often does not happen

5.2.2 The Common Pool Problem

- Suppose a company is currently worth $9 million
- The company owes $1 million each to 10 different creditors
- If the company is liquidated, $7 million would be generated
- A creditor could foreclose on a loan to in an attempt to recover all of its money
- However, this means that other creditors will not all of their money
- Chapter 11 provides a solution to the common pool problem through an automatic stay provision
  - This limits individual creditors and their ability to for foreclosure and collect individual claims
  - Liquidation can only occur if all creditors collectively agree

5.2.3 The Holdout Problem

- Suppose a company owes $1 million to 10 different creditors
- The company wants to informally reorganize its debt, but it can only get 7 of the 10 creditors to agree
- The other three "holdout" to try to get keep their original debt agreement
- Generally, all creditors would want to be paid in full, this makes informal reorganization difficult
- Bankruptcy court will sort creditors into different classes
- Each class can accepts a reorganization plan if $^2/_3$ of the amount of debt and $^1/_2$ of the claimants vote for the plan
    - This is called a cramdown
- **Prepackaged bankruptcies**
    - If a company can meet the cramdown requirements, it go to bankruptcy court with an agreement already in place when it files Chapter 11

5.2.4 Formal Liquidation

- If a company is unable to reorganize it's debt, then it must be liquidated
- Liquidation should occur if the value of selling all of a company's assets is worth more than their expected future cash flows
- Chapter 7 provides safe0guards against frauds and ensures equitable distribution of assets among the creditors
- Allows owners who own the debt to start a new business and not have to worry about creditors coming to collect past debts

Section 6

Financial Statements and Free Cash Flow

- Companies that are listed on an exchange in the United States are governed by the Securities and Exchange Commission (SEC)
- The SEC requires any company listed on an exchange, have more than $10 million in assets, or more than 500 shareholders to file certain documents with the SEC
    - Income Statement
    - Balance Sheet
    - Statement of Cash Flows

6.1 Income Statement

- The income statement measures the changes to income (or earnings) over a specified period of time (monthly, quarterly, or annually)
    - You can think of the income statement as a "flow" from one period to the next

Table 6.1: Sample Income Statement

	2019	2020
Net Sales	$3,432,000	$5,834,400
Cost of Goods Sold	2,864,000	4,980,000
Other Expenses	340,000	720,000
Depreciation and Amortization	18,900	116,960
Earnings Before Interest and Taxes	209,100	17,440
Interest Expense	62,500	176,000
Earnings Before Taxes	146,000	(158,560)
Income Taxes (40%)	58,640	(63,424)
Net Income	87,960	(95,136)
Shares Outstanding	460,000	460,000
Earnings Per Share	$5.23	($4.84)

- **Net Sales**
  - The amount of revenue generated from selling goods and services
  - This is sometimes referred to as the top line
  - Analysts and investors want to see this growing over time
- Cost of goods sold (COGS)
  - The cost to manufacture and deliver goods and services
    - Labor
    - Raw Materials
    - Any other expense related to production
- Depreciation and Amortization
  - The estimated costs of the assets that wear out in the production of goods and services
  - Allows for the cost of an asset to be spread out over time instead of incurring the cost in year one
    - There are two types of depreciation: accelerated and straight-line
    - Example: You have a $100,000 machine with a life of 5 years
      - $\frac{\$100,000}{5} = \$20,000$ per year
    - Depreciation applies to physical assets (equipment, buildings, machines)
    - Amortization applies to nonphysical assets (patents, copyrights, trademarks)
- **Total Operating Costs** = COGS + Depreciation and Amortization + Other Expenses

- **Earnings Before Interest and Taxes (EBIT)** = Net Sales - Operating Costs
  - This is sometimes called operating income
    - You can think of this as how good a company is at its core operations
  - Some companies report **Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)**
    - EBITDA = Net Sales - COGS - Other Expenses
    - Since depreciation and amortization are non-cash charges, some companies choose not to report these
    - EBITDA can overstate the true operating income because the cost of machines and equipment are spread out over time and are an actual expense in production
- Interest Expense
  - Cost incurred from borrowing money (bonds, loans, and other debt)
  - Calculated by *Interest Rate* $\times$ *Outstanding Principal*
- **Earnings Before Taxes** = EBIT - Interest Expense
- Income Taxes = Earnings Before Taxes $\times$ Tax Rate
- **Net Income** = Earnings Before Taxes - Income Taxes
  - Net Income is also called Accounting Profit, Profit, or Earnings
- **Earnings Per Share (EPS)** $= \dfrac{\text{Net Income}}{\text{Outstanding Shares of Stock}}$
  - This is the amount of income that is available to be distributed to common stock holders as dividends or it can be used to reinvest in the company

6.2 Balance Sheet

- The balance sheet shows the "stock" of each item on the day it is prepared
  - It is a "snapshot" on the last day of the period (typically quarterly or yearly)
  - It would change everyday as inventories change, fixed assets change, and loans are borrowed and paid off
- **Assets**
  - Things the company owns
    - Cash, short-term investments, accounts receivable, inventories, etc.
- **Liabilities**

- A claim held by someone else against the company (something it owes)
  - Accounts payable, notes payable, accruals, long-term bonds, etc.

- **Shareholder Equity**
  - How much the owners of a company have invested into the business
  - If shareholder equity is positive, that means the owners have enough assets to cover the liabilities
  - If shareholder equity is negative, the companies liabilities exceed its assets
    - Value of common stock, value of preferred stock, and retained earnings

- **Assets = Liabilities + Shareholder Equity**

Table 6.2: Sample Balance Sheet

	2019	2020
Assets		
Current Assets		
Cash	$9,000	$7,282
Short-Term Investments	48,600	20,000
Accounts Receivable	351,200	632,160
Inventories	715,200	1,287,360
Total Current Assets	1,124,000	1,946,802
Gross Property, Plant, and Equipment	491,000	1,202,950
Less: Depreciation	146,200	263,160
Net Fixed Assets	344,800	939,790
Total Assets	1,468,800	2,886,592
Liabilities and Shareholders' Equity		
Current Liabilities		
Accounts Payable	$145,600	324,000
Accruals	136,000	284,960
Notes Payable	200,000	720,000
Total Current Liabilities	481,600	1,328,960
Long-Term Debt	323,432	1,000,000
Shareholders' Equity		
Common Stock, $1 par	460,000	460,000
Retained Earnings	203,768	97,632
Total Shareholders' Equity	663,768	557,632
Total Liabilities and Equity	1,468,800	2,886,592

6.2.1 Assets

- **Current Assets**
  - Assets that are expected to be turned into cash by the end of the year
    - Accounts Receivable
      - When a company sells a product but does not demand immediate payment, the customer has an obligation to pay at a later date
      - Essentially and "I Owe You"
    - Inventories
      - Raw materials, work in progress, or finished goods not yet sold
      - First-in, first-out (FIFO)
      - Last-in, first-out (LIFO)
- **Fixed Assets**
  - Gross Property, Plant, and Equipment
    - Price paid for long-term assets such as land, buildings, machinery, furniture, etc.
  - Must subtract out depreciation
  - Some companies report Net Property, Plant, and Equipment which is Gross Plant, Property, and Equipment - Depreciation
  - If a company does not purchase any new assets, the value of fixed assets will decline over time due to depreciation

6.2.2 Liabilities and Shareholder Equity

Liabilities

- **Current Liabilities**
  - Accounts Payable
    - When a company purchases something but does not immediately pay for it, it still has an obligation to do so at a later date
  - Accruals
    - A company does not pay taxes or wages each day, the amount that is owed at any given point in time is called an accrual
  - Notes Payable
    - When a company takes out a loan that must be paid within a year
- **Long-Term Debt**
  - Any outstanding debt held by the company that matures after one year
    - Bonds

Shareholders' Equity

- Common Stock
  - Number of shares of outstanding stock × par value of the stock
    - The par value of the stock is set in the companies charter and is not related to the value of the stock
- Retained Earnings
  - Net income that was not paid to common or preferred stockholders as a dividend

6.3 Statement of Cash Flows

Table 6.3: Sample Statement of Cash Flows

==	2020
Operating Activities	
Net Income	($95,136)
Adjustments	
Deprecation and Amortization	116,960
Change in Accounts Receivable	(280,960)
Change in Inventories	(572,160)
Change in Accounts Payable	178,400
Change in Accruals	148,960
Net Cash Provided (Used) by Operations	($503,936)
Investing Activities	
Cash used to Acquire Fixed Assets	($711,950)
Change in Short-Term Investments	28,600
Net Cash Provided (Used) by Investing Activities	($683,350)
Financing Activities	
Change in Notes Payable	$520,000
Change in Long-Term Debt	676,568
Payment of Cash Dividends	(11,000)
Net Cash Provided (Used) by Financing Activities	$1,185,568
Summary	
Net Cash Provided (Used) by Operations	($503,936)
Net Cash Provided (Used) by Investing Activities	($683,350)
Net Cash Provided (Used) by Financing Activities	$1,185,568
Net Change in Cash	($1,718)
Cash at Beginning of Year	$9,000
Cash at End of Year	$7,282

==

- Tracks the flow of cash throughout the year
- Net income is a product of accounting rules and conventions that can be misleading
  - Depreciation methods, inventory methods, etc.
- Net income also does not mean the company is generating cash
- Companies can use cash in many ways, it does not have to keep it in the bank
  - Increase inventories
  - Finance accounts payable
  - Invest in fixed-assets
  - Reduce debt
  - Pay dividends
- The statement of cash flows separates a company's activities into three categories
  - Operating activities
  - Investing activities
  - Financing activities
- The Statement of Cash Flows is good for answering the following questions:
  - Is the firm generating enough cash to purchase additional assets to help the company grow?
  - Is the firm generating any extra cash it can use to repay debt or invest in new products (R&D)?

6.3.1 Operating Activities

- This section shows the amount of cash generated or lost by a company's operating activities
  - Revenues
  - Purchase or sale of inventories
  - Collecting accounts receivables
  - Paying accounts payable
  - Salaries and bonuses
  - Taxes
- Non-cash activities

    - Some revenues and expenses reported on the income statement are not received or paid in cash during the year
        - Depreciation and amortization reduce reported income but are not cash payments, so they must be added back

- This may be the most important part of all financial statements. If a company is not able to generate cash from its core operations, there is a problem with the company

6.3.2 Investing Activities

- Includes all transactions involving fixed assets and short-term financial assets
    - Capital assets
    - Plant and equipment
    - Investing in bonds and securities

6.3.3 Financing Activities

- Includes activities for raising cash by issuing short-term debt, long-term debt, or stock
    - Debt repayment and stock purchases can also decrease cash

6.3.4 Summary of Statement of Cash Flows

- Net change in cash will equal change in cash from the balance sheet
- Cash end of 2019 is the amount of cash to start 2020

6.4 Free Cash Flow

- Free Cash Flow (FCF) refers to how much money a business has left over after it has paid for everything it needs to continue operating
- A firms intrinsic value of a company's operations is determined by the stream of cash flows it generates now and into the future

6.4.1 Calculating Free Cash Flow

- **Net Operating Profit After Taxes (NOPAT)**
    - The amount of profit a company would generate if it had no debt and held no financial assets
    - If two companies have different amounts of debt (thus different interest expenses), they could have identical operating performances but different net incomes
    - This is a better measure than net income for reflecting a manager's performance

$$NOPAT = EBIT(1 - Tax\ Rate)$$

$$NOPAT_{2019} = \$209,100(1 - 0.4) = \$125,460$$
$$NOPAT_{2020} = \$17,440(1 - 0.4) = \$10,464$$

- **Operating Current Assets**
  - The current assets needed to support operations
    - Includes: cash, inventory, and accounts receivables
    - Does not include: any asset that pays interest

$$Operating\ Current\ Assets = Cash + Accounts\ Receivable + Inventories$$

- **Operating Current Liabilities**
  - The current liabilities resulting from normal operations
    - Includes: accounts payable and accruals
    - Does not include: any liability that charges interest

$$Operating\ Current\ Liabilities = Accounts\ Payable + Accruals$$

- **Net Operating Working Capital (NOWC)**
  - Each dollar of operating current liabilities is a dollar the company does not have to conduct its short-term operating activities

$$NOWC = Operating\ Current\ Assets - Operating\ Current\ Liabilities$$

$$NOWC_{2019} = (9,000 + 351,000 + 715,200) - (145,600 + 136,000) = \$793,800$$
$$NOWC_{2020} = (7,282 + 632,160 + 1,287,360) - (324,000 + 284,960) = \$1,317,842$$

- **Total Net Operating Capital**
  - In addition to working capital, most companies use long-term assets to support their operations
    - Land, building, factories, equipment, etc.
    - Operating Long-Term Assets = Net Fixed Assets from the balance sheet

$$Total\ Net\ Operating\ Capital = NOWC + Operating\ Long\text{-}Term\ Assets$$

$$Total\ Net\ Operating\ Capital_{2019} = 793,800 + 344,800 = \$1,138,600$$
$$Total\ Net\ Operating\ Capital_{2020} = 1,317,842 + 939,790 = \$2,257,632$$

- **New Investment in Operating Capital**
  - Total Net Operating Capital in Current Year - Total Net Operating Capital in Previous Year

$$Net\ Investment\ in\ Operating\ Capital = 2,257,632 - 1,138,600 = \$1,119,032$$

- **Free Cash Flow (FCF)**
  - FCF represents the cash a company generates after accounting for cash outflows to support operations and maintain its capital assets
  - Unlike net income, FCF is a measure of profitability that excludes the non-cash expenses of the income statement and includes spending on equipment and assets as well as changes in working capital from the balance sheet

$$FCF = NOPAT - Net\ Investment\ in\ Operating\ Capital$$

$$FCF_{2020} = 10,464 - 1,119,032 = -\$1,108,568$$

6.4.2 Return on Invested Capital (ROIC)

- Is negative FCF always bad?
  - No, it depends on why it is negative
- It is bad if FCF is negative because $NOPAT$ is negative
  - This means the company is probably experiencing operating problems
- Large companies may have a positive $NOPAT$ but negative FCF because of large investments in operating assets
- It is important to determine if these investments are actually adding growth

$$ROIC = \frac{NOPAT}{Total\ Net\ Operating\ Capital}$$

$$ROIC_{2019} = \frac{125,460}{1,138,600} = 0.1101 = 11.01\%$$

$$ROIC_{2020} = \frac{10,464}{2,257,632} = 0.0046 = 0.46\%$$

- We can compare $ROIC$ to the Weighted Average Cost of Capital
- **Weighted Average Cost of Capital (WACC)**
  - The WACC is the rate that a company is expected to pay on average to all its security holders to finance its assets
  - The WACC is commonly referred to as the firm's cost of capital
  - Importantly, it is dictated by the external market and not by management
  - We will calculate this in later chapters, but for now we will take it as given

- If $ROIC > WACC$, the company is generating a sufficient rate of return to compensate investors
- If $ROIC < WACC$, the company is not generating a sufficient return to satisfy investors

Section 7

Analysis of Financial Statements

- Financial statements are just a first look at a companies operations and performance
- Managers and investors should be able to analyze and extract information to evaluate a company's performance
- To analyze performance, we are going to use financial ratio analysis
- a Ratio is a performance metric that is backward looking
    - They cannot predict what will happen to a company in the future, but can give us an idea of how the company has performed recently
- Companies can use ratio analysis in two ways
    - **Trend Analysis** - comparing financial ratios over time within the same company
        - How is performance changing over time?
        - Is performance getting better or worse?
    - **Benchmarking** - comparing financial ratios to the industry average or top competitors in the industry
        - Can help you determine if changes to a company are due to industry specific dynamics or if they are due to actions taken by the company
            * If industry trend is the same as a company's trend, this likely means the dynamics of the industry are influencing the company
            * If they are differing, then that signals that something the company is doing is different from the industry (good or bad)
- When evaluating the performance of a company, no single ratio can fully evaluate performance
    - We need to use the information from multiple ratios to try to get the most complete picture we can

7.1 Liquidity Ratios

- **Liquidity Ratios** help determine if a company can pay its debts in the coming year

7.1.1 Current Ratio

$$Current\ Ratio = \frac{Current\ Assets}{Current\ Liabilities} \tag{7.1}$$

- We can interpret this ration as a company has x times the number of current assets relative to current liabilities
- A current ratio of 1.0 or higher generally means that company has sufficient liquidity
  - Current assets are converted to cash quickly, so this is a good measure of a company's ability to pay off its debts
- A low current ratio means that liabilities are rising faster than assets
  - This could mean that a company may start paying its bills more slowly and borrowing money (possible sign of financial trouble
- A very high current ratio may mean that the company has a lot of money in non-productive assets

7.1.2 Quick Ratio

$$Quick\ Ratio = \frac{Current\ Assets - Inventories}{Current\ Liabilities} \tag{7.2}$$

- **Liquid Assets** are assets that can be easily converted into cash
- Inventories are the least liquid asset a firm assets
  - Relying on inventories to pay short-term liabilities is not a good metric
- The quick ratio is a measure of a company's ability to pay off its short-term liabilities without relying on the sale of inventories
- A quick ratio below 1 would mean that a company would have to sell some inventories to pay off current liabilities if the company got into financial trouble
- A "healthy" quick ratio is anything above a 0.75
- Using the balance sheet, we can re-write the Quick Ratio:
  - $Current\ Assets = Cash + Accounts\ Receivable + Inventories$
  - $Current\ Assets - Inventories = Cash + Accounts\ Receivable$

$$Quick\ Ratio = \frac{Cash + Accounts\ Receivable}{Current\ Liabilities}$$

7.2 Asset Management Ratios

- Measures how effectively a company its assets
- If a company has excessive investments in assets then its operating capital is very high
    - This reduces its Free Cash Flow and ultimately its stock price
- If a company does not have enough assets, then it may lose sales
    - This also reduces Free Cash Flow, profitability, and its stock price
- Thus, it is important to have the right amount of assets

7.2.1 Total Assets Turnover Ratio

$$Total\ Assets\ Turnover\ Ratio = \frac{Sales}{Total\ Assets} \tag{7.3}$$

- Measures how effectively a company is using all of its assets, including current and fixed assets
- This ratio is usually compared to the industry average as it can vary a lot from industry to industry
    - If a company's total asset turnover ratio is lower than its industry average, it means the company is not generating as much business as its peers given its asset involvement
- If assets are a problem, the following ratios will help identify where the problem is

7.2.2 Fixed Assets Turnover Ratio

$$Fixed\ Assets\ Turnover\ Ratio = \frac{Sales}{Net\ Fixed\ Assets} \tag{7.4}$$

- If a company's ratio is lower than the industry average, then the company is not using its fixed assets as intensively as other companies
- Inflation can cause problems when interpreting this ratio
    - An older company that acquired its assets many years ago will report the historical costs which might lead to a higher asset turnover ratio

7.2.3 Days Sales Outstanding (DSO)

$$Days\ Sales\ Outstanding = \frac{Accounts\ Receivable}{Average\ Sales\ Per\ Day} = \frac{Accounts\ Receivable}{Annual\ Sales/365} \tag{7.5}$$

- Used to appraise accounts receivable
- Represents the average length of time that a company must wait after making a sale before receiving the cash
    - Can think of this as the "average collection period"
- Days Sales Outstanding under 45 is generally considered to be good, but can vary by the type of business
- If the ratio is higher than the average, then this can mean that customers are not paying their bills on time
- High levels of accounts receivable cause high levels of NOWC, which can hurt Free Cash Flow and stock price
    - If a company has a high DSO ratio, it can mean that its customers are paying late, they may be in financial trouble and they should review their credit standards

7.2.4 Inventory Turnover Ratio

$$Inventory\ Turnover\ Ratio = \frac{Cost\ of\ Goods\ Sold}{Inventories} \tag{7.6}$$

- The number for this ratio is roughly the amount of times the inventory is "turned over" every year
- If the number is lower than the industry average, that means that company is holding too much inventory
    - High levels of inventory add to NOWC, which reduces Free Cash Flow and lower stock price
    - A low Inventory Turnover Ratio can also mean that a company is holding onto obsolete goods
- Inventory Management is really important to a company's operations
    - If a company has too low of inventories, they can miss out on sales and lose goodwill from consumers
    - If a company has too high of inventories, product can be wasted and go unused (wasted costs)
    - Operations management helps managers develop methods to have proper inventory management

7.2.5 Inventory Conversion Period

$$Inventory\,Conversion\,Period = \frac{Inventories}{COGS\,per\,day} = \frac{Inventories}{COGS/365} \tag{7.7}$$

- The amount of time it takes a company to sell its inventory and covert it to accounts receivable

7.2.6 Payables Deferral Period

$$Payables\,Deferral\,Period = \frac{Accounts\,Payable}{COGS\,per\,day} = \frac{Accounts\,Payable}{COGS/365} \tag{7.8}$$

7.2.7 Cash Conversion Cycle

$$\begin{aligned} Cash\,Conversation\,Cycle &= Inventory\,Conversion\,Period \\ &+ Days\,Sales\,Outstanding - Payables\,Deferral\,Period \end{aligned} \tag{7.9}$$

- The Cash Conversion Cycle is a metric that shows the amount of time it takes a company to convert its investments in inventory to cash
- Measuring a company's cash conversion cycle to its cycles in previous years can help with gauging whether its working capital management is deteriorating or improving
- Comparing the cycle of a company to its competitors can help with determining whether the company's cash conversion cycle is "normal" compared to industry competitors

7.3 Leverage Ratios

- **Leverage** is the extend to which a firm uses debt financing

7.3.1 Debt-to-Assets Ratio

$$Debt - to - Assets\,Ratio = \frac{Total\,Debt}{Total\,Assets} \tag{7.10}$$

- Total Debt = Notes Payable + Long-Term Debt
- This ratio tells us how much of a company's assets are financed by debt
- If this ratio is higher than the industry average, then it is more leveraged than other companies (it uses too much debt)

7.3.2 Debt-to-Equity Ratio

$$Debt - to - Equity\ Ratio = \frac{Total\ Debt}{Shareholder\ Equity} \tag{7.11}$$

- Shows the amount of debt for every dollar of equity

7.3.3 Liabilities-to-Assets Ratio

$$Liabilities - to - Assets\ Ratio = \frac{Total\ Liabilities}{Total\ Assets} \tag{7.12}$$

- Shows the extent to which a company's assets are not financed by equity

7.3.4 Times Interest Earned (TIE) Ratio

$$Times\ Interest\ Earned\ Ratio = \frac{EBIT}{InterestExpense} \tag{7.13}$$

- This is sometimes called the interest covered ratio
- Measures the extent to which operating income can decline before a company is unable to pay its annual interest costs
- This ratio shows how many times over a company can "cover" its interest
- As long as the ratio is above 1.0, then there is enough EBIT to pay the interest expense

7.4 Profitability Ratios

7.4.1 Net Profit Margin

$$Net\ Profit\ Margin = \frac{Net\ Income}{Sales} \tag{7.14}$$

- This gives us the profit per dollar of sales
- If the profit margin is below industry average, is it due to inefficient operations? High interest expense? Or both?

7.4.2 Operating Profit Margin

$$Operating\ Profit\ Profit\ Margin = \frac{EBIT}{Sales} \tag{7.15}$$

- Shows how a company is performing with respect to its operations before the impact of interest expenses are considered

7.4.3 Gross Profit Margin

$$Gross\ Profit\ Margin = \frac{Sales - COGS}{Sales} \tag{7.16}$$

- This identifies the profit per dollar before any other expenses are deducted

7.4.4 Basic Earning Power Ratio

$$Basic\ Earning\ Power\ Ratio = \frac{EBIT}{Total\ Assets} \tag{7.17}$$

- Shows the earning power of a company's assets before the influence of taxes and leverage
- Useful for comparing companies with different tax situations and different degrees of financial leverage

7.4.5 Return on Total Assets (ROA)

$$Return\ on\ Total\ Assets = \frac{Net\ Income}{Total\ Assets} \tag{7.18}$$

- ROA gives us an idea as to how well management is using its assets to generate earnings
- A higher number is better for owners

7.4.6 Return on Equity (ROE)

$$Return\ on\ Equity = \frac{Net\ Income}{Shareholder\ Equity} \tag{7.19}$$

- Stockholders invest to earn a return on their money, this ratio tells how well they are doing
- Is the company using the money it gets from stock and its retained earnings to invest in the company to gain income?
- A higher number is better and makes owners happy

7.4.7 The DuPont Equation

- This equation provides a framework to see how managerial actions affect a firms profitability, asset efficiency, and financial leverage
- Then we can see how they interact to determine Return on Equity

$$Equity\ Multiplier = \frac{Total\ Assets}{Shareholder\ Equity} \tag{7.20}$$

- The equity multiplier shows the percentage of assets that are financed or owed by stockholders

$$ROE = \frac{Net\ Income}{Sales} \times \frac{Sales}{Total\ Assets} \times \frac{Total\ Assets}{Shareholder\ Equity} \tag{7.21}$$

$$ROE = (Profit\ Margin)(Total\ Assets\ Turnover)(Equity\ Multiplier) \tag{7.22}$$

- Sometimes it is useful to just focus on profitability and financial leverage
- Companies that have a lot of financial leverage (lots of liabilities) have a high equity multiplier because the assets are financed with a small amount of equity
- Therefore, ROE depends on the ROA and the use of leverage

$$ROE = ROA \times Equity\ Multiplier \tag{7.23}$$

7.5 Market Value Ratios

- Ultimately, a company should be concerned with generating long-term value for its owners.
- For publicly traded companies, long-term value is achieved through price appreciation of the shares of common stock plus any income returned through dividends.

7.5.1 Book Value per Share

$$Book\ Value\ per\ Share = \frac{Total\ Assets - Total\ Liabilities}{Common\ Shares\ Outstanding} \tag{7.24}$$

- the amount of equity in a company per share of outstanding stock
- measures the "book value" of a company per share of stock
- When a stock is undervalued, it will have a higher book value per share in relation to its current stock price in the market

7.5.2 Earnings Per Share

$$Earnings\ per\ Share\ (EPS) = \frac{Net\ Income}{Common\ Shares\ Outstanding} \tag{7.25}$$

- EPS indicates how much money a company makes for each share of its stock and is a widely used metric for estimating corporate value.

7.5.3 Price-to-Earnings (P/E) Ratio

$$P/E\ Ratio = \frac{Current\ Market\ Price}{EPS} \tag{7.26}$$

- One of the most widely used ratios
- Measures how much the market is willing to pay for the earnings of a company
- It is often used to help determine if a stock is 'expensive' or 'cheap'
- A high P/E ratio could mean that a company's stock is over-valued, or else that investors are expecting high growth rates in the future
- A low P/E can indicate either that a company may currently be undervalued or that the company is doing exceptionally well relative to its past trends
- The P/E ratio indicates the dollar amount an investor can expect to invest in a company in order to receive one dollar of that company's earnings
- Can compare the P/E ratio to:
  - A historical median of that company's P/E Ratio
  - Other companies P/E Ratio
  - The industry average

7.6 Limitations of Ratio Analysis

- Some ratio's have information from the income statement and the balance sheet
  - The income statement tracks changes in revenues and expenses over the year
    - It tracks the "flow" over the year
  - he balance sheet is a snapshot at a specific moment in time
    - It tracks the "stock" at any one point in time
  - Some textbooks suggest that when a ratio mixes income statement and balance sheet items, the investor should average the balance sheet account across this year and last year as a proxy for measuring the flow of the balance sheet item through time
  - However, some textbooks just use end of the year items from the balance sheet
  - There are pros and cons to each approach, as an investor, you should choose what approach you think is best, and it can never hurt to calculate ratios both ways to compare
- Many large companies have different divisions in different industries, this makes it hard to compare industry averages

- Seasonal factors can affect ratio analysis
    - A company that only operates during the summer or has high volume during holidays may have very different inventory than a company open all year
- Companies can use different accounting practices (inventory valuation, depreciation methods, timing of loans) that can distort the financial ratios and can make it difficult to compare two companies

Section 8

Stock Valuation

- The bond market is much larger than the stock market, in terms of daily trading volume
- However, typically when you turn on the news, you get updates on the stock market
- Stocks are more accessible to the average person, but that does not mean the understand how to value stocks
- In this section, you will be able to determine what the intrinsic value of a stock is

8.1 Dividend Payments

- A dividend is a payment made from a company to the owners of stock, either common or preferred
- Dividends are typically paid quarterly, however, a company can declare and pay dividends without a set schedule
- For a stock that pays a dividend, we can calculate the dividend yield

$$Dividend\,Yield = \frac{Dividend\,Per\,Share}{Current\,Share\,Price} \tag{8.1}$$

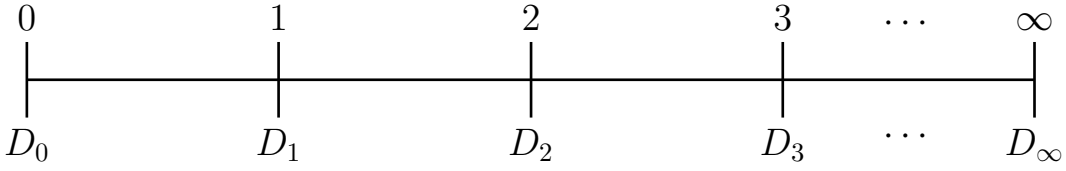
8.2 Intrinsic Value Models

- When we discussed Free Cash Flow in Section 6, we mentioned that one way to determine the intrinsic value of a company is determined by the stream of cash flows a company can generate now and in the future
- However, there are other methods and models for calculating the intrinsic value of a company
- Determining intrinsic value is important because the market determines the price, but the price may over value, under value, or properly value the stock

8.2.1 Dividend Discount Model

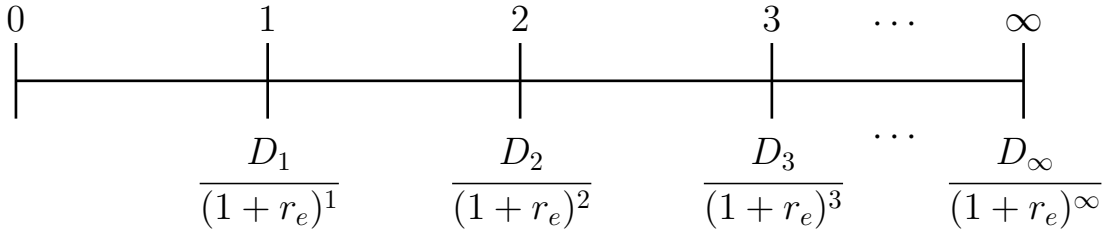
- An investor should value any investment, including stocks, based on the amount of cash that they can receive from the investment
- This is how we calculated the value of a bond
- Common stocks can generate cash through regular dividend payments:

Figure 8.1: Common Stock Dividend Payments



- The Dividend Discount Model (DDM) treats regular dividends from common stock like bond coupon payments, by appropriately discounting all future dividends (D_1 to D_∞) to the present using the required rate of return on the stock, r_e, then summing them to determine the intrinsic value, V_i
- As noted in Section 3, r_e is largely determined by the risk-free rate and adjustments because of risk and inflation

Figure 8.2: Dividend Discount Model



$$V_i = \frac{D_1}{(1+r_e)^1} + \frac{D_1}{(1+r_e)^2} + \cdots + \frac{D_\infty}{(1+r_e)^\infty} = \sum_{t=1}^{\infty} \frac{D_t}{(1+r_e)^t} \tag{8.2}$$

- Estimating the value of a company is relatively straight forward
- The challenge is estimating the dividends that will be paid today until the end of a company, which could be infinite
- Estimating future dividends is a function of estimating the future growth of a company
- If you can estimate the growth rate and the dividend payout ratio for a company, then you can estimate the dividends into the future

8.2.2 Gordon Growth Model

- The DDM is essentially a discounted cash flow analysis, like discussed in Section 2
- However, It is not reasonable, to think that an analyst can estimate each dividend with any confidence throughout the life of a company
- In the long run, dividend's can't grow faster than earnings
- A dollar used to pay dividends can't be used to reinvest into the company or to pay down debt
- So all else equal, higher dividends must be associated with either with declining earnings growth due to lack of reinvestment, or with increasing debt levels
- Growth in dividends can be supported by increasing debt for a short period of time, but to avoid unacceptably high levels of debt, long-term dividend growth must be limited to long-term earnings growth
- Long-term earnings per share (EPS) growth depends on several factors
  - Economy-wide factors (recessions and inflation)
  - Industry-wide factors (technological innovation)
  - Firm-specific factors (management, brand identity, monopoly power, etc.)
- For a firm to grow faster than the economy, either the industry must become a bigger part of the economy or the firm must take market share away from its competitors
- However, as markets mature, increased competition and market saturation will tend to limit EPS growth to a constant, long-term rate, approximately equal to the sum of population growth and inflation
- Some companies are in growing industries and won't hit their long-term constant growth rate for many years
- Some companies are in mature and saturated industries and are already at their long-term growth rate
- For now, we will focus on companies that are in mature industries that are already at their long-term rate, we will address the other group later
- The Gordon Growth Model, or constant growth model, allows for the dividends to grow by a constant rate, g
- This means the dividend in period 1 will be greater than the dividend in period 0 by a rate of g:

$$D_1 = D_0 + gD_0 = D_0(1+g) \tag{8.3}$$

- Period 2 will be greater than period 1 by the rate of g:

$$D_2 = D_1 + gD_1 = D_1(1+g) \tag{8.4}$$

- By substituting Equation 8.4 into Equation 8.3, we get:

$$D_2 = D_0(1+g)(1+g) = D_0(1+g)^2 \tag{8.5}$$

- We can extend Equation 8.5 out so that:

$$D_t = D_0(1+g)^t \tag{8.6}$$

- We can substitute Equation 8.6 into the DDM model in Equation 8.2 to derive the Gordon Growth Model:

$$V_i = \frac{D_0(1+g)^1}{(1+r_e)^1} + \frac{D_0(1+g)^2}{(1+r_e)^2} + \cdots + \frac{D_\infty D_0(1+g)^\infty}{(1+r_e)^\infty} = D_0 \sum_{t=1}^{\infty} \frac{(1+g)^t}{(1+r_e)^t} \tag{8.7}$$

- Through some algebraic manipulation, which can be seen step-by-step in the textbook, Equation 8.7 becomes:

$$V_i = \frac{D_0(1+g)}{r_e - g} \tag{8.8}$$

- The Gordon Growth Model makes two important assumptions:
  - The growth rate, g, must be constant
  - The requires rate of return must be greater than the growth rate: $r_e > g$
- If $r_e > g$, then the fraction $\frac{1+g}{1+r_e}$ converges to 0 as the series approaches infinity
- This captures that dividends paid out much later in a companies life are worth considerably less when considering the intrinsic value today
- With these assumptions, we can re-write the Gordon Growth Model in its most common form:

$$V_i = \frac{D_1}{r_e - g} \tag{8.9}$$

Example

Assume that Verizon just paid a dividend of \$1.15 (that is that $D_0 = \$1.15$). It's stock has a required rate of return of 13.4% and investors expect the dividend to grow at an 8% constant rate in the future. What is the value of Verizon's stock?

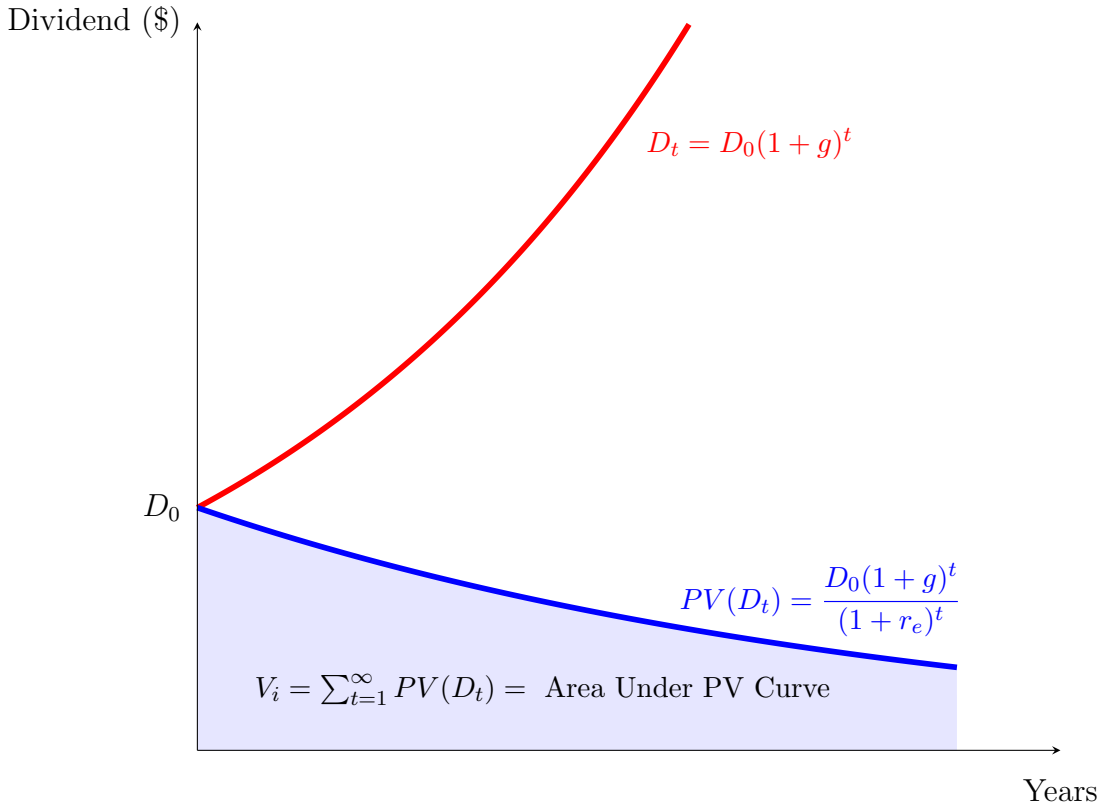
$$V_i = \frac{\$1.15(1.08)}{0.134 - 0.08} = \frac{\$1.242}{0.054} = \$23.00$$

- If the market is in equilibrium, then the intrinsic value of the stock, V_i will equal the market value of the stock today, P_0

- So, when the market is in equilibrium:

$$V_i = P_0 \tag{8.10}$$

Figure 8.3: Gordon Growth Model Illustration



8.2.3 Do Stock Prices Reflect Long-Term or Short-Term Events?

- Managers often complain that the stock market is short sighted and investors care about longer term conditions
- We can use the Gordon Growth Model to test this assumption

Example

From the previous example using Verizon, $D_0 = \$1.15$ and is expected to grow at 8% per year. Because we know the growth rate, we can forecast the dividends for the next 5 years and then find their present values:

$$PV = \frac{\$1.15(1.08)^1}{(1.134)^1} + \frac{\$1.15(1.08)^2}{(1.134)^2} + \frac{\$1.15(1.08)^3}{(1.134)^3} + \frac{\$1.15(1.08)^4}{(1.134)^4} + \frac{\$1.15(1.08)^5}{(1.134)^5}$$

$$PV = 1.095 + 1.043 + 0.993 + 0.946 + 0.901 = \$4.978$$

Recall that if the market is in equilibrium, Verizon's stock price is \$23.00. This means that only $\sim$ \$5, or $\sim$ $^5/_{23} = 22\%$ of the \$23 stock price is attributed to short-term cash flows.

- This results from this example means that Verizon's managers will affect the stock price more by working to increase long-term cash flows than by focusing on short-term cash flows
- In fact, researchers have used actual company data to show that more than 80% of a typical companies stock price is due to cash flows expected farther than 5 years into the future
- This brings up an interesting question: if a most of a stock's value is due to long-term cash flows, why do investors and analysts care so much about quarterly earnings?
    - If quarterly earnings are lower than expected because of an increase in spending on research and development, this is probably a good thing, and usually the stock price will increase
    - If quarterly earnings are lower than expected because consumers did not like a new product a company released, this may impact the future of g, and thus, long-term growth
        - We will show later that small changes in g can lead to large changes in V_i

8.2.4 Expected Rate of Return on a Constant Growth Stock

- If an investor is going to purchase a share of stock in a company, then that company must be expected to pay a return that is better than the next best alternative
- If know that when the market is in equilibrium that $V_i = P_0$, then we can substitute Equation 8.10 into Equation 8.9 to get an equation for the expected rate of return:

$$\hat{r}_e = \frac{D_1}{P_0} + g \tag{8.11}$$

- We can see that the expected rate of return, is equal to the dividend yield plus the growth rate

$$\hat{r}_e = \text{Expected Dividend Yield} + \text{Expected Growth Rate} \tag{8.12}$$

Example

If you buy a stock for price $P_0 =$ \$23 and you expect the stock to pay a dividend of $D_1 =$ \$1.242 in a year and to grow at constant rate $g = 8\%$m calculate the expected rate of return.

$$\hat{r}_e = \frac{\$1.242}{23} + .08 = 0.134 = 13.4\% \tag{8.13}$$

- This equation also highlights that a company that does not currently pay a dividend can still have a high expected rate of return, if investors believe that future g will be extremely high
- The model suggests that a high g indicates to shareholders that the investor will have a much larger share of retained earnings to sell to a future investor
- This further suggests that higher retained earnings can lead to high dividend payments when the company no longer has extremely high growth prospects
- It is not uncommon to see investors require a high return from a company with a high growth rate and no dividends

8.2.5 Valuing Non-Constant Growth Stocks

- It may seem unreasonable to assume that a company will grow at a constant rate of g forever
- Companies often go through "life-cycles"
  - Early years where they grow faster than the economy
  - Mature years where they match economic growth
  - Depending on market and industry conditions, they may enter a phase where growth is slower than the economy
- These are called non-constant growth companies and we can extend the Gordon Growth Model to a Multistage Growth Model
- In the Multistage Growth Model, there are multiple stages, typically two, but sometimes three
- In a two-stage model, there is a period of N years where the dividend will grow at relatively high rates
- After N years, companies usually face increased competition, and the dividend will settle into its long-term growth rate

$$V_i = \underbrace{\frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \cdots + \frac{D_N}{(1+r_s)^N}}_{\text{PV of dividends during high (non-constant) growth}} + \underbrace{\frac{D_{N+1}}{(1+r_s)^{N+1}} + \cdots + \frac{D_\infty}{(1+r_s)^\infty}}_{\text{PV of dividends during constant growth}} \tag{8.14}$$

- From the Gordon Growth Model, once a firm hits is long-term constant growth rate, we know how to calculate the value of that stream of dividend payments from Equation 8.9, which shoes that $V_i = \dfrac{D_1}{r_e - g}$
- However, the value of that stream of constant growth dividends is starts N years in the future, therefore we need to discount that cash flow back to the PV
- Therefore, we can rewrite Equation 8.14 to be:

$$V_i = \left[\frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \cdots + \frac{D_N}{(1+r_s)^N}\right] + \frac{\dfrac{D_{N+1}}{r_e - g}}{(1+r_e)^N} \tag{8.15}$$

Example

Suppose a new tech company, Skywalker Industries, is currently experiencing high growth. Skywalker industries just paid a dividend of \$0.50 per share and they expect about 25% growth over the next 5 years. After 5 years, more competitors will have entered the market and they expect to settle at a more sustainable growth rate of 8%. Because of this high growth, investors require a 14% rate of return to invest in Skywalker Industries. Find the value of Skywalker Industries per share.

High Growth Period

$D_0 = \$0.50$

$D_1 = 0.50(1.25) = \$0.63$

$D_2 = 0.50(1.25)^2 = \$0.78$

$D_3 = 0.50(1.25)^3 = \$0.98$

$D_4 = 0.50(1.25)^4 = \$1.22$

$D_5 = 0.50(1.25)^5 = \$1.53$

Constant Growth Period

$D_6 = 1.53(1.08) = \$1.65$

$$V_i = \left[\frac{0.63}{(1.14)^1} + \frac{0.78}{(1.14)^2} + \frac{0.98}{(1.14)^3} + \frac{1.22}{(1.14)^4} + \frac{1.53}{(1.14)^5}\right] + \frac{\dfrac{1.65}{0.14 - 0.08}}{(1.14)^5}$$

$$V_i = 0.55 + 0.60 + 0.66 + 0.72 + 0.79 + \frac{27.5}{(1.14)^5}$$

$$V_i = \$17.60$$

- The Gordon Growth Model and Multistage Growth Model are susceptible to providing widely varying answers

- The intrinsic value estimates depend heavily on the required rate of return and growth estimates, therefore it is extremely important to have an accurate estimate of these values
- In Section 9, we will discuss how to estimate the required rate of return using the Capital Asset Pricing Model (CAPM)

8.3 Free Cash Flow Model

- Another challenge of the Gordon Growth Model, is that it cannot calculate the value of a company that does not pay a dividend
- Because of these challenges, the Gordon Growth Model is generally of limited use for internal management purposes
- Additionally, many firms have several different divisions with many assets, so the firms value will depend on the cash flows from many different assets and the actions of many managers
- In Section 6, we showed how to calculate Free Cash Flow (FCF), which does not depend on dividends and it can be applied to divisions and subunits, as well as the entire firm
- The FCF model is similar to the Multistage Growth Model, excepte that it estimates the value of a company's operations instead of the value per share
    - There is a period of high and non-constant grown in FCF in periods 1 to N, then in period $N+1$ to ∞, FCF experiences stable growth at a constant rate

$$V_{op} = \left[\frac{FCF_1}{(1+WACC)^1} + \frac{FCF_2}{(1+WACC)^2} + \cdots + \frac{FCF_N}{(1+WACC)^N}\right] + \frac{\frac{FCF_{N+1}}{WACC-g}}{(1+WACC)^N} \quad (8.16)$$

Example

You have the following information on the Free Cash Flow (in millions of dollars) for Kenobi's Kebabs from 2018-2021:

2018	-$18.00
2019	-$23.00
2020	$46.40
2021	$49.00

The owners expect that after 2021, the companies growth will stabilize at a 5% growth rate. If the cost of capital is 10.84%, what is the value of Kenobi's Kebabs as of 2021? If Kenobi's Kebabs experiences constant growth after 2021, then FCF in 2022 would be $49.00(1.05) = \$51.45$.

$$V_{op} = \left[\frac{-19.00}{(1.1084)^1} + \frac{-23.00}{(1.1084)^2} + \frac{46.40}{(1.1084)^3} + \frac{49.00}{(1.1084)^4} \right] + \frac{\frac{51.45}{1.1084 - .05}}{(1.1084)^4}$$

$$V_{op} = \$615.27 \text{ million}$$

- If we wanted to apply the FCF model to a firm that was in a mature industry and already at its constant growth rate, we could do so:

$$V_{op} = \frac{FCF_0(1+g)}{WACC - g} \tag{8.17}$$

8.3.1 Estimating the Price per Share

- In order to estimate the price per share, we need to know the value of a company's nonperating assets, claims on value (debt and preferred stock), and the number of shares of common stock outstanding
- A company's value can be thought if like a pie
  - The first slice of pie belongs to debt holders
  - The second slice of pie belongs to preferred stockholders, and whatever is left (if any) belongs to common shareholders

$$V_i = \frac{V_{op} + \text{Value of Non-operating Assets} - \text{Debt} - \text{Preferred Stock}}{\text{Shares of Common Stock Outstanding}} \tag{8.18}$$

- The value of non-operating asets can be found on the balance sheet under current assets either as "short-term investments," "marketable securities," or something similar
- Accounts payable and accruals are used in the calculation of FCF, to when we subtract out debt, we cannot include them because it would be double counting
- So debt in this calculation would be the value of long-term debt and notes payable from the balance sheet
- The value of preferred stock would also come from the balance sheet

Example

If we use the previous example, $V_{op} = \$615.27$. On Kenobi Kebab's balance sheet you have the following information (in millions of dollars) and you know that there are 100 million shares of common stock outstanding:

Short-Term Investments	\$63.00
Notes Payable	\$123.00
Long-Term Debt	\$124.00
Preferred Stock	\$62.00

What is the estimated stock price per share for Kenobi Kebabs?

$$V_i = \frac{615.27 + 63.00 - (123.00 + 124.00) - 62.00}{100} = \$3.69$$

Section 9

Risk and Return

- When you invest money in the stock market, a bond, or a savings account, you expect that over time your account will grow in value
- However, most investments have some risk that the portfolio will grow in value and some risk that it will decline in value
- This section we will look at how to evaluate risk and how to use that evaluation to analyse the risk level of your investment portfolio and determine the risk of an individual investment
    - A portfolio is the a collection of your investments

9.1 Calculating Rate of Return

$$\text{Rate of Return} = \frac{\text{End Value} - \text{Beginning Value}}{\text{Beginning Value}} \tag{9.1}$$

Example

Suppose you buy 10 shares of stock for \$1,000. The stock pays no dividends and at the end of 1 year you sell the stock for \$1,100. What is your rate of return?

$$\text{Rate of Return} = \frac{1,100 - 1,000}{1,000} = 0.10 = 10\%$$

Example

9.1.1 Risk

- Risk is the probability that you end up with a lower rate of return than expected
    - Stand-alone risk is the risk of an individual asset
    - Portfolio risk is the risk of all of your portfolio

- Market risk is the risk of the entire market
  - Market bubbles
  - Worldwide pandemics
  - Major war
  - Oil crisis
  - Federal Reserve announcements

- We can evaluate risk using probability distributions
- A probability distribution is a set of possible outcomes and the probability that those outcomes occur
  - There is a 100% change that one of the possible outcomes will occur, so probability must always sum to 100%
- We will use probability distributions to calculate the expected return of a series of possible outcomes

$$E[return] = \hat{r} = p_1 r_1 + p_2 r_2 + p_3 r_3 + \cdots + p_n r_n = \sum_{i=1}^{n} p_i r_i \tag{9.2}$$

Where,

p_i is a the probability an event occurs (p_i must sum to 1)

r_i is the outcome of a specific event

9.2 Standard Deviation

- Standard deviation measures how spread out a set of possible outcomes are
- The more widely spread out the set of possible outcomes are, the greater the risk

$$S_D = \sqrt{\sum_{i=1}^{n} (r - \hat{r})^2 \times p_i} \tag{9.3}$$

Example

Suppose Congress is debating whether or not to raise the debt ceiling and these debates create some uncertainty in the market. An investor is faced with the following possible outcomes in the market:

Best Case	30% chance market goes up by 37%
Most Likely	40% chance market goes up by 11%
Worst Case	30% chance market goes down by 15%

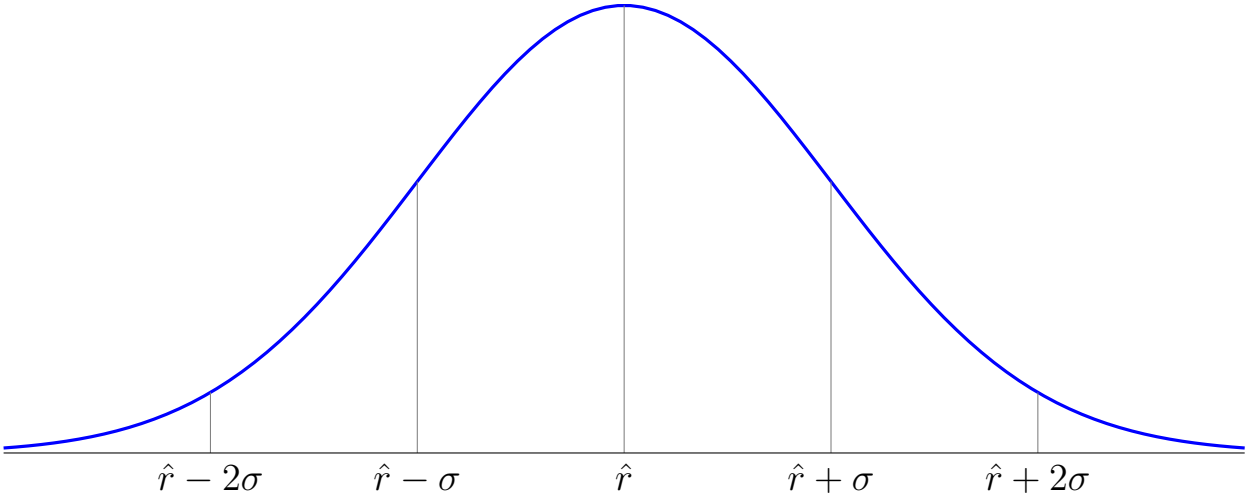
What would the expected rate of return and standard deviation be for the investor?

$$E[return] = 0.3(0.37) + 0.4(0.11) + 0.3(-0.15) = 0.11 = 11\%$$

$$\sigma = \sqrt{(.37 - .11)^2 \cdot 0.3 + (.11 - .11)^2 \cdot 0.4 + (-.15 - .11)^2 \cdot 0.3} = .201 = 20.1\%$$

9.2.1 The Normal Distribution

- Stock market returns typically follow a normal distribution



- We are calculating an estimate for the expected return, $\hat{r}$
- Therefore, we cannot say with certainty that we will get that value
- The normal distribution helps provide a range for which gives us more certainty to our expected return
- 68.3% of the time, our expected return, $\hat{r}$, will fall within 1 standard deviation of the mean: $\hat{r} \pm \sigma$
- 95.4% of the time, $\hat{r}$, will fall within 2 standard deviations of the mean: $\hat{r} \pm 2\sigma$
- Alternatively, we can think of this there is a $\sim 2.5\%$ change that our expected return will be greater than $\hat{r} + 2\sigma$ and a $\sim 2.5\%$ change that our expected return will be less than $\hat{r} - 2\sigma$

Example

We can calculate these and fill out the values on the distribution using our example:

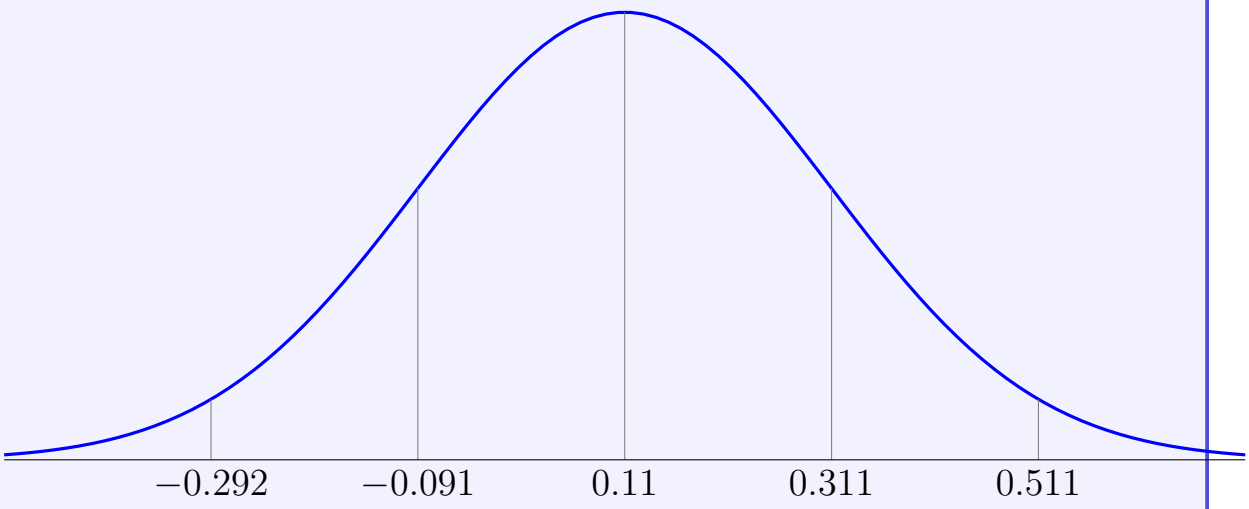
$$\hat{r} = 0.11 \text{ and } \sigma = 0.201$$

$$\hat{r} + \sigma = 0.11 + 0.201 = 0.311$$

$$\hat{r} + 2\sigma = 0.11 + 2(0.201) = 0.511$$

$$\hat{r} - \sigma = 0.11 - 0.201 = -0.091$$

$$\hat{r} - 2\sigma = 0.11 - 2(0.201) = -0.292$$



- This means there is a $\sim 95\%$ chance our expected return is between -29.2% and 51.1%
- We could also think of this as there is $\sim 2.5\%$ chance our expected return is below -29.2% and a $\sim 2.5\%$ chance our expected return is above 51.1%

9.3 Using Historical Data

- Sometimes the best predictor of the immediate future is the immediate past
  - Immediate past can be relative, we could be talking about the last 20 minutes, the last 20 hours, the last 20 days, or the the last 20 years
- We can use historical data to figure out:
  - The average rate of return
  - The average standard deviation
  - The average correlation between two stocks
- Let's look at some historical data on the stock market:

Table 9.1: S&P Historical Facts, 1928-2020

Average Annual Return	9.79%
Average Total Return	11.64%
Number of Positive Years	68
Average Positive Return	20.81%
Number of Negative Years	25
Average Negative Return	−12.31%
Largest Annual Loss	−43.84%
Largest Annual Gain	52.56%

9.3.1 Average Rate of Return

To calculate the average rate of return:

$$\bar{r} = \frac{r_t + r_{t-1} + r_{t-2} + \cdots + r_{t-n}}{n} = \frac{\sum_{t=1}^{n} r_t}{n} \tag{9.4}$$

9.3.2 Historical Standard Deviation

To calculate the historical standard deviation:

$$\sigma = \sqrt{\frac{(r_t - \bar{r})^2 + (r_{t-1} - \bar{r})^2 + \cdots + (r_{t-n} - \bar{r})^2}{n-1}} = \sqrt{\frac{\sum_{t=1}^{n}(r_n - \bar{r})^2}{n-1}} \tag{9.5}$$

9.3.3 Historical Correlation

If we want to determine if two stocks move in the same direction, we can calculate the correlation between the two stocks

$$\rho_{x,y} = \frac{(r_{x,t} - \bar{r}_x)(r_{y,t} - \bar{r}_y) + (r_{x,t-1} - \bar{r}_x)(r_{y,t-1} - \bar{r}_y) + \cdots + (r_{x,t-n} - \bar{r}_x)(r_{y,t-n} - \bar{r}_y)}{S_D^x \cdot S_D^y (n-1)} \tag{9.6}$$

$$\rho_{x,y} = \frac{\sum_{t=1}^{n}(r_{x,n} - \bar{r}_x)(r_{y,n} - \bar{r}_y)}{S_D^x \cdot S_D^y (n-1)} \tag{9.7}$$

- ρ is always between -1 and 1
- A negative ρ means that the two stocks tend to move in opposite direction
- A positive ρ means that the two stocks tend to move in the same direction

***** WORKSHEET ON RISK *****

9.4 Portfolio Management

9.4.1 Portfolio Return

- A portfolio is a collection of assets
- Some of the assets in your portfolio will have more weight than others
    - Some stocks will have a higher value than others and therefore will make up a higher percentage of the total value of your portfolio
- To calculate the weight of each stock:

$$w_i = \frac{\text{Market Value of Stock}}{\text{Total Value of Portfolio}} \tag{9.8}$$

- To calculate the weighted return of a portfolio:

$$\bar{r}_p = w_1\bar{r}_1 + w_2\bar{r}_2 + \cdots + w_n\bar{r}_n = \sum_{i=1}^{n} w_i\bar{r}_i \tag{9.9}$$

Where,

w_i is the weight for stock i

$\bar{r}_i$ is the average annual return for stock i

Example

Suppose this is your portfolio that is worth $10,000:

Stock	Value	Return
Apple	$2,900	15%
Google	$4,430	17%
Nike	$520	6%
Ford	$950	5%
Pfizer	$1,200	8%
Total	$10,000	

$$w_{apple} = \frac{2,900}{10,000} = 0.29 = 29\%$$

$$w_{google} = \frac{4,430}{10,000} = 0.443 = 44.3\%$$

$$w_{nike} = \frac{520}{10,000} = 0.052 = 5.2\%$$

A chance in the value of Nike's stock will have a much smaller impact on the total value of the portfolio than a change in the value of Google or Apple.

Because of this, we want to know what the weighted average return of the portfolio is:

$$\bar{r}_p = \left(\frac{2,900}{10,000}\right)0.15 + \left(\frac{4,430}{10,000}\right)0.17 + \left(\frac{520}{10,000}\right)0.06 + \left(\frac{950}{10,000}\right)0.05 + \left(\frac{1,120}{10,000}\right)0.08$$

$$\bar{r}_p = 0.13564 \text{ or } 13.564\%$$

9.4.2 Portfolio Diversification

- Diversification is the process of investing in different industries to reduce the risk of your entire portfolio
- The goal is to have a collection of investments that that cancel each others stand-alone risk out
  - Recall from earlier that there is market risk, which is out of our control
- **Historical Data**
  - If you own 1 stock, the average standard deviation of returns is near 50%
  - By owning 10 stocks that are randomly selected from various industries, the standard deviation of returns drops to around 24%
  - By owning 40 stocks that are randomly selected from various industries, the standard deviation drops to about 20%
  - Adding more than 40 stocks may make the standard deviation drop slightly more, but not much more
  - Research shows that with proper diversification, a portfolio can get a standard deviation of about 20%, which we consider the standard deviation of the market

9.4.3 Capital Asset Pricing Model (CAPM)

- We want to know how much risk each stock contributes to a portfolio
- We can measure this by calculating the Beta of each stock

$$\beta_i = \left(\frac{\sigma_i}{\sigma_M}\right) \cdot \rho_{i,M} \tag{9.10}$$

Where,

σ_i is the standard deviation of stock i

σ_M is the standard deviation of the market (σ_M=0.20)

$\rho_{i,M}$ is the correlation between returns of stock i and the returns of the market

- By making some substitutions, we can rewrite the equation for β_i to be

$$\beta_i = \frac{\sum_{t=1}^{n}(r_{x,n} - \bar{r}_x)(r_{m,n} - \bar{r}_m)}{(\sigma_M)^2(n-1)} \tag{9.11}$$

- **Interpreting Beta**
  - If $\beta_i < 1$, a stock is less risky relative to the market
  - If $\beta_i = 1$, then the stock has equal risk to the market
  - If $\beta_i > 1$, then the stock is more risky relative to the market
- Because each stock has a different weight in a portfolio, we want to calculate the portfolio beta
  - The portfolio beta tells us the risk of the entire portfolio relative to the market

$$\beta_p = w_1\beta_1 + w_2\beta_2 + \cdots + w_n\beta_n = \sum_{i=1}^{n} w_i\beta_i \tag{9.12}$$

- We want to be as close to 1 as possible
- **Standard Deviation of the Portfolio**

$$\sigma_p = b_p\sigma_M \tag{9.13}$$

  - If $\beta_p = 1$, then $\sigma_p = \sigma_M$ and the portfolio is perfectly diversified

9.4.4 The Security Market Line (SML

- The Security Market Line (SML) captures the tradeoff between expected return and systemic risk, as measured by beta
- The SML gives us the rate of return that is required by investors to be adequately compensated for the level of risk of the investment
- Why do we care about the required rate of return?
  - If analysts are able to forecast the expected return of a stock and find that the expected return is greater than the required return, that could mean the stock is undervalued

$$r_i = r_f + \beta_i(r_M - r_f) \tag{9.14}$$

Where,

r_f is the risk-free rate

b_i is the beta of stock i

r_M is the expected return of the market

- $r_M - r_f$ is know as the Risk Premium of the Market, RP_M

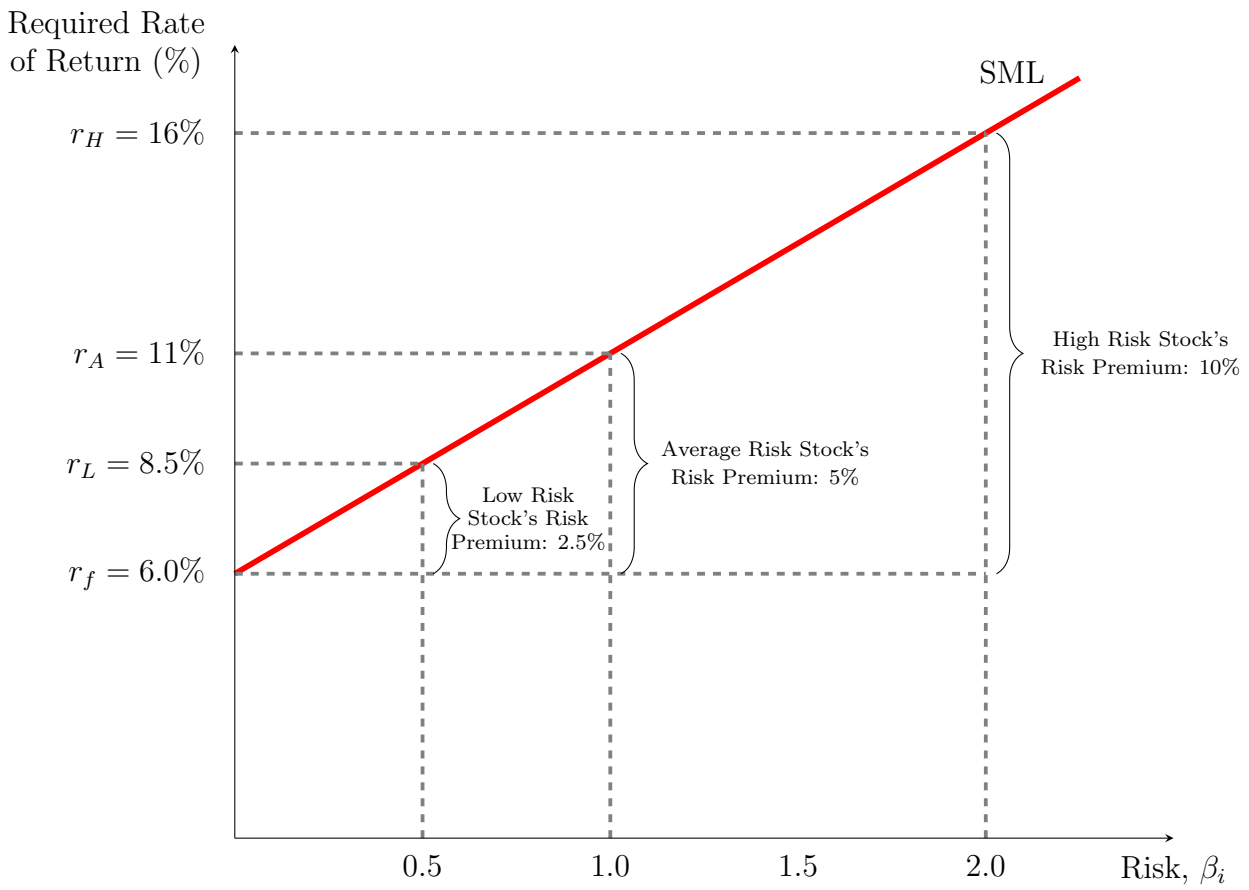
Example

Suppose that investors expect the market to earn an 11% rate of return over the next year and the yield on 3-month US Treasury Bill is 6%. What would be required rate of return be for the following stocks:

1. A low-risk sock $\beta_L = 0.5$
2. An average-risk stock, $\beta_A = 1.0$
3. A high-risk stock, $\beta_H = 2.0$

$$r_L = .06 + 0.5(0.11 - 0.06) = 0.085 = 8.5\%$$
$$r_A = .06 + 1.0(0.11 - 0.06) = 0.11 = 11.0\%$$
$$r_H = .06 + 2.0(0.11 - 0.06) = 0.16 = 16.0\%$$

- Using the values from the example, we can plot the Security Market Line:



- We can also use the SML to compare two stocks that have the same beta
  - Stocks above the SML are undervalued
  - Stocks below the SML are overvalued

9.5 Efficient Market Hypothesis

- The efficient market hypothesis (EMH) says that all known information about investment securities, such as stocks, is already factored into the prices of those securities
- If that is true, no amount of analysis can give you an edge over "the market"
- EMH does not require that investors be rational; it says that individual investors will act randomly, but as a whole, the market is always "right." In simple terms, "efficient" implies "normal"
- For example, an unusual reaction to unusual information is normal. If a crowd suddenly starts running in one direction, it's normal for you to run that way as well, even if there isn't a rational reason for doing so
- **Forms of the Efficient Market Hypothesis**
  - **Weak Form**
    - Suggests that all past information is priced into securities
    - Fundamental analysis of securities can provide you with information to produce returns above market averages in the short term. But no "patterns" exist
    - Therefore, fundamental analysis does not provide a long-term advantage, and technical analysis will not work
  - **Semi-Strong Form**
    - Implies that neither fundamental analysis nor technical analysis can provide you with an advantage
    - It also suggests that new information is instantly priced into securities
  - **Strong Form**
    - All information, both public and private, is priced into stocks
    - Therefore, no investor can gain advantage over the market as a whole
    - Strong form EMH does not say it's impossible to get an abnormally high return because there are always outliers in averages
- EMH does not say that you can never outperform the market, it says that there are outliers who can beat the market averages
- Those who "win" are lucky; those who "lose" are unlucky

- Empirical studies suggest the market is weakly efficient but not strongly efficient
    - There are people who are able to take advantage of insider trading to make a profit, so there is private information that is not reflected in the price
        - If caught insider trading, will go to jail

Section 10

Cost of Capital

- Companies have a range of capital components they can use when pursuing long-term projects
- By long-term, we mean more than one year, because is important to note that these are projects that cannot be funded by working capital
- Long-term projects are projects that are intended to grow the business by increasing the amount of cash flow that is generated over multiple years
- When companies want to pursue these types of projects, they typically have to acquire additional capital secured through capital markets
- Each of the capital components exist because there is demand from investors
    - Common stock
    - Bonds
    - Preferred stock
- If investors are going to continue to demand capital products from a company, they expect to be compensated for the specific risks associated with a given investment
- Managers and owners need to have mechanisms for evaluating potential projects to determine if the initiative is projected to earn enough such that it compensates investors (or the owner for a small business)
- Almost all projects have some measure of uncertainty, so we can only say

10.1 Cost of Debt

- The cost of debt is the interest rate that companies must pay to entice investors to purchase debt issued by the company
- The easiest way to think about this value is the Yield to Maturity (YTM)

  - Recall from Section 4, that the YTM is the yield an investor would get if it purchased a bond today and held it until maturity

- If a company had no publicly traded debt, its staff could look at the yields on publicly traded debt of other firms to get a reasonable estimate
- Prior to the 2017 Tax Cuts and Jobs Act (TCJA), calculating the cost of debt was relatively simple
- Prior to TCJA, the tax code allowed for the full destructibility of interest for income tax purposes, while dividends paid to shareholders were not (and still are not) deductible
- TCJA limits the amount of interest a business can deduct up to 30% of their adjusted taxable income
- Adjusted taxable income is a companys EBIT, or operating income
- We can define the cost of borrowing as follows:

$$(q)(1-t)r_d + (1-q)r_d \tag{10.1}$$

Where,

t is the tax rate faced by the company

r_d is the YTM

$q = \min\left(\frac{z}{3.33}, 1\right)$ where $z = \max\left(\frac{EBIT}{Interest\ Expense}, 0\right)$

- The variable q captures the percentage of interest expense that is deductible
- This value can no longer be greater than 1, which is why q takes the lesser value of $\frac{z}{3.33}$ or 1

Example

Suppose the YTM on a company's most recently issued bonds was 10% and their marginal tax rate is 21%. The company earned $1,000 in operating income and paid $500 in interest expense. Calculate the company's cost of borrowing.

Step 1: Calculate z

$$z = \max\left(\frac{1,000}{500}, 0\right) = 2$$

Step 2: Calculate q

$$q = \min\left(\frac{2}{3.33}, 1\right) = \frac{2}{3.33} = 0.601$$

Step 3: Calculate the cost of borrowing

$$(0.601)(1 - 0.21)(0.10) + (1 - 0.601)(0.10) = 0.0874 = 8.74\%$$

- For the value of r_d, it is recommended to use either the value of the YTM on recently issued debt or the average YTM of all currently outstanding debt

10.2 Cost of Equity

- The cost of equity is the rate of return that the company must pay to entice investors to purchase common stock issued by the company
- An investor expect to earn a return on investing in a company's stock through appreciation of the share price and through the receipt of dividend payments, if applicable
- For companies that do not pay dividends, they compensate the investor by making the right capital allocation decisions that grow the overall value of the company, and thus the value of each individual's share of the company's value
- So far, we have discussed several metrics for calculating the value of common stock and the required rate of return
  - Discounted Cash Flow analysis (e.g., Gordon Growth Model and FCF model)
  - Capital Asset Pricing Model (CAPM)
- Before we can evaluate these two models, we must determine if there is a difference between a company using earnings that have previously been earned, but not allocated and a company that must issue new stock to generate funds necessary
- If a company funds a project through internally generated funds versus issuing new stock, the "cost" will not be the same because of flotation costs
- Flotation costs are costs a company must pay to a financial intermediary to help them sell additional stock (e.g., an investment bank)

10.2.1 Security Market Line

- The CAPM model is the more intuitive explanation for the cost of equity by using the Security Market Line (SML) that was discussed in Section 9

$$r_e = r_f + \beta_i(r_M - r_f) \tag{10.2}$$

Example

A company has a beta of 1.35 and the market is expected to earn 9% next year. If the risk-free rate is 3%, how much do your company investors require as a return to compensate them for investing in your company's risky common stock?

$$r_e = 0.03 + 1.35(0.09 - 0.03) = 0.111$$

This tells us that if a company were to use its own internally-generated funds, the company must earn at least 11.1% to adequately compensate common stockholders.

- The SML approach is not as flexible as the Discounted Cash Flow approach, because the SML can't be easily modified to reflect flotation costs
- Using the SML to estimate the cost of equity is suitable if the company does not need to issue new stock

10.2.2 Discounted Cash Flow

- The Discounted Cash Flow approach can be used to estimate the cost of equity for internally generated funds or if the company issues new common stock
- If you recall from Section 8, we solved the Gordon Growth Model for r_e:

$$r_e = \frac{D_0(1+g)}{P_0} + g \qquad \text{or} \qquad r_e = \frac{D_1}{P_0} + g \tag{10.3}$$

- However, we need to modify this equation to account for flotation costs if the company must issue new stock
- If a company wants to issue new stock at a price of $\$P_0$, then an investment bank will charge costs that are equal to either a percent of the share price or a fixed dollar value per share price
- If flotation costs are expressed as a percent of the sale price, where f is the percentage:

$$r_e = \frac{D_1}{P_0(1-f)} + g \tag{10.4}$$

- If flotation costs are expressed as a fixed dollar value per share price, where F is the dollar value:

$$r_e = \frac{D_1}{P_0 - F} + g \tag{10.5}$$

Example

A company recently paid a dividend of \$5.00 per share. You expect the dividend to grow at a 6% constant rate and the current stock price is \$45. If there is a 10% flotation cost, what is the required rate of return to compensate investors?

$$r_e = \frac{\$2.50(1+0.06)}{\$45.00(1-0.10)} + 0.06 = 0.1245 \text{ or } 12.45\%$$

If instead you were told that flotation costs are \$4.50 per share, we could find r_e:

$$r_e = \frac{\$2.50(1+0.06)}{\$45.00 - \$4.50} + 0.06 = 0.1245 \text{ or } 12.45\%$$

- Flotation costs increase the amount of capital a company needs to raise, so it is important to consider how much is necessary

$$\text{Gross Amount to Raise} = \frac{\text{Net Capital Needed}}{1-f} \tag{10.6}$$

Example

In from our previous example, we needed to raise \$4,050,000, how much capital would we need to raise to cover flotation costs?

$$\text{Gross Amount to Raise} = \frac{4,050,000}{1-.10} = \$4,500,000$$

10.2.3 Preferred Stock

- Preferred stock operates differently from common stock in that owners do not have ownership in the company, but it pays a perpetual dividend
- To estimate the value of preferred stock, we can use the perpetuity formula:

$$V_{pref} = \frac{Dividend}{r_p} \tag{10.7}$$

- We can rearrange this equation to find the required return on preferred stock:

$$r_p = \frac{Dividend}{V_{pref}} \tag{10.8}$$

Example

A preferred share of stock pays a dividend of \$2.50 and currently sells for \$25.00. Estimate the required return for this stock?

$$r_p = \frac{\$2.50}{\$25.00} = 0.10 \text{ or } 10.0\%$$

10.3 Weighted Average Cost of Capital (WACC)

- We have gone through all of the components of the cost of capital, so we can not put it all together
- The WACC equation following the changes from the 2017 TCJA is as follows:

$$WACC = w_d[(q)(1-t)r_d + (1-q)r_d] + w_e r_e + w_p r_p \tag{10.9}$$

Where,

w_d is the component weight of debt

w_e is the component weight of equity

w_p is the component weight of preferred stock

- However, if you recall when discussing the cost of debt, the value of q depends as the amount of interest that that is being deducted
- So it may be more helpful to think of the WACC equation as a piecewise function

$$WACC = \begin{cases} w_d \left[\frac{z}{3.33}(1-t)r_d + \left(1 - \frac{z}{3.33}\right) r_d \right] w_e r_e + w_p r_p & \text{if } 0 \leq z \leq 3.33 \\ w_d(1-t)r_d + w_e r_e + w_p r_p & \text{if } z \geq 3.33 \end{cases} \tag{10.10}$$

Where,

$$z = \max\left(\frac{EBIT}{Interest\ Expense}, 0\right)$$

- If z is between 0 and 3.33, then interest is not fully deductible and you must use the top equation
- If z is greater than 3.33, the entire interest expense is deductible, which was always the case before the 2017 TCJA
- The last piece is how to calculate the weights

- Let V be the value of all capital, D be the value of all debt (bonds), E to be the value (market capitalization) of all equity, and P be the value of preferred stock
- V=D+E+P
- To calculate the weights:

$$w_d = \frac{D}{V} \tag{10.11}$$

$$w_e = \frac{E}{V} \tag{10.12}$$

$$w_p = \frac{P}{V} \tag{10.13}$$

Example

You are have the following information about a company:

- \$500,000 in short-term debt
- \$2,000,000 in long-term debt
- EBIT is \$150,000
- \$60,000 in interest expense
- 2,000,000 shares of common stock outstanding at a current price of \$40
- The company just paid a dividend of \$2.50 per share (D_0) and is expected to grow at a constant 8.5% rate (g)
- 50,000 shares of preferred stock outstanding with \$25 par value that pays a 10% dividend, and currently sells for \$30 per share
- The company's most recent bonds sold with a YTM of 8.5% (r_d)
- They paid a tax rate of 21%

What is the WACC for this company?

Step 1: Calculate V

To get the value of debt, add short-term and long-term debt:

$D = \$500,000 + \$2,000,000 = \$2,500,000$

Value of equity: $E = 2,000,000(\$40) = \$80,000,000$

Value of preferred stock: $P = 50,000(\$30) = \$1,500,000$

$$V = \$2,500,000 + \$80,000,000 + \$1,500,000 = \$84,000,000$$

Step 2: Calculate the weights

$$w_d = \frac{2,500,000}{84,000,000} = 0.02976$$

$$w_e = \frac{80,000,000}{84,000,000} = 0.9524$$

$$w_p = \frac{1,500,000}{84,000,000} = 0.01786$$

Step 3: Calculate z

$$z = \max\left(\frac{150,000}{60,000}, 0\right)$$

$$z = \max(2.5, 0)$$

$$z = 2.5$$

Step 4: Calculate q

$$q = \min\left(\frac{2.50}{3.33}, 1\right)$$

$$q = \min(0.751, 1)$$

$$q = 0.751$$

Step 5: Calculate r_e

Using the Gordon Growth Model:

$$r_e = \frac{\$2.50(1 + 0.085)}{\$40} + 0.085 = 0.15$$

Note: If there were flotation costs, you would need to incorporate them.

Step 6: Calculate r_p

The dividend is calculated as a percent of par value: $\$25(0.10) = \$2.50$

$$r_p = \frac{\$2.50}{\$30} = 0.083$$

Step 7: Calculate WACC

$$WACC = w_d[(q)(1-t)r_d + (1-q)r_d] + w_e r_e + w_p r_p \tag{10.14}$$

$$WACC = 0.030[(0.751)(1-0.21)(0.085)+(1-0.751)(0.085)]+(0.95)(0.15)+(0.018)(0.083)$$

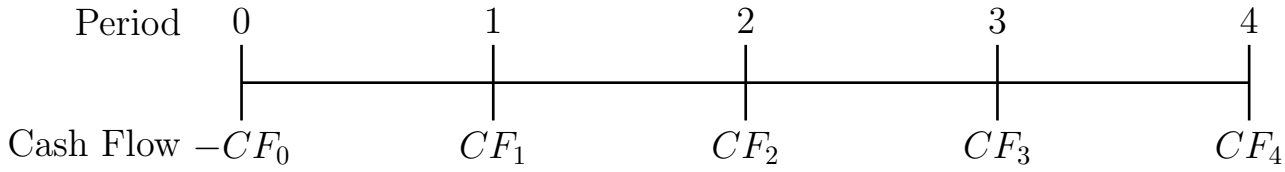
$$WACC = 0.00213 + 0.14286 + 0.0015$$

$$WACC = 0.14649 \text{ or } 14.649\%$$

Section 11

Capital Budgeting & Evaluating Cash Flows

- Capital Budgeting is the process used to compare the costs associated with a project against future streams of cash
- The goal of this section is to give you (as a manager) the tools to help accept or reject proposed projects
- A project is any "undertaking" of some finite duration that requires the initial spending of cash and is followed by and inflow of cash at points in the future



- Cash flow in future periods does not necessarily have to be positive, it could be negative
  - Sometimes machinery or technology required maintenance or the cost of operating in a certain year may be more than what it generates (sometimes equipment is idle)
- **Types of Projects**
  - Replacement of old or damaged equipment
  - Upgrading technology
  - Expansion of operations (new or existing)
  - Downsizing during a recession
  - Safety or environmental projects

- Sometimes, a manager wants to evaluate the merits of a project on its own
  - When this is the case, it is called an independent project
- Other times, a manager wants to compare two projects and pick the best one for the company (i.e. pick one or the other)
  - When this is the case, they are called mutually exclusive projects

11.1 Net Present Value

- The best analytical tool available to managers to evaluate projects is **Net Present Value (NPV)**
- NPV calculates the present value of a projects expected future cash flows, including the initial costs
- To calculate NPV, we calculate the PV of each cash flow discounted at the projects risk-adjusted rate of capital ($WACC$)
  - This process is essentially identical to calculating the PV or uneven cash flows

$$NPV = CF_0 + \frac{CF_1}{1+WACC} + \frac{CF_2}{(1+WACC)^2} + ... + \frac{CF_n}{(1+WACC)^n} \tag{11.1}$$

- Note: CF_0 is the start-up cost and is usually negative
- **Decisions Criteria**
  - For independent projects
    - If $NPV > 0$, the project adds value to the company, managers should approve the project
    - If $NPV < 0$, the project takes away value from the company, managers should reject the project
    - If $NPV = 0$, the project neither adds nor takes away value, managers would be indifferent between accepting or rejecting
  - For mutually exclusive projects
    - Managers should chose whichever project has the higher NPV to maximize the value added to the company
    - If both projects have a $NPV < 0$, then managers should reject both projects

Example

You are the manager of a Walmart and you are considering a project to upgrade some cashier stands to be self-checkout which you hope will increase the speed of check-out for most customers. You have the following information about the expected cash flows

from this project if WACC=10%:

	Cash Flows		
	0	1	2
Cash Flows	($1,000)	$2,300	$3,200

$$NPV = -1,000 + \frac{2,300}{1.10} + \frac{3,200}{(1.10)^2} = \$3,735.53$$

11.2 Internal Rate of Return

- The **Internal Rate of Return (IRR)** is the discount rate (or $WACC$) that forces the expected value of future cash flows to equal the initial expenditure on the project (CF_0)
  - In other words, what is the value of r that makes $NPV = 0$

$$NPV = 0 = CF_0 + \frac{CF_1}{1 + IRR} + \frac{CF_2}{(1 + IRR)^2} + ... + \frac{CF_n}{(1 + IRR)^n} \tag{11.2}$$

- IF IRR exceeds the cost of funds used the finance the project, then the difference benefits the company's stockholders
- **Decisions Criteria**
  - For independent projects
    - If $IRR >$ risk-adjusted $WACC$, the project adds value to the company, managers should approve the project
    - If $IRR <$ risk-adjusted $WACC$, the project takes away value from the company, managers should reject the project
    - If $IRR =$ risk-adjusted $WACC$, the project neither adds nor takes away value, managers would be indifferent between accepting or rejecting
  - For mutually exclusive projects
    - Managers should chose whichever project has the higher IRR to maximize the value added to the company
    - If both projects have a $IRR <$ risk-adjusted $WACC$, then managers should reject both projects
- The $WACC$ is a good starting point, but we should only use the $WACC$ if the project has average risk
- However, it would be appropriate to adjust the $WACC$ up or down, to reflect a higher or lower risk project

- The risk-adjusted $WACC$ is often called a hurdle rate
- It is not possible to calculate IRR by hand unless by trial and error
- You can calculate it using a financial calculator or Microsoft Excel

11.2.1 Problems with IRR

- While IRR is a popular tool used by managers, there are some problems with it that suggest it should almost never be used
  - IRR makes the assumption that all cash flows are reinvested at the IRR, which us unreasonable and unrealistic
  - For independent projects, IRR will always yield the same result at NPV
  - For mutually exclusive projects, the result might differ from NPV
    - Should default to the outcome of NPV analysis if this is the case
  - If any of the future cash flows are negative, then there may be two different IRR's that make $NPV = 0$

11.3 Modified Internal Rate of Return

- The Modified Internal Rate of Return (MIRR) works to overcome some of the issues with IRR
  - The $MIRR$ changes the reinvestment assumption such that cash flows are reinvested at the $WACC$ not the IRR
  - The $MIRR$ provides a single rate if any of the future cash flows are negative
- The $MIRR$ is the rate that equates the sum of all negative cash flows discounted to the present with the sum of all positive cash flows discounted at the $WACC$
- Like IRR, this is calculated using a financial calculator or Microsoft Excel

11.4 Profitability Index

- The **profitability index (PI)** of a project shows the relative profitability of a project

$$PI = \frac{\frac{CF_1}{1+WACC} + \frac{CF_2}{(1+WACC)^2} + ... + \frac{CF_n}{(1+WACC)^n}}{|CF_0|} \tag{11.3}$$

- **Decisions Criteria**
  - For independent projects

  - If $PI > 1$, the project adds value to the company, managers should approve the project
  - If $PI < 1$, the project takes away value from the company, managers should reject the project
  - If $PI = 1$, the project neither adds nor takes away value, managers would be indifferent between accepting or rejecting
  - PI will always yield the same results as NPV, IRR, and $MIRR$ for independent projects
- For mutually exclusive projects
  - Managers should chose whichever project has the higher PI to maximize the value added to the company
  - If both projects have a $PI < 1$, then managers should reject both projects
  - Sometimes, PI will give different answers to NPV, should always pair with NPV and default to NPV if the answer differ

11.5 Payback Period

- The payback period is the number of years required to recover the funds that were invested into its projects from operating cash flows

$$Payback\ Period = \begin{array}{c}\text{Number Years Prior}\\ \text{to Full Payback}\end{array} + \frac{\left|\begin{array}{c}\text{Uncovered Cost at}\\ \text{Start of Year}\end{array}\right|}{\begin{array}{c}\text{Cash Flow During}\\ \text{that Year}\end{array}} \tag{11.4}$$

Example

Suppose you have the following cash flow information about a project:

	Cash Flows			
	0	1	2	3
Cash Flows	($10,000)	$5,300	$4,300	$1,874

To calculate the payback period, you first must calculate "cumulative cash flow" :

	Cash Flows			
	0	1	2	3
Cash Flows	($10,000)	$5,300	$4,300	$1,874
Cumulative Cash Flow	-10,000	$-10,000 + 5,300 = -4,700$	$-4,500 + 4,300 = -400$	$-400 + 1,874 = 1,474$

The year that the cumulative cash flows turns positive is year 3. Therefore there are 2 years prior to full payback. The uncovered cost from the start of year is the cumulative cash flow in the year prior to full payback: -400. The cash flow during the payback year $-\$1,874$.

$$Payback\ Period = 2 + \frac{|-400|}{1,874} = 2.21 \text{ years}$$

11.6 Mutually Exclusive Projects with Unequal Lives

- Suppose you are a manger of a company and you have two projects that you want to evaluate
- One project has a life of 6 years and the other has a life of 3 years
- Just simply calculating NPV, $MIRR$, or PI would make it impossible to directly compare
- If we want to compare two projects with unequal lives, we can use the replacement chain approach or common life approach
    - We will pretend the investment in the shorter project is made twice so that we can compare the two projects

	Cash Flows						
	0	1	2	3	4	5	6
Project X	CF_0	CF_1	CF_2	CF_3	CF_4	CF_5	CF_6
Project Y	CF_0	CF_1	CF_2	CF_3 CF_0	CF_1	CF_2	CF_3
"Common Life"	CF_0	CF_1	CF_2	$CF_3 + CF_0$	CF_1	CF_2	CF_3

- Now we can calculate the NPV of Project X and the "common life" for Project Y

Section 12

Project Cash Flow Estimation

- Cash flow estimation is simply a process that entails identifying all the costs associated with the project, while also identifying all of the relevant cash inflows that will occur
- One thing to keep in mind, though, is that we are estimating, or projecting
- Because of this, there may be some degree of uncertainty with cash flow and factors that need to be considered when estimating cash flows

12.1 Incremental Cash Flows

- When evaluating projects, we care about incremental cash flows
    - How much extra money the project will bring to the company

  Incremental Cash Flow = Cash Flow with Project − Cash Flow without Project

- This sounds easy, but there are a lot of things that could threaten a projects expected cash flow

12.1.1 Replacement vs Expansion Projects

- Expansion projects generate additional (incremental) revenues from new sales due to a new product, location, etc.
- Replacement projects are a little more difficult because money is being spent to replace existing operations that are already generating cash flow
    - Sorting out the incremental cash flows for an existing project can be tricky

12.1.2 Sunk Costs

- A sunk cost is money that is spent that cannot be recovered, regardless if a project is accepted or rejected
    - **Example**: Money spent to scout out possible new locations
- Sunk costs are not included in the NPV of a project because it is money that would have been spent regardless if the project happens or not (they don't determine incremental cash flows)

12.1.3 Opportunity Costs of Existing Assets

- Suppose a company owns a lot of land worth $2 million
- The company wants to build a new building on this land for $10 million
- They must include the value of that land in the NPV calculation becasue that land could be sold for $2 million if the building was not built
- The value or selling the land is the opportunity cost of the building
- Companies should always consider how else could they have used money they are going to spend or assets they are going to use when making decisions

12.1.4 Externalities

- An externality is an external cost or benefit of business activity that is not accounted for

Negative Within-Firm Externalities

- There is a Macadoo's in Lexington, VA
- Suppose they decide they want to build another location in Buena Vista
- They conduct surveys and focus groups to make estimates as to the number of people that will eat at the new location and how much money they expect to make
- However, they did not consider that some people that currently live in Buena Vista currently eat at the location in Lexington and that by opening the new location the Macadoo's in Lexington will lose some sales to the new location
- This is called cannibalization

Positive Within-Firm Externalities

- Sometimes new products can be complementary to existing products
    - The sales of a new product can enhance the sales of an existing product
- This can increase the cash flows of an existing project, this increasing making the NPV of the new product higher then originally expected

Environmental Externalities

- A new project may cause pollution
    - Pollution is more than just "smoke in the air"
        - Air pollution – smoke or foul smell (paper mill)
        - Noise pollution (construction)
        - Ground pollution (runnoff from fertilizer or pesticides)
        - Light pollution (shopping center)
- Pollution negatively affects the people that live in the vicinity of the company and is a social cost that the company does not consider

12.1.5 Salvage Value

- The salvage value is the resale value of an asset
- Often a company will replace an asset before it is totally worn out
- Other companies may be interested in buying the used equipment and this could be a potentially positive cash flow at the end of a projects useful life

12.2 Estimating Cash Flows

- When we did NPV, PI, and Payback Period calculationg, we assumed those cash flows were given
- In practice, there is no way to know what the cash flow of a project will be, they are estimated

12.2.1 Scenario Analysis

- Scenario analysis is used to determine the likelihood of different possible outcomes (NPVs) of a project
- We can calculate the best case, worse case, and most likely scenario and calculate the expected NPV and expected standard deviation of the NPV like we did with probability distributions

- We can also calculate the coefficient of variation (CV)

$$CV = \frac{\text{Standard Deviation}}{\text{Average}}$$

- This is the measure of stand-alone risk
  - It measures the risk per dollar of NPV

12.2.2 Sensitivity Analysis

- Sensitivity analysis measures how sensitive the NPV calculation is as each input variable changes
  - Sales
  - Units sold
  - sales price
- Sensitivity analysis measures the percent change in NPV that results from a percent change in a particular input variable
  - A sensitivity analysis can be done for each of the possible scenarios

12.2.3 Monte Carlo Simulation

- Monte Carlo Simulation is done using statistical software and combines scenario and sensitivity analysis
- Each input variable is assigned a probability distribution
- The computer picks random variables for each input from their probability distribution and calculates the NPV
- This process will be repeated many times until the simulation "converges" on a particular result

Section 13

Corporate Governance

- Corporate governance is the set of rules and procedures that influence a company's operations and managers decisions
- The goal of corporate governance is to limit agency conflicts and agency costs
    - An **agency conflict** occurs whenever the owner gives authority to someone else to act on their behalf and they do not act in the best interest of the owner
    - **Agency costs** are the costs associated with an agency conflict that reduce the value of a company

13.1 The Principal-Agent Problem

- The principal-agent problem is a model in game theory
- There is a principal who is trying to make a decision about an agent but the principal does have a complete set of information as to how the agent is going to act
- **Example 1**:
    - A manager wants to hire a worker, but has no way of knowing if that worker is going to be a high productive worker or a low productive worker
    - The manger could impose requirements on the job, like having a certain level of education, to try to filter out low productive workers
- **Example 2**:
    - Someone applies for a loan at a bank to build a deck on their house
    - The bank has no idea if the person that is borrowing that money is actually going to use that money to build a deck or if they are going to go gamble it away at a casino
    - This is why banks use credit scores/history and require down payments to try to make sure they are going to get their money back

- For our purposes, this manifests itself in that the owners of a company hires managers to run the company and make money for the owners
- However, sometimes managers make decisions that are in their own best interest and not the interest of the company, which can cause agency costs
    - **Nonpecuniary Benefits**
        - Sometimes managers spend money on things like nice office furniture, personal assistants, country club memberships, corporate jets, corporate retreats, etc.
        - Sometimes these expenses may add value to the company, but if they don't, then thes are agency costs
    - Managers may avoid risky projects, even if it is in the best interest of the company, because they fear that if they project fails it may cost them their job
    - Managers may not make the appropriate value enhancing decision due to personal relationships
        - Terminating a bad project
        - Closing a location or plant
        - Layoffs
    - Managers may withhold bad news from owners which could lead to improper valuation of the company
    - **Entrenchment**
        - When managers believe they have achieved job-security and there is little chance they will be removed and they stop taking actions that benefit the company

13.2 Corporate Governance

- Managers have a greater incentive to maximize the intrinsic value of a company's stock if their compensation is linked to their company's performance
- **Board of Directors**
    - A group that is elected by stockholders and are responsible to monitor and discipline senior managers (set policies and conduct oversight)
    - Effective boards are not too large, are diverse, and have people from outside the company
- **Stock Option Compensation**
    - Part of all of a board member or managers salary is in stock options
    - They are allowed to purchase stock at the strike price which is set equal to the current stock value

- They then have a vesting period of 1-5 years before they can cash in on the stock
- The only way they get compensated is if the value of the stock grew since they were issues the stock option
- Stock options have an expiration date usually after 10 years
- Stock options cannot be sold

- Stock options can incentives mangers to only make decisions that are in the interest of increasing the stock price, and thus the value of the company
  - Sometimes, this can cause managers to commit fraud in efforts to drive the stock price up
    - See Enron, watch movie/documentary titled *The Smartest Guys in the Room*