



## Chapter 5 – Economics and Investment Analysis

21 Questions



# Chapter 5 Economics and Investment Analysis – 21 Qs

Macroeconomics

Microeconomics

Statistics

Financial Mathematics

Fundamental and Technical Analysis

Yields and Ratios

Valuation

Economics can be divided into:

**Microeconomics** - this is the smaller-picture view of the economy; that is, the study of the decisions made by individuals and firms in a particular market.

**Macroeconomics** - looks at the bigger-picture view by seeking to explain how, by aggregating the resulting impact of these decisions on individual markets, variables such as national income, employment and inflation are determined.

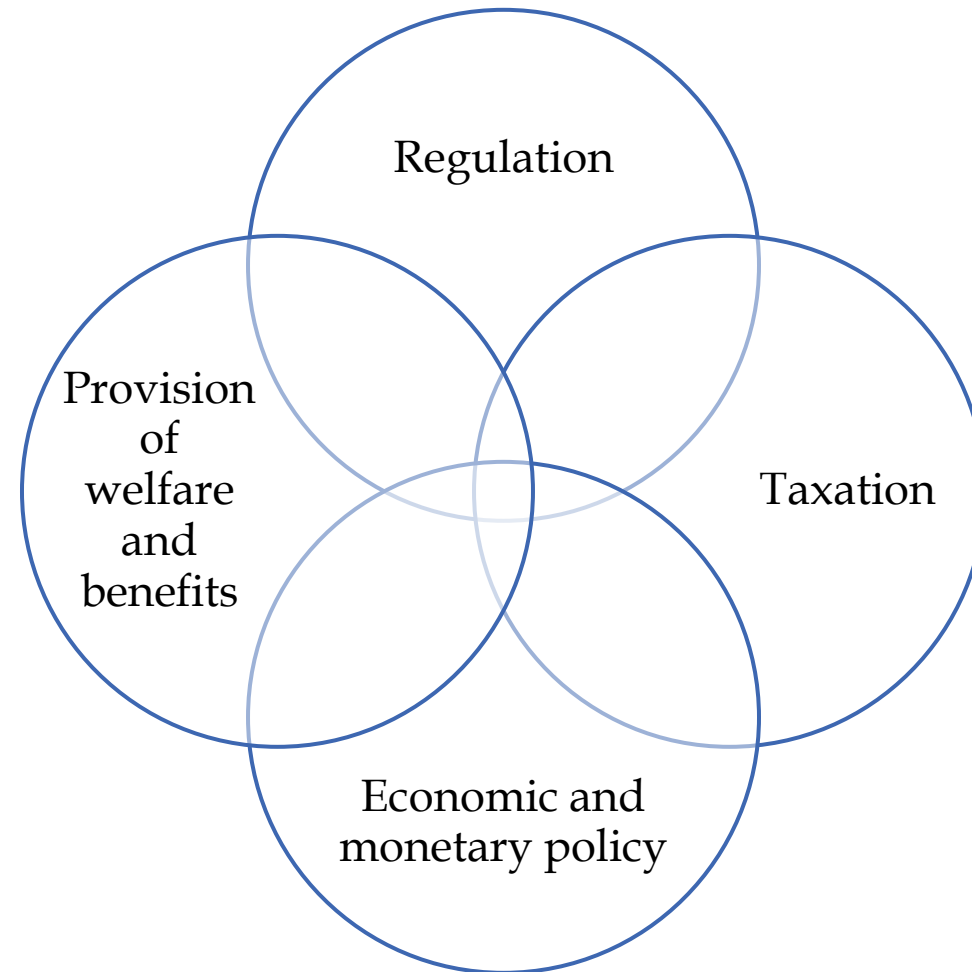
Economics is concerned with resources - **Land, Labour and Capital**

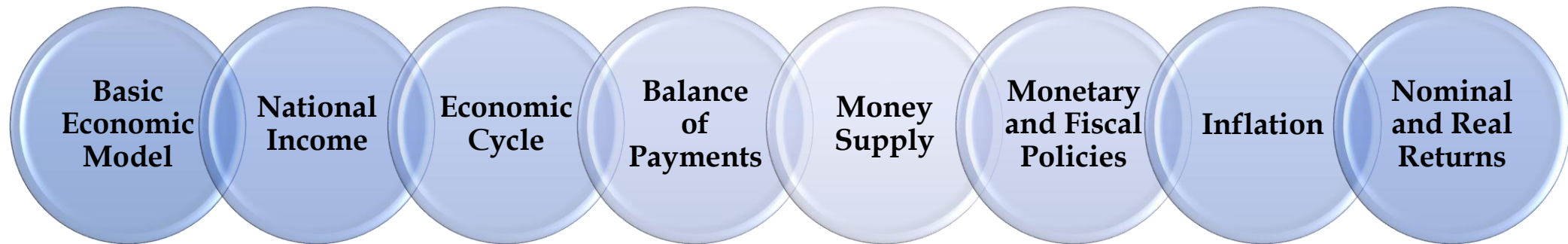
**4<sup>th</sup> Factor of Production - Enterprise or Organisation:** Emphasises the integral role performed by entrepreneurs in combining the above three resources together into productive and wealth-creating businesses.

The **task** of economics is to measure and foster economic growth which will then lead to greater social welfare and happiness (in theory).

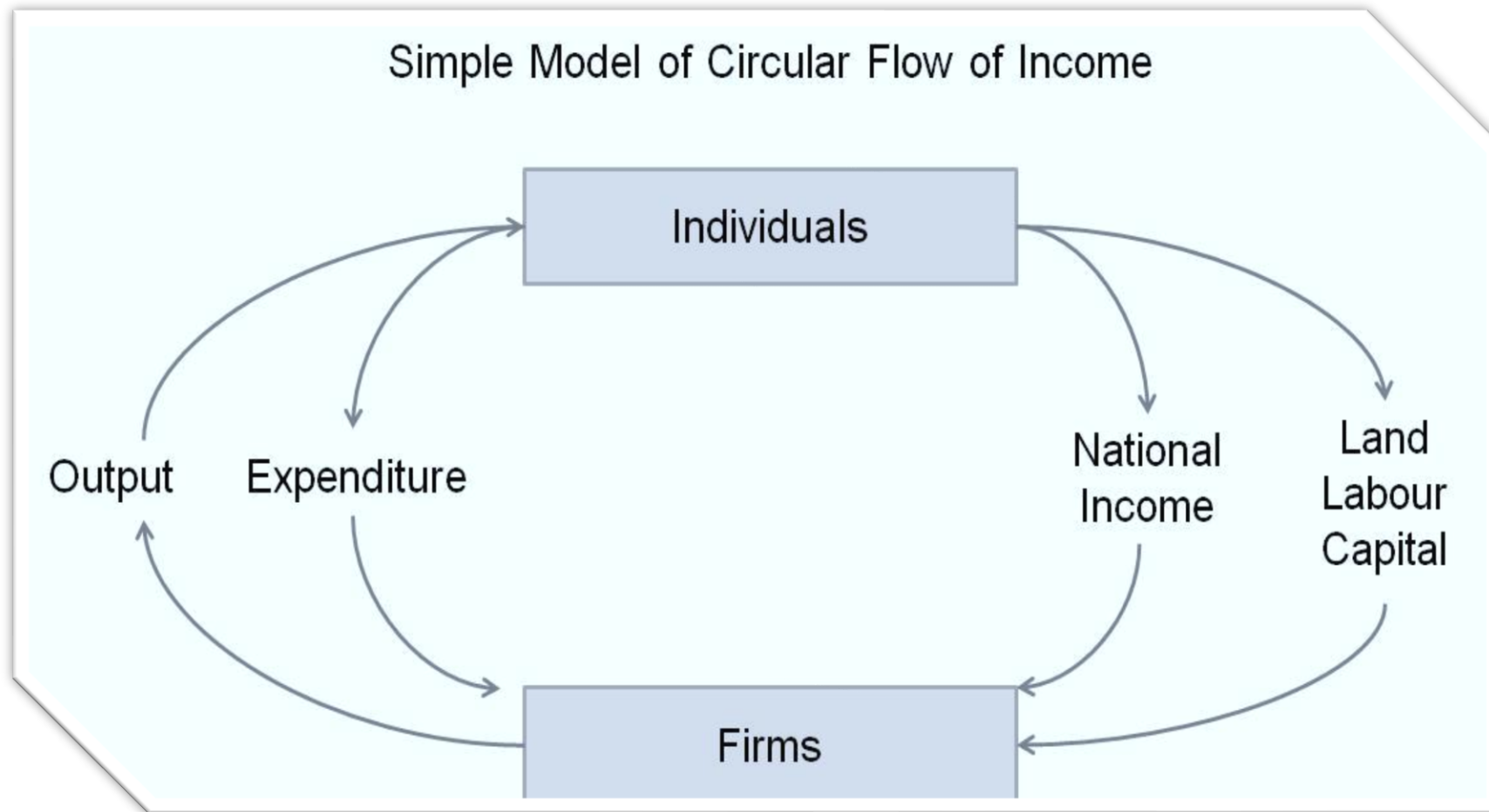


# Role of Government





# Circular Flow of Output, Income and Expenditure



# National Income – GDP & GNP

## Gross Domestic Product

Measures the total market value of all final goods and services produced domestically during a calendar year.

$$\text{GDP} = \text{Consumption} + \text{Investment} + \text{Government expenditure} + (\text{Exports} - \text{Imports})$$

## Gross National Product

Also includes the contribution made during the calendar year to an economy's circular flow by its nationals (firms & individuals) based overseas. This contribution is known as net property income and comprises wages, profits, interest and dividends.

Put simply  $\text{GNP} = \text{GDP} + \text{net property income generated from overseas economies by that country's factors of production.}$

**Example** American GNP measures the production levels of any American or American-owned entity, regardless of where in the world the actual production process is taking place, and defines the economy in terms of the citizens.



# Uses and Limitations of GDP

GDP per capita =  
 $\text{GDP} \div \text{Population}$

Economic Growth - GDP per capita, along with annual growth of GDP

Used as barometers of national prosperity, but  
Limitations

May just benefit a narrow section of society

GDP only capture those aspects of economic activity that are measurable. Therefore, fails to account for:

Undesirable side effects of economic activity, such as pollution and congestion

Non-marketable production such as DIY

The subjective value attributed to leisure activities

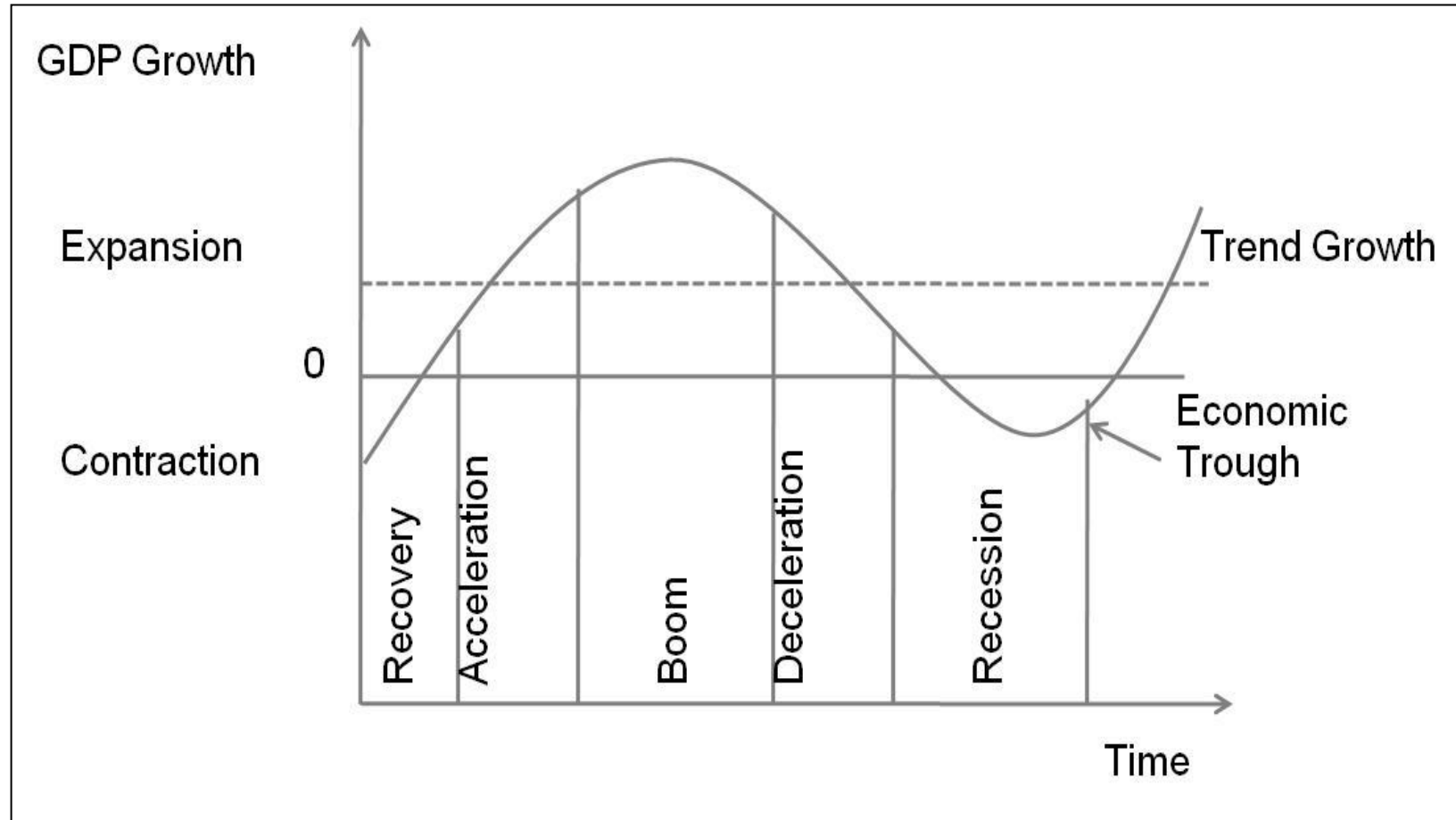
Economic activity in the so-called shadow economy, where, as a result of tax evasion, certain activities go unrecorded





# Economic Cycle

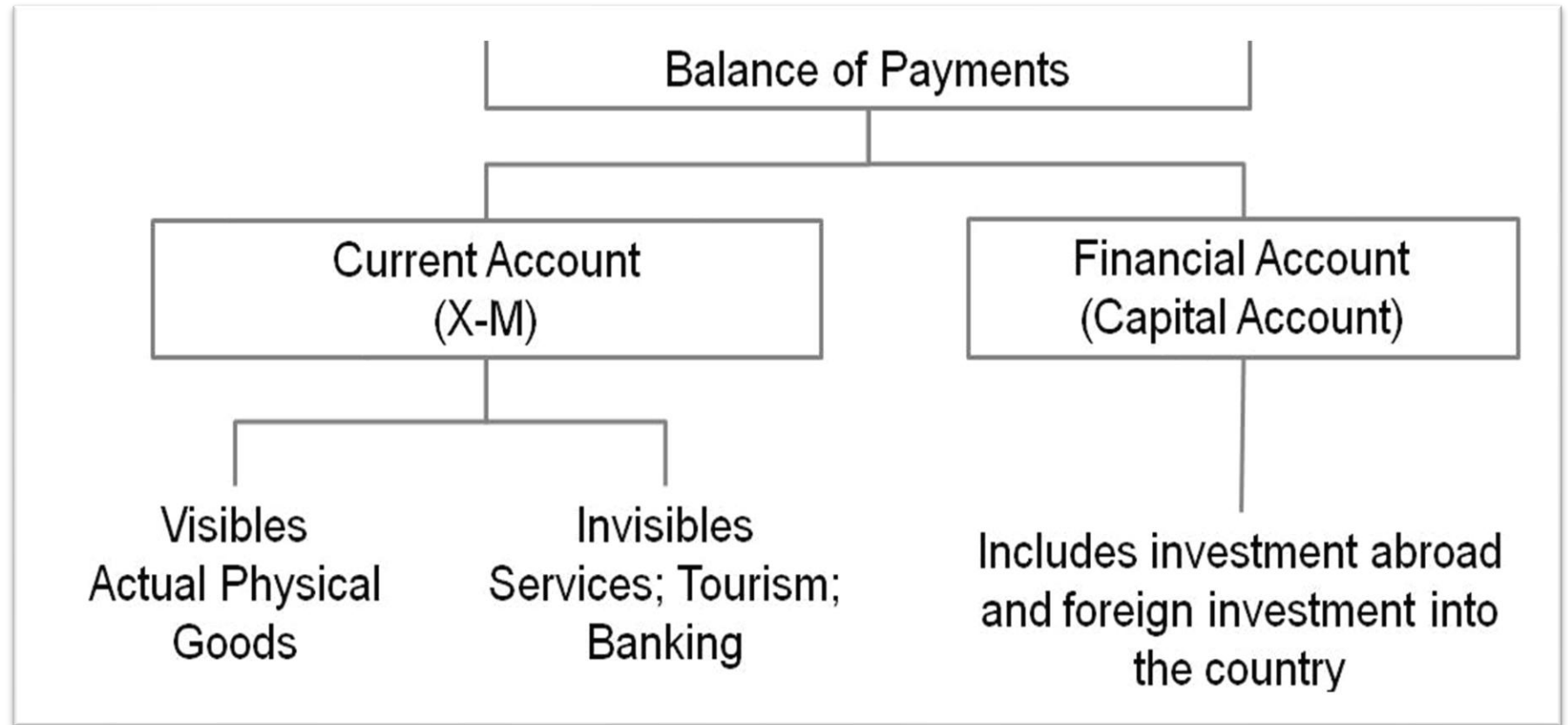
Actual growth fluctuates and deviates from trend growth in the short term gives rise to the **economic cycle**, or **business cycle**.



**Recession:** when its economic growth rate turns negative for at least two consecutive calendar quarters

# Balance of Payments

The **balance of payments** is a summary of all economic transactions between one country and the rest of the world, typically conducted over a calendar year.



**To Balance:**  $CuA = CaA + / -$  balancing item (used to rectify the many errors in compiling the balance of payments)  $+ / -$  any change in central bank foreign currency reserves



# Money Supply

The **money supply** is the amount of money that exists in the economy at any point in time.

'**Money**' is anything that is generally acceptable as a **means of settling a debt** and is an acceptable medium of exchange. It must also act as a

- **store of value** for future consumption by maintaining its purchasing power
- provide a **unit of account** against which the price of goods and services can be compared.

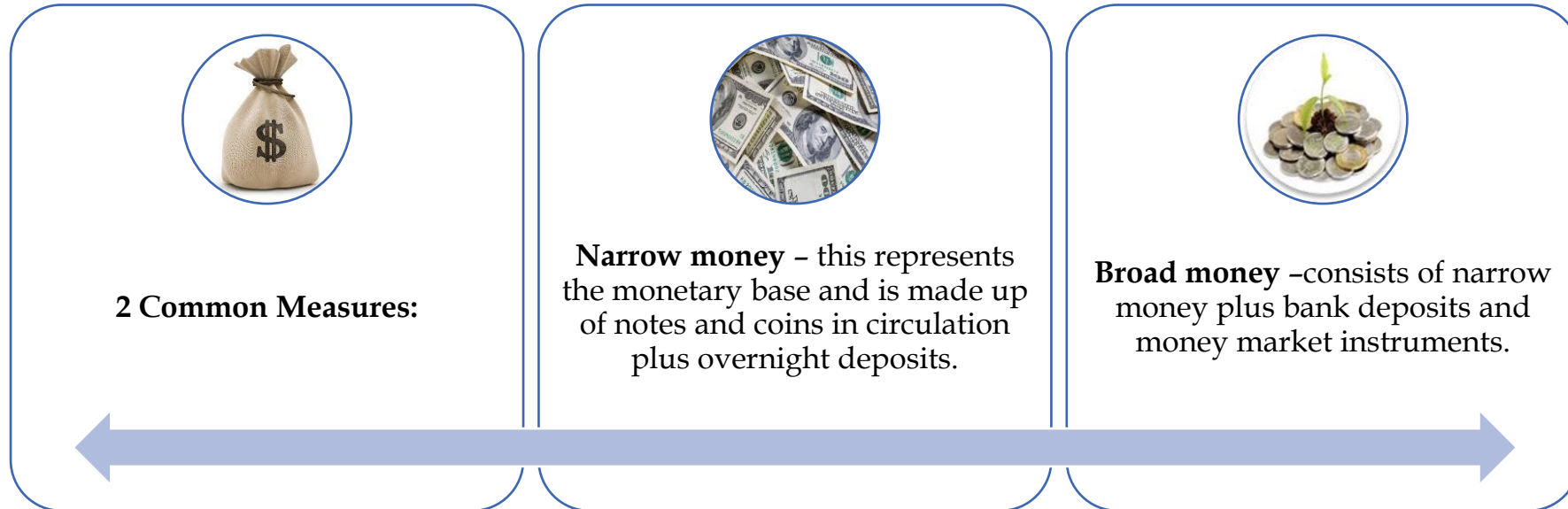
To be acceptable, however, money must also be easily **recognisable, divisible, portable and durable**.

Money takes the form of a **fiat currency** i.e. has no intrinsic value but which is demanded for what it can itself purchase.

- Declared legal tender by government
- Not backed by physical commodity



# Measures of Money Supply



In the **US**, the two measures of money supply are M1 and M2.

- **M1**, the narrowest measure, covers most liquid forms of money: currency, demand deposits and other deposits against which cheques can be written.
- **M2**, the broadest measure, is defined as M1 plus savings accounts, time deposits of less than \$100,000 and balances in retail money market mutual funds.

*See page 20 for Eurozone & UK Measures*

# Money Supply - Credit Creation & Money Multiplier

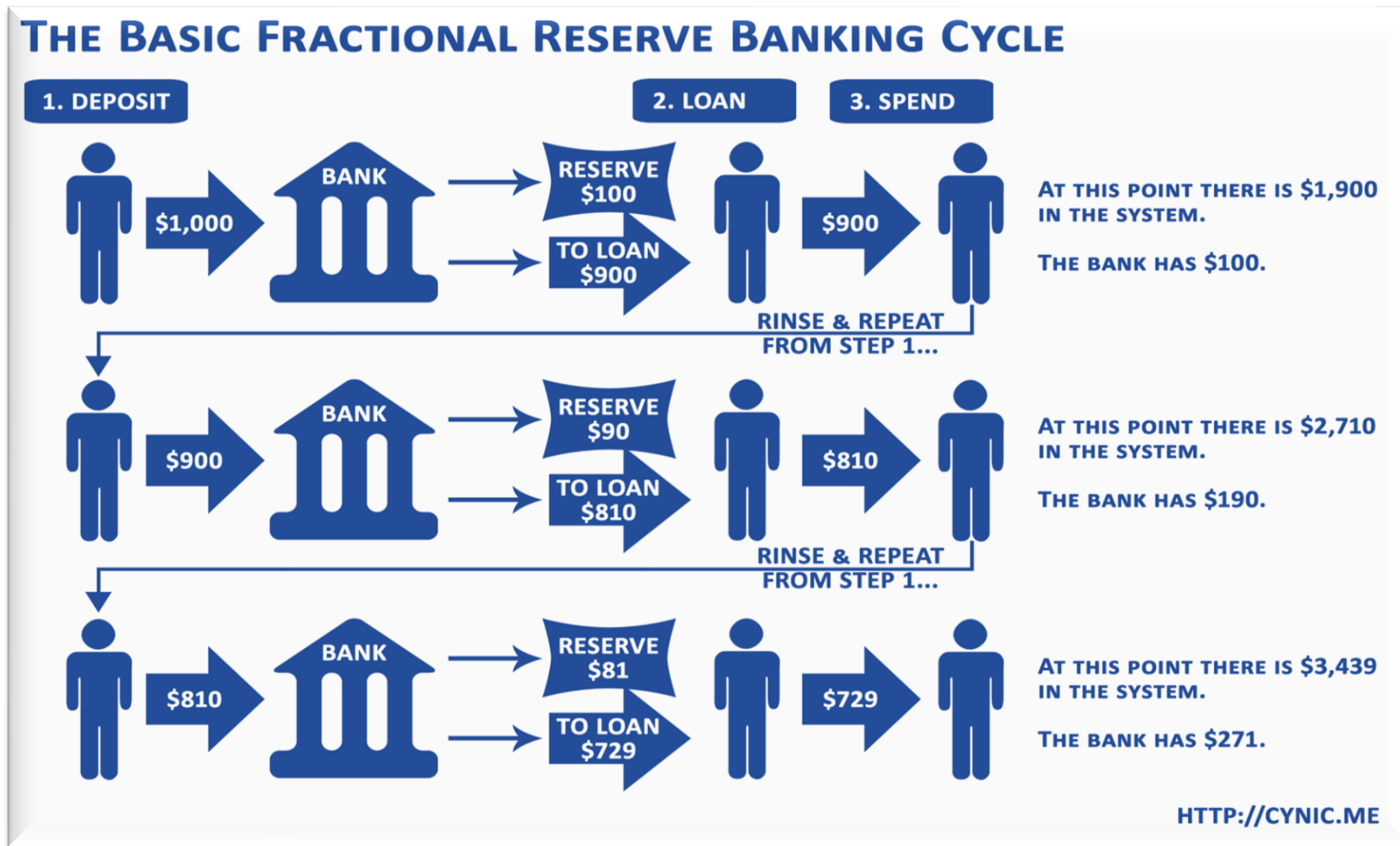
**Credit creation and the money multiplier:-**

**Banks are only required to hold a small proportion of their deposits as reserves to meet day-to-day withdrawals - known as the reserve ratio**

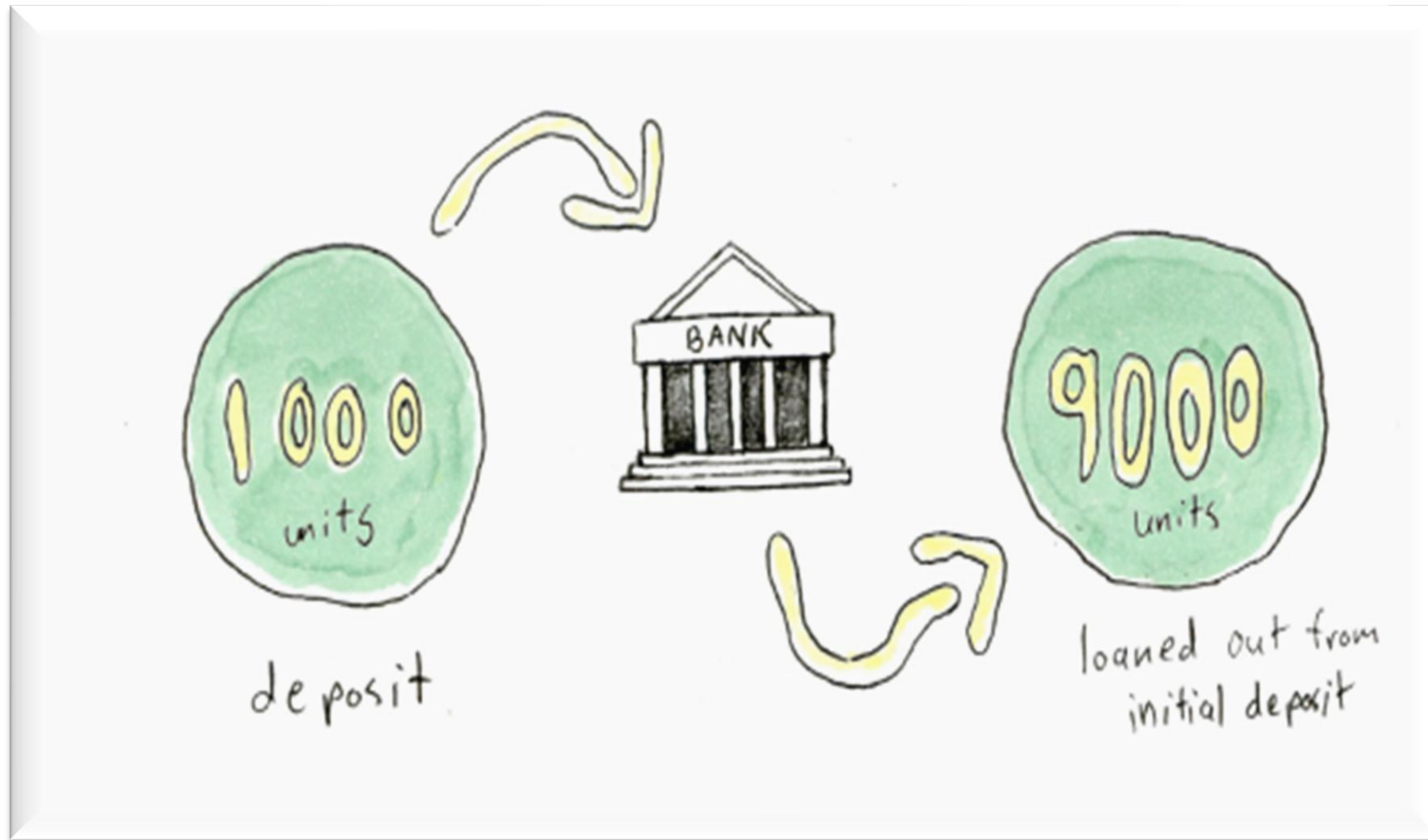
**They can lend out the significant remainder, assuming that bank depositors' required ratio of cash holdings to deposits does not exceed this ratio**

**As a sizeable proportion of each loan made from bank deposits is re-deposited and then extended as another loan, so credit is created and the money supply expands**

# Fractional Reserve Banking (FRB) in Detail



# FRB Effect – Credit Creation



# Other Factors Affecting Money Supply

**Reserve requirements** – the amounts that commercial banks are required to hold as deposits at the central bank

**Discount rate** – The interest rate charged by central bank to banks

**Government bond issues** – central banks can also influence the amount of money in circulation as a result of the issuance and repayment of bonds and **treasury bills**.



# Role of Central Banks

## Controlling the Money Supply i.e. Monetary Policy

- Setting the official short term rate of interest
- Setting the Reserve Requirement
- Open Market Operations

## Oversee and Supervise the banking system

- Lender of last resort
- Depositors protection scheme

## Acting as banker to the government

## Managing the national debt

## Issuing notes and coins

## Holding the nation's gold and foreign currency reserves



# Economic Policies - Fiscal and Monetary Policies

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**The role of government - manage the economy through taxation, economic and monetary policy**

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**Stabilisation Policies:**  
Policies to reduce the impact of fluctuations in economic activity.

**Fiscal Policy** involves making adjustments using government spending and taxation

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**Monetary Policy** involves making adjustments to interest rates and the money supply.

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**Governments implement their monetary policies through their central bank**

## Fiscal Policy

- Discretionary or pro-active to deliberately boost or restrain demand
- Passive where transfer payments automatically increase and tax decreases as economy moves into recession – built-in stabilisers
- Can be neutral, expansionary or contractionary in order to achieve its macroeconomic aims.
- Issues - time lags; crowding out; impact on future tax rates.

## Monetary policy

- Seeks to influence economic activity by controls on:
  - the supply of money
  - the availability of money, and
  - the cost of money or rate of interest.
- Quantitative Easing - buying securities (like government debt, mortgage-backed securities or even equities) from banks.
- Negative Interest Rate Policy (NIRP) – negative interest on reserves



# Quantitative Easing

## The Policy

- Policy Instrument adopted by many central banks.
- Involves injecting money directly into banks.
- Aims to get money flowing in the economy when cutting interest rates is not working.

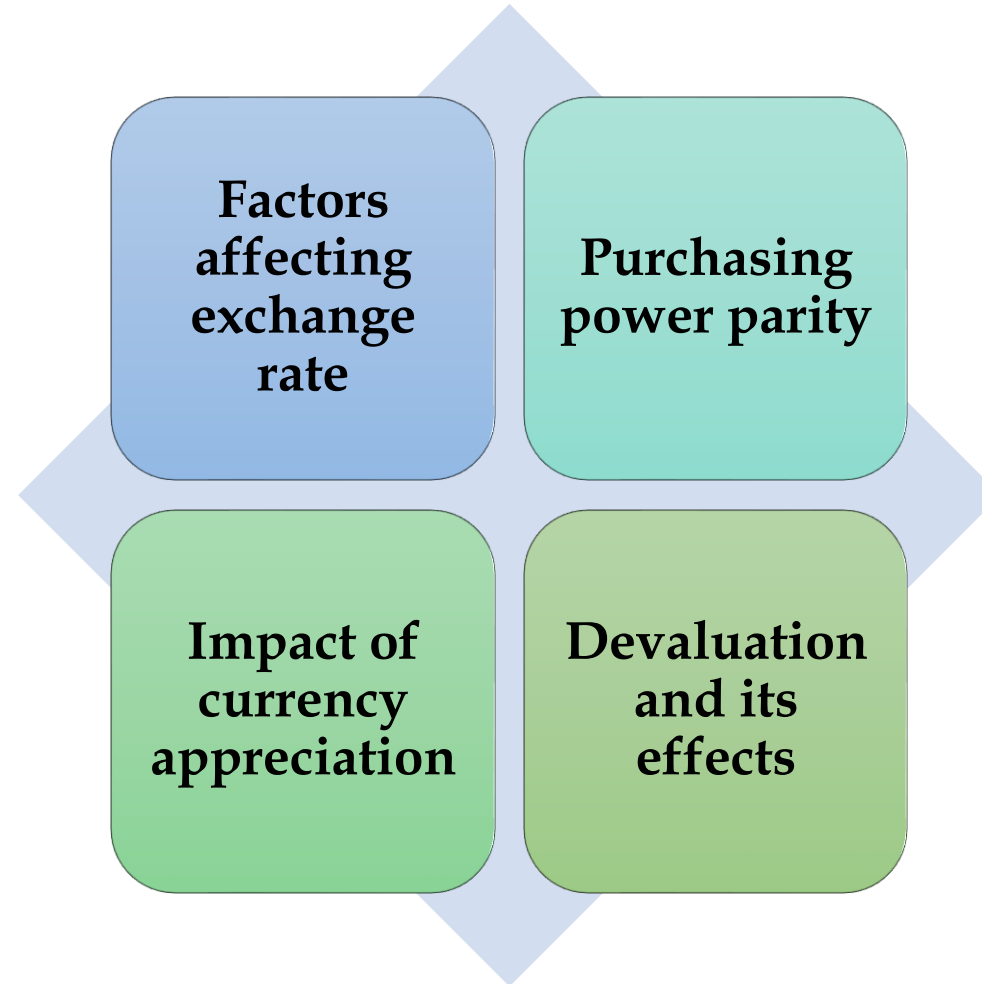
## How it works

- Central banks buy assets in exchange for money
- Government debt, MBS or equities
- Results in higher spending of the economy
- Helps with growth to reduce impact of recession



# Exchange Rates

Can either be a fixed exchange rate system (e.g. pegged to the USD or crawling peg) or a floating exchange rate system.



**Inflation: Persistent increase in the general level of prices. Also erosion in the PP of money.**

**Causes – Cost Push or Demand Pull**

- Excess demand in the economy
- Scarcity of resources and key workers
- Rapidly increasing government spending

**Most western governments seek to control inflation at a level of about 2-3% pa**

**What Problems does it cause? What are the Benefits?**

**Central banks use interest rates to control inflation. What happens if rates fall or rise?**

**Changes in base rate can take up to two years to have their full impact on inflation**

**Deflation: Defined as a general fall in price levels. Typically results from negative demand shocks**

**Disinflation – slowing rate of inflation**

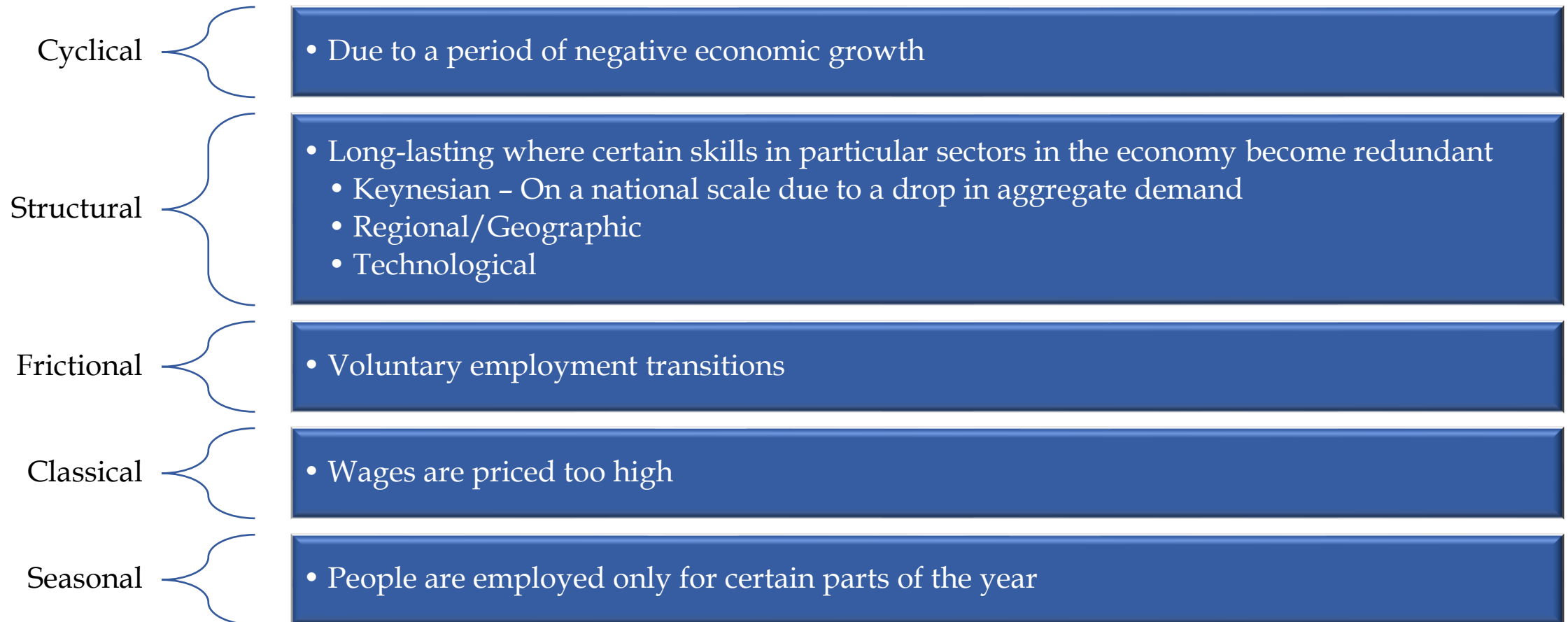
**Stagflation – inflation is combined with slow or negative growth**

**Consumer Price Index (CPI) – most common method for measuring inflation. Popular in Europe.**



# Unemployment

**Unemployment is one of the negative effects of inflation.**



**‘Natural rate of unemployment’** - when the labour market is in equilibrium, so that all those who want a job can get one and any unemployment is purely voluntary.

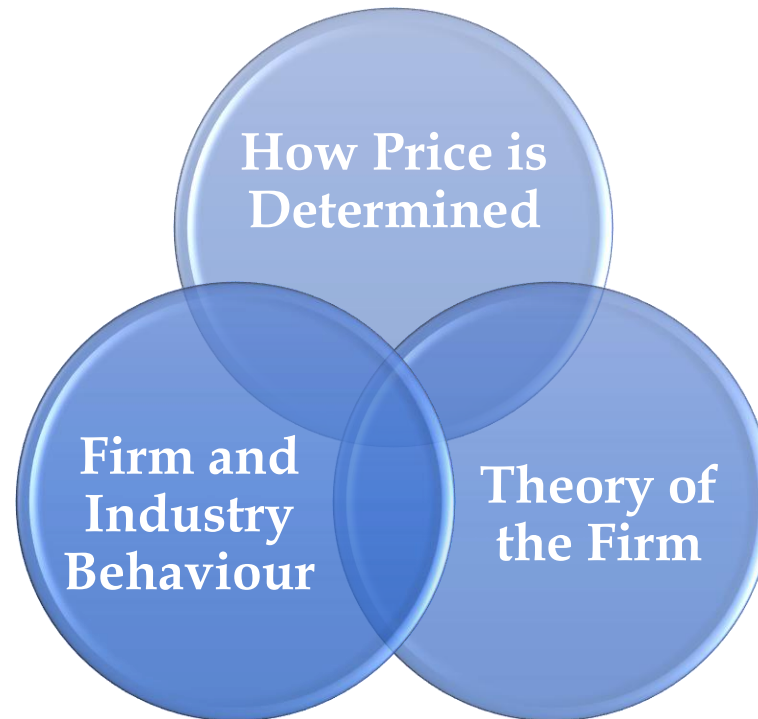
# Central Banks – G8

Federal Reserve	<ul style="list-style-type: none"><li>• Statutory duty of promoting price stability and sustainable economic growth</li><li>• FOMC meets every six weeks to set rates</li><li>• Lender of last resort</li></ul>
European Central Bank	<ul style="list-style-type: none"><li>• Responsible for setting monetary policy for the entire Euro zone with the sole objective of maintaining internal price stability</li><li>• Its objective of keeping inflation, as defined by the Harmonised Index of Consumer Prices (HICP), “close to but below 2% in the medium term” is achieved by influencing factors such as the external value of the euro and growth in the money supply</li></ul>
Bank of England	<ul style="list-style-type: none"><li>• Manages inflationary targets by interest rate setting through the Monetary Policy Committee</li><li>• Responsible for all other traditional central bank activities with the exception of managing the national debt and providing a depositors protection scheme for bank deposits</li></ul>

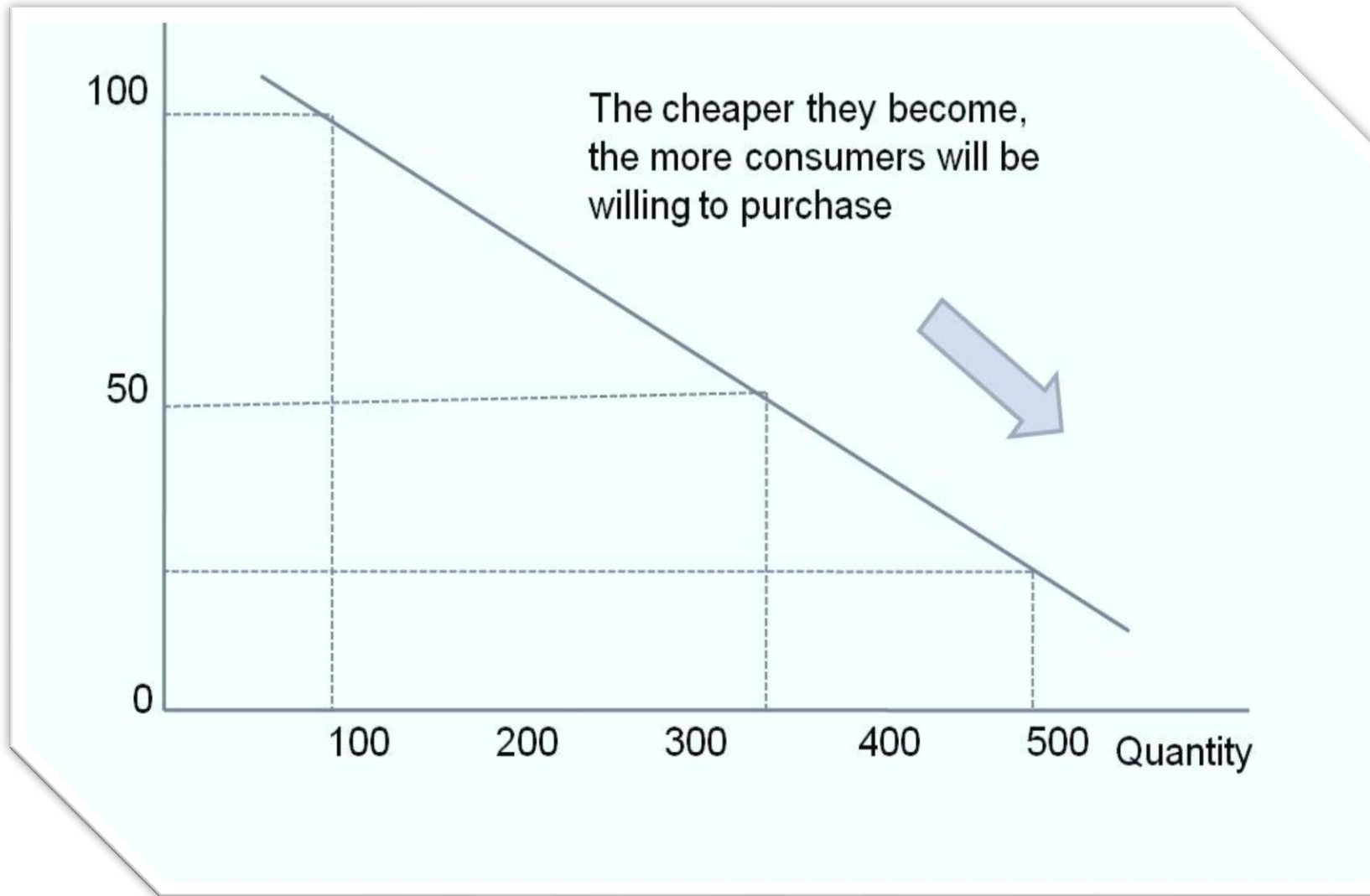
**Also see Central Banks of Japan, China, Russia and Canada**



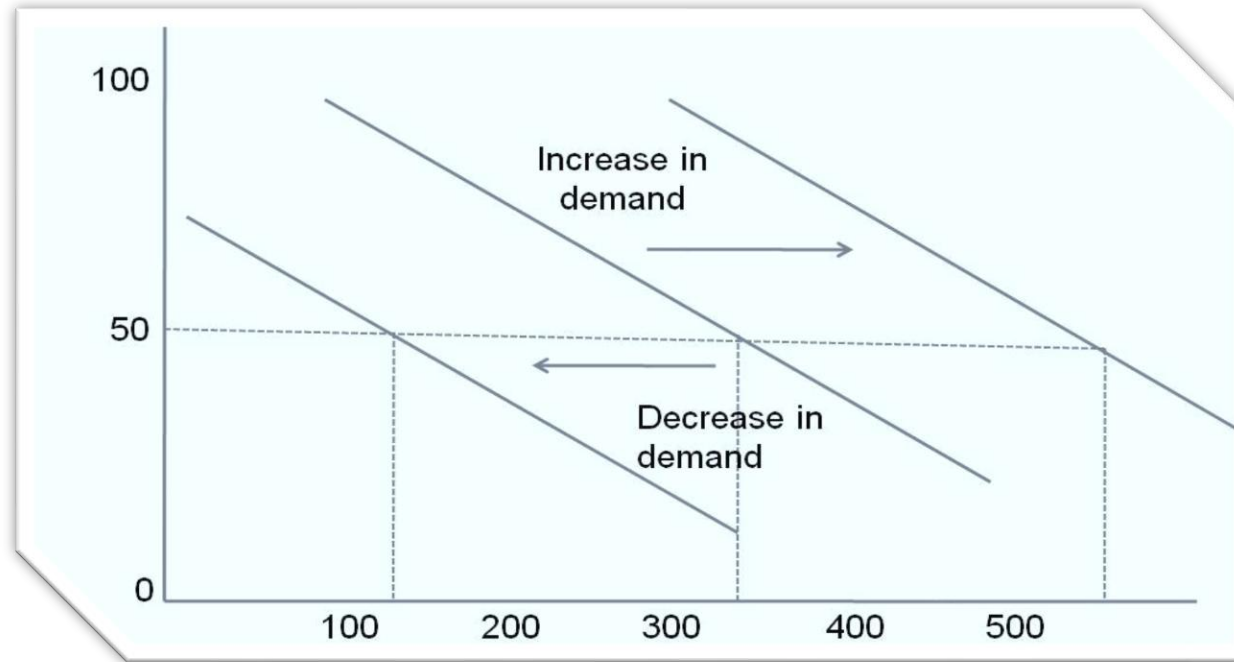
Views the economy from the standpoint of how individuals and firms allocate their limited resources in order to maximise an individual's financial position or the production, profitability and growth of a firm.



# Demand Curve



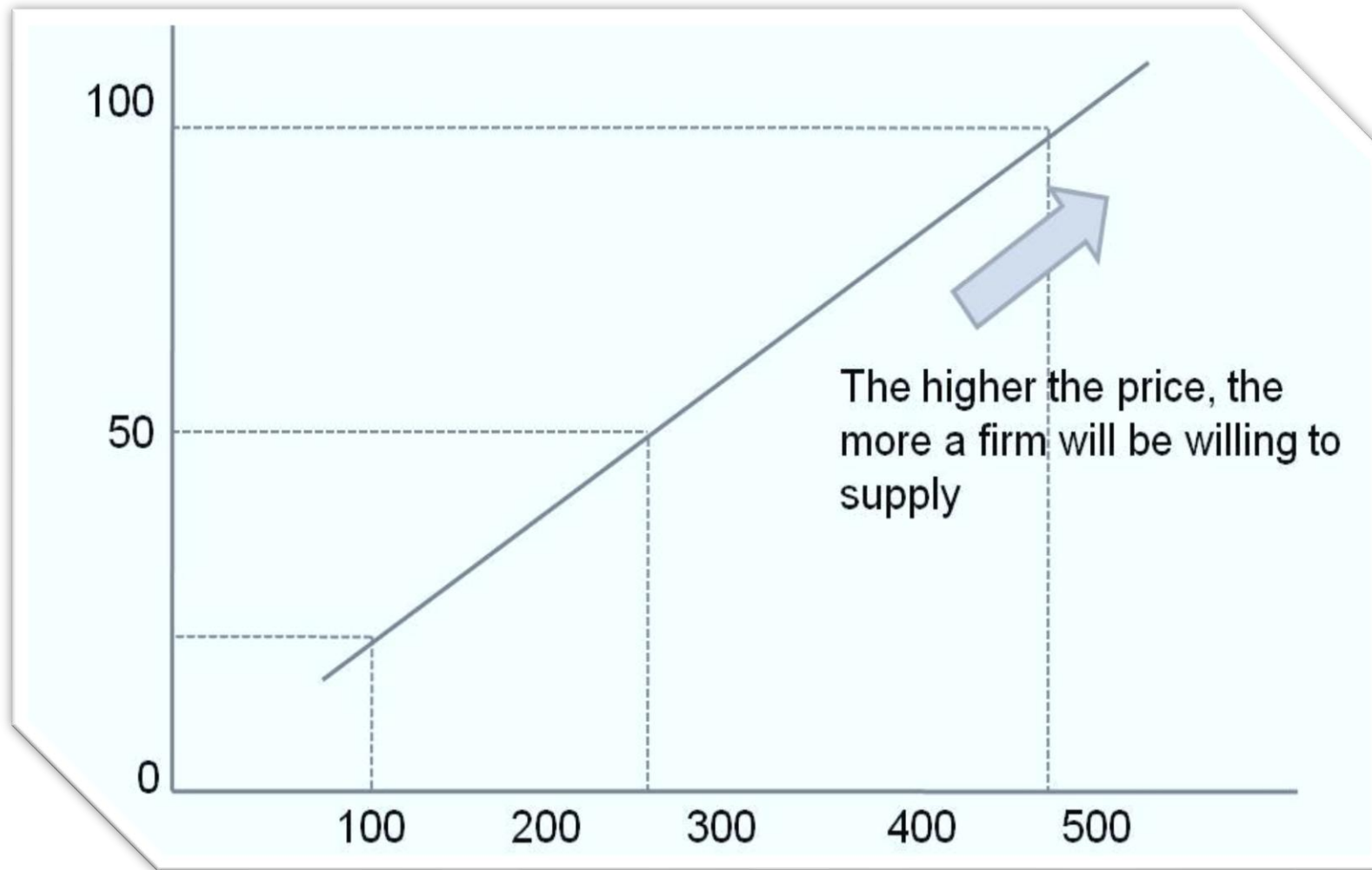
# Demand Shifts



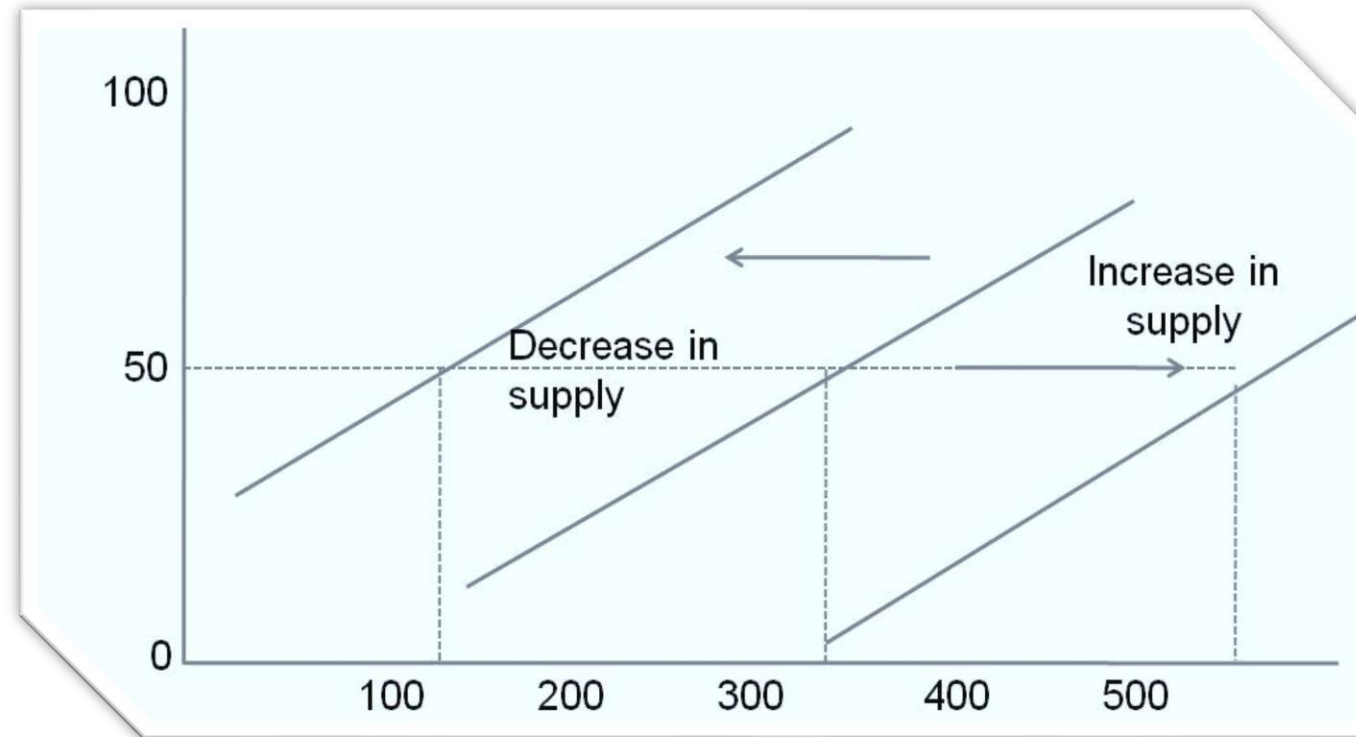
Changes in the demand curve can also take place as a result of something other than price: Caused by Change in:

- The price of Substitute or Complimentary Goods,
- Consumers Income
- Consumer Tastes

# Supply Curve



# Supply Shifts



A change in anything other than a change in the price of the good could result in the supply curve shifting to either the left or right. E.g. Change in the cost of production

# Equilibrium



When a market is allowed to operate freely, the price mechanism always brings supply and demand back into equilibrium. This is known as Say's Law: supply creates its own demand.

# Elasticity of Demand

Quantifies the extent to which demand for a product will change as a result of a small change in price

Elastic demand - describe a position where the quantity demanded changes by a bigger percentage than the price change

Inelastic demand - where the demand change is a smaller percentage than the price change.

**Giffen Goods:** are more essential to a consumer than others, and so demand can be insensitive to price changes as consumers will still need to buy the product. E.g. 'ostentatious' goods can fall into this category as well.



# 3 Types of Elasticity

**1. Price elasticity of demand (PED)** quantifies the extent to which the demand for a particular good changes in proportion to small changes in its price.

By knowing the PED of a product, firms are able to calculate the impact that a small price rise or price reduction will have on the total revenue generated by the product.

**Example** A watch is priced at \$2, and 1,000 units are sold. If, however, the price is reduced to \$1.90 per unit, 1,200 units would be sold.

A 5% reduction in price, therefore, results in a 20% increase in the volume of sales

$$\text{PED} = \% \Delta \text{Quantity Demanded} / \% \Delta \text{Price}$$

$$\text{PED} = +20\% / -5\% = -4$$

The PED of -4 tells us that for a 5% reduction in price, the quantity demanded will increase at four times the rate.

E.g. Rail companies, for instance, meet inelastic demand for peak services with higher

prices than for elastic off-peak travel.

Total revenue is maximised at the point of **unit elasticity**.





# 3 Types of Elasticity

2. Cross elasticity of demand (XED) measures the change in quantity demanded against the change in price of either a substitute or complementary good.

Substitute goods have a positive XED so, for example, if the price of cars rises, then the demand for alternative methods of travel will increase.

Complementary goods have a negative XED so, for example, if the price of diesel and petrol increases, then the demand for cars will fall.

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**3. Income elasticity of demand (YED)** measures the sensitivity of demand to consumers' disposable income and shows the percentage change in the quantity demanded given a small change in income.

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Rising income results in increased demand for normal goods - all normal goods have a positive YED.

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The **necessities** of life, however, have a YED of one or less. Some necessities have positive values, others negative. Those with negative values are **inferior goods**, that is, goods that account for a smaller percentage of an individual's budget as their income rises



## Profit maximisation principle

- Firms seek to maximise profits
- Firms maximise profit at point where extra marginal revenue earned from one extra unit equates to cost of producing it -  $MR = MC$

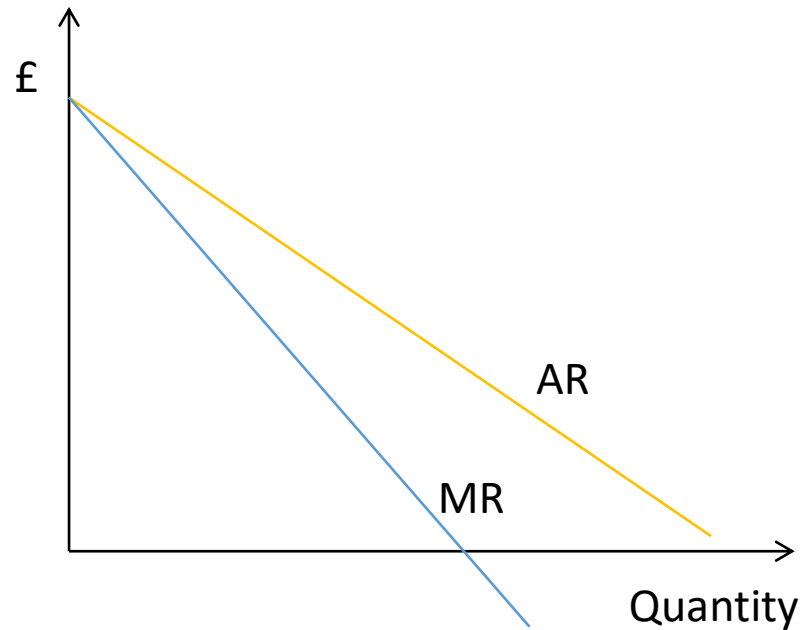
This requires us to look at supply and the production process

- Production - the relationship between inputs and outputs
- Input side consists of three factors of production - Land; Capital; Labour
- The costs of production are considered in both short run and long run

## Law of diminishing returns



# Revenue Maximisation - Average and Marginal Revenue



- The more units we buy the lower the average price per unit
  - This is depicted by the average revenue (AR) curve, which is also the demand curve
- The progressively smaller additional amount of revenue received from the sale of each additional unit of product as we move down the AR curve is illustrated by the MR curve.

# Short and Long Run Costs

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In the **Short Run (SR)**, it is assumed that the stock of capital equipment for production is fixed. This represents **fixed cost** i.e. because the cost will be incurred regardless of production.

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In the SR only labour and raw materials can be changed – so they are the **variable costs**.

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In the **Long Run (LR)** all costs are variable.

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As production increases, the short run average cost of producing additional units falls.

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**Why?**

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However, beyond a certain level of output, the marginal cost of producing one additional unit becomes greater than the average total cost.

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**Why?**

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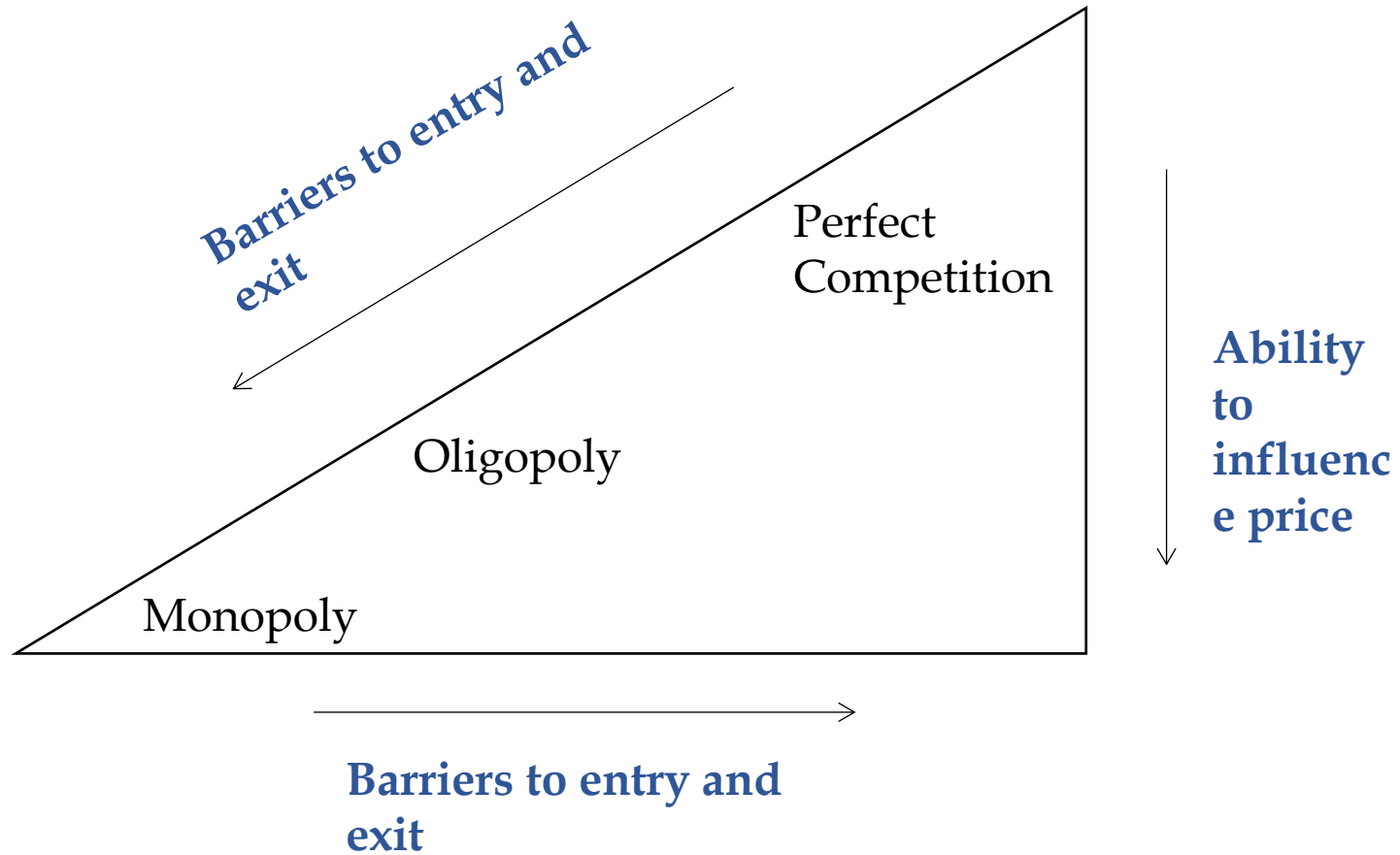
Because **diminishing returns to labour** begin to set in i.e. as the increased use of labour becomes less productive given that the firm's productive capacity is constrained by a fixed amount of capital equipment.

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What differentiates the short run from the long run is the length of time necessary for adjustments to be made to each and every one of the factors of production used in the production process.



# Industrial Structure



## Perfect competition

- Large number of firms supplying large number of customers
- Each firm's output has no overall effect on price
- No barriers to entry
- No product differentiation
- E.g. the market for grain

## Monopoly

- There is one firm in the industry
- The firm is a price maker
- There are barriers to entry

**Oligopoly** exists where a limited number of highly interdependent firms dominate an industry, typically through either implicit or explicit collusion on price and output.



# Central Tendency & Dispersion

Dealing with data or numerical distributions

Need to make inferences about the data being considered

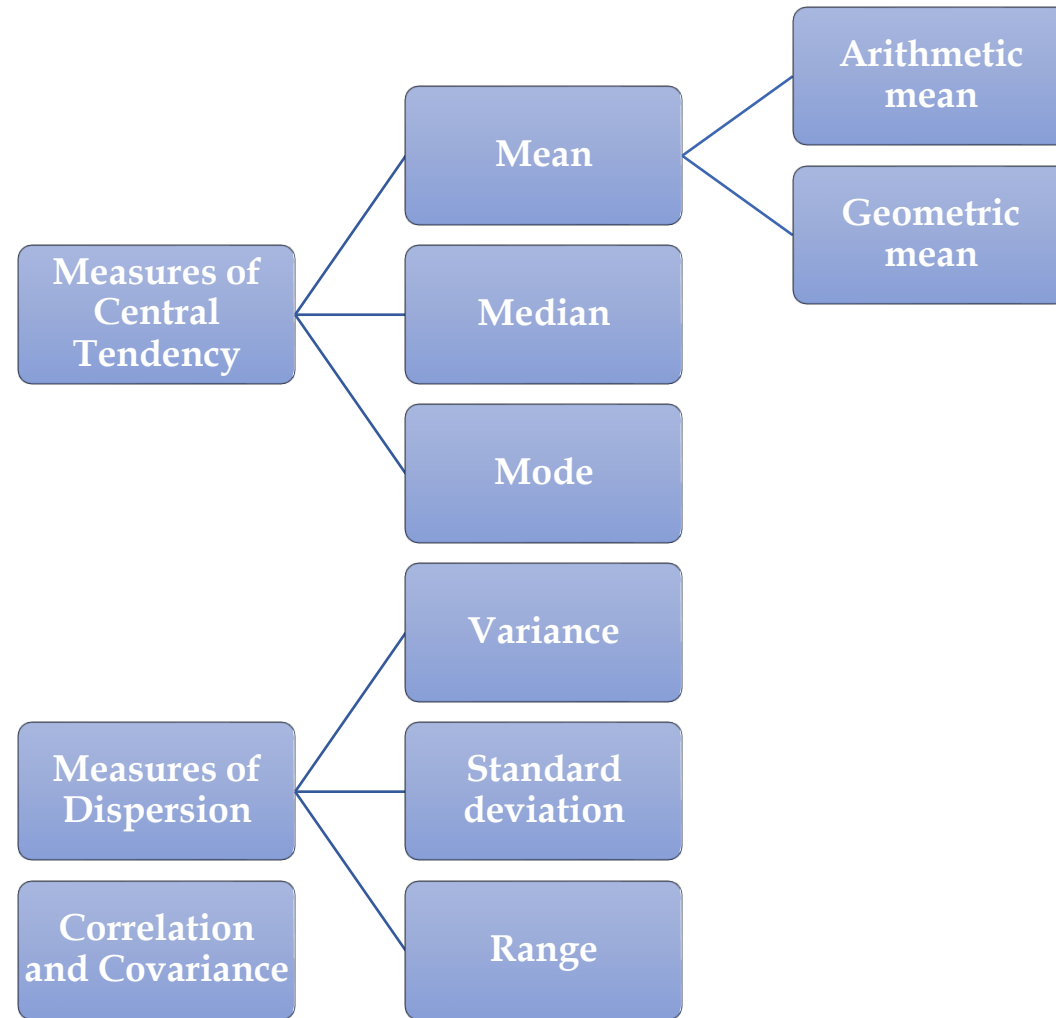
Use it to make predictions about the population

Techniques used are known as measures of central tendency and measures of dispersion

Measures of central tendency

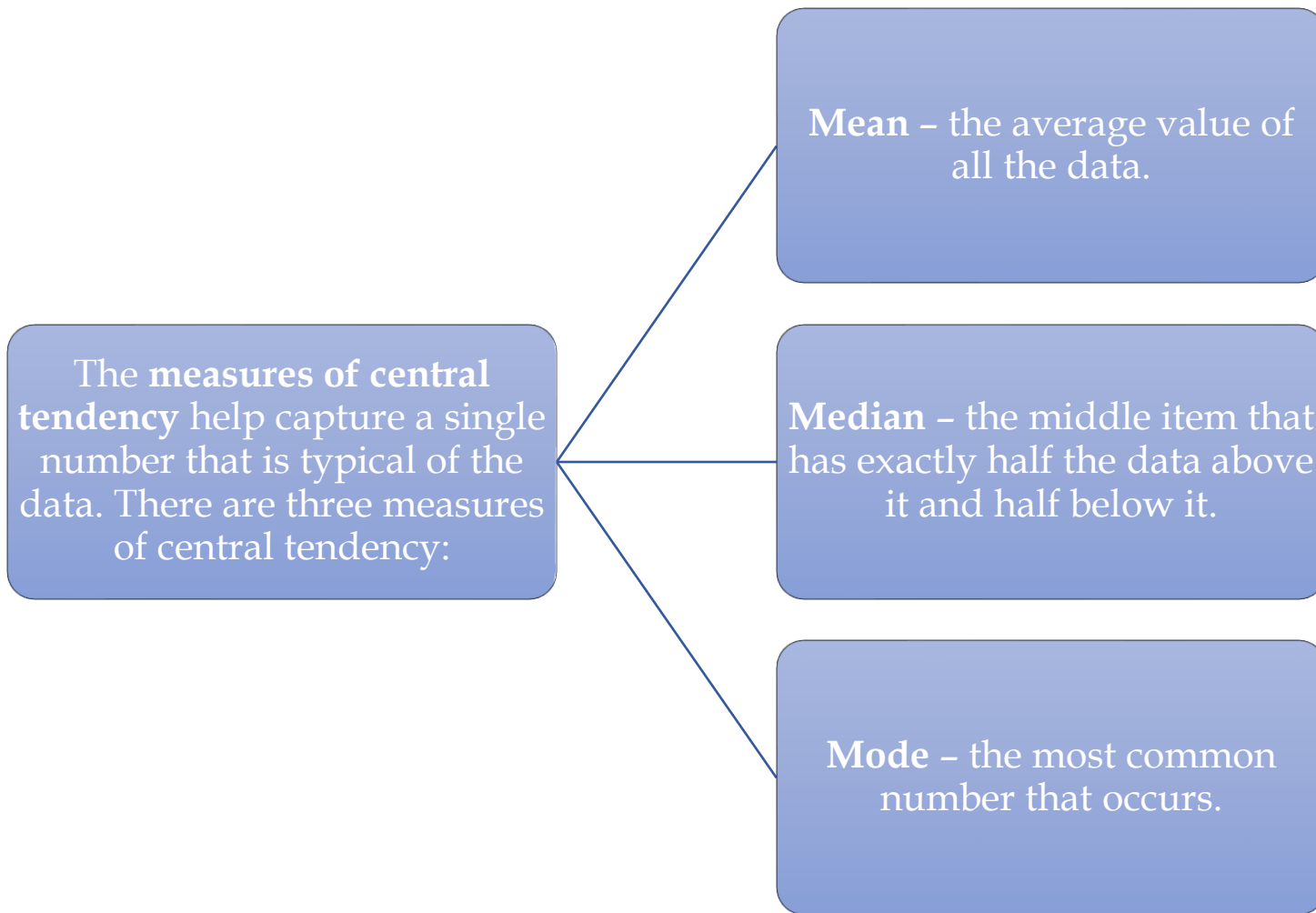
Measures of dispersion







# Measures of Central Tendency – Mean, Median & Mode



# Arithmetic Mean

## Arithmetic Mean

The average or mean

$$\bar{x} = \frac{\sum x}{n}$$

The sum of all the observed values

The number of observed values

A diagram illustrating the arithmetic mean formula. On the left, a box contains the text "The average or mean". An arrow points from this box to the variable  $\bar{x}$  in the formula  $\bar{x} = \frac{\sum x}{n}$ . The formula is centered. To the right of the formula, there are two boxes. The top box contains the text "The sum of all the observed values" and has an arrow pointing to the numerator  $\sum x$ . The bottom box contains the text "The number of observed values" and has an arrow pointing to the denominator  $n$ .

**Example** if you have six investment funds in your portfolio that produce returns of 7%, 8%, 9%, 10%, 11% and 12%. What is the average or mean return?

**Ans:**  $(7\%+8\%+9\%+10\%+11\%+12\%) \div 6 = 9.5\%$ .

# Median

## Median

The value of the middle item in a set of data arranged in chronological order

### Odd Numbers

2	5	8	9	12	13	15	16	18
4 numbers				Median	4 numbers			

### Even Numbers

2	5	8	9	12	13	15	16	18	19
				Median = 12.5 $\frac{(12+13)}{2}$					

# Mode

## Mode

The most frequently occurring number in a set of data.



## Example -

House price values - \$100k, \$125k, \$115k, \$135k,  
\$95k, \$100k

\$100k is the mode



Can also be no mode, bimodal, trimodal and multimodal



# Geometric Mean

## Geometric Mean

- Calculated by multiplying the values and then taking the nth root of the resulting product

## Example -

- You have a deposit of 10,000 that you expect will earn 5% pa this year, 6% next year and 5.5% in the third year
- 1. What is the average rate of return?
- 2. With interest reinvested what will the balance of the account be at the end of the three years?

$$\text{Average Return} = 5\% + 6\% + 5.5\% = 5.5\%$$

$$2. \sqrt[3]{1.05 * 1.06 * 1.055} - 1$$

$$\text{GM} = 5.499\%$$

$$\text{USD } 10,000 * 1.05499^3 =$$

$$\text{USD } 11,742.15$$



# Measures of Dispersion – Range, Variance & Standard Deviation, Inter-quartile range

## Range

Is the difference between the highest and lowest values in a set of data

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Return	13	11	2	6	5	8	7	9	7	6

$$\text{Ans: Range} = 13 - 2 = 11$$

Main drawback - it is distorted by extreme values and ignores the numbers in between

# Variance

Variance measures the spread of data to determine the dispersion of data around the arithmetic mean

	Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
1	Return	13	11	2	6	5	8	7	9	7	6	
2	Difference from the arithmetic mean	5.6	3.6	-5.4	-1.4	-2.4	0.6	-0.4	1.6	-0.4	-1.4	
3	Difference squared	31.36	12.96	29.16	1.96	5.76	0.36	0.16	2.56	0.16	1.96	86.40
4	Average (86.40/10)											8.64

Arithmetic Mean =  $(13\%+11\%+2\%+6\%+5\%+8\%+7\%+9\%+7\%+6\%) \div 10 = 7.4\%$ .



# Standard Deviation

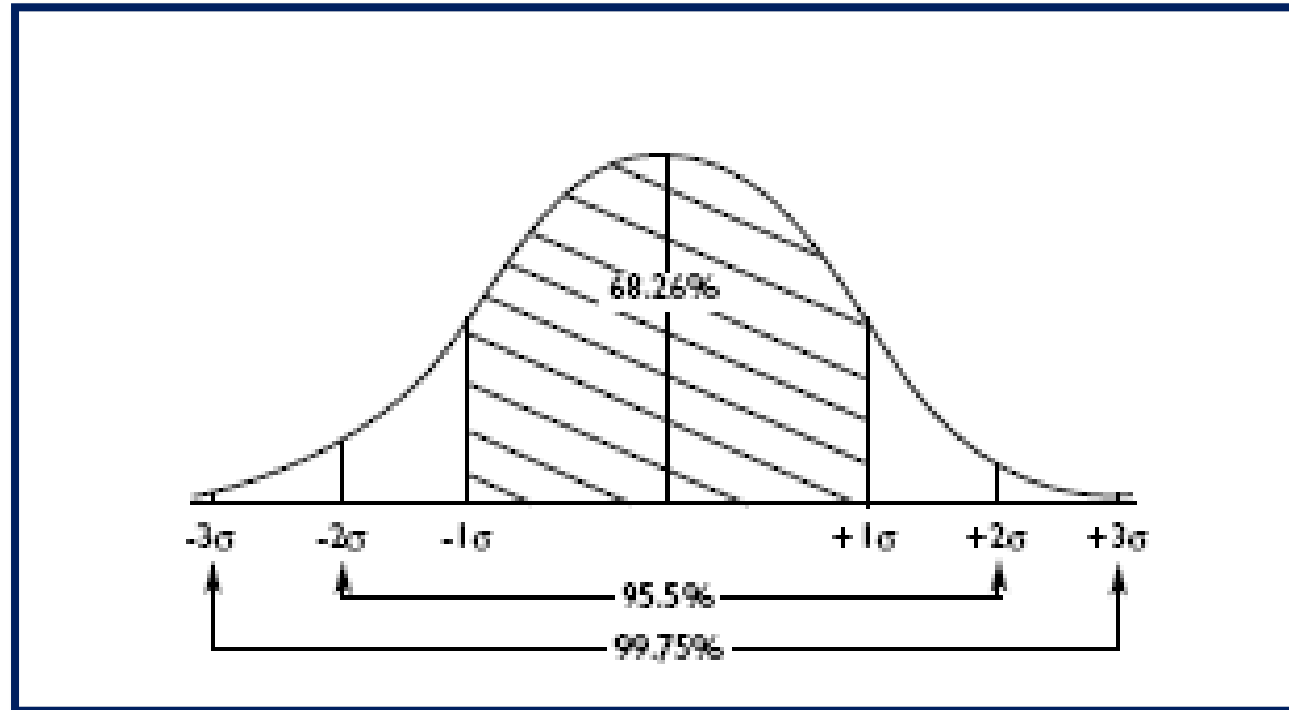
## Standard Deviation

- The square root of the variance and is the most commonly used measure of dispersion

So in previous example  $SD = \sqrt{8.64} = 2.94$



# Normal Frequency Distribution Curve



May not be normal:

- If the peak of the curve is to the left of centre it is said to be **positively skewed**
- If to the right **negatively skewed**

# Inter-Quartile Range

## Inter-Quartile Range

Ranks data against each other and presents the data as a series of quartiles and then measures the difference from the lowest rank quartile to the highest

Fund	A	B	C	D	E	F	G	H	I	J	K	L
Return	9%	8%	7.5%	7%	6.5%	6%	5.75%	5%	5%	4.75%	4%	3.5%
Median 5.875%												
Quartiles	1 <sup>st</sup> Quartile			2 <sup>nd</sup> Quartile			3 <sup>rd</sup> Quartile			4 <sup>th</sup> Quartile		
Inter-quartile range				←—————→								

The inter-quartile range is the difference in returns between the 25th percentile-ranked fund and the 75th percentile-ranked fund.

# Diversification and Correlation

## Diversification -

- The risk of holding securities A and B in isolation is given by their respective standard deviation of returns
- By combining these two assets the portfolio's standard deviation of return will be lower than the weighted average
- This reduction in risk for a given level of expected return is known as diversification

## Quantifying diversification uses -

- Correlation
- Covariance

Involves analysing the relationships between the movements of different assets and relies on regression analysis



# Diversification and Correlation

Correlation coefficient measures how the returns from two different assets move together over time and is scaled between +1 and -1

- Positive correlation - as one share price rises so does another
- Negative correlation - as one share price rises another falls

Perfect correlation -

- Change in the price of one share is exactly matched by a change in another
- If both increase together they have a positive correlation
- If one decreases as the other increases - a perfect negative correlation

Diversification -

- Is achieved by combining securities whose returns ideally move in the opposite direction to one another, or, if in the same direction, at least not to the same degree



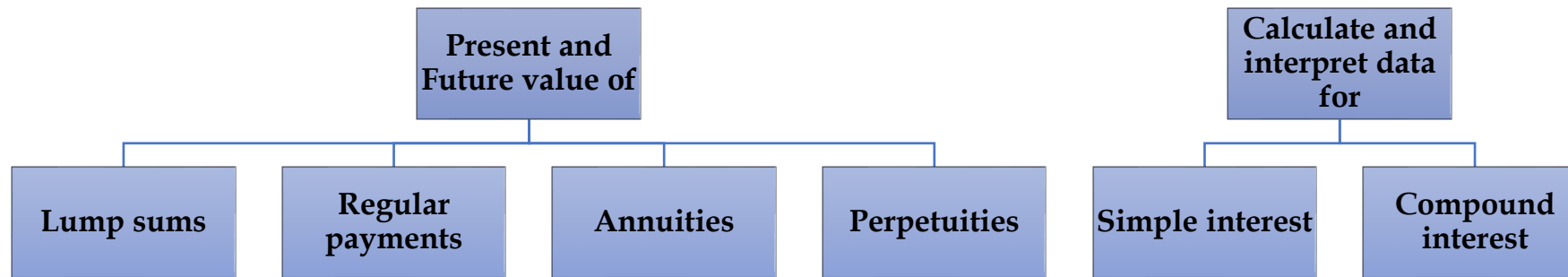
## Measures the relationship between two variables such as share prices

- A positive covariance means they have moved in the same direction
- A negative covariance means they have moved inversely
- The larger the covariance, the greater the historic joint movements of the two securities in the same direction.
- The covariance between two shares is calculated by multiplying the standard deviation of the first by the standard deviation of the second share and then by the correlation coefficient.

## Conclusions:

- Two combinations of two different securities may have the same correlation coefficient but each may have a different covariance
- If a security with a high standard deviation does not have a high covariance but has a low correlation with the other shares in a portfolio then its inclusion in the portfolio may reduce overall portfolio risk
- To minimise risk portfolios should contain securities as negatively correlated with each other as possible and with low standard deviations to minimise the covariance





**Used to calculate the expected returns from investments, in bond pricing and for appraisal of investment opportunities.**

# Simple Interest

- ❑ Calculated on the original amount only and assumes that at the end of each interest period that the interest is withdrawn.
- ❑ **Formula: Simple Interest = Principal x Rate x Time**
- ❑ **E.g. 1** If \$100 is invested at 5% for one year – how much interest is earned?  
**Ans:** \$5 interest.
- ❑ **E.g. 2** If \$200 is invested at a rate of 7% pa for two years, how much interest is earned?  
**Ans:**  $\$200 \times 0.07 \times 2 = \$28.00$
- ❑ **E.g. 3** If \$300 is invested at a rate of 5% pa for 60 days how much interest is earned?  
**Ans:**  $\$300 \times 0.05 \times 60/365 = \$2.47$ .



# Compound Interest

- ❑ Assumes that the interest earned is left in the account or reinvested at the same rate
- ❑ **Formula**  $\text{Initial Sum Invested} \times (1 + r)^n$
- ❑ **E.g.** How much will \$100 earning 5% interest per annum compounded be worth after 6 years?  
**Ans:**  $\$100 \times (1 + .05)^6 = \$134$





# Future Value

- Refers to the future value of an amount invested now at a given rate of interest

- **Future Value = Present Value  $\times (1 + r)^n$**

- **Example 1** - if a client were to invest \$10,000 for seven years and the anticipated growth is 6% per annum, how is his investment expected to be worth in 7 years?

**Ans:**  $\$10,000 \times (1+0.06)^7 = \$15,036.30$

- Example 2** - \$100 deposited for 5 years but with interest of 5% paid per annum but compounded semi annual, what will it be worth in 5 years?

**Ans:**  $\$100 \times 1.025^{10} = \$128.00845$



# Present Value of a Future Lump Sum

Present value -

- Used to determine how much to invest today given a rate of interest or growth and frequency of payment in order to achieve a required amount

Present value of a future sum -

- The amount that needs to be invested today is established by discounting the amount that is required by the rate of interest

- **Formula: Present Value =  $\frac{\text{Terminal Value}}{(1+r)^n}$**

- **Example** How much does an investor need to invest today if they need a lump sum of \$25,000 in 7 years' time and the rate that can be earned is 6% per annum?

**Ans:**  $\frac{\$25,000}{(1+0.06)^7} = \$16,626.43$



# Present Value of an Annuity or Regular Payment

Present value of an annuity -

- Refers to a series of equal cash payments that will be received over a specified period of time.
- If we expect to receive payments of \$100 over the next three years, we can calculate their present value (assuming interest rates are 5%) using the previous formula:

Year	Cash Flow	Discount Rate	Formula	Discount Factor	Present Value
1	100.00	5%	$100.00 \div 1.05$	0.9524	95.24
2	100.00	5%	$100.00 \div 1.05^2$	0.9070	90.70
3	100.00	5%	$100.00 \div 1.05^3$	0.8638	86.38
<b>Total</b>					272.32



# Present Value of an Annuity or Regular Payment

- Present value of an annuity – Quicker Method

$$\text{Present Value of an Annuity} = \text{£}x \times \frac{1}{r} \left[ 1 - \frac{1}{(1+r)^n} \right]$$

- $PV = \$100 \times \frac{1}{0.05} \left[ 1 - \frac{1}{(1+0.05)^3} \right] = \$272.32$



# Present Value of a Perpetuity


Present value of a perpetuity -

- A series of regular cash flows that are due to be paid or received indefinitely
- In practice is defined as a period beyond 50 years

$$\text{Present Value of a Perpetuity} = \text{annuity} \times \frac{1}{r}$$

- What is the present value of a perpetuity of \$1,000 at an interest rate of 5%
- **Ans:**  $PV = \$1,000 / .05 = \$20,000$





Difference between fundamental and technical analysis:

- Primary objectives
- Quantitative techniques
- Charts
- Primary movements
- Secondary movements
- Tertiary movements

The methods used to **analyse securities** in order to make **investment decisions** can be broadly categorised into **Fundamental Analysis** or **Technical Analysis**.

# Fundamental Analysis

Involves the valuation of a company based on quantitative and qualitative factors

## Quantitative factors

- Numerical results from the analysis of the financial statements
- Comparison to markets it operates in

## Qualitative factors

- Business model
- Its brand, patents and proprietary technology
- Competitive position
- Management team
- Industry it operates in and its competitive position



# Technical Analysis

Involves the valuation of a company or market based on historical price and volume data

## Trend analysis

Uses charts to identify patterns that can suggest future price movements

Unconcerned whether a security is undervalued and simply concerns itself with future price movements

## Direction types:

Uptrend,  
Downtrend  
Sideways

## Time types:

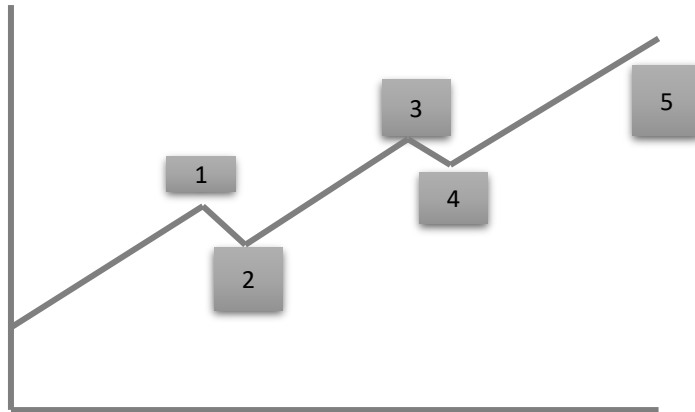
Primary - i.e. bull or bear market  
Secondary  
Tertiary

## Chart types

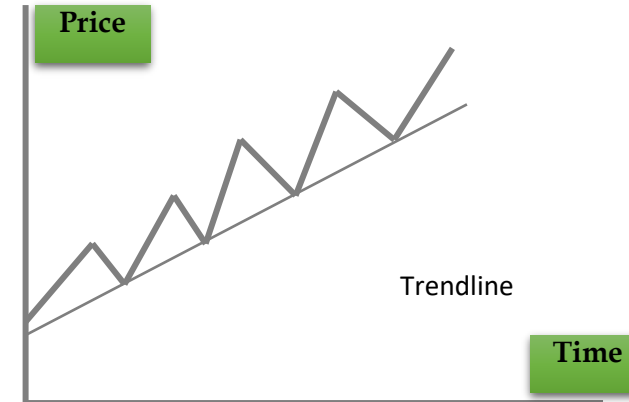


# Technical Analysis – Types of Charts

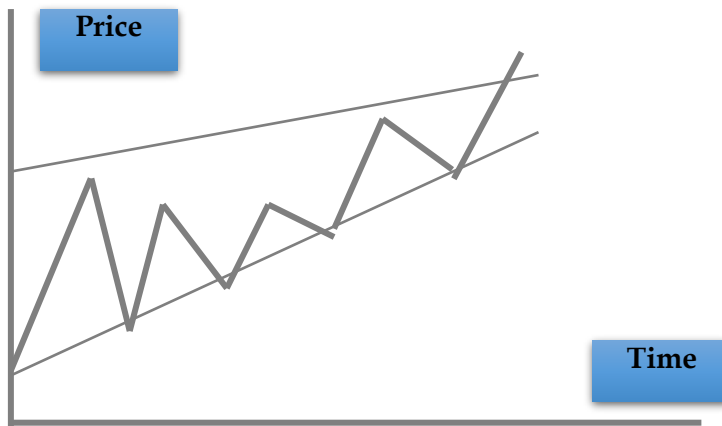
## Uptrend



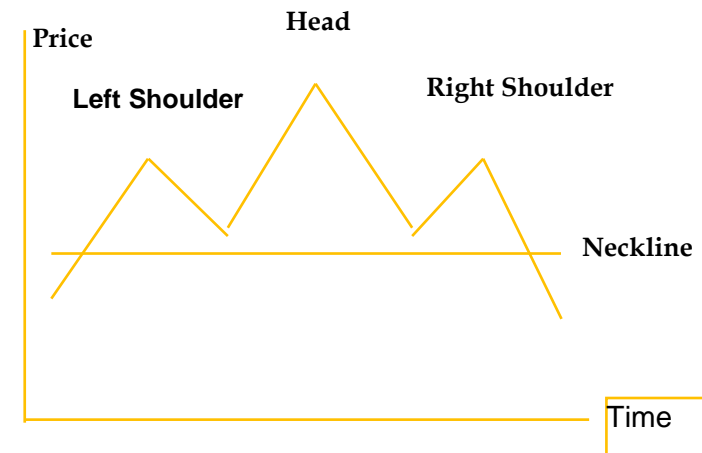
## Trendline



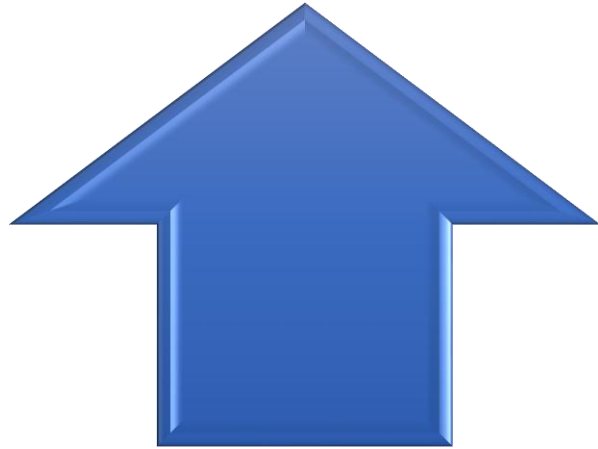
## Triangle



## Head and Shoulders

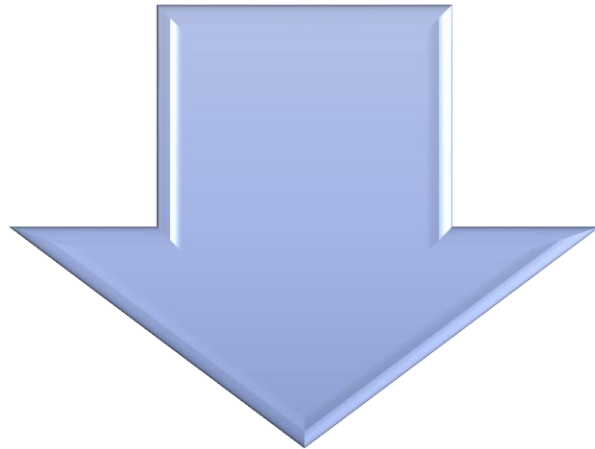


# Fundamental v Technical



## Assumption of fundamental analysis -

- Market do not always value securities correctly in short term
- By identifying the intrinsic value of a company, securities can be bought at a discount



## Assumption for technical analysis -

- Markets discount everything
- Prices move in trends
- History tends to repeat itself

Other differences: Time horizons and Investing versus trading

# Yields and Ratios

## Profitability Ratios

Return on Capital Employed (ROCE)

Asset turnover

Net profit margin

Gross profit margin

## Gearing Ratios

Financial gearing

Interest cover

## Liquidity Ratios

Working capital (current) ratio

Liquidity ratio (acid test)

Cash ratio

Z-score analysis

## Investors' Ratios

Earnings per share (EPS)

EBITDA

EBIT

Historic and prospective PERs

Dividend yields

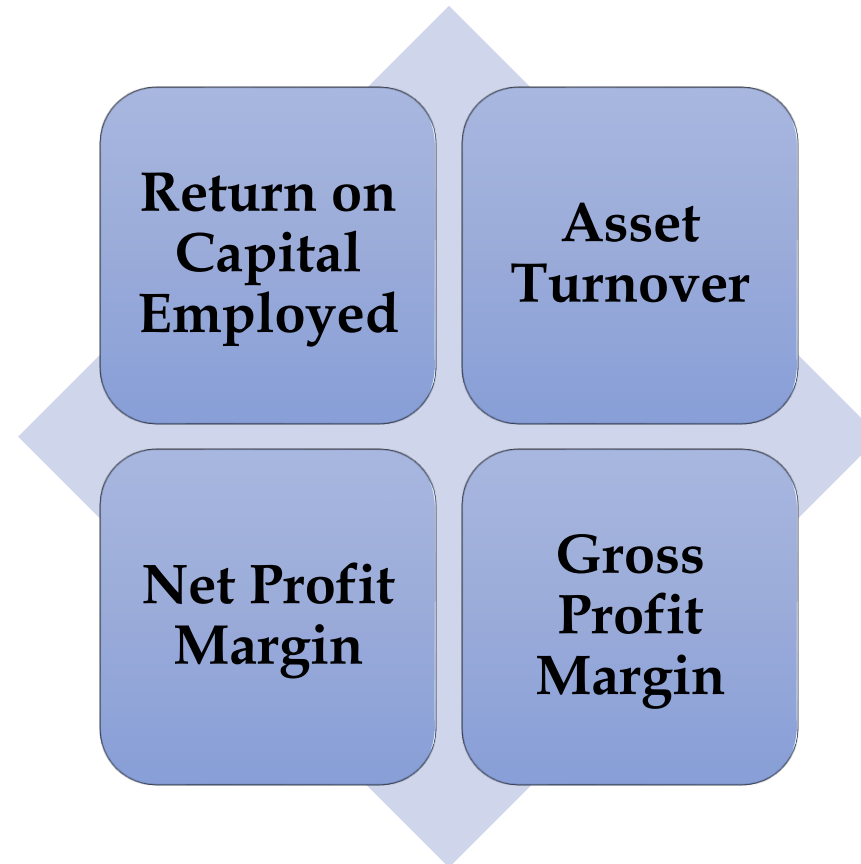
Dividend cover

Price to book



# Profitability Ratios

Used to assess the effectiveness of a company's management in employing the company's assets to generate profit and shareholder value.



# Return on Capital Employed (ROCE)

- Returns generated from the total capital employed - debt as well as equity
- Expresses income generated by the company as a % of its total capital

Formula -

$$\text{Return on Capital Employed} = \frac{\text{Profit before Interest and Tax}}{\text{Capital Employed}} \times 100 = x\%$$

Capital Employed = Total assets - current liabilities + short term borrowing



## Uses of ROCE -

- Compare returns to the cost of borrowing
- Establish trends across accounting periods
- Make comparisons with other companies

## Raising of new finance at the end of accounting period -

- Will increase capital employed but will not affect the profit figure used in the equation

## Revaluation of fixed assets during accounting period -

- Will increase the amount of capital employed whilst also reducing the reported profit by increasing the depreciation charge

## Acquisition of a subsidiary at the end of accounting period

- Capital employed will increase but there will not be any post acquisition profits from the subsidiary to bring into the consolidated income statement



# Asset Turnover & Profit Margin

## Asset Turnover -

- Relationship between sales and the capital employed in a business

$$\text{Asset Turnover} = \frac{\text{Sales}}{\text{Capital Employed}}$$

- Describes how efficiently a company is generating sales by looking at how hard a company's assets are working

## Profit Margin -

- How much profit is being made for each pound's worth of sales

$$\text{Profit Margin} = \frac{\text{Profit before Interest and Tax}}{\text{Sales}}$$

- Measures how effective price and cost management has been in the face of industry competition



# Calculating ROCE, Profit Margin and Asset Turnover

Assume ABC Ltd has sales of \$5m, a trading profit of \$1.5m and the following items on its balance sheet:

- Share capital \$1.0m
- Reserves \$5.0m
- Loans \$1.0m
- Overdraft \$0.5m

**Calculate ROCE, profit margin and asset turnover?**





# Calculating ROCE, Profit Margin and Asset Turnover

Return on Capital Employed:

$$\frac{\text{Profit before interest and tax}}{\text{Capital employed}} \text{ or } \frac{\$1.5\text{m}}{(\$1.0\text{m} + 5.0\text{m} + \$1.0\text{m} + \$0.5\text{m})} \times 100 = 20\%$$

**Profit Margin:**

$$\frac{\text{Profit before interest and tax}}{\text{Sales}} = \frac{\$1.5\text{m}}{\$5\text{m}} \times 100 = 30\%$$

**Asset Turnover:**

$$\frac{\text{Sales}}{\text{Capital employed}} = \frac{\$5\text{m}}{\$7.5\text{m}} = 0.67 \text{ times}$$



# Gross, Operating and Net Profit Margin

**Gross Profit Margin** shows the profit a company makes after paying for the cost of goods sold.

- It shows how efficient the management is in using its labour and raw materials in the process of production.

**Formula: Gross profit margin (%) = (Gross profit/revenues) x 100**

**Operating profit margin** shows how efficiently management is using business operations to generate profit.

- operating profit margin accounts for the cost of goods sold and administration/selling expenses.

**Formula: Operating profit margin (%) = (Operating profit/revenues) x 100**

**Net profit margin** analyses profitability further by taking into account interest and taxation.

**Formula: Net profit margin (%) = (Net income/revenues) x 100**



# Debt Ratios – Financial Gearing

## Financial Gearing -

- Ratio of debt to equity capital employed
- Also known as the debt to equity ratio

## Formula -

$$\text{Debt to equity ratio} = \frac{(\text{Interest bearing debt} + \text{Preference shares})}{\text{Ordinary shareholders equity}} \times 100$$

## Uses -

- Can determine potential impact on earnings growth
- Debt finance can enhance a company's earnings growth as it is a more tax-efficient and generally less expensive means of financing than equity capital
- If excessive can also lead to volatile earnings stream, given that debt interest must be paid regardless of the company's profitability



# Debt Ratios – Interest Cover

- Ability to service or pay the interest on interest-bearing debt
- Formula -

$$\text{Interest Cover} = \frac{\text{Profit before Interest and Tax}}{\text{Interest Payable}}$$

- Uses -
  - The higher the interest cover, the greater the safety margin for its ordinary shareholders
  - High cover indicates more scope to raise additional loan finance without impacting its ability to service interest payments or compromise its earnings stream
  - Interest cover of 1.5 or less would indicate that its ability to meet interest expenses may be questionable
  - Requires careful interpretation as it is susceptible to changes in the company's capital structure and general interest rate movements, unless fixed-rate finance or interest rate hedging is employed



# Liquidity Ratios

- A company's survival is dependent upon both its profitability and its ability to generate sufficient cash to support its day-to-day operations
- Current ratio
  - Also known as the working capital ratio
  - Simply calculated by dividing a company's current assets by its current liabilities

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

- Uses -
  - Companies need to hold sufficient stock to meet anticipated demand
  - Must ensure it doesn't tie up so many resources as to compromise its profitability or its ability to meet its liabilities
  - The higher the result the more readily a company should be able to meet its liabilities that are coming due and still fund its ongoing operations



# Liquidity Ratios

- Liquidity ratio -
  - Also known as the quick ratio and the acid test
  - Excludes stock from the calculation of current assets in order to give a tighter measure of a company's ability to meet a sudden cash call

$$\text{Liquidity Ratio} = \frac{\text{Current Assets} - \text{Stock}}{\text{Current Liabilities}}$$

- A ratio of more than one will indicate that a company has sufficient short-term assets to cover its short-term liabilities
  - Less than one may indicate the need to raise new finance
- Cash Ratio – excludes inventory and accounts receivable
    - (Cash + Cash equivalents + Invested funds) / Current Liabilities
- Z score analysis -
    - A more detailed way of establishing whether a company is dangerously close to becoming insolvent – looks at Gearing and Sales mix.
    - If negative, this implies that a company's insolvency is imminent



# Investment Ratios – Earnings Per Share

## Basic EPS

- Measures the profit available to ordinary shareholders and is taken as the profit after all other expenses and payments have been made by the company

$$EPS = \frac{(\text{Net Income} - \text{Preference Dividends})}{\text{Number of Ordinary Shares in Issue}}$$

## EBIT

- Calculated before the impact of interest payments and taxation i.e. operating income or operating profit

## EBITDA

- Excludes depreciation and amortisation and allows international comparisons i.e. as accounting practices differ



# Investment Ratios – Price Earnings Ratio

## PE ratio -

- Measures how highly investors value a company in its ability to grow its income stream
- PE ratio = Share price/ EPS
- A high PE ratio relative to its sector average reflects investors' expectations that the company will achieve above average growth
- a low PE ratio indicates that investors expect the company to achieve below average growth in its future earnings
- Can be Historical or Prospective PE ratios

## Price Earnings to Growth (PEG) ratio -

- Way of establishing whether a company's PER is justified
- Divide PER by a realistic estimate of the company's average earnings growth rate for the next five years
- A number of less than one indicates that the shares are potentially attractive





# Investment Ratios – Dividend Yields and Cover

## Dividend yields -

- Indication of the expected return on a share

$$\text{Dividend Yield} = \frac{\text{Net dividend per share}}{\text{Share price}} \times 100 = x\%$$

- Also provides an indication of a company's perceived ability to grow its dividends
- A low dividend yield may imply high dividend growth whereas opposite may be true of a high dividend yield

## Dividend cover -

- Ability of a company to continue paying a level of dividend
- Looks at how many times a company could have paid out its dividend based on the profit for the year

$$\text{Dividend Cover} = \frac{\text{EPS}}{\text{Net Dividend per Share}}$$

- The higher the dividend cover, the less likely it is that a company will have to reduce dividends if profits fall



## Price to book ratio -

- Measures relationship between the company's share price and the net asset value per share attributable to its ordinary shareholders

$$\text{Price to Book Ratio} = \frac{\text{Share Price}}{\text{Net Asset Value (NAV) per Share}}$$

- If the ratio shows that the share price is lower than its book value it can indicate that it is undervalued or simply that the market perceives that it will remain a stagnant investment
- If the share price is higher than its book value, then this would suggest that investors view it as a company which has above average growth potential



## Net Asset Value

- NAV represents the net asset value per share attributable to ordinary shareholders
- Calculated-  $\text{Net Assets} / \text{No. of Shares}$  ( $\text{NA} = \text{Total Assets} - \text{Liabilities} - \text{Preference Shares}$ )
- Should represent the minimum share price a company trades
- Good for valuing property companies and Investment Trusts
- Not useful for services oriented companies, those with intellectual, non tangible assets – other valuation methods used

Gordon  
Growth  
Model

Market Value  
Added  
(MVA)

Economic  
Value Added  
(EVA)



# Dividend Valuation & Gordon Growth Model

A **Dividend Valuation model** is used to identify theoretical price of a company's shares by discounting the company's expected flow of future dividends

- Uses present value of perpetuity formula but applied to dividends

**Dividend Valuation Example:** ABC plc is expected to pay a dividend of 10p next year. Assuming the required return to equity holders is 11% and the dividend is expected to continue at this level, the share price should be:

$$\text{Share price} = D/K = \$0.10/0.11 = \$0.91\text{p}$$

D = next year's dividend and k = required return to the equity holders

However, takes no account of the potential for rising dividends. This gives rise to the **Gordon Growth Model** - assumes that future dividends will grow at a constant rate.

Assuming ABC plc's dividends are expected to grow at a constant rate of 5%, the share price should be:

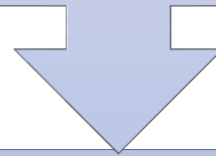
$$\text{Share price} = D/(K-G) = \$0.10/(0.11 - 0.05) = \$1.67$$

where: g = growth rate in dividends in perpetuity



# Shareholder Value Models – EVA & MVA

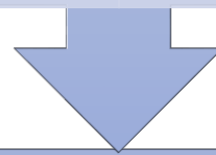
Used to establish whether a company has the ability to add value for its ordinary shareholders by earning returns on its assets in excess of the cost of financing these assets



## Economic Value Added (EVA)

Calculated by adjusting operating profit and subtracting weighted average cost of capital (WACC) multiplied by an adjusted net assets figure

If the result is positive, then value is being added. If negative, value is being destroyed.



## Market Value Added (MVA)

Market's assessment of the present value of the company's future annual EVAs

If the present value of the company's future annual EVAs is greater than that implied by the MVA, this implies that the company's shares are undervalued and vice versa

# EVA & MVA: Formulae

## Economic Value Added

$$\text{EVA} = \text{NOPAT} - (\text{Invested Capital} \times \text{WACC})$$

- NOPAT is the Net Operating Profit After Tax
- Invested Capital = debt + capital leases + shareholder's equity
- WACC is the Weighted Average Cost of Capital

## Market Value Added

$$\text{MVA} = V - K$$

- V is the market value of the company (including the firm's equity and debt)
- K is the total amount of capital invested in the company

