Business Finance

BUSINESS FINANCE

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CONTENTS

Part I. Main Body

The purpose of this OER is to explain business finance concepts to students in a simplified manner without overwhelming them with too much materials. While this resource is written from the Australian perspective using Australian examples, the content of the resource is international in nature. Our students are from a wide range of countries and it is intended that the resource be useful in these environments. The content of the book is divided into ten topics.

The first topic discusses the three important decisions that managers in a typical business make. The decisions are in what type of asset they should invest, what are the potential sources of funds that can finance the assets and how much of the profit should be distributed among the owners of the business. In the first topic, we will cover the overview of the three important decisions, the financial and overall objective of the manager, and the fundamental concepts in finance. Further, we will cover financial mathematics which is necessary to understand financial concepts.

In the second and third topic, we will cover the topic of risk and return. In this topic, we will show how risk and return are related in the context of a business and how the return of an asset is determined. We will also discuss different types of risks that a business faces and how investors can diversify these risks when they are investing in the share market.

In topic four, we will discuss how to value bonds and how bond values and interest rates are related. How long does it take to get all the cash from the bond? How is this related to bond value.

In topic five, we will explain the valuation of shares using dividend discount and market based valuation models. What are the different methods that can be used to value a share? What is the difference between the value of a share and the price of a share? How can you value a share if it is not traded in the stock market?

In topics six and seven we will discuss different tools and methods that managers use to make investment decisions. What are the important expenditures that they need to take into account in order to make the investment decisions? What are the different risks that can affect these investment decisions?

In topics eight and nine we will discuss the different sources of funding available for a business. What are the cost and benefits of these sources of funding? How can a business optimise the mix of funding sources to maximise the value of a business? What is the role of life cycle in determining the mix of funding sources for the business? How to calculate the hurdle rate for the business?

In topic ten we will discuss how the manager decides how much of the profit should be distributed among the owners of the business. What are the different ways a manger can distribute profits to the shareholders? What is the effect on share price when profits are distributed among the owners of the business? How imputation tax system affects the decision to distribute profits among the shareholders. How a firms life cycle determines how much of the profit should be distributed among the owner of the business.

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COMPANY ANNUAL REPORTS

The Annual Report is an important document through which companies communicate details of their strategies, financial results and activities to shareholders and other stakeholders. Annual reports are usually very long. However, it is not necessary to read the whole document to be able to understand companies' strategies and activities. It is possible to focus on specific parts of the annual report and have a good understanding of the business.

For this unit you need to have an understanding of the following tables in the annual report:

- Consolidated financial position/Balance Sheet:
    - Assets = Liabilities + Shareholders' Equity
- The statement of profit or loss/Income statement
- Cash Flow Statement

Consolidated financial position/Balance Sheet

The balance sheet is a financial statement that reports a company's assets, liabilities, and equity as of a specific date. It provides a snapshot of a company's financial position at a given moment in time. The balance sheet is an important tool for stakeholders, including investors, creditors, and management, to assess the company's solvency and ability to meet its financial obligations.

The assets section of the balance sheet lists all of the company's resources, including cash, investments, property, and equipment, in order of liquidity. Liabilities, on the other hand, are obligations that the company owes to others, such as loans, accounts payable, and taxes owed. Equity represents the residual interest in the assets of the company after deducting its liabilities. This section includes information about the company's owners, including common stock, retained earnings, and other equity.

The balance sheet must balance, meaning that assets must equal the sum of liabilities and equity. This balance provides a picture of the company's financial position and its ability to pay its debts and generate profits.

The statement of profit or loss/Income statement

The profit and loss statement, also known as an income statement, is a financial report that summarizes a company's revenues and expenses over a specified period of time, typically a fiscal quarter or year. The purpose of the profit and loss statement is to show how much money a company has earned and spent during the reporting period and what its net income or loss was.

The profit and loss statement starts with the company's total revenue, which is the amount of money

it has earned from the sale of goods or services. This is followed by a list of all the expenses the company incurred during the period, such as the cost of goods sold, marketing expenses, salaries, rent, and taxes. The sum of all expenses is subtracted from total revenue to arrive at the company's net income or loss.

The profit and loss statement provides valuable information about a company's financial performance, including its operating efficiency, profitability, and ability to generate revenue. Investors, analysts, and other stakeholders use this information to assess a company's financial health and make informed decisions about investing in the company.

Cash Flow Statement

The cash flow statement is a financial report that provides information about a company's cash inflows and outflows over a specified period of time, typically a fiscal quarter or year. It gives stakeholders a comprehensive picture of the company's cash position, showing how much cash was generated from operations, how much was used for investments, and how much was provided by financing activities. It gives stakeholders a comprehensive picture of the company's cash position and its ability to generate cash from operations, make investments, and obtain funding from lenders and investors.

The cash flow statement is divided into three main sections: cash flows from operating activities, cash flows from investing activities, and cash flows from financing activities.

Cash flows from operating activities show the cash generated from the company's day-to-day operations, such as the sale of goods and services. This section also includes information about the company's cash payments for expenses such as salaries, rent, and taxes.

Cash flows from investing activities show the cash used for investments in property, plant, and equipment, as well as investments in other companies. This section provides information about the company's long-term cash needs and its ability to fund growth.

Cash flows from financing activities show the cash provided by or used for financing activities, such as issuing or repaying debt or issuing new stock. This section provides information about the company's ability to obtain funding from lenders and investors.

TOPIC 1: ROLE OF MANAGERS

Introduction

The first topic in Business Finance is the "Role of Managers". Business Finance is just another name for Corporate Finance. In Corporate Finance/Business Finance you will learn about the different decisions that a financial manager makes. In today's context, the Financial Manager is usually the Chief Financial Officer (CFO) of a company. They are the top financial manager within a firm. Other financial managers include Treasurer and Controller.

Financial manager or CFO: The Financial Manager/CFO answers all finance-related questions associated with the business.

Treasurer: The Treasurer overseas cash management, credit management, capital expenditures and financial planning.

Controller: The Controller oversees taxes, cost accounting, financial accounting and data processing.

In this topic, we will cover the following concepts:

Concept 1: Major types of Business structures

Concept 2: Three important business finance decisions

Concept 3: Financial objective and overall objective

Concept 4: Fundamental concepts in Finance

Concept 1: Major types of Business structures

There are 3 different types of business structures. They are sole traders, partnerships and company forms of business.

Sole Traders

The first type is a sole trader. A sole trader is an individual who runs and owns the business alone. Let's look at some of the advantages and disadvantages of a sole trader.

Advantages as a sole trader:

- It is relatively easy to start since the business starts as a small business.
- The sole trader is the least regulated by the [Australian Securities and Investments Commission (ASIC)](). ASIC is an independent Australian Government body. ASIC is Australia's integrated corporate, markets, financial services and consumer credit regulator. It administers the law effectively in Australian financial markets. It makes information about companies and other bodies available to

the public as soon as practicable. It takes whatever action it can, and which is necessary, to enforce and give effect to the law.

- Since the sole trader is a single owner. It gets to keep all the profits from the business.
- Business income and personal income are usually taxed at different rates. Business income can be taxed twice. You will learn about double taxation in Topic 10. Although the sole trader sets up a business, the income from the sole trader is taxed once as personal income.

Disadvantages as a sole trader:

- The business set up by the sole trader is limited to life of the owner unless the business is sold to somebody else.
- Whatever capital is required for the sole trader is limited to owner's personal wealth. Therefore, there is a limitation to how much the business can grow.
- There is unlimited liability. If the business has debt and incurs a loss, then the sole trader has to pay off the debt from their pocket.
- Difficult to sell ownership interest. Here ownership interest refers to any share an individual/party owns in the sole trader. Since the sole trader is owned by a single individual, only the individual has ownership interest.

Partnership

The second type of business is partnerships. In a partnership, two or more people combine their funds to set up a business. Let's look at some of the advantages and disadvantages of a partnership form of business.

Advantages to the partnerships form of business:

- There are two or more owners in a partnership. Responsibility to manage the business is shared among the owners. No single owner is responsible for the business.
- There is more knowledge and capital available for the partnerships since there are multiple owners in the business.
- Similar to a sole trader, it is relatively easy to start a partnership.
- Similar to a sole trader, partnership income is taxed once as personal income.

Disadvantages to the partnerships form of business:

- Similar to a sole trader, partnerships have unlimited liability. There are different types of partnerships:
  - General partnership. In this partnership, unlimited liability applies to all partners.
  - Limited partnership. In this partnership, unlimited liability applies to general partners. Some partners have limited liability for the amount they have contributed to the business. Limited partners are passive investors who do not participate in the day-to-day business.

- ◦ Incorporated limited partnerships. Limited liability for partners in the business but there has to be one general partner who has unlimited liability in the business.
- A partnership dissolves when one partner dies or wishes to sell it to others.
- It is rather difficult to transfer ownership in a partnership.

Company

The third form of business structure is a company. According to the 2001 corporations Act, a company is a separate legal entity. This is the first important distinction between a company, sole trader and partnership. A business set up by a sole trader or a partnership is not a legal entity. Let's look at some of the advantages and disadvantages of a company form of business.

Advantages to the company form of business:

- Company form of business has limited liability. What does limited liability mean? Let's say you have invested in company A. Let's say you have bought 20 shares of Company A and each share costs about $20. Now let's say Company A has a debt of 1 billion dollars and if company A goes bankrupt for some reason, then your loss will be only $400 =$20*20. The lenders are not going to recover any of the company's debt from your wealth. This is the second point of difference between sole traders and partnerships. Sole traders and partnerships have unlimited liability.
- The company form of business has unlimited life.
- In a company form of business there is a separation of ownership and management. Owners of the business hire manager to run the business.
- In a company form of business transfer of ownership is easy by selling shares.
- It is easier to raise capital by selling shares in the initial public offering.

Disadvantages to the company form of business:

- Dividends are paid from a firm's after-tax earnings. Dividends are not tax deductible.
- Because of the separation of ownership and management there could be agency issues. Agency issues arise when owners and managers interest are not aligned. Managers could behave opportunistically and maximise their own wealth rather than the shareholders' wealth. This type of agency issue is not there in sole trader or partnership form of business structures because in those form of business structure owners are managers.

Concept 2: Three important business finance decisions

The role of the financial manager/CFO is to make three important financial management decisions help firms run its operation efficiently. These are investing, financing and dividend decisions.

Investment Decisions/Capital Budgeting

Investment decisions are long-term in nature. What long-term investments or projects the investment should take on? This is the first important decision. The Company decides what type of assets they want to invest in. If you think carefully, the starting point of a business is the investment decision. A business starts because the owner decides to invest to produce a particular product or service. If you think about marketing a product or building strategy around a product it all starts with the decision to invest in a product or service which is the first business finance decision. A business keeps investing in new ideas and products on an ongoing basis. For example, facebook's decision to buy WhatsApp messenger is an investment decision. Disney planning to invest in a theme park in Rio is an investment decision.

Related to this is the working capital management decision where businesses manage the day-to-day finances of the firm.

Financing Decisions/Capital Structure:

In financing decisions, the company decides what will be the funding source for the investment decisions. What will be the source of capital for the investment decision? There are two broad sources of financing for the investment decisions. They are debt and equity. Should the company use debt, equity or a mix of both to finance the investment decisions. By debt it means taking a loan from the bank or selling bonds to investors. By equity its means selling shares to investors to raise the funds.

Dividend Decisions

Companies invest in products and services to generate profit. What does it do with the profit? Profit could be distributed among the shareholders or retained to be reinvested in the business. Think about the profit Disney will generate if it decides to build a theme park in Rio. Think about the profit Facebook is earning from its WhatsApp business. How much of the profit is reinvested in the business and how much is returned to the owners is the dividend decision.

Concept 3: Financial objective and overall objective

Financial Objective

In the previous concept, you learnt about the three important business decisions that a company makes. What do you think is the purpose/objective of these decisions? Is it to:

- Maximise revenue
- Minimise costs
- Maximise profit
- Maximise share price

Let's go over these choices one by one. Should the company maximise revenue? Maximising revenue cannot be the firm's objective because revenue does not take into account costs incurred by the firm.

How about minimising costs? The company can minimise costs by not investing in new investment

opportunities such as machines and buildings. This decision may not be good for the business since by not investing, the company can go out of business.

How about maximising profit? When we talk about profit, it is about accounting profit. But there are issues with this objective since changes in accounting rules can have a significant effect on the profit/ earnings number. Take the example of facebook (https://www.cfo.com/accounting-tax/2017/02/ accounting-change-facebook/). Changing the way the company account for employee stock option boosted Facebook's earnings by 934 million dollar.

How about maximise share price? The purpose of a company form of business to make money for its owners. Maximising the current share price increases the wealth of the owners of the firm. The share price should incorporate expectations about the future of the company. We will use this idea in Topic 5 Share Valuation. The idea of maximising share price is similar to maximising owners' equity for firms that are not publicly listed.

Overall objective

Before we settle on this, let's think about it carefully. Since the days of Milton Friedman, we have learnt that the objective of a company is to maximise share price. However, now it is time for the firms to act responsibly so that there is no further damage to society and the environment. Regulators are now imposing regulations to make sure corporations behave socially responsibly. Do customers/investors care about society and the environment?

Yes, they do. The 2021 global consumer insights pulse survey and another survey by creative research platform visual GPS showed that 55% of customers chose sustainable products that help protect the environment. Customers care if firms are behaving socially responsibly when they are communicating or advertising. Customers also said they are doing everything to minimise their impact on the environment.

Who are these customers? As it turns out, consumers in the Asia pacific region are more eco-friendly. Consumers from the Philippines, Indonesia, Vietnam, Egypt and UAE are more environmentally friendly. These eco-friendly consumers are aged between 23 to 32.

These are United Nations 17 sustainable development goals to transform the world and prepare the world for our future generations. If you think carefully, corporations can contribute to all 17 UN goals. To pick a few, they can contribute to good health and wellbeing, gender equality, responsible consumption, climate action, life below water, life on land and so on.

Image source: un.org

Should we rethink about the objective of firm? The revised overall objective of firms should be to maximise welfare. This overall objective will help firms archive their financial objective which is maximising their share price. Because investors will invest in firms that behave socially responsibly, the outcome of this will be a higher share price for the company in the long run. Academic research by Oliver Hart and Luigi Zingales also shows this (https://promarket.org/where-friedman-was-wrong/).

Concept 4: Fundamental concepts in Finance

In this topic you will learn five fundamental concepts in finance. They are:

- Time value of money
- Value of firm
- Risk aversion
- Market efficiency and asset pricing
- Agency relationship

Time value of money: This means a dollar is worth more today than tomorrow. This is because a dollar can be invested today to earn a return tomorrow. For example, if you invest $100 in 2022 at 10% interest

rate you will get $110 in 2023. If you are getting the money in 2023 then you will be better off getting $110 than $100.

Value of Firm: The second important concept is the value of a firm. This is also called enterprise value. The value of a firm is the sum of the market value of debt and the market value of equity. By market value, from whose perspective do we calculate the value? We calculate the value of debt and equity from the investors who want to invest in the company. You will learn about valuation concepts in Topic 4 and 5. Managers also care about the firm value because higher value of the firm can attract more investors to invest in the company.

Risk aversion: The concept of risk aversion is important in finance. The idea of risk aversion is usually discussed in the context of rational investors. A rational investor always prefers more money to less money. Rational investors do not like to take risk. Given a level of return, the rational investor will choose a less risky investment. To invest in a risky business, the investor would require a higher return. You will learn more about this in the next topic.

Think about these two alternative scenarios. In both cases the average pay off is $100. Which one would you prefer? As rational investors, you would choose alternative 1 because alternative 1 is less risky than alternative 2.

Alternative 1:

	Probability	Probability	Average Payoff
	0.5	0.5	
payoff	200	0	
	100	0	100

Alternative 2:

	Probability	Probability	Average Payoff
	0.9	0.1	
payoff	0	1000	
	0	100	100

Market Efficiency: In early January 2019, Apple cuts its revenue outlook in almost two decades due to slowing demand in the Chinese market. As a result of this Apple share fell by 7.8%. if we observe the sequence of events: Apple cuts its revenue outlook, rational investors receive this information and process it and take decisions by selling apple shares as a result apple share fell by 7.8%.

By efficient capital market, we mean that investors, managers and regulators have access to the same information. Investors are rational i.e they take decisions to maximise their benefit. In the previous

example, apple stock fail by 7.8% as a result of apple's announcement. Stock prices reflect all available information in the market.

Asset Pricing: What would determine the **return or price** of an asset? Note return of an asset depends on its price. The return on an asset will be determined by its riskiness. There are two types of risk. One is the systematic risk which is also called the market risk. These are risks related to macroeconomics such as changes in interest rates, inflation and other macroeconomic factors. The second type of risk is the unsystematic risk specific to the company. For example, if there is a labour strike or suppose a company commits fraud, then this would be a company-specific risk. The idea of asset pricing is that the return on an asset will only be determined by the level of market risk or systematic risk. The market will not price unsystematic risk or company-specific risk.

Agency Relationship: Agency relationship exists when owners hire managers to run the business. This is true in the context of a company form of business because owner (i.e shareholder) hire managers to run the business. It is important to understand the concept of agency conflict or agency issue. Agency issue arises when owners (shareholders) hires managers to run the business. Managers can act opportunistically to maximise their personal benefit rather than maximising shareholders' benefit. This type of agency issue is not there for sole traders or partnerships because the owners of sole traders and partnerships are in fact the managers.

We have witnessed many infamous examples in corporate world as a result of this agency issue/agency conflicts shown in this slide. The collapse of the Enron, Lehman brothers are all because of agency conflict where managers acted opportunistically to maximise their private benefit. More recently the royal commission into the misconduct in the financial industry in Australia which talks about the bad banking behaviour.

How to fix agency conflict: It is possible if both shareholders and managers interests are aligned. One way to achieve this by mapping manager's compensation to firm performance. A portion of manager's compensation is tied to firms' performance. Another way to have more independent directors on the board of corporate governance. By independent directors we mean directors that have no close family ties with the CEO. Regulation is another way to align the interests of shareholders and managers. The firm can face lawsuits if it fails to comply with the regulation. Another important aspect is corporate culture. Corporate culture is about integrity, ethics, doing the right thing, collaboration, employee safety and so on. Firms with a strong culture will have fewer of these agency issues. The 2017 Royal commission report also talks about how important it is to have a good corporate culture. CASH is King in Finance.

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TOPIC 2: RISK AND RETURN PART I

Risk and return is one of the important topics in finance. The economic foundation of this topic is based on the following assumptions:

Investor rationality: Investors are rational. This means they prefer more money to less and less risk to more, all else equal. The result of this assumption means that the ex-ante risk-return is positively related. Higher the risk higher return.

As risk-averse return-seekers, investors will take actions consistent with the rationality (above) assumptions. They will require higher returns to invest in riskier assets and are willing to accept lower returns on less risky assets.

Similarly, they will seek to reduce risk while attaining the desired level of return or increase return without exceeding the maximum acceptable level of risk.

In this topic, you will learn the following concepts.

Concept 1: Measures of return: Holding period return, Expected return

Concept 2: Measures of risk: variance, standard deviation

Concept 3: How investors use risk, return and Normal distribution to make decisions.

Concept 4: Relation between risk and return

Concept 5: Portfolio return and risk

Concept 1: Measures of return: Holding period return and Expected return.

Return

Return is the net dollar gain or loss of an investment over a specified time period. When you use the term rate of return, then it is expressed as a percentage of the investment's initial cost. Rate of return is calculated by determining the percentage change from the $ value in the beginning of the period until the end.

Dollar returns

Total dollar return = income from investment + capital gain (loss) due to change in price

Example:

You bought a bond for $950 one year ago. You have received two coupons of $30 each. You can sell the bond for $975 today. What is your total dollar return?

- Income = $30 + $30 = $60

- Capital gain = $975 – $950 = $25
- Total dollar return = $60 + $25 = $85

Percentage returns

It is generally more intuitive to think in terms of percentage rather than dollar returns:

- Dividend yield = income / beginning price
- Capital gains yield = (ending price – beginning price)/ beginning price
- Total percentage return = dividend yield + capital gains yield

Note that the 'dividend' yield is just the yield on cash flows received from the security (other than the selling price).

You will learn two types of returns; holding period returns and expected returns.

Example: Calculating Holding Period Returns

You bought a share for $35 in 2015, and you received dividends of $1.25. The share is now selling for $40 in 2022.

2.1   Holding period return (Discrete compounding)
$$R_T = R_{CA} + R_I = \frac{P_1 - P_0}{P_0} + \frac{CF_1}{P_0}$$

What is your total dollar return?

- Dollar return = $1.25 + ($40 – $35) = $6.25

What is your percentage return?

- Dividend yield = $1.25 / $35 = 3.57%
- Capital gains yield = ($40 – $35) / $35 = 14.29%
- Total percentage return = 3.57% + 14.29% = 17.86%

If you notice carefully, the total percentage return is equal to total dollar return / beginning share price.

- Total percentage return = $6.25 / $35 = 17.86%

Expected returns

Expected returns are based on the probabilities of possible "future" outcomes. This is measured in the context of the future.

2.3   Expected return on an asset (Probability given) $$E(R_{Asset}) = \sum_{i=1}^{n} (p_i \times R_i)$$

Suppose you have predicted the following returns for shares CCC and TTT in three possible states of the economy. What are the expected returns?

State	Probability	CCC	TTT
Boom	0.3	0.15	0.25
Normal	0.5	0.10	0.20
Recession	?	0.02	0.01

What is the probability of a recession? 1 – 0.3 – 0.5 = 0.2
     What is the expected return of share **CCC** and **TTT?**
     E(RCCC)=9.9%=0.3*0.15+0.5*0.10+0.2*0.02
     E(RTTT)=17.7%=0.3*0.25+0.5*0.20+0.2*0.01
     We also use **'expected'** means **'average'** if the process is repeated many times. The 'expected' return does not have to be a possible return.

2.4   Expected return on an asset (number of periods/ equal probability is given) $$E(R_{Asset}) = \frac{\sum_{i=1}^{n} R_i}{n}$$

Let's say you have daily/monthly returns of a stock for the last 10 years. In this case, you can use formula 2.4 to calculate "expected"/"average" return. This can give you some idea about what the return is going to be in the future. The reason you apply formula 2.4 in this case because these returns have already occurred so you assign equal probabilities to each occurrence of return.

     You need to annualise expected returns so that you can compare the performance of different securities available in the market. Annualise expected return so you can interpret it as return per annum.

Concept 2: Measures of risk: variance, standard

deviation

Risk is there whenever investors are not certain about the outcome of an investment. Risk is measured by variance or standard deviation. Essentially, it means by how much a particular return deviates from an expected return (average return).

Variance

When probabilities are given use 2.5 to calculate variance:

Example: Variance of CCC and TTT share.

2.5	Variance of return on an asset (Probability Given)	$Var(R) = \sigma_R^2 = \sum_{i=1}^{n} \left\{ (p_i \times [R_i - E(R)]^2 \right\}$

Variance of CCC = 0.3*(0.15 − 0.099)^2 + 0.5*(0.10 − 0.099)^2 + 0.2*(0.02 − 0.099)^2 = 0.00209

Variance of TTT = 0.3*(0.25 − 0.177)^2 + 0.5*(0.20 − 0.177)^2 + 0.2*(0.01 − 0.177)^2 = 0.007441

2.6	Variance of return on an asset	Population Variance: $Var(R) = \sigma_R^2 = \dfrac{\sum_{i=1}^{n} [R_i - E(R)]^2}{n}$ Sample Variance: $Var(R) = \sigma_R^2 = \dfrac{\sum_{i=1}^{n} [R_i - E(R)]^2}{n - 1}$

Let's say you have daily/monthly returns of a stock for the last 10 years. In this case you can use formula 2.6 to calculate variance of return. This can give you some idea about what the variance of return is going to be in the future. The reason you apply formula 2.6 in this case because these returns have already occurred, so you assign equal probabilities to each occurrence of return.

Standard Deviation

This is another measure of risk. It is just the square root of variance. It is easier to interpret than variance because it is measured in the same unit as the return (%).

Use formula 2.7 to compute standard deviation of returns.

2.7	Standard Deviation	$StDev(R) = \sqrt{Var(R)} = \sqrt{\sigma_R^2}$

Annualise the standard deviation of returns so you can interpret it as risk per annum.

Risk Premium

Risk premium is how much compensation you have to pay to investors to get them to invest in equity as a class of asset. Therefore, it is measured as the difference between average equity return and the risk-free rate (government bond rate).

If the average return of CCC and TTT are 9.9% and 17.7%. Risk-free rate is 4.15%, what is the risk premium of CCC and TTT?

Share CCC: 9.9 – 4.15 = 5.75%

Share TTT: 17.7 – 4.15 = 13.55%

Concept 3: How investors use risk, return and Normal distribution to make decisions.

Investors use mean, standard deviation of returns and normal distribution to make investment decisions. Let's first see what is normal distribution.

Normal distribution

The normal distribution is a symmetric, bell-shaped frequency distribution. It is completely defined by its mean and standard deviation. We will assume that returns are normally distributed. The probability on the left hand side is 50% and on the right hand side is 50%. The total area is 100% or 1.
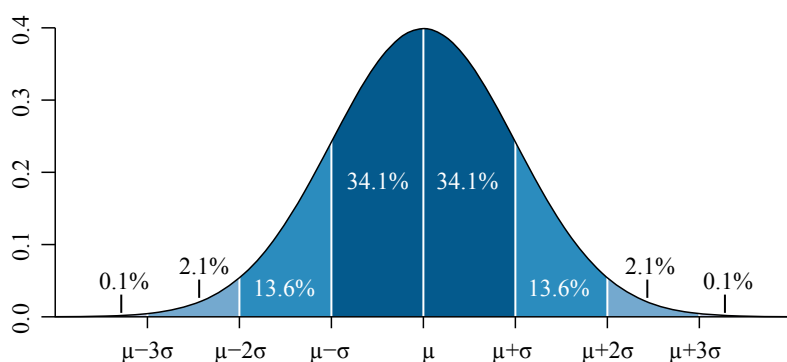
Image source: https://commons.wikimedia.org/wiki/File:Standard_deviation_diagram_micro.svg

Once you know the normal distribution rule you can apply these rules, mean and standard deviation to measure the probability if return is going to be positive, negative or range of returns.

The normal distribution is just the picture of all possible return outcomes since we have assumed returns are distributed normally. The mean return is the central point of the distribution. The standard deviation

is the average deviation from the mean. Assuming investors are rational, the mean is a proxy for expected return and the standard deviation is a proxy for total risk.

Concept 4: Relation between risk and return

There is also a trade-off between risk and return. Higher the risk, higher the return. To give you an example. When you buy a government bond, you get a return of about 2.5% (I am talking about the short term government bond rate here) but if you invest in a real estate stock then you may get a return of 6% or 7% but there is a high risk involved in it. If the market for real estate stock does not do well, you may lose all your money. However, in case of an Australian government bond there is no such risk. Note that there is a positive relation between risk and return.

There are three types of investors. They are:

Risk-neutral investor:

One whose utility is not affected by risk; when chooses to invest, investor focuses only on expected return

Risk-averse investor:

One who demands compensation in the form of higher expected returns in order to be induced into taking on more risk.

Risk-seeking investor:

One who derives utility from being exposed to high risk. The investor may be willing to give up some expected return in order to be exposed to additional risk.

The standard assumption in finance theory is all investors are risk averse.

This does not mean an investor will refuse to bear any risk at all.

Rather, investors consider risk as something undesirable, but may take if compensated with sufficient return; it's a trade-off between risk and return.

The risk of assets

The risk of an individual asset is summarised by the standard deviation (or variance) of returns.

Investors usually invest in a number of assets (a portfolio) and will be concerned about the risk of their overall portfolio.

You need to consider how individual asset risks will interact to provide you with overall portfolio risk.

Concept 5: Portfolio return and risk

A portfolio is a collection of assets. An asset's risk and return are important in how they affect the risk and return of the portfolio. The risk-return trade-off for a portfolio is measured by the portfolio expected return and standard deviation. The concept is similar to how you measure risk and return of individual assets.

Each individual has their own level of risk tolerance. Some people are naturally more inclined to take risk, and they will not require the same level of compensation as others for doing so. Individual risk preferences

also change through time. You may be willing to take more risk when you are young and without a family. But, once you start a family, your risk tolerance may drop.

Portfolio Weights

Suppose you have $15 000 to invest and you have purchased securities in the following amounts. What are your portfolio weights in each security?

- $2000 of CCC
- $3000 of KKK
- $4000 of NNN
- $6000 of BBB

Weight of CCC = $2000 / $15000 = 13.33%
   Weight of KKK = $3000 / $15000 = 20.00%
   Weight of NNN = $4000 / $15000 = 26.67%
   Weight of BBB = $6000 / $15000 = 40.00%
   Remember the sum of weights of a portfolio is always 100% or 1.
   13.33% +20.00% + 26.67% + 40.00% = 100%

Portfolio expected returns

The expected return of a portfolio is the weighted average of the expected returns of the individual assets in the portfolio.

   If portfolio return and probabilities are given for different state of the economy, you can find the expected return by finding the portfolio return in each possible state and computing the expected value as you did with individual securities.

   Let's say the expected return of the assets are given as follows:
   CCC 19.69%
   KKK: 5.25%
   NNN: 16.65%
   BBB: 18.24%
   What is the expected return of the portfolio.

2.11   Expected return for a portfolio

$$E(R_p) = \sum_{j=1}^{n} w_j E\left(R_j\right)$$

E(RP) = 0.133(19.69%) + 0.2(5.25%) + 0.267(16.65%) + 0.4(18.24%) = 15.41%

Portfolio variance

It is a bit complicated to compute portfolio variance of a 4-asset portfolio. Therefore, for MAF203 we will focus on only on a two-asset portfolio.

Portfolio (comprising two assets) risk depends on:

- the proportion of funds invested in each asset (w)
- the riskiness of the individual assets ($\sigma 2$)
- the relationship between each asset in the portfolio with respect to risk, correlation (ρij)
- for a two-asset portfolio the variance is:

2.12 Two-asset portfolio variance	$\sigma_{p}^{2} = w_1^2\,\sigma_1^2 + w_2^2\,\sigma_2^2 + 2w_1 w_2 \rho_{1,2}\,\sigma_1 \sigma_2$ *Or* $\sigma_p^2 = w_1^2\,\sigma_1^2 + w_2^2\,\sigma_2^2 + 2w_1 w_2 Cov\,(R_1,R_2)$

Relationship measures

- **Covariance**
  - This describes the relationship between two variables
  - It is positive if both variables move together in the same directions.
  - is negative if both variables move in the opposite direction.
- **Correlation coefficient**
  - It is another measure of the strength of a relationship between two variables. It is very similar to covariance.
  - It is equal to the covariance divided by the product of the asset's standard deviations.
  - It is simply a standardisation of the covariance, and for this reason is bounded by the range +1 to –1.
  - Correlations are measured in percentage. Therefore, it is easy to interpret than covariance.

Example:

Suppose you invest in a portfolio that consists of two stocks. Stock CCC is worth $50,000 and has a standard deviation of 20%. Stock BBB is worth $100,000 and has a standard deviation of 10%. The correlation between the two stocks is 0.85.

What are the portfolio weights?

What are the portfolio risk?

Total $ value of the portfolio = $100,000 + $50,000 = $150,000

Given this, the portfolio weight of Stock CCC is 33.3% = ($50,000 / $150,000)

Portfolio weight of Stock BBB is 66.7% = ($1000,000 / $150,000)

If you plug in this information into the formula, the variance is calculated to be:

Variance = (33.3%^2 x 20%^2) + (66.7%^2 x 10%^2) + (2 x 33.3% x 20% x 66.7% x 10% x 0.85) = 1.64%

Since Variance is not a very intuitive statistic to interpret on its own, you calculate the standard deviation, which is simply the square root of variance. In this example, the square root of 1.64% is 12.81%.

The portfolio risk is 12.81%

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TOPIC 3: RISK AND RETURN PART II

The importance of financial markets

Financial markets allow companies, governments and individuals to increase their utility. Savers can invest in financial assets so that they can defer consumption and earn a return to compensate them for doing so. Borrowers have better access to capital that is available so they can invest in productive assets. Financial markets also provide us with information about the returns that are required for various levels of risk.

In Topic 2, you learnt the foundation knowledge about risk and return. In Topic 3, you will continue to build on your knowledge of risk and return. More specifically, in this topic, you will learn the following concepts:

Concept 1: Portfolio diversification

Concept 2: Systematic vs unsystematic risk

Concept 3: The capital asset pricing model (CAPM) and the security market line (SML).

Concept 4: Capital Market Line (CML) and efficient portfolios

Concept 1: Portfolio diversification

Meaning of Diversification

Portfolio diversification means investing in several different asset classes or sectors. It does not mean holding a lot of assets. For example, if you own 50 real-estate shares, you are not diversified. However, if you own 50 shares that span 20 different industries, then you are diversified.

What is the principle of diversification?

The purpose of diversification is to substantially reduce the variability of returns without an equivalent reduction in expected returns. This reduction in risk arises because worse than expected returns from one asset are offset by better-than-expected returns from another. However, there is a minimum level of risk that cannot be diversified away and that is the systematic portion.

The degree of gain from diversification (risk reduction) increases as the correlation between the rates of return on two securities decreases:

- $r = +1$: Perfectively positive correlated. No risk reduction.
- $0 < r < 1$: Less than perfectively positive correlated. Some risk reduction.

- $r = < 0$: Negatively correlated. More risk reduction

Diversification with multiple assets

The more assets we incorporate into the portfolio, the greater the diversification benefits are. The key is the correlation between each pair of assets in the portfolio. For a diversified portfolio, the variance of the individual assets contributes little to the risk of the portfolio. The risk depends largely on the covariances between the returns on the assets.

Diversifiable risk

This is the risk that can be eliminated by combining assets into a portfolio. This is also known as unsystematic, unique or asset-specific risk. If you hold only one asset, or assets in the same industry, then you are exposing yourself to risk that you could diversify away.

Concept 2: Systematic vs unsystematic risk

In order to distinguish between systematic and unsystematic risk, you need to understand the concept of total risk.

Total risk = Systematic risk + Unsystematic risk

The standard deviation of returns is a measure of total risk. For well-diversified portfolios, unsystematic risk is very small. Consequently, the total risk for a diversified portfolio is essentially equivalent to the systematic risk

Systematic risk

One of the fundamental concept of finance is that there is a reward for bearing risk. This means there is no reward for bearing risk unnecessarily. In other words, there is no reward for bearing unsystematic risk.

The expected return on a risky asset depends only on that asset's systematic risk since unsystematic risk can be diversified away. One simple way investors can achieve diversification is by investing in mutual funds and ETFs.

Measuring systematic risk

How do we measure systematic risk? We use the beta coefficient.

2.13 Asset's beta (systematic Risk)	$$\beta_i = \frac{Cov(R_i, R_m)}{\sigma_M{}^2} \text{ or } \beta_i = \frac{\rho_{i,M} \times \sigma_i}{\sigma_M}$$
	Note: i denotes specific asset/stock

What does beta tell us?

- A beta of 1 implies the asset has the same systematic risk as the overall market (AORD index)
- A beta < 1 implies the asset has less systematic risk than the overall market
- A beta > 1 implies the asset has more systematic risk than the overall market

Total vs systematic risk

Consider the following information:

Security	Standard Deviation	Beta
CCC	25%	1.50
KKK	30%	0.97

- Which security has more total risk?
- Which security has more systematic risk?
- Which security should have the higher expected return?

Portfolio betas

Consider our previous example with the following four securities.

Security	Weight	Beta
CCC	0.133	1.685
KKK	0.2	0.195
NNN	0.267	1.161
BBB	0.4	1.434

What is the portfolio beta?

| 2.16 | Portfolio beta | $$\beta_{n \; Asset \; portfolio} = \sum_{i=1}^{n} \left(w_i \times \beta_i \right)$$ |

Beta = 0.133(1.685) + 0.2(0.195) +0.267(1.161) + 0.4(1.434) = 1.147

Portfolio performance appraisal

Investors need a way to measure the performance of their portfolio. You need to measure the portfolio risk and then measure the performance against a benchmark with the same risk. Portfolio performance may differ from the benchmark due to:

- asset allocation
- market timing
- security selection
- random influences.

Portfolio performance measures

Simple benchmark index is the most common approach. Another approach is to compare to closest index.

Sharpe ratio

$$Sharpe \; ratio = \frac{\overline{r_p} - \overline{r_f}}{\overline{\sigma_p}}$$

The Sharpe ratio measures excess return per unit of total risk.

where

$\overline{r_p}$ = the average portfolio return

$\overline{r_f}$ = the average risk-free rate of return

$\overline{\sigma_p}$ = the standard deviation of the returns on the portfolio.

Compare the Sharpe ratio of the portfolio to the Sharpe ratio of the benchmark.

Treynor ratio

$$Treynor\ ratio = \frac{\overline{r_p} - \overline{r_f}}{\overline{\beta_p}}$$

The Treynor ratio measures excess return per unit of systematic risk.

where

$\overline{\beta_p}$ = an estimate of the portfolios' systematic risk

Compare the Treynor ratio of the portfolio to the Treynor ratio of the benchmark.

Beta and the risk premium

Recall the definition of risk premium. It is Expected return – Risk-free rate.

The higher the beta, the greater the risk premium should be. Can we define the relationship between the risk premium and beta so that we can estimate the expected return? Yes, you can.

Concept 3: The capital asset pricing model (CAPM) and the security market line (SML).

The pricing of risky assets

What determines the expected rate of return on an individual asset? Risky assets will be priced such that there is a relationship between returns and systematic risk. Investors need to be sufficiently compensated for taking on the risks associated with the investment.

What determines the expected rate of return on an individual asset?

Risky assets will be priced such that there is a relationship between returns and systematic risk. Investors need to be sufficiently compensated for taking on the risks associated with the investment.

The capital market will only reward investors for bearing risk that cannot be eliminated by diversification. Unsystematic risk can be diversified away, so the capital market will not reward investors for taking this type of firm specific risk.

However, CAPM states the reward for bearing systematic risk is a higher expected return, consistent with the idea of higher risk requires higher return.

In equilibrium, the expected return on a risky asset i (or an inefficient portfolio), is given by the security market line:

$$E\left(R_i\right) = R_f + \left(\frac{E\left(R_M\right) - R_f}{\sigma_M^2}\right) Cov(R_i, R_M)$$

The covariance term is the only explanatory factor in the equation that is specific to asset i.

As $Cov(R_i, R_M)$ is the risk of an asset held as part of the market portfolio, and s^2_M is the risk of the market portfolio, *beta* (b_i) measures the risk of i relative to the risk of the market as a whole.

We can thus write the SML as the CAPM equation:

2.15 CAPM/SML

$$E(R_i) = R_f + \beta_i \left[E(R_m) - R_f\right]$$

Note: i denotes specific asset/stock

Implementation of the CAPM

The three components of the CAPM are R_f, B_i and $E(R_M)$. They can be obtained as follows:

- R_f = the yield of the government security with the same term as the proposed project
- B_i = source time series data on the rates of return on shares and market portfolio; use market model to estimate beta
- $E(R_M)$ = two ways to calculate, either calculate the average return in share market index over a long period of time and deduct R_f or estimate market risk premium directly over a long period of time.

Tests of the CAPM

Early empirical evidence was supportive of CAPM. Roll's critique (1977) states that the market portfolio (theoretically all assets in the economy) is unobservable in practice. Tests of the CAPM can only determine whether the market portfolio used is efficient. Factors other than beta were shown to explain returns. However, CAPM is a useful tool when thinking about asset returns.

Fama–French three-factor model

Fama and French (1992) provide evidence on factors that explain asset returns — no support for CAPM; support for firm size, leverage, P–E, BV/MV, though not definitive. Fama and French (1995) leads to the most common three-factor model: Includes the CAPM market factor, a small minus large portfolio factor (SML) and a high minus low market to book portfolio (HML). Empirical evidence of Fama-French three-factor can be found from the following website:

http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

This model is supported by Australian data. While the three-factor model is empirically robust, it suffers from difficult economic interpretation. Why do company size and BV/MV explain asset returns? The three-factor model is now very common in empirical research. Carhart (1997) added a fourth factor called momentum. The momentum factor is based on the finding that the companies that have had high (low) returns in the past 3–12 months have high (low) returns in the next 3–12 months.

Concept 4: Capital Market Line (CML) and efficient portfolios

The set of all feasible portfolios that can be constructed from a given set of risky assets.
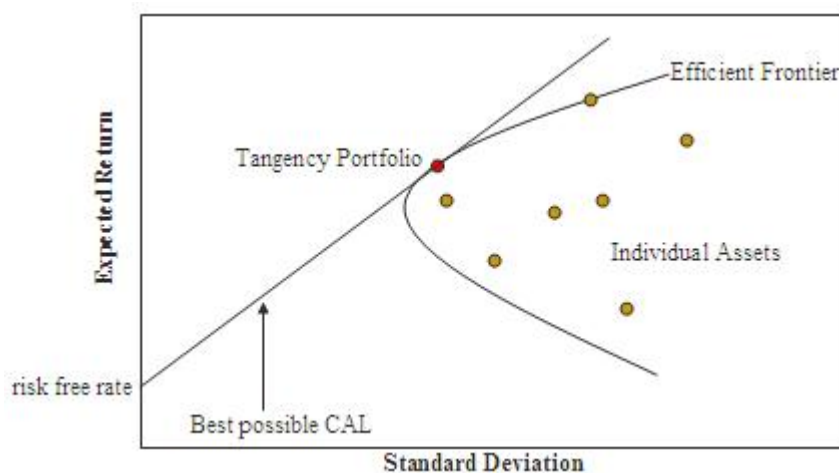
Image: Markowitz frontier (Public Domain) – CAL is Capital Allocation Line.

Investor will try to secure a portfolio on the efficient frontier. The efficient frontier is determined on the basis of dominance. A portfolio is efficient if:

- no other portfolio has a higher return for the same risk, or
- no other portfolio has a lower risk for the same return.

Investors are a diverse group and, therefore, each investor may prefer a different point along the efficient frontier.

An efficient frontier is a graph that shows the trade-off between risk and return for a set of investments. The efficient frontier is constructed by plotting the expected return of each investment against its standard deviation, which is a measure of its volatility or risk. The efficient frontier represents the set of portfolios that offer the highest expected return for a given level of risk, or the lowest risk for a given level of expected return. Portfolios that lie on the efficient frontier are considered to be "efficient" because they provide the maximum possible return for a given level of risk, or the minimum possible risk for a given level of return.

In financial analysis, the efficient frontier is often represented as a curve on a two-dimensional graph, with expected return on the y-axis and standard deviation on the x-axis. The curve starts at the point with the lowest standard deviation and rises to the point with the highest expected return. The portfolios that

lie on the efficient frontier are those that maximize expected return for a given level of risk, or minimize risk for a given level of expected return.

The capital market line

Combining the efficient frontier with preferences, investors choose an optimal portfolio. This can be enhanced by introducing a risk-free asset: The opportunity set for investors is expanded and results in a new efficient frontier—capital market line (CML).

The CML represents the efficient set of all portfolios that provides the investor with the best possible investment opportunities when a risk-free asset is available. The CML links the risk-free asset with the optimal risky portfolio (M). Investors can then vary the riskiness of their portfolio investment by changing weights in the risk-free asset and portfolio M. This changes their return according to the CML:

2.14 Capital Market Line (CML)	$$E\left(R_P\right) = R_f + \left(\frac{E\left(R_m\right) - R_f}{\sigma_M}\right)\sigma_P$$

Appendix:

Expected vs unexpected returns

Realised returns are generally not equal to expected returns. The realised return has the expected component and the unexpected component. At any point in time, the unexpected return can be either positive or negative. Over time, the average of the unexpected return component is zero.

Announcements and news

Announcements and news contain both an expected component and a surprise component. It is the surprise component that affects a share's price and therefore its return. This is obvious when you watch how share prices move when an unexpected announcement is made or earnings are different than anticipated.

Efficient markets

Efficient markets are a result of investors trading on the unexpected portion of announcements. The easier it is to trade on surprises, the more efficient markets should be. Efficient markets involve random price changes because you cannot predict surprises.

Efficient capital markets:

In efficient capital markets, share prices are in equilibrium or are 'fairly' priced. If this is true, then you should not be able to earn 'abnormal' or 'excess' returns. Efficient markets do not imply that investors cannot earn a positive return in the share market. They can return based on the systematic risk of the asset.

Reaction of share price to new information in efficient and inefficient markets

What makes markets efficient?

There are many investors do research in the capital market. As new information comes to market, this

information is analysed and trades are made based on this information. Therefore, prices should reflect all available public information. If investors stop researching shares, then the market will not be efficient. One consequence of the wider availability of information and lower transaction costs is that the market will be more volatile. It is easier to trade on 'small' news instead of just big events. It is also important to remember that not all available information is reliable. It's important to still do the research and not jump on everything that crosses the news wire.

Common misconceptions about the efficient market

Efficient markets do not mean that you cannot make money. They do mean that, on average, you will earn a return that is appropriate for the risk undertaken. There is not a bias in prices that can be exploited to earn excess returns. Market efficiency will not protect you from wrong choices if you do not diversify. You still do not want to 'put all your eggs in one basket'.

Claims of superior performance in share picking are very common and often hard to verify. However, if markets are semi-strong form efficient, the ability to consistently earn excess returns is unlikely.

Even the experts get confused about the meaning of capital market efficiency. Consider the following quote from a column in Forbes magazine: 'Popular delusion three: Markets are efficient. The efficient market hypothesis, or EMH, would do credit to medieval alchemists and is about as scientific as their efforts to turn base metals into gold.' The writer is definitely not a proponent of EMH. Now consider this quote: 'The truth is nobody can consistently predict the ups and downs of the market.' This statement is clearly consistent with the EMH. Ironically, the same person wrote both statements in the same column with exactly nine lines of type separating them.

Strong form efficiency

In strong form of efficiency prices reflect all information, including public and private. If the market is strong form efficient, then investors could not earn abnormal returns regardless of the information they possessed

Empirical evidence indicates that markets are not strong form efficient and that insiders could earn abnormal returns.

Semi-strong form efficiency

Prices reflect all publicly available information including trading information, annual reports, press releases, etc. If the market is semi-strong form efficient, then investors cannot earn abnormal returns by trading on public information. Implies that fundamental analysis will not lead to abnormal returns

Empirical evidence suggests that some shares are semi-strong form efficient, but not all. Larger, more closely followed shares are more likely to be semi-strong form efficient. Small, more thinly traded shares may not be semi-strong form efficient, but liquidity costs may wipe out any abnormal returns that are available.

Weak form efficiency

Prices reflect all past market information such as price and volume. If the market is weak form efficient, then investors cannot earn abnormal returns by trading on market information. Implies that technical analysis will not lead to abnormal returns. Empirical evidence indicates that markets are generally weak form efficient. Just because technical analysis shouldn't lead to abnormal returns, that doesn't mean that you won't earn fair returns using it—efficient markets imply that you will. There are also many technical

trading rules that have never been empirically tested; so it is possible that one of them might lead to abnormal returns. But if it is well publicised, then any abnormal returns that were available will soon evaporate.

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TOPIC 4: BOND VALUATION

In this topic, you will learn different concepts on bonds. A bond is a debt security. Borrowers issue bonds to raise money from investors willing to lend them money for a certain amount of time.

When you buy a bond, you are lending to the bond issuer. The issuer may be a government, municipality, or corporation. In return, the bond issuer promises to pay you a specified rate of interest during the life of the bond and to repay the principal. The interest payment is known as the coupon and the principal is known as the face value or par value of the bond.

Bond markets are primarily over-the-counter transactions with dealers connected electronically. There are extremely large number of bond issues, but generally low daily volume in single issues. Therefore, it makes getting up-to-date prices of the bonds difficult, particularly for a small company. However, government securities are an exception. The reported volume of bonds traded is not indicative of total activity in the bond market due to off-exchange transactions.

In this topic, you will learn the following concepts:

Concept 1: Articulate characteristics and types of bonds.

Concept 2: Bond valuation.

Concept 3: Relation between interest rate and bond value

Concept 4: Duration of bonds

Concept 5: Factors that affect bond coupon rate

Concept 1: Articulate characteristics and types of bonds.

Bonds are classified based on:

- Registered or bearer bonds.
- Security on the bond
  - It can be collateral—secured by financial securities
  - It can be mortgage—secured by real property, normally land or buildings
  - It can be notes—unsecured debt
- Seniority
  - Secured bonds: Secured debt is less risky because the income from the security is used to pay it off first
  - Unsecured bonds

Potential bond issuers would be willing to pay rating agencies tens of thousands of dollars in order to receive a rating. Even though, the possibility is that the resulting rating could be less favourable than expected. This is because there is agency cost and information asymmetry between the bond issuer and buyer. A bond rating can mitigate information asymmetry.

By looking at bond ratings, you can identify if the bond is of investment quality or junk. Investment grade bonds can be high grade and medium grade where the capacity of repayment is strong or very strong.

High grade bonds are Moody's Aaa and S&P AAA—capacity to pay is extremely strong and Moody's Aa and S&P AA—capacity to pay is very strong

Medium Grade bonds are Moody's A and S&P A—capacity to pay is strong, but more susceptible to changes in circumstances and Moody's Baa and S&P BBB—capacity to pay is adequate, adverse conditions will have more impact on the firm's ability to pay

Speculative bonds can be low or very low grades. Low-grade bonds are Moody's Ba and B, S&P BB and B. It is considered possible that the capacity to pay will degenerate.

Very low-grade bonds are Moody's C (and below) and S&P C (and below) income bonds with no interest being paid, or in default with principal and interest in arrears.

There are other types of bonds:

- Catastrophe bonds: These are issued by property and casualty companies. It pays interest and principal as usual unless claims reach a certain threshold for a single disaster. At that point, bondholders may lose all remaining payments. These types of bonds have higher coupon rate.
- Income bonds: For these bonds coupon payments depend on level of corporate income. If earnings are not enough to cover the interest payment, it is not owed. These types of bonds have higher coupon rate.
- Put bonds: bondholder can force the company to buy the bond back prior to maturity. These types of bonds have lower coupon rate.

Concept 2: Bond valuation

Financial assets such as bonds are valued by discounting the known future cash flows at the market interest rate and adding the resultant present values of the future cash flows.

A coupon is also known as yield. However, yield to maturity is the market return of similar bonds.

Valuing a bill

Suppose you want to borrow $100 000 for 180 days. Currently, 180-day bills are trading in the market at a yield of 4.25%. What amount would you receive today if you issued this bill?

We will use the below formula with a little change since we are valuing a 180 day bill.

$$3.3 \quad \text{Price of a zero-coupon bond} \qquad P_B = \frac{F_{mt}}{(1 + r/m)^{mt}}$$

Daily rate = 0.0425 ÷ 365 = 0.00011
   Rate for 180 days = 0.00011 * 180 = 0.0209
   Price = $100 000 / (1+ 0.0209)
   = $97 947.14

Valuing a discount bond with annual coupons

Consider a bond with a coupon rate of 10% with annual coupons. The face value is $1000, and the bond has 5 years to maturity. The yield to maturity is 11%. What is the value of the bond?

$$3.1 \quad \text{Price of a bond} \qquad P_B = \frac{C}{r} \times \left[1 - \frac{1}{(1+r)^t} \right] + \frac{F_t}{(1+r)^t}$$

Price = PV of annuity + PV of lump sum
   Price = $100[1 - 1/(1.11)^5] / 0.11 + 1000 / (1.11)^5$
   Price = 369.59 + 593.45 = 963.04

Valuing a premium bond with annual coupons

Suppose you are thinking about buying a bond that has a 10% annual coupon and a face value of $1000. There are 20 years to maturity, and the yield to maturity is 8%. What is the price of this bond?

$$3.1 \quad \text{Price of a bond} \qquad P_B = \frac{C}{r} \times \left[1 - \frac{1}{(1+r)^t} \right] + \frac{F_t}{(1+r)^t}$$

Price = PV of annuity + PV of lump sum
   Price = $100[1 - 1/(1.08)^{20}] / 0.08 + 1000 /(1.08)^{20}$
   Price= 981.81 + 214.55 = 1196.36

Concept 3: Relation between interest rate and bond value

In this section you will understand the relation between bond prices and interest rate. This is in the form of bond pricing theorem.

Bond pricing theorems

Theorem 1: Bond prices are inversely related to interest rate movements. As interest rates decline, prices of bonds rise; as interest rates rise, prices of bonds decline.

Theorem 2: For a given change in interest rates, the prices of long term bonds will change more than short term bonds.

Theorem 3: For a given change in interest rates, the prices of lower coupon bonds change more than the prices for higher coupon bonds.

Further,
   If YTM = coupon rate, face value = bond price
   If YTM > coupon rate, face value > bond price

- Why? The discount provides yield above coupon rate
- Price below face value, called a discount bond

If YTM < coupon rate, face value < bond price

- Why? Higher coupon rate causes value above face value
- Price above face value, called a premium bond

Notice, that there are the purely mechanical reasons for these results. You know that present values decrease as rates increase. Therefore, if you increase your yield above the coupon, the present value (price) must decrease below face value. On the other hand, if you decrease your yield below the coupon, the present value (price) must increase above face value.

There are also more intuitive ways to explain this relationship. Note that the yield to maturity is the interest rate on newly issued debt of the same risk and that debt would be issued so that the coupon = yield. Then, suppose that the coupon rate is 8% and the yield is 9%. Which bond you would be willing to pay more for? You will probably think that you would pay more for the new bond. Since it is priced to sell at

$1000, the 8% bond must sell for less than $1000. The same logic works if the new bond has a yield and coupon less than 8%.

Another way to look at it is that return = 'dividend yield' + capital gains yield. The 'dividend yield' in this case is just the coupon rate. The capital gains yield has to make up the difference to reach the yield to maturity. Therefore, if the coupon rate is 8% and the YTM is 9%, the capital gains yield must equal approximately 1%. The only way to have a capital gains yield of 1% is if the bond is selling for less than face value. (If price = face value, there is no capital gain.) Technically, it is the current yield, not the coupon rate + capital gains yield, but from an intuitive standpoint, this helps some students remember the relationship and current yields and coupon rates are normally reasonably close.

Interest rate risk

The interest rate risk is the chance that interest rates will change in the future, thereby changing the value of an asset.

Interest rate risk in the context of Bond Valuation

Interest rate risk refers to the risk that the value of a bond will change due to changes in the prevailing interest rates in the economy. In general, when interest rates rise, the value of existing bonds with lower interest rates decreases, since investors can obtain higher returns by investing in new bonds that offer higher interest rates. Conversely, when interest rates fall, the value of existing bonds with higher interest rates increases, since investors will pay a premium to obtain these higher returns.

Interest rate risk is particularly relevant in the context of bond valuation, since the value of a bond is determined by the present value of its future cash flows, which are discounted using an interest rate. As interest rates change, the discount rate used to value the bond will also change, which in turn will affect the bond's present value. Thus, changes in interest rates can have a significant impact on the value of a bond, and investors must take this risk into account when valuing and investing in bonds.

Risk-free bonds are typically defined as bonds issued by a government with a low default risk, such as the United States Treasury bonds or Research Bank of Australia bonds. While these bonds may be considered relatively safe, they are still subject to certain types of risks.

One type of risk faced by risk-free bonds is **interest rate risk**. As mentioned earlier, changes in prevailing interest rates can affect the value of a bond. Even though risk-free bonds may be considered to have a lower default risk, the value of these bonds can still be impacted by changes in interest rates.

Another type of risk is **inflation risk**. Inflation risk refers to the possibility that inflation will erode the purchasing power of the bond's future cash flows. Inflation can reduce the real value of the bond's future cash flows, reducing the bond's overall return.

There is also the risk of **liquidity risk**. This refers to the possibility that there may not be enough buyers or sellers for the bond, making it difficult to sell or buy the bond at a fair price.

Finally, there is **reinvestment risk**, which refers to the possibility that when a bond matures or is sold,

the investor may not be able to find a similar investment that provides the same return. If interest rates have fallen, the investor may have to reinvest their money in a lower yielding bond, which can lead to a lower overall return.

Inflation and interest rates

Inflation and interest rates are often closely related, as changes in inflation can impact interest rates, and vice versa.

In general, inflation refers to the rate at which the general level of prices for goods and services is increasing over time. When inflation is high, the purchasing power of money decreases, since the same amount of money can buy fewer goods and services. Central banks may respond to high inflation by increasing interest rates, in order to slow down economic growth and reduce demand for goods and services. This, in turn, can help to reduce inflation, since higher interest rates can make borrowing more expensive and slow down spending.

On the other hand, when inflation is low, central banks may decrease interest rates in order to stimulate economic growth and encourage borrowing and spending. Lower interest rates can make borrowing cheaper and incentivize businesses to invest in new projects and hire more workers, which can help to stimulate economic activity.

Thus, there is often an inverse relationship between inflation and interest rates: as inflation increases, interest rates tend to increase, and as inflation decreases, interest rates tend to decrease. However, the relationship between inflation and interest rates is not always straightforward, and other factors such as economic growth, monetary policy, and global events can also impact both inflation and interest rates.

The Fisher effect: The Fisher effect defines the relationship between real rates, nominal rates and inflation:

$(1 + R) = (1 + r)(1 + h)$, where

R = nominal rate

r = real rate

h = expected inflation rate

Approximation is $R = r + h$

The approximation works well with 'normal' real rates of interest and expected inflation. If the expected inflation rate is high, then there can be a substantial difference. For example, currently, the inflation rate is high. Therefore the approximation and the actual calculation will vary to a greater extent. Let's take an example.

If you require a 10% real return and you expect inflation to be 8%, what is the nominal rate?

R = (1.1)(1.08) − 1 = 0.188 = 18.8%

Approximation: R = 10% + 8% = 18%

Because the real return and expected inflation are relatively high, there is a significant difference between the actual Fisher effect and the approximation.

In late 1997 and early 1998 there was a great deal of talk about the effects of deflation among financial experts, due in large part to the combined effects of continuing decreases in energy prices, as well as the upheaval in Asian economies and the subsequent devaluation of several currencies. How might this affect observed yields? According to the Fisher Effect, you should observe lower nominal rates and higher real rates and that is roughly what happened. The opposite situation, however, occurred in and around 2008.

What is happening now?

Term structure of interest rates

The term structure of interest rates, also known as the yield curve, refers to the relationship between the yield on bonds of different maturities. In other words, it is a graph that shows the interest rates for different periods of time, ranging from short-term to long-term bonds.

In a typical yield curve, short-term bonds tend to have lower yields than long-term bonds, reflecting the fact that investors generally expect to be compensated with higher returns for taking on the risk of holding bonds for longer periods of time. This pattern is known as a normal yield curve.

However, the yield curve can also take on other shapes depending on market conditions. For example, in a flat yield curve, yields are similar for bonds of different maturities. In a steep yield curve, long-term yields are significantly higher than short-term yields.

.The term structure is illustrated by the yield curve, which plots bond yield against term to maturity:

- **Normal – upward-sloping; long-term yields are higher than short-term yields**
- **Inverted – downward-sloping; long-term yields are lower than short-term yields**
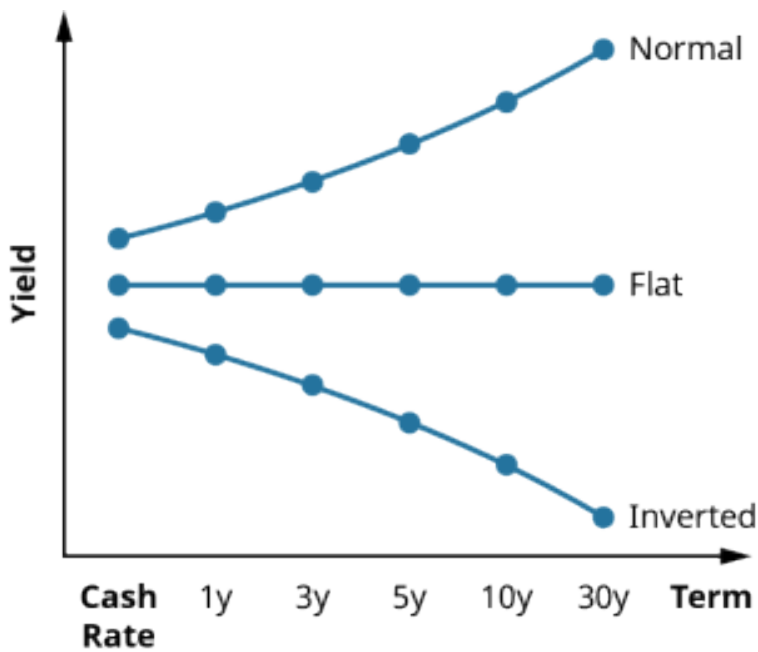- **Flat – imply interest rates unlikely to change in near future.**

Image: Principles of Finance by OpenStax CC BY 4.0 International License.

The shape of the yield curve can be influenced by several factors, including inflation expectations, economic growth expectations, monetary policy decisions, and market demand for different types of bonds. Analysts and investors often study the yield curve as an indicator of future economic and financial conditions, as it can provide insights into market expectations for inflation, growth, and interest rates.

The term structure of interest rates and the risk of default are two key factors that are important in valuing debt securities.

The term structure of interest rates is important because it determines the interest rate that will be paid on a bond or other debt security. The term structure refers to the relationship between the yields on bonds of different maturities, and this relationship can have a significant impact on the value of a bond. Typically, longer-term bonds have higher yields than shorter-term bonds, reflecting the fact that investors demand a higher return for holding bonds for longer periods of time. When valuing a bond, the term structure of interest rates is used to determine the appropriate discount rate to apply to the bond's cash flows.

The risk of default is also an important consideration when valuing debt securities. The risk of default refers to the possibility that the issuer of a bond will be unable to make its payments on time or in full. If an issuer defaults on its obligations, investors may not receive the full amount of principal and interest that they are owed. This risk is reflected in the credit rating of a bond, which is an assessment of the issuer's ability to make its payments. When valuing a bond, the risk of default is used to adjust the bond's cash flows to reflect the possibility of a partial or total loss of principal or interest.

Overall, both the term structure of interest rates and the risk of default are important factors to consider when valuing debt securities. These factors can have a significant impact on the value of a bond, and investors must take them into account when making investment decisions.

Concept 4: Duration of bonds

Duration

Duration is a financial metric used to measure the sensitivity of a bond's price to changes in interest rates. It is a key concept in bond valuation and is used by investors to manage interest rate risk.

Duration takes into account both the amount and timing of a bond's cash flows, and it measures the average time it takes for an investor to receive the bond's cash flows, taking into account the present value of each cash flow. In other words, duration provides an estimate of the bond's price sensitivity to interest rate changes, based on the bond's cash flows and the present value of those cash flows.

Duration is expressed in years, and it provides a rough estimate of how much the price of a bond will change in response to a 1% change in interest rates. For example, if a bond has a duration of 5 years and interest rates increase by 1%, the price of the bond is expected to decrease by approximately 5%. Similarly, if interest rates decrease by 1%, the price of the bond is expected to increase by approximately 5%.

Duration is an important tool for investors because it allows them to assess the risk associated with changes in interest rates. By understanding a bond's duration, investors can adjust their portfolio to manage interest rate risk, by selecting bonds with shorter or longer durations based on their investment objectives and risk tolerance.

.Use the following formula to calculate duration of a bond.

	$$D = \sum_{t=1}^{t} \left(\frac{PV(C_t)}{P_0} \right) t = \frac{PV(C_1) \times 1}{P_0} + \frac{PV(C_2) \times 2}{P_0} + \ldots + \frac{PV(C_n) \times t}{P_0}$$
3.4 Duration of a bond	$$D = \frac{\sum_{t=1}^{t} \frac{C_t \times t}{(1+r)^t}}{\sum_{t=1}^{t} \frac{C_i tt}{(1+r)^t}} = \frac{\frac{C_1 \times 1}{(1+r)^1} + \frac{C_2 \times 2}{(1+r)^2} + \ldots + \frac{C_t \times t}{(1+r)^t}}{\frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \ldots + \frac{C_t}{(1+r)^t}}$$

Duration and immunisation

Duration and immunisation are both concepts used in fixed income investing to manage interest rate risk. Duration is a measure of a bond's sensitivity to changes in interest rates. It measures the average time it takes for an investor to receive the bond's cash flows, taking into account the present value of each cash flow. By calculating the duration of a portfolio of bonds, investors can assess the portfolio's sensitivity to changes in interest rates.

Immunisation is an investment strategy used to minimize interest rate risk. The goal of immunisation is to structure a portfolio of bonds so that the portfolio's duration matches the investor's investment horizon. This means that the portfolio's cash flows are timed to coincide with the investor's expected future cash needs.

To achieve immunisation, investors may need to adjust the composition of their portfolio by buying or selling bonds. If interest rates are expected to increase, for example, an investor may need to sell bonds with longer durations and buy bonds with shorter durations to reduce the portfolio's overall duration. Conversely, if interest rates are expected to decrease, an investor may need to sell bonds with shorter durations and buy bonds with longer durations to increase the portfolio's overall duration.

By matching the duration of the portfolio with the investor's investment horizon, immunization can provide a degree of protection against changes in interest rates, while still allowing the investor to receive the expected cash flows from the portfolio. However, it's worth noting that immunisation does not completely eliminate interest rate risk, as unexpected changes in interest rates can still impact the value of the portfolio.

.Duration and elasticity

When interest rates change, all bond prices respond in the opposite direction, but not to the same extent. Different bonds have different interest elasticities.

Bond duration has a tight link with interest rate elasticity and the price response to interest rate changes. The interest elasticity of a bond's price is proportional to its duration.

3.5	Interest elasticity of a bond's price	$E = -\left(\dfrac{1}{1+r}\right)D$

Duration and bond price changes

Given that duration can be related to interest elasticity, it follows that it is possible to use duration to work out the approximate percentage price change that will occur for a given change in interest rates.

For 'small', discrete changes in interest rates and bond prices, we have the following approximation:

3.6	Percentage change in price of bond	$\dfrac{\Delta P_0}{P_0} \approx -\left(\dfrac{1}{1+r}\right)D\,\Delta r$

Concept 5: Factors that affect bond coupon rate

There are many risk factors that can affect coupon rate of a bond:

1. **Interest rate risk**
2. **Marketability of Bonds:** Marketability refers to the ability of an investor to sell securities quickly at a low transaction cost. If companies issue low marketable bonds, they will have to increase their bond coupon rate to compensate the low marketability.
3. **Default Risk:** The possibility of a failure on the borrower's part to meet, repay the debt or meet

interest payments. If companies issue bonds with high default risk, they will have to increase their bond coupons to compensate the investor for this additional risk.

4. **Call Provisions:** A call provision gives the company issuing the bond the option to purchase the bond at a pre-determined price (call price), and the investor MUST sell it at that price. If bonds have call provisions, the company has to compensate the investor with a higher coupon.

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TOPIC 5: SHARE VALUATION

In this topic, you will learn how you can value the share of a company. A company may be public or private.

Public Company: Public company shares are traded in the stock market. However, private company shares are not traded. Public company shares are owned by thousands of investors. Therefore, ownership is more dispersed. Equity or shares are a company's certificates of ownership. Once the company's IPO is over, outstanding shares of a company are bought and sold among investors in the secondary markets. From the investors view, secondary markets provide marketability at a fair price for shares of securities they own. Virtually all secondary share market transactions in Australia take place on the Australian Stock Exchange.

Active secondary market enables companies to sell their new debt or equity issues at lower funding costs.

There are three types of secondary markets: Broker, Dealer, Auction

Broker: Brokers charge a commission to bring buyers and sellers together. Brokers' extensive contacts provide a pool of information about prices that individual investors could not economically duplicate themselves. By charging a commission less than the cost of direct search, they give investors incentives to utilise information by hiring them as brokers.

Dealer: Market efficiency is improved if someone in the market can provide continuous bidding (selling or buying) for security. Dealers provide this service by holding inventories of securities, which they own, then buying (bid) and selling (ask) from inventory to earn profit based on the price difference (spread). NASDAQ is an example of a dealer market. Their electronic communications network systems provide additional price information to investors, increase marketability and competition, which should improve market efficiency.

Auction: In an auction market, buyers and sellers confront each other directly and bargain over price. The ASX originally operated as an 'open out-cry' market. In NYSE, auction for a security takes place at a specific location on the floor of the exchange, called a post. The auctioneer is the specialist designated by exchange and allowed to act as dealer to represent orders placed by public customers.

Private Company: On the other hand, private company ownership is concentred among a small group of investors. Irrespective of whether a company is public or private there are tools that can be utilised to value the company.

In this topic, you will learn the following concepts.

Concept 1: Articulate characteristics of equity.

Concept 2: Discounted cash flow valuation method to value share.

Concept 3: Market-based valuation method to value share.

Concept 4: Few important ratios to check the health of the company

Concept 1: Articulate characteristics of equity:

As a first step, it is important to understand the characteristics of a share or equity. Equity is another name for the share.

Ordinary and preference shares are the two types of equity securities.

Ordinary shares represent a basic ownership claim in a company. One of the owner's rights is to vote on all important matters that affect life of company, such as vote to elect board of directors, capital budget, or proposed merger or acquisition.

Owners of ordinary shares are not guaranteed any dividend payments and have lowest priority claim on company's assets in event of insolvency. Legally, ordinary shareholders enjoy limited liability.

Preference shares also represent ownership interest in a company, but gets preferential treatment over ordinary shares in certain matters. Preference share dividend payments are company's fixed obligations, similar to interest payments on corporate bonds. Dividend payments are paid with after-tax dollars subject to taxation.

Preference share owners are given priority over ordinary share owners with respect to dividends payments and claims against company's assets in event of insolvency or liquidation. Even though preference shares are equity, owners have no voting privileges. Preference shares are legally classified as perpetuities because they have no maturity. Preference shares often have "credit" ratings similar to those issued to bonds. Preference shares are sometimes convertible into ordinary shares. Most preference share issues today are not true perpetuities.

Legally, preference shares are equity. Like dividends on ordinary shares, preference share dividends are taxable. A strong case can be made that preference shares are really a special type of bond. Increasingly, preference share issues have the sinking fund feature, which requires mandatory annual retirement schedules. Valuation of ordinary and preference shares are done by using same basic methodology discussed under bond valuation topic.

Concept 2: Discounted cash flow valuation method to value share.

Applying a valuation procedure to ordinary shares is more difficult than applying it to bonds for various reasons. They are as follows:

- In contrast to coupon payments on bonds, size and timing of dividend cash flows are less certain.
- Ordinary shares are true perpetuities in that they have no final maturity date.
- Unlike rate of return, or yield, on bonds, rate of return on ordinary shares cannot be observed directly.

A one period model: This provides estimate of market price. Value of an asset is present value of its future cash flows – the future dividend and the end of period share price.

A two period model: This can be viewed as two one-period models tied together.

A perpetuity model: This is comprised of series of one-period share pricing models tied together. Although theoretically sound, this model is not practical to apply. The number of dividends could be infinite.

The general dividend valuation model

The general expression for the value of a share: Price of a share is present value of all expected future dividends. The formula does not assume any specific pattern for future cash dividends, such as a constant growth rate.

4.3	The general dividend valuation model	$P_0 = \sum_{t=1}^{\infty} \dfrac{D_t}{(1+R)^t} = \dfrac{D_1}{(1+R)} + \dfrac{D_2}{(1+R)^2} + \ldots + \dfrac{D_\infty}{(1+R)^\infty}$

This model makes no assumption about when the share is going to be sold in future. The model suggests that to calculate a share's current value, you need to forecast an infinite number of dividends. The model implies that underlying value of a share is determined by market's expectations of company's future cash flows. In efficient markets, share prices change constantly as new information becomes available and is discounted into company's market price. For publicly traded companies, a constant stream of information about company reaches the market, some having impact on share price while other information has no effect.

Another point to note is that the formula is completely general. The dividend in the numerator is always for one period later than the price you are computing. This is because you are computing a present value, so you have to start with a future cash flow.

The growth share pricing paradox

Growth Shares: Shares of companies whose earnings are growing at above-average rates and are expected to continue to do so for some time. Fast growing companies typically pay no dividends on their shares during the growth phase.

Management believes the company has a number of high-return investment opportunities, both the company and its investors will be better off if earnings are reinvested. Common sense suggests if you own shares in a company that will never pay you any cash, market value of those shares are worth absolutely nothing.

Do you think the above is true?

No. In reality, these companies will eventually pay out dividends in distant future. If internal

investments succeed, the share's price should go up significantly. Investors can then sell their shares at much higher price than what they paid.

Three different assumptions can cover most growth patterns:

- Dividend payments remain constant over time; i.e., they have growth rate of zero
- Dividends have constant growth rate
- Dividends have mixed growth rate pattern; i.e., they have one payment pattern then switch to another.

Example:

If you buy a share, you can receive cash in two ways: The company pays dividends and you sell your shares, either to another investor in the market or back to the company.

Suppose you are thinking of purchasing the share of MMM Ltd, which is expected to pay a $2 dividend in one year, and you can sell the share for $14 at that time.

If you require a return of 20% on investments of this risk, what is the maximum you would be willing to pay? Compute the PV of the expected cash flows.

$$Price = (14 + 2) / (1.2) = \$13.33$$

Now, what if you decide to hold the MMM share for two years?

In addition to the dividend in one year, you expect a dividend of $2.10 in two years and a share price of $14.70 at the end of year 2.

Now how much would you be willing to pay?

$$PV = 2 / (1.2) + (2.10 + 14.70) / (1.2)^2$$

$$PV = 13.33$$

Finally, what if you decide to hold the MMM share for three years?

In addition to the dividends at the end of years 1 and 2, you expect to receive a dividend of $2.205 at the end of year 3 and the share price is expected to be $15.435.

Now how much would you be willing to pay?

$$PV = 2 / 1.2 + 2.10 / (1.2)^2 + (2.205 + 15.435) / (1.2)^3$$

$$PV = 13.33$$

If you could continue to push back the year in which you will sell the share, you would find that the price of the share is just the present value of all expected future dividends.

To estimate all future dividend payments you will apply one of the three dividend valuation models discussed in this topic.

Example:

Suppose a firm's share is selling for $10.50. It just paid a $1 dividend, and dividends are expected to grow at 5% per year.

What is the required return?

$$R = [1(1.05)/10.50] + 0.05 = 15\%$$

What is the dividend yield?

$$1(1.05) / 10.50 = 10\%$$

What is the growth rate?

g = 5%

The relationship between R and *g*

Constant-growth dividend model yields solutions that are invalid whenever dividend growth rate equals or exceeds discount rate (g ≥ R).

If g > R, the present value of the dividend gets bigger and bigger rather than smaller and smaller as it should. This implies that a company that is growing at a very fast rate, does so forever.

Concept 3: Market-based valuation method to value share

So far you learned about discounted cash flow valuation method to calculate share price. But think about the following situations:

> First scenario: the firm may be new so do not have enough history for you to calculate future dividends.
>
> Second scenario: firms may not pay any dividend.
>
> Third scenario: suppose you are valuing a private firm, they are not traded in the stock market.

In these above situations, how do you calculate the firm's share price? In these cases, you apply the method of relative valuation. In relative valuation, the objective is to value assets based on how similar assets are currently priced in the market. You will value the firm by looking at similar firms in the industry the firm in question is operating.

One of the ways you do relative valuation is by looking at the P/E ratio. P/E ratio is share price to earnings ratio. The intuition is to calculate the price per dollar of earnings. The P/E ratio is the average P/E ratio for the firms in the industry. Then we multiply the earnings per share (EPS) with the P/E ratio to calculate the share price of the firm. The P/E ratio in the formula below is the average P/E ratio of firms in the industry.

4.10	P/E Model	$$P_0 = EPS \times \frac{P}{E}$$

To do relative valuation follow the step below:

1. Identify comparable assets and obtain market values for these assets
2. Convert these market values into standardized values. This process of standardizing creates price multiples.
3. Compare the standardised value (or multiple) for the asset being analysed to the standardised values for comparable asset.

Concept 4: Few important ratios to check the health of the company

The 'real-world' financial statements are not as straightforward as the simplified ones presented in textbooks. That is why in this unit you are using actual financial statements to understand business finance concepts.

Financial ratios are calculated from a company's financial statement variables. The financial ratios allow for better comparison through time or between companies. In other words, it helps you do a trend analysis. In ratio analysis you need to ask yourself what the ratio is trying to measure and why is that information important. Ratios are used for both companies and industry.

There are many ratios that can tell you the health of the company. However, for this unit you will focus on few ratios that can be used to gauge the wealth of the company. Please note that you need to observe these ratios over time to get a sense about the measure. The ratios are:

- Debt/Asset
- Debt/Equity
- EBIT (Earnings Before Interest and Taxes)/Interest expense
- Profit/Revenue
- Profit/Asset
- Profit/Equity
- Price/Earnings
- Market value of share/Book value of share

Long term Solvency ratios

Debt/Asset and Debt/Equity are long term solvency ratios. They are also called leverage ratios. The numerator has total debt and the denominator has total assets or total equity. The debt/asset ratio measures how much of the total asset are being used in financing debt. Suppose the debt/asset ratio is 52% then it means the firm finances about 52% of its assets with debt. The ratio debt/equity measures the relative proportion of debt and equity in the business. Suppose the debt/equity ratio is 2.5. This means if the firm has a $1 equity then it has $2.5 of debt. The amount of debt is 2.5 times the amount of equity.

(Interest) Coverage ratio

The coverage ratio measures the ability of the firm to service its debt. Higher the ratio better the ability. Higher debt in a firm is still OK as long as the company generates enough cash to pay interest on the debt. The coverage ratio measures this. Suppose the interest coverage ratio is 6. This means the company is generating earnings before paying interest and taxes 6 times the amount of interest that it has to pay on its debt.

Profitability ratio

Profit/Revenue, Profit/Asset and Profit/Equity are profitability ratios. This measures the firm's ability

to generate profit from \$1 of revenue, asset, and equity respectively. Higher the number, better the profitability ratio.

Benchmark ratio

The Price/Earnings ratio measures the price of the asset per \$ of earnings it generates. The price in the numerator measures the share price of the asset. This ratio is used to measure the relative performance of the firms in the industry.

Growth ratio

The market value of share/book value of share measures the growth opportunities of the firm. Higher the ratio better it is. Let's say the ratio is 15. This means the market value of share has grown 15 times the book value of the share.

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TOPIC 6: CAPITAL BUDGETING PART I

In this topic, you will learn how companies make capital budgeting decisions. Capital budgeting decisions are the most important investment decisions made by companies management teams. Capital investments are important because they involve substantial cash outlays and, once made, are not easily reversed. In this topic, you will learn different types of capital budgeting techniques and which one is the best technique.

Concepts covered in this topic are as follows:

Concept 1: What is capital budgeting?

Concept 2: Types of projects.

Concept 3: Evaluate projects using **non-discounted cash flow methods**. Discuss the advantages and disadvantages of non-discounted cash flow methods.

Concept 4: Evaluate projects using **discounted cash flow methods**. Discuss the advantages and disadvantages of discounted cash flow methods.

Concept 5: NPV method is preferred to all other methods

Concept 1: What is capital budgeting?

Capital budgeting is a process a business undertakes to evaluate potential major projects or investments. Capital budgeting techniques help management to systematically analyse potential business opportunities to decide which are worth undertaking.

The goal of these decisions is to select capital projects that will increase the value of the company. An investment in a project will create value if it generates more cash inflows than its cost. It is also important to note that the projects that a firm invests in will determine its business risk. Example – Hayat hotels deciding to invest in a casino could alter their riskiness by entering a new line of business (Casinos).

Concept 2: Types of projects

Capital budgeting projects can be broadly classified into three types:

- Independent projects
- Mutually exclusive projects
- Contingent projects

Types	Description	Example

Independent	Two projects are independent when their cash flows are unrelated.
	    Accepting or rejecting one project does not affect the acceptance decision on the other.
		A firm can raise funds for all projects that it identifies. In this case, the following projects are independent.
		    A company manufactures computers; in addition, the company may want to install a plant to manufacture printers. It also wants to install new air conditioning and heating systems.

Mutually exclusive	Accepting one project automatically prevents the other. Mutually exclusive projects typically perform the same function.	A firm may own a piece of land that is large enough to establish a shoe or steel manufacturing plant. The selection of one will exclude the acceptance of the other.

Contingent projects	Contingent projects are those where one project's acceptance depends on another.
	    Contingent projects can be optional or mandatory.
		Suppose a builder is building a water recycling plant if its housing project is approved by the city council.
		    Optional: Intel invests in a new computer for the home market. Intel can invest in a gaming system that is bundled with the computer.
		    Mandatory: An electricity company that builds a power plant must invest in a pollution control system to meet environmental standards.

Concept 3: Evaluate projects using non-discounted cash flow methods. Discuss the advantages and disadvantages of non-discounted cash flow methods.

Methods of Project Evaluation using non-discounted cash-flow methods are:

1. Payback period
2. Accounting rate of return

These methods **do not** involve discounting future net cash-flows back to time 0.

Non-Discounted Cash-Flow Methods – Payback Period Method

The payback period is the amount of time required for an investment to generate net cash flows to cover the initial cost of the investment. An investment is accepted if its payback period is below some pre-specified threshold (e.g. 5 years). This technique can serve as a risk indicator since the more quickly you recover the cash, the less risky the project is.

To calculate the payback period:

5.2 Payback period	$PB = Years\ before\ cost\ recovery + \dfrac{Remaining\ Cost\ to\ cover}{Cash\ flow\ during\ the\ year}$

Identify the number of years that will pass before the year in which the cost will be fully recovered, and then add to this the relevant fraction of the year in which the total cost will be recovered.

Example of Payback Period Cash Flows and Calculations

A project needs an initial investment (cash outflow) of $70,000 (at time 0).

Net cash inflows expected are: Yr 1 $30,000; Yr 2 $30,000; Yr 3 $20,000, & Yr 4 $15,000. What is the payback period of this project?

YEAR	CASHFLOW	CUMULATI (HOW MU
0	-70000	-70,000
1	30000	-70,000+30,00
2	30000	-40,000+30,00
3	20000	-10,000+20,00
4	15000	+10,000+15,0

The table above shows that the payback period should be somewhere within Year 3 where Cumulative Cash flow becomes 0.

Payback period is: 2 + (10,000/20,000)= 2.5 years

No economic rationale links the payback method to shareholder wealth maximization. Below example illustrates this point.

Year	0	1	2	3
Project AAA (in million)	-$50	$12	$38	$0
Project BBB (in million)	-$50	$47	$0	$10
Project CCC (in million)	-$50	$0	$0	$60(

Payback Periods:

Project AAA is 2 years
Project BBB is 3 years

Project CCC is 3 years

If you assume that these projects are mutually exclusive, you can only invest in one of the projects.

Payback Period Method Decision:

Choose the project that pays itself off most quickly – Project AAA.

This decision is not correct because Project CCC involves much higher net cash-inflows and will most likely increase the firm's market value by the most.

Advantages of Payback Period Method

- **Simplicity of the measure:** The payback period calculation is straightforward to understand, which makes it accessible to a wide range of stakeholders, including business owners, investors, and managers.
- **Measures liquidity:** The payback period measures the liquidity of an investment, which is the ability of an investment to generate cash flows and recover its initial cost quickly. This is important for businesses that need to maintain a certain level of liquidity to operate effectively.
- **Considers risk:** The payback period takes into account the time it takes to recover the initial investment, which is a critical factor in assessing the investment's risk. A shorter payback period indicates a lower risk investment as the initial cost is recovered more quickly.
- **Can be a benchmark:** The payback period can be used as a benchmark to compare different investment options. This can help businesses evaluate which investment will provide the most significant return on their investment in the shortest amount of time.
- **Encourages capital conservation:** The payback period encourages capital conservation as it measures the time it takes to recover the initial investment. This can help businesses evaluate whether an investment is worth the cost and avoid investing in projects that may take too long to recover the initial cost.

Disadvantages of the Payback Period Method

- **Ignores time value of money:** The payback period calculation does not consider the time value of money, which means that it does not take into account the fact that money received in the future is worth less than money received today. This can lead to an inaccurate assessment of the investment's profitability.
- **Ignores cash flows beyond the payback period:** The payback period only measures the time it takes for an investment to recover its initial cost. It does not consider the cash flows generated by the investment beyond the payback period. This can lead to a limited view of an investment's profitability potential.
- **Ignores risk:** The payback period does not take into account the risk associated with an investment, such as the volatility of cash flows or the uncertainty of future market conditions. This can lead to an inaccurate assessment of the investment's overall potential.
- **Subjective determination of payback period:** The determination of the payback period involves subjective decisions about the appropriate length of time to recover the initial investment. Different

people may arrive at different payback periods for the same investment, which can lead to inconsistency in decision-making.

Non-Discounted Cash-Flow Methods – Accounting Rate of Return (ARR)

It is a measure of an investment's profitability, measured as:

5.3	Accounting rate of return	$$ARR = \frac{Average\ net\ income}{Average\ book\ value}$$

A project is accepted if its ARR > the target rate of return. The target rate is determined by management.

Example of calculation of ARR:

	1	2
Sales	$400	$260
Expenses	-$180	-$140
Gross profit	$220	$120
Depreciation	-$80	-$80
Earnings Before Interest and Taxes (EBIT)	$140	$40
Tax (25%)	-$35	-$10
Net Profit	$105	$30

Suppose the initial cost of investment (cash outflow at time 0) = $240

What is the ARR based on the average investment measured as the capital invested at the beginning and the end of the project's life?

Accounting Rate of Return

Average net profit $= \dfrac{\sum Net\ Profit}{n} = \dfrac{105 + 30 + 0}{3} = 45$

Average Book Value $= \dfrac{Intial\ investment + final\ book\ value}{2} = \dfrac{240 + 0}{2} = 120$

Accounting Rate of Return

ARR $= \dfrac{Average\ Net\ Profit}{Average\ Book\ Value} = \dfrac{45}{120} = 0.375 = 37.5$

If, for example, the management's target rate of return is 20%, then because this project has an ARR of 37.5% (which is > 20%) you would proceed with the project. However, if, for example, the target rate of return is 40%, then because this project has an ARR of 37.5% (which is < 40%) you would reject the project.

Advantages of ARR

- **Simple measure:** The ARR calculation is straightforward to understand, which makes it accessible to a wide range of stakeholders, including business owners, investors, and managers.
- **Uses accounting data:** The ARR relies on accounting data, such as net income and book value, which are readily available in a company's financial statements. This makes it easy to calculate and compare the returns of different investments.
- **Focuses on profitability:** The ARR measures the profitability of an investment, which is a critical factor in decision-making. It helps businesses assess whether an investment will likely generate a sufficient return to justify the investment.
- **Long-term view:** The ARR considers the expected returns over the investment's entire life, which is a more comprehensive approach than other metrics, such as payback period or net present value, which only consider the initial investment and cash flows.
- **Considers non-cash items:** The ARR takes into account non-cash items, such as depreciation and amortization, which can have a significant impact on a company's profitability.

Disadvantages of ARR

- **Ignores the time value of money:** ARR does not take into account the time value of money, which means that it does not consider the fact that money received in the future is worth less than money received today due to inflation and other factors. This can lead to an inaccurate assessment of the investment's profitability.
- **Relies on accounting data:** While using accounting data is an advantage, it can also be a disadvantage. The ARR calculation is based on historical accounting data, which may not reflect the current or future market conditions. Therefore, it may not be a reliable indicator of an investment's profitability.
- **Ignores cash flows:** The ARR does not consider the timing and amount of cash flows associated with an investment. This can lead to an inaccurate assessment of the investment's profitability, particularly in cases where cash flows are uneven or vary significantly over time.
- **Ignores the risk:** The ARR does not consider the risk associated with an investment. An investment with a higher ARR may not necessarily be a better investment if it has a higher level of risk than an investment with a lower ARR.
- **Subjectivity:** The ARR calculation involves making assumptions and estimates, such as the useful life of an asset or the salvage value, which can be subjective and may vary from person to person. This can lead to different people arriving at different ARR values for the same investment.

Concept 4: Evaluate projects using discounted cash flow methods. Discuss advantages and disadvantages of discounted cash flows methods

Methods of Project Evaluation using discounted cash-flow methods are:

- Net present value (NPV)
- Internal rate of return (IRR)

These methods **do** involve the discounting of future net cash-flows back to time 0.

Discounted Cash-Flow Methods – Net Present Value

NPV method estimates the amount by which the benefits (cash inflows) from a project exceed the cost of the project in present value (dollar) terms. NPV is a capital budgeting technique that is consistent with the goal of maximizing shareholder wealth. NPV provides a $ value of how much cash is flowing out or in to the firm.

NPV= PV of cash inflows *less* PV of cash outflows

Net Present Value Analysis

Net Present Value (NPV) analysis is used in finance to evaluate investment projects by comparing the present value of expected cash inflows to the present value of expected cash outflows, considering the time value of money. The basic principle underlying NPV analysis is that a dollar received in the future is worth less than a dollar received today because of the opportunity cost of not investing that money today.

In simple terms, NPV analysis involves taking the expected cash inflows and outflows associated with an investment project and discounting them back to their present value using a discount rate, which reflects the cost of capital or minimum required return. The resulting net present value represents the difference between the present value of the expected cash inflows and the present value of the expected cash outflows.

If the NPV is positive, it suggests that the investment project will generate more cash than the initial investment, and therefore, it may be worth pursuing. If the NPV is negative, it suggests that the investment project will not generate enough cash to cover the initial investment and it may not be worth pursuing.

NPV analysis can be a powerful tool for businesses and investors to make informed decisions about capital allocation and risk management. By taking into account the time value of money, expected cash flows, and the cost of capital, NPV analysis helps in making sound investment decisions.

Steps to calculate NPV

1. **Identify the investment project:** Select the investment project that needs to be evaluated.
2. **Estimate the cash flows:** Estimate the cash flows that the project will generate over its lifetime, including the initial investment, expected inflows, and expected outflows.
3. **Determine the discount rate:** Determine the discount rate, which is the rate used to convert future cash flows into present values. The discount rate is usually based on the cost of capital, which is the minimum return required by investors for the investment to be worth pursuing.

4. **Calculate the present value of each cash flow:** Convert each cash flow to its present value using the discount rate. The formula for calculating the present value is PV = CF / (1+r)^n, where PV is the present value, CF is the cash flow, r is the discount rate, and n is the number of years into the future that the cash flow is expected to occur.

5. **Sum up the present values:** Sum up the present values of all expected cash flows, including the initial investment, to arrive at the net present value of the investment.

6. **Compare the NPV to the initial investment:** If the NPV is positive, it indicates that the investment is expected to generate more cash flows than the initial investment, and it may be worth pursuing. If the NPV is negative, it indicates that the investment is not expected to generate enough cash flows to cover the initial investment, and it may not be worth pursuing.

NPV=PV of expected cash inflows less PV of expected cash outflows.

Standard NPV formula is:

$$NPV = \sum_{t=0}^{\infty} \frac{NCF_t}{(1+R)^t} = NCF_0 + \frac{NCF_1}{1+R} + \frac{NCF_2}{(1+R)^2} + \ldots + \frac{NCF_t}{(1+R)^t}$$

5.1 Net present value

Note: If cash flow from year 1 – year N are equal amount, the NPV formula could convert to:

$$NPV = NCF_0 + \frac{NCF_t}{R} \times \left[1 - \frac{1}{(1+R)^t}\right]$$

Then make a decision. Accept project if NPV is positive; reject project if NPV is Negative.

NPV Example 1

Project AAA will initially cost $300,000 and has a lifespan of five years. Sales from the project will be $300,000 per year and cost of sales and other costs (excluding depreciation) will amount to $220,000 per year. The machinery purchased for the project can be sold at the end of the 5th year for $30,000.

Assuming that the cost of capital of the firm is 15%, compute the NPV of the project.

NPV Example 1: Solution

	0	1	2	3
Initial Cost	-$300			
Cash inflows		$300	$300	$300
Cash outflows		-$220	-$220	-$220
Salvage				
Net Cash flow	-$300	$80	$80	$80

Calculate Present Value of Cashflow and sum them up

NPV= -300+801.15+801.152+801.153+801,154+110(1.15)5

NPV = -300 + 69.57 + 60.49 + 52.60 + 45.74 + 54.69

NPV = -$16.91 = -$16,910

Make Accept/Reject Decision Based On NPV

Negative NPV – Do not accept the project

Advantages of NPV

- **Time value of money:** NPV analysis accounts for the time value of money, recognising that a dollar today is worth more than a dollar in the future due to inflation and the potential for earning a return on that dollar if invested today.
- **A precise measure of profitability:** NPV analysis provides a clear measure of the profitability of an investment project, by calculating the expected return in terms of present value cash inflows compared to the present value cash outflows.
- **Considers all cash flows:** NPV analysis considers all cash inflows and outflows over the life of the investment project, including initial investments, operating costs, and expected revenue streams. This helps to provide a comprehensive view of the financial performance of the investment project.
- **Takes into the cost of capital:** NPV analysis incorporates the cost of capital or minimum required return, which helps businesses and investors to evaluate the investment project's potential return in comparison to the cost of obtaining funds to finance the project.
- **Allows for scenario analysis:** NPV analysis allows for scenario analysis, which can help investors and businesses to evaluate the potential impact of different scenarios on the investment project's financial performance. You will learn this in Topic 7.

Disadvantages of NPV

- **Requires accurate cash flow forecasts:** NPV analysis requires accurate cash flow forecasts for the life of the investment project. However, in practice, it can be challenging to predict future cash flows

with certainty, which can affect the accuracy of the NPV calculation.

- **Relies on subjective assumptions:** NPV analysis relies on subjective assumptions, such as the discount rate used to calculate the present value of future cash flows. These assumptions can vary depending on the individual or organization making the analysis, which can lead to inconsistencies in decision-making.
- **Ignores non-monetary factors:** NPV analysis only considers monetary factors and ignores non-monetary factors that may affect the investment project's success, such as regulatory changes, changes in market conditions, or other external factors.
- **Doesn't account for project size:** NPV analysis doesn't take into account the size of the investment project, and it may be more appropriate to use other financial evaluation methods for smaller projects.
- **May not consider risks:** NPV analysis may not account for all the risks associated with the investment project. For example, it may not consider the potential impact of project delays, cost overruns, or changes in market conditions, which could affect the project's financial performance.

Discounted Cash-Flow Methods – Internal Rate of Return (IRR)

IRR and NPV techniques are similar in that both depend on discounting cash flows from a project. IRR method is an important and legitimate alternative to the NPV method. When you use the IRR approach, you are looking for the rate of return (rather than a $ amount) associated with a project so that you can determine whether this rate is higher or lower than the company's cost of capital (i.e., you compare IRR with the cost of capital)

Internal Rate of Return (IRR)

IRR is the discount rate/interest rate/required rate of return that makes the present value of the project's future net cash-inflows equal to the cost of the project. IRR is the actual rate of return for the project. A project is accepted if its IRR is > the required rate of return (R). You can calculate IRR using Excel's IRR function.

Calculation of Internal Rate of Return

By setting the NPV formula to zero and treating the rate of return as the unknown, the IRR is given by:

$$-NCF_0 + \frac{NCF_1}{1+IRR} + \frac{NCF_2}{1+IRR^2} + ... + \frac{NCF_t}{1+IRR^t} = 0$$

Calculation of Internal Rate of Return

Example

Find the IRR for the following project:

Year	0	1	2	3	4
NCF	-2000	1000	2000	2000	1000

Choose a discount rate and substitute it into the NPV equation.

If the NPV is negative (positive) the discount rate guessed is too high (low).

By narrowing down the difference between the two rates, we can approach the IRR. In this case the IRR is approximately 73.08%.

IRR= 0.7308: Plug this rate as irr in the equation below and you will get 0:

$$-2000 + \frac{1000}{(1+IRR)^1} + \frac{2000}{(1+IRR)^2} + \frac{2000}{(1+IRR)^3} + \frac{1000}{(1+IRR)^4} + \frac{4000}{(1+IRR)^5} = 0$$

Calculation of Internal Rate of Return:

DISCOUNT RATE	NPV
10%	$4,755.74
20.0%	$2,891.16
30.0%	$1,761.88
40.0%	$1,048.29
50.0%	$581.62
60.0%	$267.87
70.0%	$52.24
73.0%	**$1.34 (Approximately $0)**
80.0%	-$98.49
90.0%	-$205.16
100.0%	-$281.25
110.0%	-$335.70
120.0%	-$374.59

You substitute different discount rates and calculate the NPV. Note that as discount rate increases, NPV decreases. 73% is the discount rate that gives an NPV closest to 0. The higher the IRR the better it is for capital budgeting decision.

IRR – Interpretation Example

Project A has an IRR of 15%. The current discount rate (cost of capital) is 10%. Should the project be accepted based on IRR?

Since IRR(15%) > discount rate (10%), you can accept.

Concept 5: NPV method is preferred to all other methods

When IRR & NPV Methods *Agree:*

The two methods will always agree as to which project is to be selected when:

- the projects are independent, &

- the projects' cash flows are conventional (i.e. after the initial (Year 0) investment is made (cash outflow), all future net cash flows are positive.

When IRR & NPV Methods *Disagree:*
The IRR and NPV methods can produce different accept/reject decisions if:

- a project has unconventional cash flows, or
- two or more projects are mutually exclusive.

IRR and Unconventional Cash Flows
Unconventional cash flows could follow several different patterns. They are:

- A negative initial cash flow is followed by positive future net cash flows and then a final negative cash flow.
- Future net cash flows from a project could be both positive and negative.
- In these circumstances, IRR technique can provide more than one solution, making result unreliable.
- IRR method should not be used in deciding about accepting or rejecting a project when unconventional cash flows are associated with the project.

IRR and Mutually Exclusive Projects
It is possible that NPVs of the two projects will equal each other at a certain discount rate. The point at which the NPVs intersect is called the crossover point. Depending upon whether the required rate of return (discount rate) is above or below this crossover point, the ranking of the projects will be different.

IRR and Reinvestment Rate Assumption
Another major weakness of IRR method compared to NPV method is the reinvestment rate assumption:

- IRR method assumes cash flows from project are reinvested at IRR, while NPV method assumes cash flows are reinvested at company's cost of capital
- This assumption in IRR method leads to some projects being accepted when they should not be.

IRR v. NPV: Final Comment
While IRR method has intuitive appeal to managers because output is expressed as a rate of return (e.g., 8%), the technique has some critical problems. On the other hand, decisions made based on a project's NPV are consistent with goal of shareholder wealth maximisation. NPV method shows $ amount by which project is expected to increase value of company. When NPV & IRR are in conflict – *always go with NPV*. For these reasons mentioned above NPV method should be used to make capital budgeting decisions.

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TOPIC 7: CAPITAL BUDGETING PART II

In the previous topic, you learned about different capital budgeting techniques that firms use to evaluate projects. The techniques are:

- NPV ($ value added to the firm from the project)
- IRR (rate of return on the project)
- Payback period (how many years it takes to get back the initial investment)
- ARR (return on investment without taking into account time value of money)

Except for ARR, cash flows are used as input in all of the techniques. These cash flows should be included in a capital budgeting analysis and are only those that occur (or do not occur) if the project is accepted.

In this topic, you will learn the following concepts.

Concept 1: Why do we calculate project cash flows?

Concept 2: Calculating project cash flows for project evaluation

Concept 3: Analyse project risk.

Concept 4: Understand capital rationing

Concept 1: Why do we calculate project cash flows?

Before you understand why and how you calculate project cash flows, it is important to understand what is "project cash flow" or "cash flow from projects". They essentially mean the same thing.

Project cash flow is used to measure the outflow and inflow of money from the project to the firm. It is not easy to do budgeting with the cash flows. The inflow of cash is known as the revenue generated from the project. This is usually a positive number, and the outflow of the cash is called the project expenditure. This is entered as a negative number.

It is important to calculate cash flows because cash flow is the input in all of the capital budgeting techniques except for ARR.

The project cash flow is used to determine the project's rate of return or value, and the flow of money into and out of the project is used in financial models to determine the net present value and the rate of return respectively.

Project cash flows are calculated by taking the difference between all cash inflows and cash outflows. It is also called net cash flow.

Let's take the example of NPV. It is theoretically the most sound capital budgeting technique.

NPV tells the managers how much in current dollar terms the company is better off/worse off as a result of undertaking the project given the cash flows that a project is expected to produce in the future.

The three steps in NPV Analysis are:

1. Identify and estimate the (net) cash flows associated with the project.
2. Identify an appropriate discount rate for the project. This discount rate reflects the riskiness of the project.
3. Discount the (net) cash flows using the discount rate to achieve the NPV

Concept 2: Calculating project cash flows for project evaluation

In the previous topic, you calculated NPV when cash flows were given in the question! Here, you will be focusing on how these cash flows are calculated.

In NPV analysis you must include all incremental cash flows. Incremental cash flows are the additional cash flows that occur as a result of taking on a project.

While doing a project evaluation you need to consider what difference it makes to the total cash-flows of the firm, whether the firm does or does not undertake the project under consideration. What to do about:

1. sunk costs?
2. opportunity costs?
3. side effects?

Sunk Costs

Sunk costs are unavoidable (incurred in the past) cash-outflows are no longer relevant to influence whether a project should be undertaken. Therefore, you ignore sunk costs in NPV project evaluation.

Sunk cost Example

$10,000 payment to be made to a marketing company for assessing the market for a project which costs $125,000 and yields net cash-inflows of $75,000 a year for 2 years when the discount rate is 10% p.a. Should the project be taken on?

NPV of the project if evaluation is done **incorrectly** and sunk cost is included

(i.e., marketing cost of $10,000 is included):

NPV = -$135,000 + $75,000(1.1)$^{-1}$ + $75,000(1.1)$^{-2}$

NPV = -$4,800. Reject the project.

NPV if evaluation is done **correctly**, and sunk cost is not included (i.e. marketing cost of $10,000 is not included):

$$NPV = -\$125,000 + \$75,000(1.1)^{-1} + \$75,000(1.1)^{-2}$$
$$NPV = \$5,200. \text{ Accept the project.}$$

Opportunity Costs

Opportunity cost refers to a situation where factors of production or resources of a firm must be used in a new project. Still, previously they were being used for another purpose. If a project uses resources that could be put to some other use, then the dollar value of the alternative use must be included as an expense and a cash-outflow in the project evaluation.

Example of Opportunity Costs

A company owns machinery which has been leased out generating income of $3m per year. The machinery will now be used in a project which yields $20m a year for 2 years and costs $30m (required rate of return is 10% p.a.). Should the project be taken on?

NPV if the evaluation is done **incorrectly** and the opportunity cost is ignored (i.e. the lost lease income of $3m per year is not included in the analysis):

$$NPV = -\$30m + \$20m(1.1)^{-1} + \$20m(1.1)^{-2}$$
$$NPV = \$4.7m. \text{ Accept the project.}$$

NPV if the evaluation is done correctly and the opportunity cost is included (i.e. the lost lease income of $3m per year is included in the analysis):

$$NPV = -\$30m + \$17m^*(1.1)^{-1} + \$17m^*(1.1)^{-2}$$
$$NPV = -\$0.5m. \text{ Reject the project.}$$

$17m = $20m revenue per year less lost lease income of $3m per year

Side Effects

Side effects refers to a situation where the sale of a new product by a company affects the sales, either positively or negatively, of other products sold by the company. In project evaluation, you must include side effects, i.e. positive or negative cash flows that occur in other aspects of the business as a result of taking on new activity.

Financing Costs

The costs of financing are interest expense for debt and dividend payments for equity. In project evaluation, the financing costs can be considered either in the cash-flows or by the discount rate R.

In your analyses, you will be taking account of the financing costs in the discount rate/required rate of

return. Therefore, it is important that financing costs are not to be taken into account in the cash flows otherwise there will be double counting.

The required rate of return of the firm is the return that the firm has to earn on the project in order to satisfy the providers of financial capital for the project, so it covers the costs of finance (capital).

Taxation

Taxation has a major impact on project cash flows. Taxation represents a cash outlay. Depreciation and other tax-deductable expenses provide a 'tax shield'. Gains (losses) on sale of productive assets (i.e. factors of production) increase (decrease) the amount of tax paid; and Capital gains (losses) on investment assets increase (decrease) the amount of tax paid.

Example of Book gain on sale of productive asset

Purchase price of asset (machine) $1m

Useful life of machine 10 years

Straight-line depreciation

Depreciation p.a. = $1m/10 years = $100,000

After seven years company decides to sell the asset.

Book value of asset after seven years = purchase price *less* accumulated depreciation = $1m *less* (7 years x $100,000) = $1m *less* $700,000 = $300,000.

Salvage value (sale price) of asset after seven years = $350,000

Gain on sale = salvage value less book value = $350,000 less $300,000 = $50,000

Tax rate = 30%

Tax on book gain = book gain x tax rate = $50,000 x 0.30 = $15,000.

Note: we **do** take depreciation into account when working out the book gain (or loss) on a productive asset.

Disposal of productive assets: gains or losses on sale.

- If the salvage value (sale price) of a productive asset is greater than the book value of the asset we have a gain on sale. Tax must be paid on the gain.
- If the salvage value (sale price) of a productive asset is less than the book value we have a loss on sale. The loss provides a tax rebate (tax shield).

Disposal of investment assets: capital gains or capital losses.

- If the sale price of an investment asset is greater than the purchase price of the asset we have a capital gain. Tax must be paid on the capital gain.
- If the sale price of an investment asset is less than the purchase price of the asset we have a capital loss. Capital losses do not provide a tax rebate but can be used to offset capital gains (in the current period

and/or in the future).

Example of Capital gain on sale of an investment asset

Purchase price of asset (investment apartment) $1m, purchased in 2016.

Sell apartment for $1.3m in 2020.

Capital gain on sale = sale price *less* purchase price = $1.3m *less* $1m = $300,000.

Marginal tax rate = 40%.

Tax due on capital gain = capital gain x marginal tax rate = $300,000 x 0.40 = $120,000.

Note: we do not take depreciation into account when working out the capital gain (or loss) on an investment asset.

An incremental cash flow reflects how much the company's total after-tax cash flows will change if a given project is accepted.

To identify an incremental cash flow ask the following question:

"Will this cash flow occur ONLY if the project is accepted?"

- "Yes", then include because it is incremental
- "No", then exclude because it will occur anyway.
- "Part of it", then include the part that occurs because of project

Conceptually, FCF is the Free Cash Flow from a project and is simply what you referred to as NCF (Net Cash Flow) in the previous chapter.

Applying Stand-alone principle (concept): The idea that you can evaluate the cash flows from a project independently from the company is known as the stand-alone principle i.e. treat the project as if it is a stand-alone company that has its own revenue, expenses, and investment requirements. You can also call it Free Cash Flow (FCF) Calculation.

FCF Calculation:

FCF = (Revenue – Operating Expenses – D&A) ×(1-t) + D&A – Cap Exp- Increase in WC

Operating Expenses: All expenses except D&A

D&A: Depreciation and Amortisation

Cap EXP: Capital Expenditure

Increase in WC=Increase in Current Assets-Increase in Current Liabilities

Equivalently,

FCF=(Revenue-OperatingExpenses) × (1-t) + D&A×t- Cap Exp- Increase WC

We exclude interest expenses when calculating NOPAT because interest expense is regarded as a financing expense rather than an operating expense.

5.4	Incremental free cash flow calculation	*FCF = [(Revenue – OpEx – D&A) x (1 – t_c)] + D&A – Cap Exp – Add WC*

FCF Calculation: Why do we add back D&A?

Depreciation is not a real CF. It's a book value (and book entry). However, depreciation is important because it **provides a tax shelter** and tax savings (Because depreciation is allowed as an expense by the tax office). Amortisation (e.g., decline in the value of intangibles) is also a non-cash expense allowed by tax department just like depreciation.

FCF = (Revenue – Operating Expenses – D&A) × (1-t) + D&A – Cap Exp – Increase WC

FCF Calculation: Why do we subtract increase in Working Capital?

Working Capital is cash employed to run day-to-day operations of a firm (*e.g.*, money tied-up in inventory). WC is not consumed but rather employed for a period of time. Increase in WC during a period means more cash is employed, *i.e.*, a cash outflow. Decrease in WC during a period means less cash is employed, *i.e.*, a cash inflow.

Example: A new machine might lead to more operating efficiency, which leads to the company needing $10,000 more in inventory (A current asset). So more $10,000 is tied up in inventory and we treat this increase an outflow!

Cash Flow for NPV Calculation

Remember you are doing:

NPV: Step 1: Identify the incremental cash flows associated with the project

Now you have all the components of incremental cash flows that are associated with the project: There are 3 parts;

1. The initial investment
2. The operating FCF/NCF that occurs during all years except year 0.
3. The terminal/Last Year cash flow.

Initial Investment (Year 0)

1. Cost of project=Purchase Price + any other additional Capital Expenditure
2. Net Working Capital Contributions (increase in in net working capital)
3. Sale price of the replaced(old) asset, if any, adjusted for taxation implications

Operating FCFF

1. These are the operating cash flows that occur during all the years except Year 0.

Terminal Cash Flow (Final Year)

The CF in the last, or terminal, year of a project often includes cash flows that are not typically included in the calculations for other years.

1. The terminal Cash Flow is the "unique" cash flows that occur in the terminal/last year only.
2. Remember: Normal Operating FCFF still occurs in the last year as well.

3. Terminal CF:

   ° Salvage (sale) Value of the project (eg: Machine) recognised in last year.
   ° Any tax effect on the sale/salvage of the machine.
   ° Recovery of Working Capital. **In these examples, we will assume that working capital investments are 100% recovered at the end of the project life.**

Tax on sale of an asset = (selling price of asset – book value of asset) x t_c

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FCF/NCF calculations from a project– example 1

You have purchased a truck for your plumbing business. The estimated life time of the truck is 10 years. The truck will increase revenues by $50,000 every year. Operating expenses will increase by $30,000 every year. Additions needed to working capital is $3000 per year. Depreciation charge will be $2,500 per year. The business faces a tax rate of 30%. Calculate the FCF from the truck for each year!

FCF = (Revenue – Operating Expenses – D&A) × (1-t) + D&A – Cap Exp – Increase WC

Solution:

FCF for new Truck	
REVENUE	$50,000
Less CASH OP EXPENSES	-$30,000
Less DEPR & AMORT	-$2,500
EBIT (Earnings before interest & tax)	$17,500
Less TAX @30%	-$5,250
NOPAT	$12,250
Plus DEPR & AMORT	$2,500
Less WC increase	-$3,000
NET CASH FLOW OR FCF (excluding the capital expenditure)	$11,750

Initial Investment calculation: example

A new machine is purchased at $100,000. A further $10,000 will be paid to install the new machine. Because of the improved operating efficiency of the new machine an additional stock of $15,000 will be needed. As a result of the purchase of the new machine the existing machine can be sold at $20,000 salvage value. The current book value(depreciated) of the existing machine is $10,000. Calculate the initial investment as at Year 0.

Solution:

YEAR	0
Cost of Machine	-110,000
Increase in WC	-15,000
Sale of Old Machine	+20,000
Tax on sale of Old Machine	-3000
Initial Investment	-+

Terminal cash flow calculation: example

Example: The new machine in the previous slide has a salvage value of $20,000 at the end of it's useful life (10 years). The machine will be fully depreciated over the useful life. The initial inventory increase as a result of the machine was $15,000 (see prior slide). The revenue increase due to the new machine is $100,000, where as the Operating Cost increase is $50,000. Calculate the Terminal Cash Flow.

YEAR	10 (Final)
Salvage Value (New Machine)	+20,000
Tax on Sale of new Machine	-6000
Recovery of Working Capital	+15,000
Terminal Cash Flow	**+29,000**

Concept 3: Analyse project risk

Financial analysts resort to different types of risk analysis. Main risk analysis methods are:

- Sensitivity analysis
- Scenario analysis
- Simulation analysis

You only examine sensitivity and scenario analysis in this topic.

Sensitivity Analysis

Sensitivity Analysis examines the sensitivity of the results (e.g., NPV, IRR) to changes in relevant variables. By how much does a project's NPV (and/or IRR) change due to a decrease or increase in the value of individual cash inflow assumptions (values of variables)? Note: Typically, only the value of one variable is changed at a time.

How to do a sensitivity analysis on NPV?

Follow these steps:

1. Compute the NPV using most likely values of the variables
2. Change the value of one variable (e.g., sales volume, discount rate, % of expenses) and compute the NPV
3. Reinstate the original value of the variable (e.g., sales volume)
4. Change the value of another variable (e.g., initial outlay) and compute the NPV
5. Repeat this procedure for all the variables
6. Tabulate all the results (NPVs)
7. Identify the most sensitive variable/s (variables which makes large changes in NPV)
8. Explore what the company can do to improve these variables (better estimation, seeking more certain arrangements/agreements, etc.)

For a given project the NPVs at different sales growth rates can be tabulated as follows:

Sales Growth	NPV
-5%	125.36
0%	134.99
+5%	145.27
+10%	156.20

For a given project the NPVs at different discount rates can be tabulated as follows:

Discount Rate	NPV
5%	185.26
10%	156.20
15%	132.95
20%	114.14

Scenario analysis

Scenario analysis examines whether the results change under alternative scenarios (states of the world). A scenario might describe how a set of project inputs might be different under different economic conditions. By comparing the range of NPVs (and/or IRR) provided by the different scenarios, it is possible to understand the uncertainty (risk) associated with the project. **In our previous example:** We could do a scenario analysis if the economy does well, the economy does badly, and the economy does average.

For a given project, the NPVs at different economic conditions:

Economy	Sales Growth	Discount Rate	Expense(%)	NPV
Good	10%	15%	40%	161.28
Average	0%	10%	50%	134.99
Bad	-5%	5%	60%	116.15

You have calculated the different NPVs under different scenarios (predicting what will happen to each variable under different circumstances).

Concept 4: Understand capital rationing

Capital rationing is used to select the best projects.

What does a company do when it does not have enough money to invest in all available positive-NPV projects?

The process of identifying the **bundle of projects** that creates the **greatest total value** and allocating the available capital to these projects is known as investment decisions under capital rationing. It involves choosing the set of projects that generates the greatest value per dollar invested in a given period.

The profitability index (PI) is computed for each project and then the company chooses the projects with the largest PI until it has allocated all available capital.

The objective is to identify the bundle or combination of positive-NPV projects that creates the greatest total value for shareholders.

Computation of PI:

5.6	Profitability index	$$PI = \frac{NPV + initial\ investment}{initial\ investment}$$

Capital Rationing steps to take:

1. Calculate the PI for each project.
2. Rank the projects from highest PI to lowest PI
3. Starting at the top of the list
   – select the project with the highest PI and
   – working way down the list
   – select the next highest PI project that fits into the total capital available (total budget)
4. Repeat step 3 until the bundle which gives the highest total NPV is identified.

Example: Which project(s) to choose from the table below if your company has only $10,000 to invest?

Project	Year 0	Year 1	Year 2	NPV @ 10%	PI
A	-$5000	$5500	$6050	$5000	2.0
B	-$3000	$2000	$3850	$2000	1.67
C	-$3000	$4400	$0	$1000	1.33
D	-$2000	$1500	$1375	$500	1.25

Choose A, B and D. C will not be chosen (although PI is higher than D's) as there is not enough capital.

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TOPIC 8: CAPITAL STRUCTURE I

In Topic 1, you learned about three important decisions that a finance manager makes. The first decision is the investment decision. The second is the financing decision or capital structure decision. Capital Structure is the mix of sources of funds used by a company to finance its activities (i.e. to finance its investment in real assets).

In this topic you will learn the following concepts:

Concept 1: Generalise major sources and types of external financing for a business

Concept 2: Characteristics of debt and equity

Concept 3: Define and measure capital structure

Concept 4: Understand theories of capital structure

Concept 5: Firm life cycle and capital structure

Concept 1: Generalise major sources and types of external financing for a business

The two major sources of external financing for a business are: Debt and Equity. Let's understand what are debt and equity financing.

Concept 2: Characteristics of debt and equity

What is Equity financing?

Generally, when you say that a company has used equity to raise funds this means that it has issued ordinary shares (common stock) in an initial public offering (IPO) in the capital market – investors purchase the newly-issued shares in the IPO and the company issuing the shares receives the capital (finance), which is the total sale price of the shares.

What are the Characteristics of Equity?

Residual claim – Dividend payment is discretionary, i.e. ordinary shareholders receive a dividend only after a company has met its financial obligations to all other claimants, such as suppliers, employees (wages & salaries), lenders (debt & interest payments), and governments (taxation).

Also, if a company is liquidated, ordinary shareholders have a residual claim on the proceeds from the sale of the company's assets.

Ordinary shareholders face greater risk than other investors in a company, so ordinary shareholders will expect a return greater than if they had lent money to the company.

Not Tax-deductible – The dividend payments that a company makes periodically to shareholders are not tax-deductible, so the company receives no tax benefit from using equity finance.

Maturity – infinite – as long as the company continues operating and is listed on the stock exchange then the ordinary shares will not mature, meaning that they cannot be 'cashed-in' with the company

Shareholders are entitled to a proportional share of any **dividend** that is declared by a company's directors.

Management Control – Ordinary shareholders exert a degree of control over management of the company through the voting rights attached to their shares, e.g. the right to elect members to the board of directors, giving them some control over the company's operations; one vote for each share held.

Shareholders have the right to sell their shares on the stock exchange (secondary market).

Advantages of Equity Finance (from the firm's point of view)

- The Company is not required to pay dividends to ordinary shareholders – payment is at the discretion of directors.
- Ordinary shares have no maturity date – issuing company is under no obligation to redeem them.
- The higher the proportion of equity in a firm's capital structure, the lower the risk lenders will suffer loss, thus lowering the interest rate that the company must pay on debt finance.

Disadvantages of Equity Finance (from the firm's point of view)

- If new shares are issued, existing shareholders either have to purchase some of the new shares or suffer a dilution of their ownership and control of the company (this is especially so for those that own a large percentage of the shares in a company, e.g. institutional investors).
- Transactions costs of issuing shares is higher than the cost of borrowing a similar amount, e.g. costs of preparing a prospectus, fees paid to underwriters.
- Not Tax-deductible – cost of equity finance (dividends) is not tax deductible

Sources of Equity Financing

There are 2 sources of Equity Finance:

- Floating a public company (IPO)
- Private Equity

Floating a Public Company (IPO)

IPO – when a company first invites the public to subscribe for shares in the company – 'floating' the company or 'going public' in order to raise (equity) capital (see [ASX for upcoming float and listings](#)).

Advantages of an IPO/Listing On The Stock Exchange

1. Access to capital for growth – greater access to the capital market and, hence, to finance, which is particularly important to high-growth companies that require funds to implement attractive new projects; listing gives a company the opportunity to raise capital at the IPO stage and, throughout their listing through seasoned offerings on the secondary market to fund future growth.
2. Large capital raisings – the amount of equity capital raised through an IPO is large; ASX rule of listing – company must have at least 300 shareholders, each subscribing for shares with a value of at least $2,000 (minimum of $600,000 raised).
3. Cash-in on success – a float allows the owner/entrepreneur of a company to cash in on the success of the business that they have developed.
4. Currency for external growth – facilitates acquisitions by providing 'currency' in the form of a more diversified and liquid share capital base.
5. Higher public and investor profile – heightens company profile with the media, analysts and the industry at large, helping sustain demand for the company's shares.
6. Institutional investment – attracts institutional investment due to increased transparency and trading liquidity, thereby increasing credibility and access to capital.
7. Improved valuation – helps generate independent valuation by the market based on available information.
8. Greater efficiency – leads to greater operating efficiency of the business due to ongoing reporting requirements and more rigorous disclosure.
9. Secondary market for company's shares – stimulates liquidity in the company's shares enabling shareholders to realise the value of their holdings and by facilitating further capital raising.
10. Alignment of employee/management commitment – provides company with the option of remunerating its employees with shares, thereby aligning employee interests with organisational goals.
11. Reassurance for customers & suppliers – improves perception of the business's strength due to the rigorous due diligence of the listing process and ongoing compliance procedures.
12. Management – attracts top management talent and motivates current managers if a company's shares are publicly traded.

Considerations For Listing (Possible Disadvantages of Listing)

1. Susceptibility to market conditions – a company's share price can be affected by conditions beyond its control including general economic conditions or other events within the same industry.

2. Under-pricing – shares sold in an IPO are usually under-priced. Money is 'left on the table and, on average, there is an immediate abnormal return to IPOs. Under-pricing is a real cost to existing shareholders – they are selling assets to the new shareholders for less than their fair value. Under-pricing – defined as the return on the first day's trading is the difference between first day market closing price and issue price; Ritter & Welch (2002) 18.80% (US); Lee, Taylor & Walter (1996) 11.90% (Aust.); Dimovski & Brooks (2003) 25.6% (Aust.); Google 18.05%; Russia 4.2%; UK 16.0%; Japan 40.2%; Malaysia 62.6%; India 88.5%; China 137.4% (Pierson et al. Business Finance, 12th Edition, p. 248)

3. Disclosure & reporting requirements/Directors responsibilities – requires a higher degree of disclosure and corporate governance and managing investor relations, which means additional management time, responsibility, and investment.

4. Short-Term Focus – going public may encourage managers to focus only on short-term profits (usually quarterly), rather than on long-term wealth maximisation.

5. Media exposure – heightened media exposure is a plus, at the same time, it requires management.

6. Costs & fees – additional costs are involved in an IPO, maintaining a listing and raising additional capital, e.g. ASX listing fees, prospectus costs (legal, accounting, expert opinions and printing and distribution); underwriters' fees and brokers' commissions (generally 4–7% of funds raised); e.g. ASX fees: 10 million shares – initial listing fee $70,000, annual listing fee $25,000.

7. Reduced level of control – the sale of company shares inevitably involves ceding a degree of control to outside shareholders.

Private Equity (PE). What is Private Equity?

Securities issued to investors that are not publicly traded, including family members & friends, & more usually the source is a private equity fund that invests equity capital in businesses. There are two Types of Private Equity:

1. 'Venture Capital' (VC) – funding for smaller & riskier companies with potential for strong growth. PE can be better than an IPO as capital required may be too small to justify an IPO and future of venture may be too uncertain to attract a large number of investors.

2. Acquisition of a mature listed public company by a group of investors who purchase 100% of the business and 'privatise' it so that it is de-listed from the stock exchange.

Four sub-types of PE

1. **Start-up financing** – for businesses less than 30 months old where funds are required to develop the company's products.

2. **Expansion financing** – where additional funds are required to manufacture & sell products commercially.

3. **Turnaround financing** – for a company in financial difficulty. &

4. **Management buyout (MBO)** – financing where a business is purchased by its management team with the assistance of a private equity fund.

Private equity is not publicly traded, so the market for PE is generally illiquid, hence, PE investors must be prepared to commit funds for the longer-term, usually from 5 to 10 years.

Fund managers usually invest from $500,000 to $20 million for periods of 5 to 10 years.

Looking for businesses with good prospects for growth, managed by people who are capable, honest, and committed to the success of the business.

Aim to increase the value of a company, and once it is increased they sell the company for a profit.

PE investment in Australia has grown rapidly since the 1990s.

Characteristics of Debt

What is Debt finance? Debt involves a contract whereby the borrower *promises* to pay future cash-flows to the lender.

Legal claim & high priority in financial trouble – The borrower *promises* to pay future cash-flows to the lender in the form of interest payments and repayment of amount borrowed; if not, lender can take possession of pledged assets (on a secured loan), and/or take legal action against borrower to recoup their (i.e. borrower's) money.

Tax-deductible – By law companies that borrow money and pay interest expense are allowed to claim the interest expense as a tax-deductible expense, i.e. the interest paid each year can be included as an expense in the company's P & L statement, thereby providing a tax shield (reducing the amount of tax to be paid). For example – corporate tax rate is 30% and Company X has $1,000,000.00 in interest expanse, leading to a tax shield of: 0.30 x $1,000,000.00 = $300,000.00 (i.e. the company's tax bill will be reduced by $300k).

Maturity is Fixed – Generally, there will be a maturity date with the borrowings, meaning that on a certain date the full amount borrowed must be repaid, e.g. 10-year $10,000 bond issued on 01/04/2017 – maturity date and date at which full amount borrowed ($10,000) must be repaid is 01/04/2027

No Management Control – An important feature of debt is that provided the company meets its obligations related to the debt, lenders have no direct control over the company's operations (apart from any covenants in the debt contract). However, if company defaults on its debt repayments lenders can exert significant influence over the company, e.g. taking control of pledged assets, appointing an administrator and having the company placed into receivership, liquidating company. Thus, while lenders have *no direct control* over a company, they have a large degree of *potential control*.

Sources of Debt

Short-Term Debt has maturity/repayment within 12 months. Sources of short term debt are banks, finance companies, investment banks, & credit unions.

Types of Short-Term Debt are:

- Non-Marketable Short-Term Debt Securities (not tradeable and no secondary market for these securities), e.g. Bank overdraft.
- Marketable Short-Term Debt Securities (tradeable, with secondary market for these securities):
- Commercial paper:
  - also known as a promissory note
  - unsecured
  - promise to pay a stated amount of money (face value) on a specified future date to the purchaser (discounter)
  - discounter may on-sell the security in the secondary market; 30 to 180 days maturity
  - borrower is the only promisor, so also called '*one-name paper*'
  - only issued by blue-chip companies and governments
  - sold at a discount to the face value;

$$P = \frac{F}{1 + rx\frac{d}{365}}$$

where: P = current market price; F = face value; r = yield (simple interest basis); d = no. of days to maturity.

Long-Term Debt has maturity/repayment greater than 12 months.

Types of Long-Term Debt are:

- Loans from banks and other financial intermediaries, e.g. asset-backed loans, such as mortgages secured by property or other assets.
- Marketable debt securities, e.g. debentures, unsecured notes, and corporate bonds.

Concept 3: Define and measure capital structure

Capital structure is the mix of debt and equity finance used by a company. Optimal capital structure is the capital structure that maximises the value of a company.

Theoretically, capital structure can affect the firm's value. By changing the firm's debt/equity ratio, you may be able to increase/maximise the firm's market value.

Value of Firm (V) = Value of Debt (D) + Value of Equity (E).

How do we measure capital structure?

There are two ways to measure financial leverage (or gearing); higher debt indicates a higher degree of financial leverage or gearing.

1. Debt/equity ratio – D/E;
2. Debt/capital ratio – D/V.

Capital = (equity (E) + debt (D)) = Firm value (V)

Also, the interest coverage ratio determines how easily a company can pay interest expenses on outstanding debt; lower the ratio, more company is burdened by debt expense; ratio of 1.5 or lower indicates ability of company to meet interest expenses may be questionable.

6.1 Interest coverage ratio	$Interest\ coverage\ ratio\ =\ \dfrac{EBIT}{interest\ expense}$

Debt and risk

Generally, there are two types of risk faced by a business:

1. Business Risk – A risk faced by all businesses; shareholders only if company is financed 100% by equity; risk posed by:

    ◦ Changes in technology
    ◦ Taste
    ◦ Market competition – Coles & Woolworths v. Aldi
    ◦ Govt. regulation

2. Financial Risk – an additional source of risk; risk involved in using debt as a source of finance:

    ◦ expected rate of return on equity increases
    ◦ variability of returns to shareholders increases
    ◦ increasing leverage involves a trade-off between risk and return.

Concept 4: Understand Theories of capital structure

Modigliani and Miller (MM) analysis

Assumptions in M&M's Perfect Markets Model:
    Capital markets are perfect, i.e.:

1. Companies and individuals can borrow at the same interest rate.
2. There are no taxes.
3. There are no costs associated with the liquidation of a company.
4. Companies have fixed investment policies, meaning that investment decisions are not affected by

financing decisions.

MM's Proposition 1 – market value of a firm is independent of its capital structure.

If a company has a given set of assets, changing the debt/equity ratio will change the way net operating income is divided between lenders and shareholders but will not change the value of the company.

Two companies that have the same assets but different capital structures are perfect substitutes and should have the same value.

There is no reason for investors to pay a premium for shares of levered companies because investors can borrow to create home-made leverage.

Home-made leverage is a perfect substitute for corporate leverage.

The central mechanism in MM's proof is the substitutability between corporate debt and personal debt.

MM's Proposition 2

The cost of equity of a levered firm is equal to the cost of equity of an unlevered firm plus a financial risk premium, which depends on the degree of financial leverage of the levered firm.

For a levered firm, the WACC (overall required rate of return of the firm) is:

6.10 WACC of a levered firm	$$WACC_L \; = \; R_D(D/V) \; + \; R_E(E/V)$$ R_D =Cost of Debt R_E=Cost of equity of a levered firm

Solving for R_E (the required rate of return on equity in a levered firm) is:

6.11	Return on equity for a levered firm	$$R_E = R_U \; + \; (R_U - RD) \times D/E$$ Note: R_U is cost of equity of an unlevered firm

where R_U is the cost of equity for an unlevered firm.

This shows that as the degree of leverage increases, the required rate of return on equity in a levered firm increases exactly in line with the increase in the available rate of return.

For the capital structure to be irrelevant, the return equity holders in a levered firm require on their investment must increase in line with the return available to them.

As 'cheaper' debt is substituted for more expensive equity in the capital structure the return required by the equity holders in a levered firm increases in response to the increased risk associated with their investment and thereby (exactly) offsets the effect on the overall cost of capital of the 'cheaper' debt finance.

Why is MM's analysis important?

MM shows what does not matter. This can also show, by implication, what does matter. In perfect capital markets, MM show that a firm's D/E ratio does not effect its WACC or market value.

By implication, if capital structure does in fact matter in the real world (so, no longer assuming perfect capital markets), then taxes and default risk could be good places to look for reasons why it matters.

Relax the assumption of perfect capital market in MM analysis

Capital market imperfections will impede MM's propositions. These imperfections include:

1. company income taxes
2. financial distress
3. agency costs

   - Lenders and shareholders
   - Managers and shareholders

4. information asymmetry

Capital Structure & Company Tax

Leverage will increase a firm's value because interest on debt is a tax-deductible expense resulting in an increase in the after-tax net cash flows to investors. The main implication of Proposition 1 with company tax is clear, but it is also extreme. A company should borrow so much that its tax bill is reduced to zero.

Capital Structure and Financial Distress

Financial distress is a situation where a company's financial obligations cannot be met or met only with difficulty. There are indirect and direct costs for financial distress.

Indirect costs of financial distress.

This involves attempting to avoid bankruptcy:

- Financial distress leads a range of stakeholders behaving in ways that can disrupt a company's operations and reduce its value.
- Effect of lost sales and reduced operating efficiency.
- Cost of managerial time devoted to attempts to avert failure (less attention paid to issues such as product quality and employee safety).

Direct costs of financial distress (bankruptcy):

This includes fees for accountancy, legal work and liquidator. Incorporating the benefits and costs of debt leads to the following expression of the value of a levered firm:

$$V_L = V_U + (PV \ of \ Debt) - (PV \ of \ expected \ bankruptcy \ costs)$$

where V_L = value of levered firm; V_U = value of unlevered firm.

The trade-off theory/ Static Theory of Capital Structure

Since financial distress brings significant costs for firms, managers choose a capital structure based on the trade-off between the benefits and the costs of debt. Managers increase debt to the point at which the costs and benefits of adding an additional dollar of debt are exactly equal. This point is referred to as the optimal capital structure point as it maximises company value.

Capital Structure and Agency Cost

Agency Cost: shareholders and debtholders

Agency costs arise from the potential for conflicts of interest between the parties forming the contractual relationships of the firm. Management may make decisions that transfer wealth from lenders to shareholders. The sources of potential conflict:

Claim dilution: A company may issue new debt that ranks higher than existing debt.

Dividend payout: A company may significantly increase its dividend payout. This decreases the company's assets and increases the riskiness of its debt.

Asset substitution: A company's incentive to undertake risky investments increases because of the use of debt. If risky investments prove successful, most of the benefits will flow to shareholders, but if it fails, most of the costs will be borne by lenders. Undertaking such investments (negative NPV) causes the total value of the company to decrease, but the value of the shares will increase and the value of the debt will fall.

Underinvestment: A company may reject proposed low-risk investments that have a positive net present value. If a company's debt is very risky it may not be in the interests of shareholders to contribute additional capital to finance new investments.

Agency Cost: shareholders and managers

Jensen's free cash flow theory : Suppose a company is generating high net operating cash flows because it is a profitable business. However, the company is declining because it does not have very many investment projects. Jensen (1986) argues that in these instances free cash flows should be paid out to investors in order to avoid poor use of funds by managers.

Capital structure with information asymmetry

The pecking order theory: It recognises that different types of capital have different costs. Managers choose the 'least expensive' capital first then move to increasingly costly capital, as follows:

1. Internally generated funds (e.g., retained earnings)
2. Debt
3. Equity

Myers explains this pecking order based on information asymmetry – a situation where all relevant

information is not known by all interested parties; managers typically have more information and if they believe that shares are under (over) valued they will issue debt (shares).

Evidence of Pecking Order Theory

In the US, most investment by non-financial companies is financed from internal cash flows, followed by external debt finance, and then by equity. The pattern in Australia is similar. However, high-growth companies have investment needs that exceed cash flows and, as a result, they depend heavily on share issues (equity finance).

Concept 5: Firm life cycle and capital structure

A firm's life cycle refers to the different stages a company goes through as it grows and matures over time.

The relationship between a firm life cycle and capital structure is that a firm's capital structure tends to change as the firm progresses through its life cycle. In general, young firms just starting out are more likely to rely heavily on equity financings, such as venture capital or angel investors, since they may not have established a track record or assets that can be used as loan collateral.

As a firm matures and becomes more established, it may shift towards a more balanced mix of debt and equity financing, with a greater emphasis on debt financing. This is because established firms often have a more stable revenue stream, assets that can be used as collateral, and a history of financial performance that can be used to demonstrate creditworthiness to lenders.

As the firm reaches the later stages of its life cycle, such as the decline phase, it may rely more heavily on debt financing to maintain operations and fund investments since equity financing may be more difficult to obtain at this stage.

To summarise, the capital structure of a firm can be influenced by its life cycle stage, with young firms more likely to rely on equity financing and established firms more likely to use a mix of debt and equity financing.

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TOPIC 9: CAPITAL STRUCTURE II

In this topic, you will learn how to calculate cost of capital of a company. Cost of Capital of a company, is the minimum return the company's investors (equity and debt holders) need to *earn* given the company's riskiness. Hence, it is the required rate of return (RRR) of the investors of the company.

From the perspective of the company management, the cost of capital is what the company has to give/provide (i.e., pay as interest and dividends and/or capital gains) to its investors (debt and equity) to obtain funds. If the company's equity (shares) and debt (bonds) securities are sold in the market, you can observe this cost of capital in the market.

The current price of a particular security reflects the return the market requires from it. For example, for a given amount of future cash inflows (returns), if the required return of the market is higher, the price would be lower. You need to clearly understand this logic!

For example, if the total return (expected cash inflows) (i.e., dividends plus capital gain) from a share is $5 per year and if this is expected to continue for the foreseeable future, and the required rate of return of the market on this share is 10%, the price of the share would be $50; if the required return is 20% the price of the share would be $25. This is calculated using perpetuity model.

Based on the same logic, if the total return of the share (dividend plus capital gain) is estimated to be $5 and current market price of the share is $50, then we know that the required return of the market for this share should be 10%

From the current prices of shares and bonds, you can calculate the required rate of return (RRR) if you know the future cash flows relevant to these securities.

Having set this background, let's have a look at the concepts you will learn in this topic.

Concept 1: Understanding Cost of Capital

Concept 2: Calculating cost of capital (Weighted Average Cost of Capital (WACC))

Concept 3: Factors affecting cost of capital

Concept 4: Individual project vs firm cost of capital

Concept 1: Understanding Cost of Capital

Understanding the 'cost of capital' is essential to understand the importance of capital structure of a company and vice versa. Cost of capital of a firm with no debt is simply the cost of equity (i.e., required return on equity). Cost of capital of a firm with debt is the weighted-average of cost of equity and debts.

In order to take into account the cost of all financing sources, we compute and use the weighted average cost of capital (WACC). From the investors' perspective, WACC is the weighted average of required returns (weighted by market value) on debt and equity.

From the company's (managers') perspective, WACC is the average cost of funds. The return the company has to offer to raise funds now. Conceptually, returns and costs are mirror images of each other.

WACC is the opportunity cost for the company's investors as of today (now). This cost of capital (WACC) is used as the discount rate (hurdle rate) for evaluating investments in new assets of *similar* risk.

Example: Proportion of debt and Equity

Suppose you have a market value of equity equal to $500 million and a market value of debt equal to $475 million. What are the capital structure weights (i.e., proportions)?

V = E + D = $500m + $475m = $975m

Weight of E = $500/$975 = 51.28%

Weight of D = $475/$975 = 48.71%

Example: Cost of Capital using intuition

Debt providers have contributed $8 million to ABC company at an interest rate of 10% p.a. Equity holders have contributed $2 million and require a rate of return of 15% on their investment. What is the company's cost of capital?

Source of Financing	$ value	Rate of Return expected	$ Return	Cost of capital
Debt	$8 million	10%	$0.8 million	
Equity	$2 million	15%	$0.3 million	
Total	$10 million		$1.1 million	$1.1 million/$10 million = 11%

Concept 2: Calculating cost of capital (Weighted Average Cost of Capital (WACC))

Cost of capital calculation involves a few steps:

- Identify sources of funding
- Calculate/identify cost of funding
- Interest payment has a tax benefit. Interest cost need to be adjusted to reflect the tax benefit.

Ordinary share and preference share do not get any tax benefit.
- Calculate proportion/weight of funding
- Multiply weight and cost of funding and then add all

The cost of debt

The current cost of debt (not past cost of debt) is the appropriate cost of debt for WACC calculations. The current cost of debt (bonds) is estimated using yield to maturity from bond valuation (Topic 4). Recall that you used market interest rate for pricing bonds:

R = the discount rate = R_D

Taxes are an important consideration in the company's cost of capital. Because interest payments can be deducted from income before tax is calculated. The after-tax cost of interest payments equals the pretax cost times 1 minus the tax rate. If the company has more than one type of debt, to get company's overall cost of debt you must first estimate the costs of each individual debt, and then calculate a weighted average of these costs (of different debts).

The cost of equity

The cost of equity is the minimum rate of return required (RRR) by a company's shareholders, given its riskiness. The cost of equity for a company is a weighted average of the costs of the different types of shares that the company has outstanding at a particular point in time.

Ordinary shares

Market information is used to estimate the cost of equity. There are several ways to do this and the most appropriate way will depend on what information is available and how reliable it is.

There are three alternative methods for estimating the cost of ordinary shares.

Method 1: Capital Asset Pricing Model (CAPM)

- Estimate the beta of the shares using historical data (for some shares Beta's are publicly available)
- Determine the current risk-free rate
- Determine the expected market risk premium
- Substitute these values into the CAPM equation below
- $E(R_i) = R_f + \beta_i[E(R_M) - R_f]$

There are some practical issues that must be considered when choosing the appropriate risk-free rate, beta, and market risk premium for the above calculation.

The recommended risk-free rate to use is the yield on a long-term Treasury security (10 year government bonds) because the equity is a long-term claim on the company's cash flows.

A long-term risk-free rate better reflects long-term inflation expectations and the cost of getting investors to invest their money for a long period of time.

Beta (β_i) for a share can be estimated using a regression analysis. (for most listed shares Beta's are publicly available).

Identifying the appropriate beta is much more complicated if the share is not publicly traded.

This problem may be overcome by identifying a "comparable" company, with publicly traded shares, that is in the same business and that has a similar amount of debt.

When a good comparable company cannot be identified, it is sometimes possible to use an average of the betas for the public companies in the same industry.

The following website updates the equity risk premium every year for each country.

https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

Method 2: Constant-growth dividend model

See Topic 5 – Share valuation, when the dividends are expected to grow at a constant rate. Rearranging the constant growth model to solve for R.

$$P_0 = (D_0 \times (1 + g))/(R - g) = D_1/(R - g)$$
$$R = (D_1/P_0) + g$$

Preference shares

The characteristics of preference shares allow you to use the perpetuity model, to estimate the cost of preference equity. Similar to ordinary shares, you can find the cost of preference equity by rearranging the pricing equation for preference shares:

$$P_0 = D_0/R$$
$$R = D_0/P_0$$

Note that the CAPM also can be used to estimate the cost of preference equity, just as it can be used to estimate the cost of ordinary equity.

Concept 3: Factors affecting cost of capital

The factors that can affect cost of capital can be determined by looking at the formula for cost of capital.

$$WACC = R_D \left(1 - t_e\right) \left(\frac{D}{V}\right) + R_E \left(\frac{E}{V}\right)$$

Cost of debt: R_D

Interest payments on loans and bonds. Whether firms bond rating is investment grade (BBB or above) or junk (below BBB) because this would determine the interest rate and further the cost of capital.

Cost of equity: R_E (if CAPM is used from Topic 3)

WACC can be affected by cost of equity. If CAPM is used to calculate cost of equity then Risk free rate, Systematic risk (beta) and Market risk premium can affect WACC.

Cost of equity: R_E (if Dividend growth model is used from Topic 5)

However, if dividend growth model is used then dividends, share price and growth rate of dividends can affect WACC.

Concept 4: Individual project vs firm cost of capital

Cost of capital refers to the cost of borrowing money from creditors or raising capital from equity investors, and it includes the cost of both debt and equity financing. In simple terms, the cost of capital is the expense a company incurs to obtain the money it needs to run its business.

As you can understand, a firm is a collection of various individual projects. The cost of capital of the firm reflects the overall risk of the company and it is the sum of the risks associated with each project. The cost of capital for the company as a whole will reflect the weighted average of the cost of capital for each individual project, adjusted for the risk associated with each project.

Therefore, when evaluating individual projects using the cost of capital of the firm, it is important to consider the following:

- The individual project has the same risk level as the overall firm's operations. The cost of capital reflects the risk associated with a firm's operations, and if the individual project has a similar risk level, the firm's cost of capital can be used to evaluate the project.
- The financing structure for the individual project is the same as the overall firm's financing structure:

If the individual project is funded using the same combination of debt and equity financing as the overall firm's financing structure, the firm's cost of capital can be used to evaluate the project.

- The project is expected to generate similar returns as the firm's other investments: If the project is expected to generate returns similar to those generated by the firm's other investments, the cost of capital can be used to evaluate the project.

Another method to calculate WACC – Adjusted Present Value Method (APV)

The APV method is an alternative way of calculating the weighted average cost of capital (WACC) for a company.

The APV method considers the specific financing structure of a project and adjusts the cost of capital accordingly. The basic idea behind the APV method is to first calculate the value of a project without considering any financing and then add the present value of any tax shields or other benefits associated with the financing.

Here are the general steps involved in the APV method:

1. Calculate the value of the project assuming an all-equity financing structure. This value is often called the unlevered value or the base-case value.
2. Calculate the present value of any tax shields or other financing benefits that would be generated using debt financing.
3. Add the value of the project from step 1 to the present value of the financing benefits from step 2 to arrive at the total project value.
4. Calculate the WACC for the levered project using the adjusted value from step 3.

The APV method is often used when a project has a unique financing structure or when the financing structure of a project changes over time. The APV method allows analysts to more accurately reflect a project's specific risk and return profile. It can lead to a more accurate estimate of the cost of capital for that project.

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TOPIC 10: PAYOUT POLICY

In Week 1, we discussed three important decisions managers make. They are investment, financing and dividend/payout decisions. Payout decision/policy is one of the 3 important decisions that managers make. It is an important decision because it can affect the financing decision of the firm and firm value. When a firm makes a profit, it can be used to fund new projects. If so, it can reduce the amount of debt in the capital structure of the firm. Hence, it could potentially affect the financing decision of the firm. Does dividend payout affect share price? Yes, it does. If you remember, in Week 5 you used different dividend discount models to value firms. They are constant, constant growth and supernormal growth dividend model. Thus, payout policy can affect firm value.

In this topic, we will discuss five concepts related to payout policy. They are as follows:

Concept 1: Articulate why cash payments to shareholders are important.

Concept 2: Explain the institutional features of dividends.

Concept 3: Dividend imputation

Concept 4: Share repurchase

Concept 5: Discuss different theories of payout policy.

Concept 1: Articulate why cash payments to shareholders are important.

Dividend policy is one of the major areas of corporate decision-making. It involves deciding the company's overall policy regarding distributions of value to shareholders:

- Whether a dividend is going to be paid in a particular year?
- How much dividend is going to be paid?
- Are there better ways to distribute wealth than paying dividends?
- Should the company pay a dividend or repurchase the shares? Or give shareholders the option of reinvesting in shares or Issue bonus shares?

When a company earns profit what does it do with it? There are 3 options:

- The company can reinvest the profit in the business.
- The company can distribute it to the shareholders as dividends.
- The company can hold it as loose cash.

From the above, option 2 is payout and you will learn about payout policy in this topic. Is it important to

distribute profits to the shareholders as dividends? There are two reasons for why it is important for firms to pay dividends. First of all, by paying regular dividends, firms can signal their financial well-being. If the firm is not in good health, it cannot pay regular dividends. Secondly, shareholders provide capital to the firm with the expectation that they will receive a return from the company in the form of a payout or capital gain.

Dividends are a distribution of company's profit to shareholders in the form of cash. Apart from dividends, there are a few other ways companies can distribute profit to shareholders. They are share buyback, special dividends and bonus issues. Companies repurchase shares from existing shareholders, and hence reduce the number of shares outstanding. In April 2019, Woolworths announced a plan to return $1.7 billion to shareholders via a share buyback programme, to be completed by 30 May 2019. A company pays a special dividend when it generates high profit in a specific period. For example, Woolworths paid a special dividend of $0.45 to its shareholders in 2021 fiscal year. There are instances where firms instead of paying cash dividends, companies may choose to pay dividends by issuing bonus shares.

Cash Dividends: Regular Cash Dividend

The most common form of dividend is the regular cash dividend, which is a cash dividend that is paid on a regular basis.

In Australia, dividends are generally paid semi-annually and are a common means by which companies return some of their profits to shareholders.

The size of a company's regular semi-annual cash dividend is typically set at a level that management expects the company to be able to maintain in the long run, barring some major change in the fortunes of the company.

Cash Dividends: Special Dividend

Management does not like to reduce the dividend because it can send a bad signal to the shareholders regarding the future prospect of the company

Management can afford to make mistake on the side of setting the regular cash dividend low because it always has the option of paying a special dividend if earnings are higher than expected.

Firm Life Cycle and Dividend Policy

The below table depicts the relation between firm life cycle and its dividend policy.

Stages of firm life cycle	External financing need	Internal financing need	Capacity to pay dividends
Introductory/start-up	High but constrained because of infrastructure	Negative or low	None since the cash flow is negative.
Growth	High	Negative	None. The investment need will be high con
High growth	High	Low	Very low. Firms in a stage of high growth are cash can be used to fund potential investmer
Mature growth	Moderate as low investment opportunities	High	High since firm will have cash flows realising
Decline	Moderate as low investment opportunities	High	High since firm will continue to have cash flo

What are the different determinants of payout?

Other financial decisions (investment and financing): If the company decides to finance its expenses and investments from its earnings, then it will have to pay less dividends to shareholders.

Signalling effect of dividends (eg what does a higher dividend signal?): If a company pays dividends then this indicates a positive future performance of the company's share. If the company is profitable, it should generate positive cash flow, and have enough funds to pay out as dividends.

Dividend clientele (characteristics of shareholders): When shareholders have a preference for current dividend income over capital gains, the company may be required to pay dividends regularly.

Future economic indications: The future economic condition of the company is one of the important factors influencing the dividend policy. If future sales are high, the earnings of the company are relatively stable. Therefore, the company is more likely to pay out a higher percentage of its earnings in dividends than another company that has unpredictable earnings.

Firm life cycle: A company in the introductory stage of its life cycle may require much of its earnings for financing investments or growth requirements. Therefore, it may not pay any dividends. On the other hand, a company in a mature stage of its life cycle can afford a more consistent dividend policy since cash flows remain stable.

How do we measure dividend distribution?

There are two ways we can measure dividend distribution. They are dividend payout and dividend yield.

- Dividend payout = Dividend/Net income

- ◦ Measures the % of earnings company pays in dividends
- What if net income is negative?
- Dividend yield = Dividend per share / share price
  - ◦ Measures the return that an investor can make from dividends alone.

Concept 2: Explain the institutional features of dividends.

Now let's look at the dividend declaration procedure. The process starts with the dividend announcement date. On this date the board of directors pass a resolution to pay dividend. Then comes the ex-dividend date. This is the date before which investors should own the share to get the dividend. The next is record date. On this date shareholders are listed in the register of shareholders to receive dividend and finally the payment date on which dividends are paid.

The announcement date: The date on which this announcement is made is known as the declaration date or announcement date. The announcement includes amount of dividend per share and other dates associated with the dividend payment process. Share price often changes when a dividend is announced because it sends a signal to the market about the future performance of the company.

The ex-dividend date: The ex-dividend date is the first date on which the share will trade without rights to the dividend. An investor who buys shares before the ex-dividend date will receive the dividend, while an investor who buys the share on or after the ex-dividend date will not.

Before the ex-dividend date, a share is said to be trading **cum dividend**, or with dividend. The share price usually drops on ex-dividend date to reflect the amount of dividend (plus franking credits) that shareholders are to receive.

The record date: The record date is the date on which an investor must be a shareholder of record (that is, officially listed as a shareholder) in order to receive the dividend. The record date typically follows the ex-dividend date by three days. The reason that the ex-dividend day precedes the record date is that it takes time to update the shareholder list (normally 3 working days) when someone purchases shares during the cum-div period.

The payment date: The final date in the dividend payment process is the payable (payment) date, when the shareholders of record actually receive the dividend (by cheque or direct transfer to the nominated bank account).

Concept 3: Dividend Imputation

Australia has moved from a classical tax system to an imputation tax system (from July 1987). **Classical Tax System** – profits were taxed at company tax rate and dividends paid were taxed again at the investor's marginal personal tax rate. This system resulted in double taxation.

Imputation Tax System – company tax paid is used as a franking credit to offset the tax liability of shareholders. Now dividends are effectively taxed only once at the personal tax rate.

- **Franked dividend**: a dividend paid out of Australian company profits on which company tax has been paid and which carries a franking credit for the income tax paid by the company.
- **Franking credit**: a credit for Australian company tax paid which, when distributed to shareholders, can be offset against their personal tax liability. When a dividend is declared, the company must state the extent to which the dividend is franked.

Concept 4: Share repurchase

So far, we have looked at cash dividends, but a number of alternatives to dividends are available to companies. All of these alternatives, like dividends, can be used to distribute cash/earnings (wealth) to shareholders. These alternatives include: Dividend reinvestment plans (DRPs), Share repurchase and Bonus shares.

A **dividend reinvestment plan (DRP)** gives shareholders the option of receiving new shares at a small discount, instead of cash dividends. Under a DRP, shareholders:

- Are deemed to have received the cash dividend and are taxed on it
- Receive franking credits that can be used to offset all or part of their tax liability

See the below video that shows the power of dividend reinvestment.

> *One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/business-finance/?p=55#oembed-1*

https://www.youtube.com/watch?v=vffTJV0IzHM

In a **share buy-back (or share repurchase)**, the company buys some of the issued shares back from shareholders. Share buy-backs differ from dividends in some ways.

- Shareholders can choose not to participate in buy-backs.
- It reduces the number of shares outstanding (In Australia, bought back shares have to be cancelled)
- Profit to the shareholders on share buybacks is considered capital gains and taxed accordingly.

(In Australia maximum allowed as buybacks per year is 10% of the issued capital. Bought back shares have to be cancelled. In USA the rules are different).

Methods of share buy-backs

- **On market buy-backs** :Company buys shares from the share market at the market price.
- **Equal access buy-back**: Buyback is offered to all shareholders on a pro-rata basis. Shareholders have to apply.
- **Selective buy-back**: Only offered to a select groups of shareholders (targeted buyback)
- **Employees share scheme buy-back**: Only offered to employees who are shareholders under an employee share scheme.
- **Minimum holding buy-back**: Firms buy back unmarketable small parcels of shares. To reduce administration costs.

Advantages of share buybacks

Buy-backs give shareholders the ability to choose when they want to receive the distribution, which may depend on the timing of the tax they must pay. Shareholders who sell shares back to a company pay tax only on the capital gains they realise, and historically these capital gains have been taxed at a lower rate than dividends. (Effectively at 50% (half) of income tax).

From management's perspective, share buy-backs provide greater flexibility in distributing value and managing the capital structure. Management can always cut back or end the buy-backs at any time. On market, buybacks are also preferred by managers as they're flexible.

Bonus share issues

One type of "dividend" that does not involve the distribution of cash (or value) is known as a bonus share issue. When a company issue bonus shares, it distributes new shares on a pro-rata basis to existing shareholders. The number of shares each shareholder owns increases but their value (price), in theory, should go down proportionately. Therefore, the shareholder is left with exactly the same total value (total wealth) as before.

Example:

Market value of ABC company (i.e., value of its assets) is $11,000. It has no debt.

The company has 10,000 ordinary shares on issue, since there is no debt, shareholders own all the assets, thus each share is worth $1.10 ($11,000/10,000).

Assume the firm issues 1000 (a 10%) bonus shares, this increases the number of ordinary shares to 11,000

The value of the company as a whole does not change. Hence, each share is now worth $1.00 ($11,000/11,000)

Shareholders' wealth is unaffected: Assume before the issue a shareholder owns 100 shares. The value of these shares= 100 @ $1.10 = $110 (total value or wealth)

After the 10% bonus share issue, the shareholder now owns 110 shares @ $1.00 each = $110 (total value or wealth)

Theoretically, bonus issues have no effect on shareholder wealth. However, this may be different in practice due to other reasons and signals

Share splits

A share split is quite similar to a bonus share issue, but it involves the distribution of a larger multiple of the outstanding shares. Theoretically, just like bonus share issues, share splits do not add value (do not increase wealth).

Concept 5: Discuss different theories of payout policy.

Miller and Modigliani's theorem says dividend policy does not matter if the market is perfect (no tax, no transaction cost and the company's investment policy is fixed). If the above conditions (assumptions) are true, shareholders can "manufacture" any dividends he or she wants at no cost.

For example, shareholders can replicate a company's dividend policy on their own by selling some of the shares for cash. Some shareholders prefer high dividend yields. For example, retirees (who depend on dividend income).

Irrelevance of Payout Policy

Modigliani & Miller (MM, 1961) argue that a company's dividend payout policy has no effect on shareholder wealth, and that the value of firm is determined solely by the earning power of the firm's assets. MM assume the following:

- The company has an investment plan and has determined how much of its assets to be acquired will be financed with borrowing.
- Perfectly competitive capital market – no taxes, transaction costs, flotations costs, or information

costs.

- Investors are rational – they prefer more to less wealth, and are equally satisfied with a given increase in wealth, whether it is in the form of cash paid out (dividends) or an increase in the value of the shares that they hold.
- If a firm increases dividend payment; as investment and borrowing decisions are fixed, extra funds needed to pay higher dividends can only come from issuing new shares; alternatively, if dividend is reduced, surplus cash can only be used to repurchase shares. Hence dividend policy involves a trade-off between higher or lower dividends and issuing or repurchasing ordinary shares.

Therefore, dividend policy will not change shareholder wealth. And the value of a company depends only on the quality of its investments; net cash that can be paid out to investors is a residual – the difference between profits and investments. Companies can adjust payouts to any level by making corresponding adjustments to the number of shares on issue.

Payout Policy is Important – The Importance of Full Payout

De Angelo & De Angelo (DD) (2006) say MM's theorem is inadequate for understanding payout policy. DD state that MM's analysis is correct *with the given assumptions*. However, concept of 'full payout' is a more logical starting point for discussion of payout policy. The 'full payout' policy – full present value of a company's free cash flow should be paid out to shareholders.

Free cash flows are cash flows in excess of those required to fund all available projects that have a positive NPV. Company value can be changed if the company retains part of its free cash flow. **DD distinguish between investment value and distribution value. In contrast to MM, DD conclude that both investment policy and payout policy are important.**

In summary, DD argue that managers are responsible for two important jobs:

- Selecting good investment projects **(Investment value)**
- Ensuring that, over the life of the enterprise, investors receive a distribution stream with the greatest possible present value. **(Distribution value)**

Under perfect capital market DD and MM support different payout policy. Now let's understand what happens if we relax the assumption of a perfect capital market.

Transaction Costs & Other Market Imperfections

Transaction costs:

In theory (with perfect markets), shareholders can develop their own payout policy – if shareholder receives

an unwanted dividend, they can use cash to buy more shares in a company, and if additional cash is needed, they can sell shares to create 'homemade dividend'.

In reality, shareholders who buy and sell shares incur transaction costs, e.g. brokerage fees, so investors who require income may prefer to hold onto shares that pay regular dividends.

Imperfections in the capital market lead to 'dividend clienteles' – different classes of investors with different preferences for current income; a firm will attract a clientele of investors suited to its dividend policy.

For Example, a company with no/low dividends will attract investors with adequate income from other sources; these investors will reinvest any dividends they receive but can avoid transaction costs by investing in companies that retain profits.

Another example is a company with stable high dividends will attract investors requiring regular income from their share portfolio to meet consumption needs, e.g. retirees, who avoid transaction costs that would arise if co. had a residual dividend policy, i.e. dividends are only paid out *if* the company has profits that it cannot profitably invest, otherwise, they will have to purchase other shares and will incur transactions costs, e.g. brokerage fees.

Transaction costs may result in dividend clienteles due to the difference in preference among different classes of investors.

Some shareholders prefer low dividends for taxation reasons. These shareholders tend to have a high marginal tax rate and prefer to have capital gains. They can also delay paying tax on capital gains (by postponing the sale until it suits them)

Floatation costs:

If a company pays dividends and retained profits are insufficient to meet investment needs, then it must raise funds externally and this involves costs, which can be quite substantial, e.g. prospectus preparation costs, underwriter's fees, loan establishment fees. Existence of flotation costs provides an incentive to preserve shareholder wealth by restricting dividends.

Behavioural factors:

Investors are not always rational, and behavioural factors may mean that sometimes investors prefer dividends being paid to increase the value of their shares. In contrast, other times, they may prefer increases in the value of their shares to dividends.

If investors are willing to pay more to invest in companies that pay higher dividends, then the arbitrage process will not prevent these companies from having higher share prices than those that don't pay dividends.

Catering theory:

Managers cater to investor demand – pay dividends when investors place higher value on dividends; don't

pay dividends when investors place higher value on increases in value of shares. This leads to 'catering theory' – managers cater to changes in investor demand for dividends.

Taxes:

Differential tax treatment of dividend income versus capital gains arising from retained profits can either favour or penalise payment of dividends. Despite the apparent tax disadvantage of paying dividends, many Australian companies pay out a significant percentage of their profits as dividends. This could be explained by the dividend imputation system that exists in Australia as opposed to the classical system present in UK and US.

This difference in tax treatment is understood by comparing a classical tax system with an imputation tax system. In a classical tax system:

Company profits are taxed at the corporate tax rate, t_c, leaving $(1 – t_c)$ to be distributed as a dividend. Dividends received by shareholders are then taxed at the shareholder's personal marginal tax rate, t_p. The consequence is that, from a dollar of company profit, the shareholder ends up with $(1 – t_c)$ x $(1 – t_p)$ dollars of after-tax dividend. Result is that profit paid as a dividend is effectively taxed twice. Also, under such a system, capital gains are either tax-free or are taxed at lower rates than dividends. From a taxation viewpoint, many investors were disadvantaged if they received a dividend and would have preferred that companies retained profits (to increase the share price). Classical tax system is still used in many countries, including the US.

In Australia, a classical tax system operated until 1 July 1987, when an imputation system was introduced.

Imputation tax system

Australian resident equity investors can use tax credits associated with franked dividends to offset their personal tax – eliminating double taxation of the classical tax system. Company tax is assessed on corporate profits in the normal way, at the corporate tax rate (t_c). As of 2014, t_c is 30%. For each dollar of franked dividends paid by company, resident shareholders are taxed at their marginal rate (t_p) on an imputed dividend of $\$D/(1 – t_c)$ — grossed-up dividend. The grossed-up dividend is equal to the dividend plus the franking credit.

This website below explains how the imputation tax system works in Australia:

www.stockwatch.com.au/articles/franking-credits.aspx

Franking credit is given by:

7.1 Franking Credit	$$Imputation\ credit = \frac{(franked\ dividend\ \times\ t_c)}{(1 - t_c)}$$

The shareholder receives a tax credit equal to the franking credit. Tax credit can be used to offset tax

liabilities associated with any other form of income. Result is that franked dividends are effectively tax-free to Australian residents if the investor's marginal tax rate is equal to the corporate tax rate.

If investor's marginal tax rate is less than corporate rate, investor will have excess tax credits, which can be used to reduce tax on other income. If investor's marginal tax rate is greater than corporate rate, some tax will be payable by the investor on the dividend. Shareholders are unable to use tax credits until franked dividends are paid. Profits earned and taxed by companies offshore do not have franking credits.

Example of dividends and imputation tax system:

To understand how the imputation tax system works, let's consider an example. Suppose a company has a profit before tax of $100. The company tax rate is 30 per cent. After tax, profit for the company is $70. Now let's say that there is only 1 shareholder in the company. If the company decides to pay all of its profit as dividend, then the dividend amount is $70 but it comes with a $30 tax credit which sits with the tax office. So the total dividend income is $100 which includes $70 dividend from the company + $30 tax credit from the tax office.

Now let's see how the dividend income is affected if a different tax rate is applicable to the shareholder. Suppose the shareholder has a personal tax rate of 10 per cent then the shareholder should pay $10 as tax on the $100 dividend income but since the company has already paid $30 on the $100, the shareholder will get a $20 tax refund. Now suppose the shareholder has a personal tax rate of 30 per cent. Then he/she has to pay a tax of $30. Now since the company has already paid the $30, the shareholder does not have to pay anything or receive anything. Now suppose the shareholder has a personal tax rate of 50 per cent then his/her income tax is $50. However, since the company has already paid $30 tax, the shareholder only has to pay $20 more to the tax office.

The following table shows the company's income statement

Company	
Profit before tax	$100
Tax Rate	30%
Profit after Tax	$70
Dividend	$70
Tax Credit provided by ATO. This amount sits at the tax office.	$30
Dividend Income	$70+$30 = $100

The following table shows how dividend income is taxed for shareholders in a different tax bracket

Shareholder under different tax bracket				
Tax Rate	Dividend Income	Income Tax	Franking Credit	Net effect
10%	$100	$10	$30	$20
30%	$100	$30	$30	0
50%	$100	$50	$30	-$20

Franking credit can be calculated as:

$$\$Dividend * \frac{t_c}{1 - t_c}$$

Information Signalling Effects of Dividends

Managers usually have better information about company's prospects than shareholders and if this affects their decisions about current dividend payments, then changes in dividends will convey management's 'inside' information about future cash flows to the market. Thus, the announcement of change in dividends provides the occasion for a change in share price, but is not the cause of the change in share price.

Evidence suggests share price changes around the time of the announcement of dividend changes are positively related to the change in the dividend.

DD argue that this supports the importance of payout policy—investors value securities only for the payouts they are expected to provide. Therefore, it is logical that a higher share price follows the announcement of higher payouts.

Agency Costs & Corporate Governance

Agency costs can be reduced by paying higher dividends because there is:

- **Greater accountability** – higher dividend force the company to raise capital externally, which requires the provision of information to investors, potential investors, underwriters, and others, who are allowed to scrutinise the company at a relatively low cost, so it increases the provision of information, increases accountability to the market, increases monitoring of managers. Managers are more likely to act in the interests of shareholders.
- **Avoid overinvestment** – where firms have free cash flows (FCF) managers may retain cash and overinvest to increase the size of the company and, hence, increase their power and remuneration. New projects may have negative NPVs, thus, reducing shareholder wealth. This argument is particularly relevant to mature firms with fewer investment opportunities; shareholders are better off

if management pays out the FCFs as dividends.

Lie (2000) and Grullon, Michaely and Swaminathan (2002) provide empirical evidence that increased payouts signal a reduced opportunity to overinvest, and that firms with excess cash relative to industry norms who do pay out have positive excess returns – the market welcomes payouts because of the belief that managers cannot be relied upon to invest retained funds profitably, and firms with limited investment opportunities exhibit a bigger abnormal return to the announcement of such initiatives.

Types of Payout Policies

Three payout policies that might be adopted are:

- **Residual dividend policy** – pay out as dividends any profit that management does not believe can be invested profitably (no fixed pay out percentage is set)
- **Stable (Progressive) dividend policy** – a target proportion of annual profit to be paid out as dividends, e.g. if profit in Yr 1 is $10m & target is 10%, dividends paid = $1m, if profit in Yr 2 is $20m (and this is a sustainable increase in profit) and target is 10%, dividends paid = $2m, if profit in Yr 2 is $20m but this is not sustainable, then target may drop to 5%, dividends paid = $1m; dividends are related to the long-run difference between expected profits and expected investment needs; dividend per share will increase if an increase in profits is sustainable, but not if increase in profit is temporary; if profits fall, generally, dividend per share is maintained.
- **Constant payout policy** – dividend payout ratio remains constant (so in the example above the dividend paid in Yr 2 would always be $2m, regardless of whether the increase in profits is permanent or temporary).

Dividends Are Sticky

Empirical evidence (e.g. Lintner (1956), Brav, Graham, Harvey, & Michaely (2005)) finds that most managers are reluctant to make changes in dividends that are likely to have to be reversed in the future.

Sticky – maintaining current level of dividend per share (DPS) is of high priority, as is not cutting DPS (external funds will be raised to finance investments rather than cutting DPS).

Inflexible – managers do not see much reward in increasing DPS; it does happen, but only after investment and liquidity needs are met.

Smoothed – target proportion of annual profit to be paid out as dividends.

Managers prefer not to pay dividends – they would prefer share repurchases as a way of rewarding shareholders as repurchases are more flexible with no need for smoothing, and repurchase decisions are made after investment decisions, so use residual cash flows.

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