The Valuation Principle

Required Reading

- **Chapter 3,** "*The Valuation Principle: The Foundation of Financial Decision Making*" from J. Berk et al., Fundamentals of Corporate Finance, Second Canadian Edition.
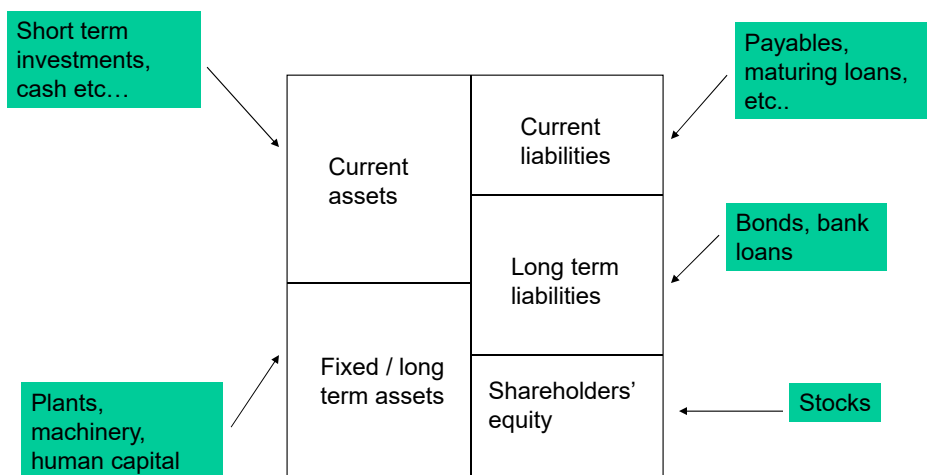
Recommended Reading

- **Chapter 1**, "*Corporate Finance and the Financial Manager*" from J. Berk et al., Fundamentals of Corporate Finance, Second Canadian Edition.
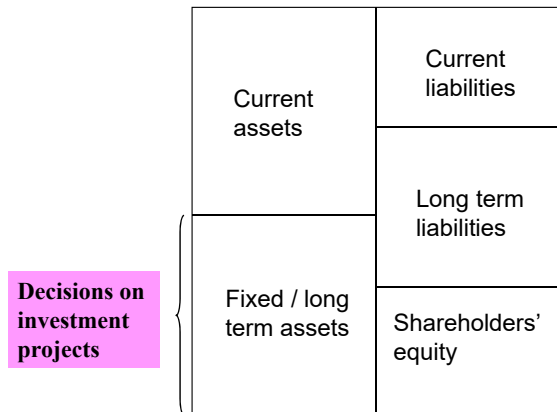
What is Finance about?

The valuation of real and financial assets is the central issue in Finance

- Investment Decisions
  - ✓Capital Budgeting
  - ✓Working Capital Management

- Financing Decisions
  - ✓Capital Structure
  - ✓Working Capital Management

Balance Sheet

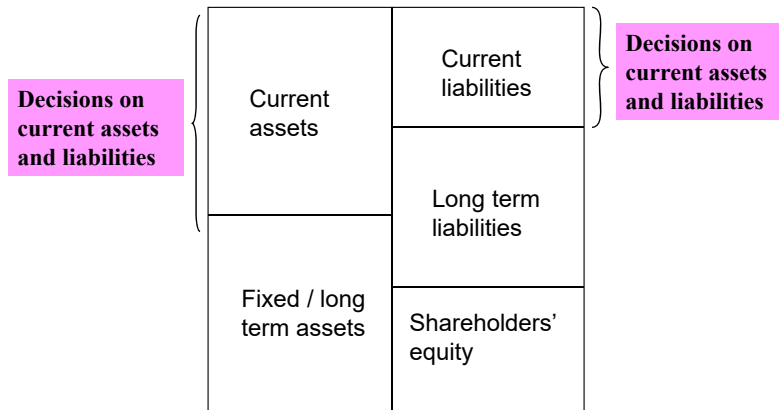Short term investments, cash etc…

Payables, maturing loans, etc..

Current assets	Current liabilities
	Long term liabilities
Fixed / long term assets	Shareholders' equity

Bonds, bank loans

Plants, machinery, human capital

Stocks

Capital Budgeting

Current assets	Current liabilities
	Long term liabilities
Fixed / long term assets	Shareholders' equity

Decisions on investment projects

Capital Structure

Current assets	Current liabilities
	Long term liabilities
Fixed / long term assets	Shareholders' equity

Decisions on
- **debt - equity mix**
- **debt maturity**
- **security design**

Working Capital Management

Current assets	Current liabilities
	Long term liabilities
Fixed / long term assets	Shareholders' equity

Decisions on current assets and liabilities (left bracket around Current assets and Fixed/long term assets)

Decisions on current assets and liabilities (right bracket around Current liabilities)

Why Study Finance?

For your business career:

- Should your firm launch a new product?

- Which supplier should your firm choose?

- Should your firm produce a part or outsource production?

- Should your firm launch a marketing campaign?

- Which IT system should your firm choose?

- Should your firm issue new stock or borrow money instead?

- How can you raise money for your start-up firm?

Why Study Finance?

For your personal (every day) finances:

- Should you study an MBA?

- Should you buy or rent a house?

- How to evaluate the terms for a home mortgage

- When to start saving and how much to save for retirement?

- Where should you invest your savings?

Cost-Benefit Analysis

Quantifying Costs and Benefits:

➢ **Any decision in which the value of the benefits exceeds the costs will increase the value of the firm.**

✓ Suppose a jewelry manufacturer has the opportunity to trade 200 ounces of silver and receive 10 ounces of gold today.

Should he agree to the trade?

Cost-Benefit Analysis

Quantifying Costs and Benefits (cont):

➢ **To compare the costs and benefits, we first need to convert them to a common unit.**

→ If the current market price for silver is $10 per ounce, then the 200 ounces of silver the jeweler gives up has a cash value of $2,000.

→ If the current market price for gold is $500 per ounce, then the 10 ounces of gold the jeweler receives has a cash value of $5,000.

→ Therefore, the jeweler's net value of the trade is:

$$\$5,000 - \$2,000 = \$3,000$$

→ Because the net value is positive, i.e., the benefits exceed the costs, the jewelry manufacturer should accept the trade.

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Valuation Principle

Role of Competitive Markets

➢ A competitive market is one in which a good can be bought and sold at the same price.

➢ In a competitive market, the market price determines the value of the good.

➢ The benefits and costs of a decision should be evaluated using those market prices

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Valuation Principle (cont)

Role of Competitive Markets

➢ When the value of the benefits exceeds the value of the costs, the decision will increase the market value of the firm

→ In the previous example (i.e., jewelry manufacturer), to compare the costs and benefits, we converted them to a common unit using the market prices of gold and silver.

Example: Competitive Market Prices and Value

• You have just won a radio contest and find out that the prize is *four* tickets to the Celine Dion concert (face value $80 each). However, it turns out that there is a second choice: *two* tickets to Justin Bieber's sold-out show (face value $50 each).

• You notice that on eBay, tickets to the Celine Dion show are being bought and sold for $60 apiece and tickets to Justin Bieber's show are being bought and sold at $100 each.

• Not being a fan of Celine Dion, you have no intention of going to the show but you would really like to go to the Justin Bieber's sold-out concert with your (boy/girl) friend.

What should you do?

Example: Competitive Market Prices and Value

Alternative 1:

Take the Justin Bieber tickets and go to the show.

Alternative 2:

Take the Celine Dion tickets, sell them on e-bay, and buy 2 tickets for the Justin Bieber's show.

- 4 C. Dion tickets have a market value of $240 (4 × $60)
- 2 J. Bieber tickets costs $200 (2 × $100)

Alternative 2 is better: you can go to J. Bieber's *concert and still have $40 (240 – 200) to go for dinner!*

Example: Competitive Market Prices and Value

Notes:

- Even though you prefer Justin Bieber's show, you should still take the opportunity to get the Celine Dion tickets instead as they have a higher market value:

    - 4 C. Dion tickets have a market value of $240
    - 2 J. Bieber tickets have a market value $200

- By taking the option with the highest market value, then you can sell it and have more $ to consume whichever good you like.

Valuation Principle

The value of a commodity or an asset to the firm or its investors is determined by its market price.

Example: Applying the Valuation Principle

Air Laval is considering flying a new route. Flying this new route would require 100,000 gallons and would earn Air Laval

$250,000 – (price per gallon x 100,000)

The current market price of oil is $3 per gallon. However, due to a pre-existing contract, Air Laval has the opportunity to buy 100,000 gallons of oil at $1 per gallon.

Should Air Laval fly the new route?

Example: Applying the Valuation Principle

➢ Use the **market price** (i.e., $3 per gallon) to asses the value of the new route:

Value of the Route = 250,000 – (3 x 100,000) = -$50,000 < 0

Air Laval should not fly the new route

➢ *What about the 100,000 gallons at $1 per gallon?*

Buy them for $1 per gallon, sell them at $3 per gallon and get a profit of **$200,000** (= (3-1) x 100,000).

Note: Using the oil to fly the new route would have resulted in a total profit of $150,000 (= 250k- 100K x 1) which is less than the $200,000 of not flying and selling the oil.

Value of a Cash Flow: Time

• Would you rather have $1M today or $1M in 2 years?

• Would you rather have $1M today or $10M in 2 years?

• Would you rather have $1M today or $1.05M in 2 years?

Value of a Cash Flow: Risk

- Would you rather have $100K for sure or $180K with probability ½?

- Would you rather have $100K for sure or $200K with probability ½?

- Would you rather have $100K today or $210K with probability ½?

- Would you rather have $100K today or _____ in 2 years?

Value of a Cash Flow

Time

- How much would an investor pay today for an asset that generates $1M in 2 years?

Risk

- How much would an investor pay today for an asset that generates $200K with probability ½ today?

*To value a cash-flow we need to learn how to adjust for its **Time** and **Risk** profile.*

Time Value of Money

Time Value of Money

- In general, a dollar today is worth more than a dollar in one year:

    $\rightarrow$ If you have \$1 today and you can deposit it in a bank at 7%, you will have \$1.07 in one year

- The difference in value between money today and money in the future reflects the **time value of money**.

Time Value of Money

Converting Cash Across Time

- By depositing money, we convert money today into money in the future:

    $\rightarrow$ You can covert \$1 of today's money into \$1.07 of next year's money by depositing the money in the bank at 7%.

- By borrowing money, we exchange money today for money in the future:

    $\rightarrow$ You can covert \$1.07 of next year's money into \$1 of today's money by borrowing \$1 from the bank at 7%.

- We use the **Interest Rate** for converting cash across time.

Time Value of Money

Interest Rate (*r*) : The rate at which money can be borrowed or lent over a given period (e.g., you can borrow or lend at 7% per year).

Interest Rate Factor (1 + *r*) : The rate of exchange between dollars today and dollars in the future (e.g., you can exchange $1 today for $1.07 (1+0.07) in one year.)

Discount Factor 1/(1+r) : The value today of a dollar received in the future (e.g., received in $1 year has a value of 1/ (1+0.07) = $0.93 today.)

Time Value of Money: Future Value

Future Value (FV): The value of a cash flow that is move forward in time. For the one period case the *FV₁* of a cash flow *C₀* is:

$$FV_1 = C_o \times (1+r)$$

Example: If you were to invest $10,000 at a 3% interest for one year, your investment would grow to:

$$FV_1 = 10,000 \times (1+0.03) = \$10,300$$

Hence $10,300 is the future value in year one of $10,000 when the interest rate is 3%.

Time Value of Money: Present Value

Present Value (PV): The value today of a future cash-flow. For the one period case the PV_0 of a cash-flow C_1 is:

$$PV_0 = \frac{C_1}{(1+r)}$$

Example: What is today's value of an investment that generates $10,300 in one year when interest rates are at 3%?

$$PV_0 = \frac{10{,}300}{(1+0.03)} = \$10{,}000$$

Hence $10,000 is the present value of a $10,300 cash-flow in year 1 when the interest rate is 3%.

Example: Time Value of Money

An investor can choose *one* of the following three assets:

- Asset A pays $250 today.

- Asset B pays $280 in one year.

- Asset C pays $90 today and $165 in one year.

If the one year interest rate is 10%, which asset should the investor choose?

Example: Time Value of Money

Calculate the value of each asset today:

$$Value_A = \$250$$

$$Value_B = \frac{280}{(1+0.1)} = \$254.55$$

$$Value_c = 90 + \frac{165}{(1+0.1)} = \$240$$

*The investor should choose project **B**.*

The *NPV* Decision Rule

Net Present Value (NPV): The NPV of a project or investment is the difference between the present value of its benefits and the present value of its costs.

NPV = PV(Benefits) – *PV*(Costs)

Example: Calculating the NPV

Calculate the NPV of an investment that costs \$3M at time 0 and generates a benefit of \$5M at time 1. Assume that the appropriate discount rate is interest rate is 4%.

Solution

Today: -\$3M   In one year: +\$5M

$$NPV = -3M + \frac{5M}{1+0.04} = -3 + 4.81 = \$1.81$$

The *NPV* Decision Rule

NPV and Firm Value

- When a firm takes a *positive* NPV project, the value of the firm *increases today* in the amount of the project's NPV.

- When a firm takes a negative NPV project, the value of the firm *decreases today* in the amount of the project's NPV.

NPV Decision Rules

- Accept positive-NPV projects and reject negative-NPV investments.

- When choosing among positive-NPV investment alternatives, take the one with the highest NPV.

Example: The *NPV* Decision Rule

An investor offers to buy a business from you whenever you are ready at $20,000. You have the following alternatives:

  A. Sell the business now.

  B. Operate normally for one more year and then sell the business (requiring you to spend $5,000 on supplies and labor now, but earn $10,000 at the end of the year).

  C. Be open only in the mornings for one more year and then sell the business (requiring you to spend $3,000 on supplies and labor now, but earn $6,000 at the end of the year).

  Assume that the one-year interest rate is 10%.

Example: The *NPV* Decision Rule

Calculate the NPV for each alternative and compare them:

Sell today: $NPV = \$20{,}000$

Operate normally: $NPV = -5{,}000 + \dfrac{30{,}000}{1.1} = \$22{,}273$

Mornings only: $NPV = -3000 + \dfrac{26{,}000}{1.1} = \$20{,}636$

The highest NPV is "operate normally".

Example: *NPV* is equivalent to cash today

After saving $1500 waiting tables, you are about to buy a 50-inch plasma TV. You notice that the store is offering a "one-year same as cash" deal. You can take the TV home today and pay nothing until one year from now, when you will owe the store the $1500 purchase price.

i)   If savings accounts earn 5% per year, what is the NPV of this offer?

ii) Show that its NPV represents cash in your pocket today.

Example: *NPV* is equivalent to cash today

i) If savings account earn 5% per year, what is the NPV of this offer?

You are getting something (the TV) worth $1500 today and in exchange will need to pay $1500 in one year:

Today: +$1500   In one year: -$1500

$$NPV = +1500 - \frac{1500}{1.05} = 1500 - 1428.57 = \$71.43$$

Example: *NPV* is equivalent to cash today

ii) Show that its NPV represents cash in your pocket.

You could take the $1428.57 and put you saving account at 5% which would give you the $1500 in one year that you need to pay for the TV:

$$FV_1 = 1428.57 \times 1.05 = \$1,500$$

Hence by taking the delayed payment offer, you have an extra cash flow of $71.43 to spend today:

$$1500 - 1428.57 = \$71.43$$

The NPV Decision Rule: Preferences

NPV and Preferences: In general individuals have different time and risk preferences. Should the financial manager take into account the identity of the shareholders in the firm's investment decisions?

Example

Dot.com is thinking of expanding into a new business, which will mean heavy investments in the short run. This strategy will start paying back after five years. Mr. Old, who is ninety-nine years old, owns half of the company and Mr. Young, who is twenty, owns the other half. Will Mr. Old and Mr. Young agree on whether the firm should expand?

The NPV Decision Rule: Preferences

Regardless of the time and risk preferences, the financial manager should always maximize NPV first.

Why?

Financial Markets allow investors to shift cash flows through time by borrowing or lending to achieve their most preferred pattern of cash flows.

Example: If expanding is NPV-positive, it will increase the value of the shares *today,* and Mr. Old can sell these shares and consume more today in he wants to do so.

McGill *Introduction to Finance - (MGCR 341) – Prof. de Motta*

The Role of Financial Markets

- Capital Markets allow individuals to

  ✓ to allocate resources across time.

  ✓ to obtain the "right" risk-return combination.

- **Key Assumptions:**

    1- Efficient Financial Markets

    2- Free Access to Financial Markets

McGill *Introduction to Finance - (MGCR 341) – Prof. de Motta*

When Does Value Depend on Preferences?

Q. The local Lexus dealer hires you as an extra in a commercial. As part of your compensation, the dealer offers to sell you today a new Lexus for $33,000. The best available retail price for the Lexus is $40,000, and the price you could sell it for in the used car market is $35,000. How would you value this compensation?

When Does Value Depend on Preferences?

- If you were planning to buy a Lexus the value to you of the Lexus is $40,000. And the dealer's offer is worth $40,000 - $33,000 =$7,000 to you.

- If you do not want to own a Lexus you can buy the Lexus from the dealer for $33,000 and sell it for $35,000. In that case the dealer's offer is worth $35,000 - $33,000 =$2,000 to you.

- Thus the offer for the dealer is worth $2,000 or $7,000 depending on whether you want or not a Lexus.

- *Notice that the problem is that you do not have free access to the car market (you cannot buy and sell at the same price).*

The Law of One Price

Law of One Price: In competitive markets, assets or portfolios with the same cash flows must have the same price.

$\rightarrow$ Consider two securities, A and B. Suppose a third security, C, has the same cash-flows as A and B combined. Then, the Law of One Price implies that:

Price (C) = Price (A) + Price (B)

Example: The Law of One Price

Consider the following three securities:

- Security A generates $60 at time 0 and $80 at time 1, and currently trades at a price of $120.

- Security B generates $60 at time 0 and nothing at time 1, and currently trades at a price of $60.

- Security C generates nothing at time 0 and $80 at time 1.

Calculate the market price of security C?

Example: The Law of One Price

Notice that Security B *plus* security C generate the same cash flow as Security A:

    At time 0: $60   At time 1: $80

Since holding Security B *plus* security C is equivalent to holding Security A:

$$\text{Price A} = \text{Price B} + \text{Price C}$$

Hence

$$\text{Price C} = \text{Price A} - \text{Price B} = 120 - 60 = \$60$$

The Law of One Price

> **The Market Price of an Asset** is determined by the present value of the cash flows obtained from owning that asset.

Example: You are considering purchasing a security, a "bond," that pays $1000 without risk in one year, and has no other cash flows. If the interest rate is 5%, what should its price be?

$$\text{Price} = \frac{1{,}000}{1 + 0.05} = \$952.38$$

The Law of One Price

Arbitrage: The practice of buying and selling equivalent goods to take advantage of a price difference

Arbitrage Opportunity: Any situation in which it is possible to make a profit without taking any risk or making any investment

In competitive markets, if securities or portfolios of securities with the same cash flows do not have the same price, there is an arbitrage opportunity.

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Example: An Arbitrage Opportunity

You are considering purchasing a security, a "bond," that pays $1,000 without risk in one year, and has no other cash flows. The interest rate is 5%. If the bond is trading at $940, show that there is an arbitrage opportunity.

→ We saw in a previous example that the price of the bond "should" be:

$$\frac{1,000}{1+0.05} = \$952.38$$

→ Hence, if the bond is trading at $940 the bond is "cheaper" than it should be.

Example: An Arbitrage Opportunity (cont)

→ Consider the following trading strategy: Borrow $940 from the bank at 5% and buy the bond.

Net Cash Flow from Buying the Bond by Borrowing

	Today $	In One Year $
Borrow $940	$940	- $987 (= 940 x 1.05)
Buy the Bond	- $940	$1,000
Net Cash-Flow	**$0**	**$13**

Example: An Arbitrage Opportunity (cont)

→ Hence, there is an **arbitrage opportunity**: The trading strategy of borrowing $940 from the bank and buying the bond generates a positive profit of $13 in year 1 without making any net investment in year 0.

→ *How will a competitive capital market adjust?* The arbitrage opportunity will attract investors who will want to buy the "cheap" bond, and this increase in its demand will force the price of the bond to rise until it is equal to $952.38.

Transaction Costs

→ In a perfectly competitive market arbitrage opportunities are like money lying on the street; once they spotted they will quickly disappear.

→ *Notice that we have ignored that in most markets there is some **transaction costs**:*

    1. **Commissions** paid to your broker.

    2. **Bid-Ask spread**: Difference of the price you receive when you sell (bid price) and when you buy (ask price) a security.

Transaction Costs

→ When there are transaction costs, arbitrage keeps prices of equivalent assets close to each other. Prices can deviate but not by more that the amount of the transaction costs.

→ For most major financial markets, transaction costs are relatively small.

→ As a first approximation, unless explicitly stated, we will ignore transaction costs in our analysis.