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A3.1 BASIC ACCOUNTING AND FINANCE

Personal Income Tax = Taxable Income × Applicable Personal Tax Rate

Capital Gains Tax = Capital Gain × Capital Gains Tax Rate

Chargeable Gain = Selling Price − Purchase Price − Allowable Deductions

Company Taxation refers to the process of imposing taxes on the profits and income earned by businesses or corporations.

Corporate Taxable Profits = Income − Allowable Expenses + Capital Gains.

Corporate Income Tax = Corporate Taxable Profits × Applicable Corporate Tax Rate

Offshore Investments Funds refers to investment funds that are established in jurisdictions outside of an individual's home country. Differences between tax systems can make international investment complex and may lead investors to pay more tax than is intended within the jurisdiction in which they live.

Double Taxation Relief (DTR) means that the local tax authority will allow companies and individuals with overseas income or capital gains to offset tax paid overseas against their liability to domestic tax on that income or capital gains. "The maximum offset is the rate of tax that would have been paid locally."

Other taxes In addition to income taxes, taxation systems also include VAT, custom duties, Stamp duty, Inheritance taxes and property taxes among others.

The Financial Reports are used to help all stakeholders of an organization in the decision-making process.

The International Accounting Standards Board (IASB) is a body that develops, issues, and withdraws accounting standards. The standards that are issued by the IASB are currently called International Financial Reporting Standards (IFRSs).

Users of Financial Statements All stakeholders of a firm are users of their financial statements, including:

- Equity Investors (i.e. both actual and potential shareholders).
- Loan creditors (both long term and short term).
- Employees.
- Business contacts (i.e. customers and suppliers).
- Government agencies (including the tax authorities).
- Competitors.
- Potential predators.

Statutory Requirements play a pivotal role in financial reporting, shaping the content and form of companies' financial statements. For instance, the UK's Companies Act mandates specific elements, including the statement of financial position, the statement of profit or loss, detailed disclosures, a directors' report, and an auditors' report. These regulations are crucial for ensuring transparency and accountability in financial reporting.

The International Accounting Standards Board The International Accounting Standards Board (IASB) is a body that develops, issues, and withdraws accounting standards.

Sustainability Development As defined by the 1987 Brundtland Report, recognizes the importance of meeting present needs without compromising the ability of future generations to do the same.

Sustainability Reporting enables organizations to measure, understand and communicate the economic, social and environmental effects of their activities. A sustainability report also presents the organization's goals, values and model of governance.

Global Reporting Initiative (GRI) is an international independent organization, which provides the world's most widely used standards on sustainability reporting.

Alternative Reporting There are two main alternatives:

- Non-financial Reporting.
- Integrated Reporting.

Non-financial reporting refers to the practice of disclosing information related to a company's environmental, social, and governance (ESG) performance and impacts, in addition to its financial performance. In the UK it includes directors' report and a strategic report.

Integrated Reporting The aim of integrated reporting is to communicate a rounded picture of an organization's performance and prospects, so in an integrated report, the organization needs to present not only its financial numbers but to place those numbers in a more holistic context.

Annual Report The annual report of a company listed on the UK Stock Exchange can easily run to 60 or 70 pages. Much of this is 'promotional' material which is published on a voluntary basis.The core of the report is, however, subject to the stringent rules imposed by the Companies Act 2006 and the detailed regulations imposed by the accountancy profession.

Corporate Governance Its purpose is to facilitate effective, entrepreneurial and prudent management that can deliver the long-term success of the company.

Financial Decisions Finance involves two basic issues: Investment Decisions; and Financing Decisions.

Investment Decision (Capital Budgeting Decision) It is the decision of investing or not in real assets in order to create value.

Financing Decision It is the decision of choosing the best combination of different sources of funds to finance investment and the operations.

Capital Markets	refer to the financial markets where companies can raise funds by issuing various types of securities to investors. For large, publicly quoted companies, the stock market serves as a performance monitor.
Key effects of the capital markets on a firm's decisions include:	• Sound investment decisions require accurate measurement of the cost of capital. • Limitations in the supply of capital focus attention on methods of raising finance. • Mergers and takeovers create threats and opportunities to be exploited. • 'Externalities' require managers to determine the appropriate role of organization.
Agency Theory	refers to the relationship between a principal (Shareholder) and an agent of that principal (Directors/Top Management), namely to situations when the former do not act in the best behalf of the former. It includes issues such as the nature of the agency costs, conflicts of interest (and how to avoid them) and how agents may be motivated and incentivized.
Value of an Asset	Present value of its expected cash flows/returns.

Present Value of Cash Flows

$$= \frac{\text{Future Cash Flow(CF)}_n}{(1+r)^n}$$

Discount Rate (r)

$$= \left(\frac{\text{Future Cash Flow}}{\text{PV}}\right)^{\frac{1}{n}} - 1$$

Economic Value Added (EVA)

$$= \text{Net Operating Profit After Taxes}$$
$$- (\text{Invested Capital} \times \text{Weighted Average Cost of Capital})$$

Gross Redemption Yield	The Gross Redemption Yield or Yield to Maturity is the annual return if the loan stock is hold until maturity and there are no default event.
Debentures	are loans which are secured on some or all assets of the company. This means that, if the company fails to make one of the coupon payments or the capital repayment, various actions are available to the stock holders.There are two types of debenture: Mortgage debenture (fixed charge) and Floating charge debenture.
Fixed Charge Debenture	A fixed charge means that there are specific secured assets mentioned in the legal documentation for the mortgage debenture.
Floating Charge Debenture	The company can change the secured assets in the normal course of business. When a company fails to make an interest or capital payment, the debenture holders can apply to the courts to convert the floating charge to a fixed charge.
Unsecured Loan Stock	Here there is no specific security for the loan. If the company defaults, the loan stock holders' only remedy is to sue the company. To compensate for the additional risk, the Gross Redemption Yield will be higher.
Floating rate notes (FRNs)	are medium-term debt securities issued in the Euro market whose interest payments 'float' with short-term interest rates, possibly with a stipulated minimum rate.
Subordinated Debt	Debt that ranks below the firm's general creditors (but ahead of preference shareholders and the ordinary shareholders). The subordinated lender holds a junior debt and is paid after all senior debt holders are satisfied.

Junior Debt	is a type of debt that ranks lower in priority for repayment compared to other forms of debt issued by a company. It is called "junior" because it is subordinate to senior debt in the hierarchy of debt repayment.
Senior Debt	is a type of debt that holds the highest priority for repayment in the event of a company's financial distress, liquidation, or bankruptcy. It is called "senior" because it is at the top of the hierarchy of debt repayment.
Asset-backed securities (ABSs)	are securities backed by ring-fenced pools of assets (which are held in trusts). Investors are repaid through interest and capital payments made from the pools of assets.
Mortgage-Backed Securities	refers to assets-backed securities (ABSs) which may be backed by mortgages.
Eurobonds	are a particular category of international debt security that are issued in a currency other than the currency of the country or countries where the bond is issued. Despite their name, Eurobonds can be issued in a variety of other currencies and not only euros.
Equity capital	refers to the total amount of capital that a company raises by issuing and selling its shares of stock to investors or shareholders. It represents the ownership stake or ownership interest that shareholders hold in the company.
Deferred shares	Shares with no right to dividends until certain conditions are met or only after a set period. Deferred shares often have limited capital rights and no right to vote.
Redeemable Ordinary Shares	"Redeemable Ordinary Shares" refer to a type of company shares that carry the feature of being redeemable by the issuing company at a pre-determined future date or under specific conditions. These shares are considered a hybrid between ordinary (common) shares and debt instruments.
Preference Shares	a class of shares in a company that entitles the holders to receive certain preferential rights and privileges over ordinary (common) shareholders. These rights often include a fixed dividend payment and priority in receiving assets in the event of liquidation. Typically, preference shares do not have voting rights.
Non-Voting Shares	is a class of ownership interest in a company that do not have the right to vote on specific corporate matters at shareholder's meetings.
Shares with Multiple Voting Rights	are a type of equity ownership in a company that gives their owners more voting power than those of ordinary or common shares.
Golden Share	is often used to describe a special class of shares that give their bearer unique and important rights, frequently within a company, in addition to the regular rights attached to common shares.
Preference Shares	a class of shares in a company that entitles the holders to receive certain preferential rights and privileges over ordinary (common) shareholders. These rights often include a fixed dividend payment and priority in receiving assets in the event of liquidation. Typically, preference shares do not have voting rights.

Convertible Unsecured Loan Stocks	are unsecured loan stocks which give the right to convert into ordinary shares of the company at a later date. The investor does not pay anything to convert other than surrendering the convertible preference shares.
Convertible Preference Shares	are preference shares which give the right to convert into ordinary shares at a later date. The investor does not pay anything to convert other than surrendering the convertible preference shares.
Rest Period	is the period prior to the first possible date for conversion of preference shares.
Conversion Premium	is the difference between the cost of obtaining one ordinary share by purchasing the required number of convertible securities and the market price of the share.
Contingent Convertibles	are loan stocks that convert into ordinary shares of the issuing company once a specified trigger is reached.
Market Capitalization	$= P(\text{Price per Share}) \times \text{Number of Shares}$
Price Per Share	$= \dfrac{\text{Market Capitalisation}}{\text{Number of Shares}}$
The components of the capital of a limited company are:	• Equity capital • Short- and medium-term debt • Long-term debt
Assets of a business can be divided into:	• Non-current assets such as land, property, plant, equipment and 'intangibles'. • Current assets such as inventories, work-in-progress, debtor balances, cash (and equivalents).
Dividends	refers to the periodic payments made by a company to its shareholders, typically in the form of cash or additional shares of stock as a distribution of the company's profits or earnings.
Real Rate	is the rate after considering taxes. The real rate is approximately equal to Nominal Interest Rate − Inflation Rate or more precisely: $$(1 + r_{\text{nominal}}) = (1 + r_{\text{real}})(1 + \text{inflation rate})$$
Nominal Rate	It represents the actual rate of interest earned on the principal amount without considering the impact of inflation.
Accounting Concepts	Accounting standards are based on concepts and conventions which have gradually come together and evolved over the many years since bookkeeping and accountancy came into being.
The Cost Concept	Under that concept, non-current assets generally appear in the statement of financial position at their original cost less depreciation to date, subject to a possible impairment write-down.
Money Measurement Concept	This concept states that accounting statements restrict themselves to matters which can be measured objectively in money terms.
Going Concern Concept	It is usually assumed that a business will continue indefinitely in its present form.

Business Entity Concept	It states that The affairs of the business are kept separate from those of the owners.
Realisation Concept	It states that income is recognised as and when it is 'earned'. It is not, therefore, necessary to wait until the customer settles his or her bill.
Accruals Concept	It states that expenses are recognised as and when they are incurred, regardless of whether the amount has been paid.
Matching Concept	It states that income and expenses which relate to each other should be matched together and dealt with in the same statement of profit or loss.
Dual Aspect Concept	The dual aspect concept recognises that every transaction or adjustment will affect two figures.
Materiality	There is little point in providing information which is so detailed as to be unintelligible. The statements can, therefore, be made clearer by showing totals such as 'administrative expenses' instead of listing every item which makes this heading up.
Prudence	This concept states that the financial statements should avoid presenting an unduly optimistic set of results regarding uncertain revenues and expenses.
Consistency	It states that the figures published by the company should be comparable from one year to the next. Accounting policies should not, therefore, be changed from one year to the next unless there is a very good reason for doing so.
Discounted Cash Flow Approach	is a valuation method used to estimate the value of a project based on the present value of its expected future cash flows. This approach is used to make an initial valuation of the likely wealth generated by the project.
The net present value or NPV	The NPV Of a series of cash flows $C_0, C_1, \ldots, C_n$ at a cost of capital r is the sum of the present values of the cash flows generated by the project:

$$NPV = C_0 + \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_n}{(1+r)^n} = \sum_{t=0}^{n} \frac{C_t}{(1+r)^t}$$

If the result is positive, then the project will create value (improve shareholders' wealth) and should be done.

The Internal Rate of Return (IRR)	The IRR is the return of the project assuming that the cash flows of the project are reinvested at the same rate. The IRR rule states that a project should be accepted if the cost of capital is lower than the IRR. It is essentially the same in method of calculation as the NPV, the difference being that rather than discounting at the cost of capital, a solution is found for the return rate that gives the project a zero NPV:

$$NPV = \sum_{t=0}^{n} \frac{C_t}{(1+r)^t} = 0$$

The Statement of Financial Position	summarises the company's financial position. Effectively, the statement consists of two lists:

- Everything owned by the business.
- The sources of finance used to fund these acquisitions.

Accounting Equation	is a simple relationship between assets, liabilities and equity:

$$\text{Assets} = \text{Liabilities} + \text{Shareholder's Equity}$$

The Statement of Profit or Loss	provides an insight into a company's trading activities. It compares the income generated from trading with the costs associated with earning that income, the difference being the profit or loss for the year.
The cash flow statement	The cash flow statement intents to identify the major causes of changes between the cash balance between the end of the previous year and the end of the current year.
Statement of Changes in Equity	The Statement of changes in equity summarises the changes in the capital and reserves attributable to equity holders of the company over the accounting period, and so reconciles the amounts shown in the statement of financial position at the start and end of the period.
Measuring Risk Associated with Loan Capital	There are a number of ratios which can be used to measure the risks borne by the shareholders because of the company's borrowing policy. These should not be confused with the risks which arise because of any volatility in the underlying business itself.
Interest Cover	is defined to be profit on ordinary activities before interest and taxation, divided by the annual interest payments due on that issue of the loan capital and on all prior ranking loan capital.

Interest Coverage Ratio	$= \dfrac{\text{EBIT}}{\text{Interest Expense}}$
Interest Priority Percentages	show the slice of profit on ordinary activities before interest and tax, which covers the annual interest payments due on each issue of loan capital.
Asset Cover - Alternative 1	$= \dfrac{\text{Total assets} - \text{Current liabilities} - \text{Intangible assets}}{\text{Loan capital} + \text{Prior ranking debt}}$
Asset Cover - Alternative 2	$= \dfrac{\text{Total assets} - \text{Current liabilities} - \text{Intangible assets}}{\text{Total loan capital}}$
Asset Priority Percentages	show the slice of total assets less current liabilities less intangible assets which is available to cover the nominal value of each issue of loan capital.
Gearing	refers to the relative proportions of long-term debt and equity finance in a company. High gearing means that the company has a high level of debt financing.
Debt-to-Equity Ratio (Asset Gearing)	$= \dfrac{\text{Total Debt}}{\text{Total Equity}} = \dfrac{\text{Borrowings}}{\text{Equity}}$
Debt-to-Capital Ratio (Asset Gearing)	$= \dfrac{\text{Total Debt}}{\text{Total Equity} + \text{Total Debt}} = \dfrac{\text{Borrowings}}{\text{Borrowings} + \text{Equity}}$

Debt-to-Enterprise Value Ratio $= \dfrac{\text{Net Debt}}{\text{Enterprise Value}}$

Shareholders' Equity Ratio $= \dfrac{\text{Shareholders' Equity} - \text{Intangibles}}{\text{Total Assets} - \text{Current Liabilities} - \text{Intangibles}}$

Income Gearing $= \dfrac{\text{Interest on Borrowings}}{\text{Profit on Ordinary Activities Before Interest and Tax}}$

Measures Used by Investors in Shares   Investors will want to know about a company's profitability, efficiency, earnings for ordinary shareholders and dividends.

Market-to-Book Ratio $= \dfrac{\text{Market Value of Equity}}{\text{Book Value of Equity}}$

Earnings Per Share $= \dfrac{\text{Net Profit After Tax}}{\text{Number Of Shares Outstanding}}$

Price Earnings Ratio (P/E Ratio) $= \dfrac{\text{Market Price of an Ordinary Share}}{\text{Earnings Per Share}}$

Dividend Yield $= \dfrac{\text{Dividends Per Share}}{\text{Market Price of an Ordinary Share}}$

Dividend Cover $= \dfrac{\text{Earnings Per Share}}{\text{Dividends Per Share}}$

Payout Ratio $= \dfrac{\text{Dividends Per Share}}{\text{Earnings Per Share}}$

Earnings Before Interest and Taxes (EBIT) $= \text{Revenues} - \text{Operating Expenses}$

EBITDA $= \text{EBIT} + \text{Depreciation} + \text{Amortisation}$

Net Asset Value Per Share $= \dfrac{\text{Ordinary Shareholders' Equity} - \text{Intangible Assets}}{\text{Number of Issued Ordinary Shares}}$

Ordinary Shareholders' Equity   means called up share capital, other reserves, including share premium account and revaluation reserve and retained earnings.

Profitability Ratios   are used to check that the company is generating an acceptable return on revenues.

Gross Profit Margin $= \dfrac{\text{Gross Profit}}{\text{Sales/Revenues/Turnover}}$

Operating Margin $= \dfrac{\text{Operating Income}}{\text{Sales/Revenues/Turnover}}$

Earnings before interest and taxes (EBIT) Margin $= \dfrac{\text{Earnings before interest and taxes (EBIT)}}{\text{Sales/Revenues/Turnover}}$

Profit Margin $= \dfrac{\text{Profit Before Taxes}}{\text{Sales/Revenues/Turnover}}$

Return Ratios   are used to check that the company is generating an acceptable return to the capital invested.

Return on Capital Employed (ROCE) - Alternative 1 $= \dfrac{\text{Profit Before Tax and Interest}}{\text{Share Capital} + \text{Reserves} + \text{Long Term Debt}} \times 100$

Return on Capital Employed (ROCE) - Alternative 2 $= \dfrac{\text{Profit Before Tax}}{\text{Share Capital} + \text{Reserves}} \times 100$

Asset Utilisation Ratio

$$= \frac{\text{Sales/Revenues/Turnover}}{\text{Share Capital} + \text{Reserves} + \text{Long Term Debt}}$$

Return on Assets

$$= \frac{\text{Net Income} + \text{Interest Expense}}{\text{Total Assets}}$$

Return on Invested Capital

$$= \frac{\text{EBIT} \times (1 - \text{Tax Rate})}{\text{Book Value of Equity} + \text{Net Debt}}$$

Return on Equity (ROE)

$$= \frac{\text{Profit after Interest and Tax ie Net Profit}}{\text{Share Capital} + \text{Reserves}} \times 100$$

Liquidity Ratios

While it is important for a business to be profitable, profit is not sufficient on its own to guarantee survival. There must be sufficient liquid assets available to ensure that short-term commitments can be met. Otherwise the company has insufficient liquidity and might be forced into liquidation. A situation of Insufficient Liquidity refers to a situation where a company does not have enough cash or easily convertible assets to meet its short-term financial obligations as they become due.

Current Ratio

$$= \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

Quick Ratio

$$= \frac{\text{Current Assets} - \text{Inventories}}{\text{Current Liabilities}}$$

Cash Ratio

$$= \frac{\text{Cash}}{\text{Current Liabilities}}$$

Efficiency Ratios

They give an insight into the effectiveness of the company's management of the components of working capital.

Inventory Turnover Period/ Inventory Days

$$= \frac{\text{Inventories}}{\text{Cost of Sales}} \times 365 = \frac{\text{Inventory}}{\text{Average Daily Cost of Sales}}$$

Inventory Turnover

$$= \frac{\text{Cost of Sales}}{\text{Inventory}}$$

Trade Receivables Turnover Period or Accounts Receivable Days

$$= \frac{\text{Trade Receivables}}{\text{Credit Sales}} \times 365 = \frac{\text{Accounts Receivable}}{\text{Average Daily Sales}}$$

Trade Receivable Turnover or Accounts Receivable Turnover

$$= \frac{\text{Annual/Credit Sales}}{\text{Trade/Accounts Receivable}}$$

Payables Turnover Period or Accounts Payable Days

$$= \frac{\text{Payables}}{\text{Credit Purchases}} \times 365 = \frac{\text{Accounts Payable}}{\text{Average Daily Cost of Sales}}$$

Trade/Accounts Payable Turnover

$$= \frac{\text{Annual Cost of Sales}^*}{\text{Trade/Accounts Payable}}$$

* Assuming a constant inventory level, such that
Cost of Sales = Purchases.

Asset Turnover

$$= \frac{\text{Sales/Revenues/Turnover}}{\text{Total Assets}}$$

Fixed Asset Turnover

$$= \frac{\text{Sales/Revenues/Turnover}}{\text{Fixed Assets}}$$

Working Capital

$$= \text{Current Assets} - \text{Current Liabilities}$$

Working Capital Cycle	$=$ Inventory turnover period $+$ Trade receivables turnover period $-$ Trade payables turnover period

Capital Asset Pricing Model (CAPM) is a financial model which attempts to provide a coherent framework for estimates returns by understanding the interaction of risk and return. Its expression is:

$$\bar{r}_i = r_f + \beta_i \left(\bar{r}_m - r_f \right)$$

where $\bar{r}_i$ is the expected return of a security, r_f is the return of a risk free asset, β is a measure of risk, and $\bar{r}_m$ is the expected market return.

Cost of Equity (r_e) The cost of equity is the expected return of an investment in equity, given its risk level:

$$r_e = Risk\ Free\ Rate + Risk\ Premium$$

In the context of CAPM the Risk Premium is given by $\beta_i \left(\bar{r}_m - r_f \right)$.

Real Rate is the rate after considering taxes. The real rate is approximately equal to Nominal Interest Rate $-$ Inflation Rate or more precisely:

$$(1 + r_{\text{nominal}}) = (1 + r_{\text{real}}) (1 + \text{inflation rate})$$

Nominal Rate It represents the actual rate of interest earned on the principal amount without considering the impact of inflation.

Real Cashflows These are cash flows which should be discounted at a real rate of return.

Nominal Cash flows These are cash flows which should be discounted at a nominal rate of return.

Cost of Capital (r_i)
$$= r_f + \beta_i \left(r_M - r_f \right)$$

Pretax Weighted Average Cost of Capital (WACC)
$$= r_e \frac{E}{E + D} + r_d \frac{D}{E + D}$$

Weighted Average Cost of Capital (WACC)
$$= r_E \frac{E}{E + D} + r_D (1 - \tau_c) \frac{D}{E + D}$$

Unleveraged/Ungeared Beta (β_{Assets})
$$= \beta_E \left(\frac{E}{E + D} \right) + \beta_D \left(\frac{D}{E + D} \right)$$

Leveraged/Geared Beta (β_L)
$$= \beta_U \left[1 + (1 - \tau_c) \frac{D}{E} \right] - \beta_d (1 - \tau_c) \frac{D}{E}$$

Cost of Debt (r_d)
$$= y - pL$$

Leveraged Beta (β_L)
$$= b_U \left[1 + (1 - \tau_c) \frac{D}{E} \right]$$

Where:

R_f	Risk-free return	β	Beta
R_m	Market Return	β_E	Beta of the Equity
β_D	Beta of the Debt	τ_c	Corporate Tax Rate
D	Debt	E	Equity
Y	Yield to Maturity	P	Probability of Default
L	Loss Rate		

A3.2 MICROECONOMICS

Scarcity

Scarcity refers to the limited availability of resources compared to unlimited wants.

Opportunity Cost

The opportunity cost is the cost of an activity measured in terms of the best alternative that is forgone. Opportunity cost can be computed as:

$$\text{Opportunity cost} = \frac{\text{What is given up}}{\text{What is gained}}$$

Rational Choice

Rational choices are made by weighing up the benefit of any activity against its cost measured in terms of opportunity cost in such a way that the objective of the decision-maker is maximized.

Allocative Efficiency

Allocative Efficiency means that the resources of the economy are distributed such that the combination of goods produced and sold maximizes consumer satisfaction relative to the cost.

Law of demand

Other things being equal, the higher the price of a good, the lower the quantity demanded, and the lower the price the higher the quantity demanded.

Change in quantity demanded

This is the term used to describe the change in the units of a commodity consumed that is due solely to a change in the price of the commodity. This is represented as a movement along the demand curve.

Change in demand

A term used to describe a change in the units of a commodity consumed due to changes in factors other than the price of the commodity. This is represented as a shift in the demand curve.

Law of supply

Other things being equal, the higher the price of a good, the higher the quantity supplied, and the lower the price the lower the quantity supplied.

Change in quantity supplied

This is the term used to describe the change in the units of a commodity supplied that is due solely to a change in the price of the commodity. This is represented as a movement along the supply curve.

Change in supply

A term used to describe a change the units of a commodity supplied due to changes in factors other than the price of the commodity. This is represented as a shift in the supply curve.

Price elasticity

The degree of responsiveness of quantity demanded (quantity supplied) to changes in the price of the commodity. The following formulas can be used to compute the price elasticity of demand and supply depending on what information is available:

1. Point elasticity: $\dfrac{\Delta Q}{\Delta P} \times \dfrac{P}{Q}$ OR $\dfrac{\%\Delta Q}{\%\Delta P}$

2. Arc elasticity formula: $\dfrac{\Delta Q}{\Delta P} \times \dfrac{\text{Average } P}{\text{Average } Q_D}$

Where: Q = Quantity demanded or Supplied

P = The price of the commodity

$$\text{Average Quantity} = \frac{Q_1 + Q_2}{2}$$

$$\text{Average Price} = \frac{P_1 + P_2}{2}$$

Interpretation of price elasticity

The value of price elasticity (P_e) can be interpreted as follows:

1. Inelastic demand or supply: $|P_e| < 1$

2. Elastic demand or supply: $|P_e| > 1$

3. Unit elastic demand or supply: $|P_e| = 1$

4. Perfectly inelastic demand or supply: $|P_e| = 0$

5. Perfectly elastic demand or supply: $|P_e| = \infty$

Income elasticity of demand

The degree of responsiveness of quantity demanded to changes in the income of consumers. Income elasticity is computed as:

$$\text{Income Elasticity} = \frac{\%\Delta Q_d}{\%\Delta I}$$

Where: Q_d = Quantity demanded, I = Income of the consumer When the income elasticity of demand is positive, the good is a **normal good**, and when it is negative the good is an **inferior good**. **Luxury goods** have a higher Income elasticity of demand than more basic goods

Cross price elasticity of demand

The degree of responsiveness of the quantity demanded of a commodity to changes in the price of a related commodity.

$$\text{Cross price elasticity for Good X} = \frac{\%\Delta Q_{dx}}{\%\Delta P_y}$$

When the cross-price elasticity between two goods is positive, the two goods are **substitutes** and when the cross-price elasticity is negative, the two goods are **complements**.

Minimum price control

This is also called a price floor. This is the lowest price set by the government below which it is illegal to sell a good. Price floors are set when the market price is considered too low. A price floor is set above the market price.

Maximum price control

This is also called a price ceiling. It is the highest price set by the government, above which it is illegal to sell a good. A maximum price is usually set when the market price is considered too high, hence it is placed below the equilibrium price.

Marginal utility

Marginal utility is the additional utility a consumer gains from consuming an extra unit of a commodity. Marginal utility can be computed as the change in total utility divided by the change in quantity:

$$MU = \frac{\Delta TU}{\Delta Q}$$

Paradox of value (Diamond-Water Paradox)	The paradox of value is a contradiction that things like diamonds are more valuable and priced higher than things like water, even though water is more useful to man and is consumed more than diamonds. This paradox was posed by Adam Smith. The emergence of the marginalist revolution resolved this paradox. This school argues that market value is determined by marginal utility, not total utility. Water, despite its high total utility, has a low marginal utility because of its abundant supply. Conversely, because of the scarcity of diamonds, they have a low total utility but a high marginal utility.
The principle of diminishing marginal utility	As more units of a good are consumed, additional units consumed yield less additional utility than the previous units consumed.
Consumer Surplus	Consumer surplus is the monetary value of the gain consumers obtain because they purchase a commodity at a price less than the highest price they would have been willing to pay for the commodity.
Equi-marginal principle	This is also called the consumer optimality decision rule. It states that consumers are said to be maximizing utility if the marginal utility per dollar is the same across all goods consumed. For goods $X_1, X_2, \ldots, X_n$ with corresponding prices $P_{x1}, P_{x2}, \ldots, P_{xn}$, the equi-marginal principle implies that for a consumer consuming this set of goods, optimal consumption occurs when $$\frac{MU_{x1}}{P_{x1}} = \frac{MU_{x2}}{P_{x2}} = \cdots = \frac{MU_{xn}}{P_{xn}}$$ where $MU_{x1}, MU_{x2}, \ldots, MU_{xn}$ are the corresponding marginal utilities.
Indifference Curves	An indifference curve is a curve showing all combinations of two goods that yield the same level of satisfaction to the consumer to which the consumer is indifferent. The indifference curve is convex.
Marginal rate of substitution	The marginal rate of substitution measures the amount of a good that a consumer has to give up to consume one extra unit of another good. This is the slope of the indifference curve. Mathematically, the marginal rate of substitution between two goods X and Y can be stated as: $$MRS_{XY} = \frac{MU_X}{MU_Y}$$ **Diminishing marginal rate of substitution** implies that as more of good X is consumed and less of good Y is consumed, the less additional good Y will a person be prepared to give up in order to obtain an extra a unit of X.
Budget line	The budget line is a line showing all the possible combinations of two goods that a consumer can afford, given the consumer's income and the price of the goods. A typical budget line of a consumer with income I, consuming two goods X and Y with corresponding prices P_X and P_Y can be written as: $$I = P_X X + P_Y Y$$ The slope of the budget line is the ratio of the prices of the two goods $\left(\frac{P_X}{P_Y}\right)$.

Income effect of a price change   The income effect of a price change is the change in quantity demanded that results from a change in the real income (purchasing power) of the consumer necessitated by the change in price.

Substitution effect of a price change   The substitution effect of a price change refers to the change in quantity demanded that can be attributed to the change in the relative price of the good.

Optimal consumption decision   A consumer, facing a given budget line is said to be maximizing utility when the budget line is tangent to the furthest indifference curve. At this point, the slope of the indifference curve and the budget lines are equal. The utility maximization condition can be expressed as:

$$\frac{MU_X}{MU_Y} = \frac{P_X}{P_Y}$$

Short-run   Short-run is the time period over which at least one-factor input is fixed in supply.

Long-run   The long run is a time period long enough for all factor inputs to be variable

Total physical product   Total Physical Product (TPP) is the total output produced in a period of time given the available inputs.

Average physical product   The average product is the output per unit of the variable input employed.

$$APP = \frac{\text{Total Physical Product (TPP)}}{\text{Quantity of variable input } (Q_v)}$$

Marginal physical product   Marginal physical product is the extra output produced by employing an extra unit of the variable factor.

$$MPP = \frac{\Delta TPP}{\Delta Q_v}$$

Average-marginal relationship   When both average and marginal product curves are rising, the marginal product lies above the average product. When both curves are declining the marginal product lies below the average product. This implies that the marginal product attains maximum before the average product and when the average product is maximum it is equal to the marginal product. This relationship also applies to the cost curves.

Diminishing Marginal Returns   The law of diminishing marginal returns is a short-run principle. It states that when one or more factors are fixed, there will be a point beyond which the extra output from additional units of the variable input employed diminishes.

Fixed cost   Fixed costs are the costs that do not vary with output levels. These are the costs incurred on the fixed inputs. Fixed costs only exist in the short run where some factor inputs are fixed.

Variable cost

Total variable cost is the total cost incurred in using the variable inputs in the short run. Mathematically:

$$TVC = TC - TFC$$

OR

$$TVC = AVC \times Q$$

Average variable cost

This is the cost per unit of variable inputs employed in the production of goods and services.

$$\text{Average Variable Cost (AVC)} = \frac{\text{Total Variable Cost(TVC)}}{\text{Quantity(Q)}}$$

In the short run, the average variable cost can be computed as:

$$AVC = AC - AFC$$

Total cost

Total cost is the sum of all the costs incurred in the production process. In the short run, total cost is the sum of total fixed cost and total variable cost. That is:

$$TC = TFC + TVC$$

Another way to compute the total cost is by multiplying the Average cost by the quantity. That is:

$$\text{Total cost (TC)} = \text{Average cost (AC)} \times \text{Quantity (Q)}$$

Average cost

Average cost is the cost per unit of production. Mathematically:

$$\text{Average Cost (AC)} = \frac{\text{Total Cost (TC)}}{\text{Quantity (Q)}}$$

In the short run average cost can be computed as:

$$AC = AFC + AVC$$

Marginal cost

Marginal cost is the extra cost of producing one more unit of output. Mathematically:

$$\text{Marginal Cost (MC)} = \frac{\Delta TC}{\Delta Q}$$

Economies of scale

Economies of scale are the cost advantages a firm enjoys as it increases output in the long run. **External economies** exist when a firm's cost per unit decreases as the whole industry grows, while internal economies exist due to the expansion of the firm itself.

Diseconomies of scale

Diseconomies of scale are the cost disadvantages that a firm incurs as it increases output in the long run.

Economies of scope

Economies of scope occur when a firm experiences cost savings as it diversifies its production.

Least cost input combination

The optimal or least cost combination of factors occurs where the marginal product from the last pound spent on each factor is equal. Mathematically, for inputs a, b, c, ..., n, the least cost combination occurs where:

$$\frac{MP_a}{P_a} = \frac{MP_b}{P_b} = \frac{MP_c}{P_c} = \cdots = \frac{MP_n}{P_n}$$

Long-run average cost curve

It shows the lowest cost of producing each quantity in the long run where all costs are variable. It is usually an envelope of short-run average cost curves each representing a particular plant size.

Total revenue

Total revenue is the total earnings from sales of a product within a specified period of time.

$$TR = P \times Q$$

OR

$$TR = AR \times Q$$

Elasticity and firm revenue

1. When demand is **price inelastic**, an increase in the price causes a less than proportionate decrease in the quantity demanded. Hence, firms can increase revenue by increasing prices. Reducing prices will reduce revenue.

2. When demand is **price elastic**, an increase in the price causes a more than proportionate decrease in the quantity demanded. Hence, revenue reduces when the price is increased. Firms can increase their revenue by reducing prices.

Average revenue

This is the revenue per unit of output.

$$\text{Average Revenue (AR)} = \frac{\text{Total Revenue(TR)}}{\text{Quantity(Q)}}$$

Marginal revenue

Marginal revenue is the extra revenue from selling one more unit per period of time.

$$\text{Marginal Revenue (MR)} = \frac{\Delta TR}{\Delta Q}$$

Profit maximization

Profit maximization occurs at the output level where marginal revenue equals marginal cost. That is:

$$MR = MC$$

In the case of perfect competition where firms are price takers, the marginal revenue is the same as the price. Hence the profit maximization condition under perfect competition can be restated as:

$$MC = P$$

Normal profit

This is a situation where a firm's total revenue equals its total costs in a perfectly competitive market. Normal profit is also called zero economic profit.

Supernormal profit	Supernormal profit also called abnormal profit occurs when a firm's total sales exceed its total cost of production.
Shutdown point of the firm	In a perfectly competitive market, the short-run shutdown point of a firm in the short-run is the level of output at which the price charged is equal to the minimum of the average variable cost. The firm will stay in business only under the following condition: $$P \geq AVC$$
Perfect competition	This is a situation where there are many buyers and sellers in a market such that no single buyer or seller has control over the price. All firms are price-takers. Firms in perfectly competitive markets face a perfectly horizontal demand curve(perfectly elastic)
Monopoly	Monopoly is a market structure characterized by only one firm who is the sole producer and seller of a commodity. This makes the monopoly firm a price maker. Monopoly firms face downward-sloping inelastic demand curves
Monopolistic competition	Monopolistic competition is a market structure characterized by many firms each producing a slightly differentiated product. There is free entry and exit from the industry. Each firm has some level of market power because of product differentiation and hence is a price maker. However, because of the free entry and exit feature, monopolistically competitive firms earn zero economic profit in the long run. Monopolistic competitive firms face a downward-sloping demand curve. The demand curve is relatively more elastic compared to the case of monopoly
Oligopoly	Oligopoly is a market structure characterized by a few firms which control the market. Firms in an oligopoly engage in strategic interaction. They face downward-sloping demand curves that are relatively more inelastic compared to monopolistic competition depending on the strategic interactions between firms.
Short run supply curve of the firm	The short-run supply curve of the firm is the upward-sloping portion of the marginal cost curve above the average variable cost curve.
Increasing cost industry	An increasing-cost industry is an industry where the average cost increases as the size of the industry expands.
Constant cost industry	A constant-cost industry is an industry where the average cost stays constant as the size of the industry expands.
Decreasing cost industry	A decreasing-cost industry is an industry where the average cost decreases as the size of the industry expands.
Collusive Oligopoly	A collusive oligopoly occurs when oligopolists either formally or informally agree to limit competition. This could be through setting output quotas, fixing prices, etc.
Tacit collusion	A tacit collusion occurs when oligopoly firms act collusively without any formal agreement to do so. The price leadership model is an example of tacit collusion.

Cournot competition	Cournot competition is a duopoly model where each firm makes its price and output decisions by accounting for the output decisions of the other firm.
Kinked demand curve	Kinked demand curves occur when the demand curve is not a straight line but has different elasticities at low and high prices. These curves are more common in oligopolistic and monopolistic competitions. The kinked demand curve is elastic at higher prices and inelastic at lower prices.
Dominant Strategy	A dominant strategy is a strategy that yields the best outcome to a firm, regardless of what rivals are doing.
Nash Equilibrium	Nash equilibrium is the optimal solution that results when all players in a game are playing their most optimal strategies based on their assumptions of the possible actions of their opponents. At the Nash equilibrium, no firm has the incentive to deviate.
Maximin strategy	A maximin strategy is a strategy of choosing a policy whose worst possible outcome is the least bad. This is a low-risk strategy.
Maximax strategy	A maximax is a strategy that involves choosing the policy that has the maximum payoff possible. This is a high-risk strategy.
Natural monopolies	Natural monopolies emerge in industries where the startup and other costs of production are so high that a monopoly becomes the most efficient way to produce.
Collusive Oligopoly	A collusive oligopoly occurs when oligopolists either formally or informally agree to limit competition. This could be through setting output quotas, fixing prices, etc.
Tacit collusion	A tacit collusion occurs when oligopoly firms act collusively without any formal agreement to do so. The price leadership model is an example of tacit collusion.
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Maximin strategy	A maximin strategy is a strategy of choosing a policy whose worst possible outcome is the least bad. This is a low-risk strategy.

Maximax strategy

A maximax is a strategy that involves choosing the policy that has the maximum payoff possible. This is a high-risk strategy.

First-degree price discrimination

This is a kind of price discrimination where each buyer is charged the maximum price they are willing to pay for each unit. The pricing is done such that the consumer surplus is fully extracted by the firm.

Second-degree price discrimination

This is a case where the seller provides a wide range of pricing options or packages for the same or similar products. Consumers then freely self-select into any of these options.

Third-degree price discrimination

Third-degree price discrimination is where the seller divides consumers into different groups based on some characteristics that inform how much consumers are willing to pay. In other words, consumers are grouped based on their elasticities of demand. The firm then charges a different price to each group.

Predatory Pricing

Predatory pricing is an illegal practice where a dominant firm sets prices unrealistically low (below its average variable costs) with the sole aim of driving competitors out of business.

Average cost pricing

Average cost pricing occurs when a firm sets its price by adding a certain percentage for (average) profit on top of average cost. That is:

$$P = AC + \text{Profit mark-up}$$

Limit Pricing

Limit pricing is a situation where a monopolist or oligopolist charges a price below the short-run profit maximizing level to deter new entrants.

Peak-Load Pricing

Peak-load pricing is a form of price discrimination where higher charges are applied during times of peak demand, such as high-season holiday prices or weekday telephone call rates. This strategy is partly justified by the inelasticity of demand during peak times. The higher prices could also reflect higher marginal costs incurred during peak times.

Product Life cycle theory

The product life cycle theory is a theory that explains the phases a product goes through from the time it is introduced to consumers to the time it becomes obsolete.

1. The first phase is the introduction phase, where the product is first introduced into the market.

2. The second phase is the growth phase where the demand for the product increases as it gains wider market acceptance.

3. The product then moves into the maturity phase where growth in sales slows down as the product reaches its peak market acceptance.

4. The final phase is the decline stage where demand begins to decline.

A3.3 MACROECONOMICS

Goals of macroeconomic policy

Governments typically pursue the following macroeconomic objectives:

1. High and stable economic growth.

2. Low unemployment.

3. Low inflation.

4. Avoidance of balance of payments deficits.

5. A stable financial system.

Flow variable

A flow variable is measured over an interval of time. Examples include wages, interest, rent, and interest.

Stock variable

A stock variable is a quantity that is measured at a given point in time. For example, a landowner's 200 hectares or £1000 in a savings account.

Labour force

Labour force is the sum of the employed and unemployed people in an economy at a given point in time.

$$\text{Labour Force} = \text{Employed (E)} + \text{Unemployed (U)}$$

Unemployment rate

The unemployment rate is the share of the labor force who currently do not have a job but are actively looking for one.

$$\text{Unemployment Rate} = \frac{\text{Unemployed}}{\text{Labor Force}} \times 100$$

Potential output

Potential output is the total output an economy is capable of producing when all the resources are fully utilized.

Output gap

The output gap is the difference between the actual output and the potential output. A positive output gap implies that the country's resources are overstretched. Similarly, a negative output gap implies the underutilization of the country's resources.

The business cycle

The business cycle represents the periodic fluctuations in business activity in an economy. Upswings in the business cycle are associated with periods of economic expansion and downswings are associated with periods of economic recessions.

Aggregate Demand

Aggregate demand is the total spending on goods and services in the economy. It is the sum of consumption expenditure (C), investment expenditure (I), government expenditure (G), and net exports (X-M).

$$\text{Aggregate Demand (AD)} = C + I + G + X - M$$

Aggregate Supply

Aggregate supply is the total amount of output firms are willing and able to supply at any given price level.

Injections

Injections are variables that add income to the circular flow. In the aggregate demand model, injections include Government purchases, export expenditures, and investment expenditures.

$$\text{Injections (J)} = I + G + X$$

Withdrawals

Withdrawals, also called leakages are variables that leak income out of the circular flow. In the aggregate demand model, withdrawals include net saving, taxation, and import expenditures.

$$\text{Withdrawals (W)} = S + T + M$$

Equilibrium national income

Equilibrium national income is the situation where the aggregate supply in an economy equals the aggregate demand. At equilibrium, total withdrawals equal total injections (W=J) or national income is equal to aggregate expenditure

$$Y = C + I + G + X - M.$$

Factors causing unemployment

Unemployment is generally caused by the following factors:

1. High real wages (Real-wage unemployment)
2. Downswings in the business cycle (cyclical unemployment)
3. Lack of information (Frictional unemployment)
4. Structural changes in the economy (Structural unemployment)
5. Seasonal factors (Seasonal unemployment)

Frictional unemployment

Frictional unemployment exists in an economy due to people changing jobs. This refers to the period of time that people are unemployed as they leave one job to another. Lack of information about job opportunities prolongs frictional unemployment.

Cyclical unemployment

Cyclical unemployment is the unemployment that is associated with business cycles. It is caused by economic downturns or recessions. Cyclical unemployment is zero when the economy is in equilibrium.

Seasonal unemployment

Seasonal unemployment occurs when the demand for certain labour fluctuates with the seasons of the year.

Structural unemployment

Structural unemployment arises due to changes in the patterns of demand and supply in the economy. This occurs due to a mismatch between the skills labour possess and the skills in demand implied by changes in demand and supply patterns.

The natural rate of unemployment

The natural rate of unemployment is the unemployment that exists when the economy is in equilibrium. This is the sum of frictional and structural unemployment at equilibrium.

Inflation

The inflation rate is the percentage increase in the price level over a period of time. It is measured as the percentage change in the index of prices in an economy. Typically the Consumer Price Index (CPI) is used in computing the inflation rate.

$$\text{Inflation Rate} = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \times 100$$

Demand-pull Inflation

Demand-pull inflation is the kind of inflation caused by a persistent rise in aggregate demand not matched by a sufficient increase in aggregate supply.

Cost-push Inflation

Cost-push inflation is caused by a persistent rise in the cost of production.

Gross domestic product (GDP)

Gross domestic product is the monetary value of all final goods and services produced within the borders of a country in a year. Using the expenditure approach, GDP for an open economy with government intervention can be computed as

$$\text{GDP} = C + I + G + (X - M)$$

GDP at market price

is GDP at actual prices. This includes taxes but excludes subsidies.

GDP at factor cost

is GDP measured at the cost of factors of production. To get GDP at factor cost, subsidies are added and indirect taxes are subtracted.

$$\text{GDP}_{\text{factor cost}} = \text{GDP}_{\text{market price}} + \text{Subsidies} - \text{Indirect taxes}$$

Nominal GDP

is GDP measured at current prices

Real GDP

is GDP adjusted for inflation. It is GDP measured in constant prices.

Gross national product

Gross national product (at market prices) is the value of all final goods and services produced by all the nation's factors of production, regardless of where they are located. It excludes output produced by foreign factors of production located in the domestic country and includes output produced by the nation's factors of production located outside the country. Mathematically:

$$\text{GNP} = \text{GDP} + \text{net factor income from abroad}$$

Net National Product

Net national product (at market prices) is Gross National Product adjusted for depreciation. Mathematically:

$$\text{NNP} = \text{GNP} - \text{Depreciation}$$

Disposable Income

Disposable personal income is the household income that remains after the deduction of taxes and addition of benefits.

$$
\begin{aligned}
\textbf{Households' disposable income} = \quad & \text{GNY at market prices} \\
& - \text{Taxes paid by firms} \\
& + \text{Subsidies received by firms} \\
& - \text{Depreciation} \\
& - \text{Undistributed profits} \\
& - \text{Personal taxes} \\
& + \text{Benefits}
\end{aligned}
$$

Consumption function

The consumption function shows a positive relationship between household consumption and national income. The slope of the consumption function is the Marginal propensity to consume (MPC).

Marginal propensity to consume (MPC)

measures the proportion of a change in national income that is consumed. That is:

$$\text{MPC} = \frac{\Delta C}{\Delta Y}$$

Marginal propensity to save

The marginal propensity to save is the proportion of a change in national income that is saved. Mathematically:

$$\text{MPS} = \frac{\Delta S}{\Delta Y}$$

Marginal propensity to import

This is the proportion of an increase in national income spent on imports. Mathematically:

$$\text{MPM} = \frac{\Delta M}{\Delta Y}$$

Marginal propensity to tax

This is the proportion of a change in income that is paid in taxes.

$$\text{MPT} = \frac{\Delta T}{\Delta Y}$$

Marginal propensity to Withdraw

The proportion of an increase in national income that is withdrawn from the circular income flow.

$$\text{MPW} = \text{MPS} + \text{MPT} + \text{MPM}$$

Spending multiplier

The spending multiplier measures how much national income changes in response to exogenous changes in the components of injections. Mathematically:

$$\text{Spending Multiplier (K)} = \frac{1}{1 - MPC}$$

Accelerator theory

The accelerator theory states that investment is the most volatile component of aggregate expenditure. A relatively modest rise in national income causes a larger percentage increase in investment. The accelerator coefficient is the ratio of investment to the change in national income $\left(\frac{I}{\Delta Y}\right)$

Balance of payments	Balance of payments is an account of a country's transactions with the rest of the world. Transactions are generally divided into the current account, the capital account, and the financial account. The **Current account** records the inflow and outflow of goods and services, the **capital account** records international capital transfers while the **financial account** records international flows relating to business investments, real estate, and investments in stocks and bonds.
Trade balance	Trade balance or balance of trade is the difference between the value of a country's exports and the value of a country's imports of goods and services over a period of time. This is also called the balance of the current account.
Exchange rate	The exchange rate is the rate at which one country's currency exchanges for another country's currency.
Currency appreciation	A currency appreciates when the exchange value of the currency compared to a foreign currency increases. For example, if the exchange rate of the US dollar in terms of the British pound (£/$) moves from 1.15 to 1.20, the US dollar has appreciated against the British pound.
Currency depreciation	A currency depreciates when the exchange value of the currency compared to a foreign currency falls. For example, if the exchange rate of the US dollar in terms of the British pound (£/$) moves from 1.20 to 1.15, the US dollar has depreciated against the British pound.
Nominal exchange rate	The nominal exchange rate is the exchange rate expressed in terms of currency units.
Real exchange rate	The real exchange rate is the exchange rate adjusted for changes in the relative prices of goods between the two countries. Let e be the nominal exchange rate between a domestic and a foreign country. Let P and P^* be the domestic and foreign price levels respectively. The real exchange rate can be computed as: $$\text{Real Exchange Rate} = e \times \frac{P}{P^*}$$
Fixed exchange rate regime	In this regime, the government ties the official exchange rate of the country to another country's currency. The exchange rate remains unchanged and the government undertakes steps to counteract any movements in the currency market that could potentially cause the exchange rate to change.
Floating exchange rate regime	In this regime, the exchange rate is freely determined by the demand and supply of currency in the foreign exchange market without any government intervention. Other intermediate exchange rate regimes include the **adjustable peg** and the **managed float regime**.
Devaluation	Currency devaluation is a deliberate action by the government to reduce the value of a country's currency.

Purchasing Power Parity Theory

The theory states that the exchange rate between two countries adjusts to offset differences in the inflation rate in these countries, ensuring that the same quantity of internationally traded goods can be bought at home as abroad with a given amount of domestic currency. The corresponding exchange rate that exists when this theory holds is called the **purchasing power parity exchange rate**.

Functions of Money

There are 3 main functions of money:

1. Unit of account. Money is used as a measure of the value of goods and services.

2. Medium of exchange. Money acts as an intermediary between the buyer and seller.

3. Store of value. This means that wealth can be held in the form of money.

Liquidity

Liquidity of an asset is the ease with which it can be converted to cash without any loss in its value.

Liquidity ratio

The liquidity ratio is a measure of a bank's ability to meet its short-term debt obligations. It determines the minimum amount of liquid assets a bank must hold to meet the withdrawal demands of depositors.

Functions of the central bank

The central bank plays the following roles in the economy:

1. Acts as a banker to the government and other banks.

2. Conducts the government's monetary policy.

3. Provides liquidity to other banks.

4. It oversees the activities of banks and other financial institutions.

5. It operates the government's exchange rate policy

Money supply

Money supply is the total sum of currency and other liquid assets in circulation in an economy. The money supply is determined by the central bank and considered exogenous.

Monetary base

The monetary base is the total amount of currency in circulation plus the total reserves held by banks.

$$\text{MB} = \text{C} + \text{R}$$

Bank deposit multiplier

The bank deposit multiplier is the maximum amount of deposits that a bank creates for each unit of reserves it holds. It is measured as the inverse of the reserve ratio.

$$\text{Deposit Multiplier} = \frac{1}{\text{Reserve Requirement}}$$

Money multiplier

The money multiplier is a measure of how much the money supply changes for a unit change in the monetary base. Mathematically:

$$\text{Money Multiplier (m)} = \frac{1+c}{r+c}$$

Where:

$$c = \text{Currency (C) Deposit (D) ratio} = \frac{C}{D}$$

$$r = \text{Reserve (R) Deposit (D) ratio} = \frac{R}{D}$$

Money demand

Money demand is the total desired holding of financial assets in the form of money. Money demand is negatively related to the interest rate. The motives for holding money are generally categorized into **Transactions motive**, **Precautionary motive**, and **Speculative motive**.

Quantity theory of money

The quantity theory of money states that the general price level is directly proportional to the amount of money in circulation. The quantity theory stems from the Fisher equation:

$$M \times V = P \times T$$

The velocity (V) of money and the volume of transactions (T) are assumed to be constant. This then establishes a directly proportional relationship between the money supply (M) and the price level (P). An increase in the money supply translates into higher price levels.

Interest rate transmission mechanism of an increase in money supply

An increase in the money supply decreases the real interest rate. The lower interest rates cause investment to increase which then translates into an increase in aggregate demand and output.

Exchange rate transmission mechanism of an increase in money supply

An increase in the money supply causes the interest rates to decline. The decline in the interest rates causes an outflow of short-term finance from the country. This causes the exchange rate to depreciate. This then increases the demand for exports and reduces import demand. The result of this is an increase in aggregate demand.

Full Employment Level of National Income

The full employment level of national income is the level of national income at which there is no deficiency in aggregate demand. It is the maximum level of output produced when all the available labor resources are fully utilized.

Inflationary gap

This is the amount by which aggregate expenditure exceeds national income at the full-employment level of national income. It measures the decrease in aggregate spending required to bring an economy operating above full employment back to the full employment level of national income.

Recessionary gap

A recessionary gap occurs when a country's real GDP is lower than the full employment or potential GDP. It measures the increase in spending required to bring an economy operating below full employment to the full employment level of national income.

Phillips curve	The Phillips curve shows an inverse relationship between inflation and unemployment. There is always a trade-off between inflation and unemployment. The Expectations Augmented Philips Curve (EAPC) accounts for the importance of inflation expectations. The EAPC in a simple form can be specified as:

$$\pi = f\left(\frac{1}{U}\right) + \pi^e + k$$

Where:

$$\pi = \text{The inflation rate}$$
$$U = \text{The unemployment rate}$$
$$\pi^e = \text{Expected inflation}$$
$$k = \text{Exogenous costs pressures on inflation}$$

Fiscal policy	Fiscal policies are policies designed to affect aggregate demand by altering government expenditure and taxation.
Expansionary fiscal policies	are designed to increase aggregate demand. This could be through increasing government expenditure, reducing taxation, or a combination of both policies.
Contractionary fiscal policies	are designed to decrease aggregate demand. This could be through decreasing government expenditure, increasing taxation, or a combination of both.
	Expansionary fiscal policy usually leads to a **budget deficit** while a contractionary fiscal policy leads to a **budget surplus**. Changing government expenditure usually has a greater effect on aggregate demand and output than changing tax rates.
General government debt	This is the accumulated deficits of the government at both the local and central levels. This is the total debt owed by the government.
Primary deficit (surplus)	This occurs when the sum of government expenditures excluding interest payments on government debt is greater than (less than) government receipts.
Automatic stabilizers	Automatic stabilizers are mechanisms that are built into government budgets that increase or decrease government spending and taxes in response to changes in aggregate demand.
Fiscal drag	Fiscal drag occurs when earnings growth and inflation push earners into higher tax brackets. Hence the government revenue increases without any explicit increase in tax rates. The effect of this is a decline in the spending rates of households. To prevent this from happening, the tax bands should be increased.
Monetary policy	Monetary policies are a set of macroeconomic policies undertaken by the central bank to control the money supply in an economy.
Contractionary monetary policy	is used to reduce the money supply during economic expansions and
Expansionary monetary policy	is used to increase the money supply during recessions.

Lags in policy effectiveness

Fiscal and monetary policy effectiveness is affected by the following time lags.

1. Recognition lag: The time it takes for authorities to recognize a recession.

2. Legislative lag: The time it takes to design and pass a bill that will address the recession.

3. Implementation lag: The time it takes from when a policy designed to address the recession is approved to when it is actually implemented.

These time lags affect the effectiveness of fiscal policy and monetary policies.

Techniques to control money supply

Some of the techniques used by the central bank in the conduct of monetary policy include:

1. Open market operations: The sale or purchase of government securities in the open market. Open market purchases will increase the money supply and open market sales will reduce the money supply.

2. Changing the reserve requirement. The reserve requirement is the percentage of deposits that must be held by banks as reserves. Changing this requirement will affect the deposit creation process of banks. A lower reserve requirement will increase the money supply and a higher requirement will reduce the money supply.

3. Changing the discount rate. The discount rate is the interest rate at which the central bank lends to other banks. A higher rate will reduce lending to banks and the money supply while lower rates will increase lending to the banks and the money supply.

Deficit bias

Deficit bias is the tendency for governments to accrue frequent fiscal deficits and rising debt-to-GDP ratios because of their reluctance to tighten fiscal policy.

The crowding-out effect of government spending

The crowding-out effect of government spending is the situation where the rise in government spending crowds out private investment spending. This is because government borrowing diverts funds away from the private sector, making it difficult for private investors to mobilize funds for investments.

A3.4 MEAN-VARIANCE PORTFOLIO THEORY

Notations
$$\mu_i = E(R_i), \quad \sigma_i^2 = \mathrm{Var}(R_i), \quad \sigma_{ij} = \mathrm{Cov}(R_i, R_j), \quad \rho_{ij} = \mathrm{Corr}(R_i, R_j) = \frac{\sigma_{ij}}{\sigma_i \cdot \sigma_j}$$

Portfolio P of N Assets
$$\mu_P = \sum_{i=1}^{N} x_i \mu_i$$

$$\sigma_P^2 = \sum_{i=1}^{N} x_i^2 \sigma_i^2 + 2 \sum_{i=1}^{N} \sum_{j<i} x_i x_j \sigma_{ij}$$

Minimum Variance Portfolio
Two Assets with $\rho_{AB} \neq 1$: $x_A = \dfrac{\sigma_B^2 - \rho_{AB}\sigma_A\sigma_B}{\sigma_A^2 + \sigma_B^2 - 2\sigma_{AB}} = \dfrac{\mathrm{Var}(R_B) - \mathrm{Cov}(R_A, R_B)}{\mathrm{Var}(R_A - R_B)}$

$\rho_{AB} \pm 1$: $x_A = \mp \dfrac{\sigma_A}{\sigma_A \mp \sigma_B}$

- With n-risky assets
Lagrangian: $F(\mathbf{x}, \lambda) = \sum_{ij} x_i C_{ij} x_j - \lambda \left(\sum_i x_i - 1 \right)$ gives equations

$2 \sum_j C_{ij} x_j - \lambda = 0 \qquad \sum_i x_i = 1$

Efficient Portfolio
Lagrangian given E_P : $F(\mathbf{x}, \lambda) = V - \lambda(E - E_P) - \mu \left(\sum_i x_i - 1 \right)$

where $V = \sum_{ij} x_i C_{ij} x_j$

$2 \sum_j C_{ij} x_j - \lambda E_i - \mu = 0$

$\sum_i E_i x_i = E_P \qquad \sum_i x_i = 1$ The solution $\mathbf{x}$ is linear in E_P

Optimal Risk (Market) Portfolio M
Step 1: Find the weights x_i such that $\mathrm{Cov}(R_i, R_M) = \mu_i - r_f$ for each i.

Step 2: Rescale the weights $(x_1, \ldots, x_n)$ so that $\sum_{i=1}^{n} x_i = 1$.

Portfolio Diversification
Given $\sigma_i^2 = \mathrm{Var}$, $\sigma_{ij} = \mathrm{Cov}$, and $x_i = \frac{1}{n}$

$\mathrm{Var}(R_P) = \dfrac{1}{n}(\mathrm{Var} - \mathrm{Cov}) + \mathrm{Cov}$

Capital Market Line (CML) $\mu_P = r_f + S_P \sigma_P$

Sharpe Ratio: $S_P = \dfrac{\mu_P - r_f}{\sigma_P}$

A3.5 ASSET PRICING MODELS

Risk Premium
Return on that asset $-$ Risk-free return $= E_P - r_f$

Capital Asset Pricing Model (CAPM)
$\beta_i = \dfrac{\mathrm{Cov}(R_i, R_M)}{\mathrm{Var}(R_M)}$

$\beta_P = \sum_{i=1}^{n} x_i \beta_i$

Security Market Line (SML)
$E(R_i) = r_f + \beta_i [E(R_M) - r_f]$

Portfolio Beta

Alpha

Single-index model
$R_i = \alpha_i + \beta_i R_M + \varepsilon_i$

R_M and ε_i are uncorrelated.

ε_i and ε_j are independent.

$$E_i = \alpha_i + \beta_i \cdot E_M$$

$$V_i = \beta_i^2 \cdot V_M + V_{\varepsilon_i}$$

$$C_{ij} = \beta_i \cdot \beta_j \cdot V_M$$

Multi-factor model

$$R_i = \alpha_i + \beta_{i1}I_1 + \cdots + \beta_{in}I_n + \varepsilon_i$$

$$E_i = \alpha_i + \sum_j \beta_{ij}\mathrm{E}[I_j]$$

$$V_i = \sum_j \beta_{ij}^2 \mathrm{Var}[I_j] + 2\sum_{j<k} \beta_{ij}\beta_{ik}\mathrm{Cov}(I_j, I_k) + V_{\varepsilon_i}$$

$$C_{ij} = 2\sum_{i<j} \beta_{ik}\beta_{jk}\mathrm{Var}[I_k]$$

Fama-French-Carhart Factor Model

Risk Measures for Loss Variable L

Variance $\sigma^2 = E[(L-\mu)^2]$

Semi-Variance $\sigma_{SV}^2 = E[(L-\mu)_+^2]$

A3.6 MARKET EFFICIENCY AND BEHAVIOURAL FINANCE

Under construction.

A3.7 INVESTMENT RISK AND PROJECT ANALYSIS

	Continuous variable	**Discrete variable**
Variance	$\displaystyle\int_{-\infty}^{\infty} (\mu-x)^2 f(x)\,dx$	$\displaystyle\sum_i (\mu-x_i)^2 p_i$ for all i
Semi-Variance	$\displaystyle\int_{-\infty}^{\mu} (\mu-x)^2 f(x)\,dx$	$\displaystyle\sum_i (\mu-x_i)^2 p_i$ for i: $x_i < \mu$

If the distribution is symmetric, Semi-variance $= \frac{1}{2}\times$ Variance

Value-at-Risk (VaR) $100p\%\,\mathrm{VaR} = F_L^{-1}(p)$ (i.e. $100p$-th percentile of L)

Tail-Value-at-Risk (TVaR) $100p\%\,\mathrm{TVaR} = E(X|X > 100p\%\,\mathrm{VaR})$

Coherent risk measures:

1. **Translation Invariance:** $\rho(X+c) = \rho(X) + c$

2. **Positive Homogeneity:** $\rho(cX) = c\rho(X)$

3. **Subadditivity:** $\rho(X+Y) \le \rho(X) + \rho(Y)$

4. **Monotonicity:** $\rho(X) \le \rho(Y)$ If $\Pr(X \le Y) = 1$

Sensitivity Analysis   Breaks the NPV calculation into its component assumptions and shows how the NPV varies as each underlying assumption change.

Scenario Testing   Here we consider some plausible combinations of input values and see what effect these have on the project.

A3.8 CAPITAL STRUCTURE

The types of Long-Term Capital of a business are:

- **Loan capital ('Debt')**: money borrowed from creditors. In exchange, the firm pays interest and an eventual return on capital.
- **Ordinary shares ('Equities')**: Represent a fraction of the equity of the firm. Shareholders are the owners of the firm and are entitled with voting rights and a share part of the company's profits.

The types of Medium-Term Company Finance of a business are:

- **Credit sale**: A credit sale is a normal sale of a good together with an agreement that payment will be made by a series of regular instalments over a set period.
- **Leasing**: A lease is an agreement where the owner of an asset gives the lessee the right to use the asset over a period, in return for a regular series of payments.
- **Bank loans**: bank loan is a form of medium-term borrowing from a bank where the full amount of the loan is paid into the borrower's current account and the borrower undertakes to make interest payments and capital.repayments on the full amount of the loan
- **Private equity funds**: Investment funds that invest in private companies, instead of public companies.

The types of Short-Term Company Finance of a business entity are as follows:

- **Bank overdrafts**: An overdraft is a form of short-term borrowing from a bank where the borrower is granted a facility to draw money out of a current account such that it becomes negative, down to an agreed limit.
- **Trade credit**: Agreement between a company and one of its suppliers to pay for goods or services after they have been supplied.
- **Factoring**: Non-recourse factoring is where the supplier sells on its trade debts to a factor in order to obtain cash payment of the accounts before their actual due date. Recourse factoring only provides early payment of invoices.
- **Bills of exchange**: A bill of exchange is effectively a claim to the amount owed by a purchaser of goods on credit and may be 'accepted' by a bank (for a fee).
- **Commercial paper**. Single name form of short-term borrowing (short-term bonds) used by large companies.

Alternative methods of raising finance outside the regular banking system include the following:

- **Shadow banking**: Shadow banks are non-bank financial institutions that engage in unregulated banking activities by borrowing short-term funds in the money market and investing them long-term..
- **Project financing**: Project financing is commonly employed for large infrastructure projects. It relies on non-recourse funding involving a consortium of lenders from both the host country and abroad..
- **Peer-to-peer lending**: Loans available on peer-to-peer lending platforms.
- **Crowdfunding** The practice of funding a project or venture by raising money from a large number of people who each contribute a relatively small amount, typically via the internet.
- **Microfinance**: are small loans that are usually easier and faster to secure than the traditional loans. No interest is paid on the loan and the investor has the benefit of being involved in initiating a venture.

The components of the capital of a limited company are:	• Equity capital • Short- and medium-term debt • Long-term debt
Assets of a business can be divided into:	• Non-current assets such as land, property, plant, equipment and 'intangibles'. • Current assets such as inventories, work-in-progress, debtor balances, cash (and equivalents).
Non-Current Assets	Assets of the entity which: • it does not expect to realise, or intend to sell or consume, in its normal operating cycle; • it does not hold primarily for the purpose of trading; • it does not expect to realise within 12 months after the reporting; • are cash or cash equivalents restricted from being exchanged or used to settle a liability for at least 12 months after the reporting period.
Current Assets	Assets of an entity which are not non-current assets.
Degree of Acceptable Gearing	The extent to which a firm's investments and operations can be funded by lenders versus shareholders, without compromising its value.
Gearing Ratio	Gearing Ratio (as in Core Reading) $= \dfrac{\text{Debt}}{\text{Equity}}$
A Leveraged Firm	is a company or firm that also relies on debt or borrowed capital to finance its operations, investments, and growth.
Market and Capital Structure	The stock market will consider every aspect of a company in making the assessment of worth that culminates in a share price. If the market considers the capital structure inappropriate or does not appear consistent with the other features of the firm, the price will change to take that into account.
Taxation and Capital Structure	The main features of taxation regarding the capital structure are: • Interest payments are tax deductible. • Capital allowances on new plant and equipment are deductible. • Lease of plant and equipment receives tax relief. • Property rental payments are tax deductible.
Cost of Equity (r_E)	$= r_A + \dfrac{D}{E}(r_A - r_D)$ (without taxes).
Cost of Equity (r_E)	$= r_A + \dfrac{D}{E}(r_A - r_D)(1 - \tau_c)$ (with taxes).
Cost of Capital (r_i)	$= r_f + \beta_i\,(r_M - r_f)$
Pretax Weighted Average Cost of Capital (WACC)	$= r_e \dfrac{E}{E+D} + r_d \dfrac{D}{E+D}$
Weighted Average Cost of Capital (WACC)	$= r_E \dfrac{E}{E+D} + r_D(1 - \tau_c)\dfrac{D}{E+D}$
Agency Costs	refers to the expenses/costs that arise when there is a conflict of interest between shareholders and management in a context of separation between the ownership and control of the company.

Information Asymmetries	often exist between the various classes of stakeholder because all parties do not share the same insights into the fortunes of the company. More commonly referred about shareholders and management.
The following are types of Business Entities:	• Sole Trader. • Partnership. • Limited Companies. • Limited Liability Partnerships • Social Enterprises.
Sole Trader	is a business which is owned by one person and which is not a limited company. Sole traders have unlimited legal liability for their business debts.
Partnership	is a business which is owned by more than one person and is not a limited company. The owners have unlimited liability.
Limited Company	is a business which has a legal identity separate from the owners of the business. The owners of the company are called shareholders. The owners' liability is limited to the fully paid value of their shares.
A Limited Liability Partnership (LLP)	is a new corporate identity, which was introduced in the UK in 2001. This is a business vehicle that gives the benefits of limited liability whilst retaining other characteristics of a traditional business partnership.
A Public Limited Company	is a company whose documentation states that it is a public company and which has an issued share capital of at least £50,000. The name of a public limited company must end with the words 'public limited company' (or the abbreviation PLC or plc). Only PLC can be listed in a stock exchange.
A Private Limited Company	All limited companies that are not Public Limites Company. A Private Limited Company or just Private Company is not allowed to offer its shares to the public and its name must end with the word 'limited' (or the abbreviation LTD or ltd).
A Social Enterprise	is a business entity which has a clear social or environmental mission. This might be, for example, to provide low-cost loans to small farmers in poor countries, provide low-cost private schools or support vaccination programmes.
Diversification	is a risk management strategy that involves spreading investments across different securities and asset classes. The primary goal of diversification is to reduce the overall risk of a portfolio without compromising return by taking advantage of non positively perfect correlation.

A3.9 INTRODUCTORY DERIVATIVES – FORWARDS AND FUTURES

Executive Stock Options	are options issued by a company on its own shares and issued to senior managers as part of their remuneration package, with strike prices that are intended to represent a performance target for the executive.
Futures Contract	is a standardised, exchange tradable contract between two parties to trade a specified asset on a set date in the future at a specified price.

Bond Futures	are financial contracts that require both the buyer and seller to deliver a quantity of a certain bond at predetermined price and date in the future. For delivery, the contract requires physical delivery of a bond. If the contract is specified in terms of a notional stock, then there needs to be a linkage between it and the cash market.
Short Interest Rate Futures	Short interest rate futures are standardized agreements to buy or sell a short-term interest rate instrument at a predetermined future date and at a price agreed upon today.
Stock Index Futures	Stock Index Futures allow traders and investors to speculate on or hedge against movements in the overall stock market without directly buying or selling the underlying stocks..
Currency Futures	are financial contracts that obligate the buyer to purchase and the seller to deliver, a specific quantity of a particular currency at a predetermined exchange rate on a specified future date.
Forwards	are non-standard contracts traded in the Over-the-Counter Market to buy or sell an asset on an agreed basis in the future. Unlike futures contracts, forward contracts are not standardised contracts and cannot be traded in a recognised exchange.
Uses of Financial Futures	Future and Forwards contracts can be used to lock future selling and buying prices of different asset classes.

A3.10 GENERAL PROPERTIES OF OPTIONS

An option	gives an investor with a long position the right, but not the obligation, to buy or sell a specified asset on a specified future date. The writer has the corresponding obligation.
Call Option	The buyer of the option has the right, but not the obligation, to buy a specified asset on a set date in the future for a specified price. The respective seller has the obligation to sell
Put Option	The buyer of the option has the right, but not the obligation, to sell a specified asset on a set date in the future for a specified price. The respective seller has the obligation to buy.
An American Style Option	is an option that can be exercised on any date before until its expiry.
An European Style Option	is an option that can be exercised only at its expiry.
Uses of Options	Options allow a company to protect itself against adverse movements in the financial environment while retaining the ability to profit from favourable movements.
A Swap	is a contract between two parties under which they agree to exchange a series of payments according to a prearranged formula.
Interest Rate Swap	Here one party agrees to pay to the other a regular series of fixed amounts for a certain term. In exchange, the second party agrees to pay a series of variable amounts based on the level of a short-term interest rate.

A Currency Swap is an agreement to exchange a fixed series of interest payments and a capital sum in one currency for a fixed series of interest payments and a capital sum in another currency.

The following are uses of swaps:
- Risk management: A company can use swaps to reduce risk by matching its assets and liabilities.
- Reducing the cost of debt: Companies can use an interest rate swap to reduce the total cost of financing, such that both benefit from a lower cost of debt.

A3.11 BINOMIAL PRICING MODELS

Under construction.

A3.12 BLACK–SCHOLES OPTION PRICING MODEL

Under construction.

A3.13 OPTION GREEKS AND RISK MANAGEMENT

Option Greeks
$$\Delta = \frac{\partial V}{\partial S}, \quad \Gamma = \frac{\partial^2 V}{\partial S^2}, \quad \Theta = \frac{\partial V}{\partial t},$$
$$\nu = \frac{\partial V}{\partial \sigma}, \quad \rho = \frac{\partial V}{\partial r}, \quad \Psi = \frac{\partial V}{\partial \delta}$$

Black-Scholes Equation
$$\frac{\partial V}{\partial t} + (r - \delta)S\frac{\partial V}{\partial S} + \frac{\sigma^2 S^2}{2}V_{SS} = rV$$

Using Greeks: $\Theta + (r - \delta)S\Delta + \dfrac{\sigma^2 S^2}{2}\Gamma = rV$

Elasticity
Asset: $\Omega = \dfrac{S \cdot \Delta}{V}$

Portfolio: $\Omega_P = \sum_i x_i \Omega_i$ where $w_i = \dfrac{\text{Value of Asset } i}{\text{Value of } P}$

Sharpe Ratio
Asset: $\dfrac{\alpha - r}{\sigma}$

Option: $\dfrac{m_V - r}{s_V}$

Delta-Gamma-Theta Approximation
$V(S(t+h), t+h) = V(S(t), t) + \Delta\varepsilon + \dfrac{1}{2}\Gamma\varepsilon^2 + \Theta h$ where $\varepsilon = S(t+h) - S(t)$

Instantaneous Mean Return/Volatility
$m_V = \Omega \cdot \alpha + (1 - \Omega)r$

$s_V = \Omega \cdot \sigma$

Option Beta
$\beta_V = \Omega \cdot \beta$, where β is the beta of the underlying asset.

Delta Hedging
Purchase $-\Delta$ shares of stock and hold cash position of $-V + S\Delta$

Self-Financing for $\Gamma > 0$
$S(t + h) < S(t)(1 - \sigma\sqrt{h})$ or $S(t + h) > S(t)(1 + \sigma\sqrt{h})$

Self-Financing for $\Gamma < 0$
$S(t)(1 - \sigma\sqrt{h}) < S(t + h) < S(t)(1 + \sigma\sqrt{h})$