# Essentials of Macroeconomics

## Unit IV

# Syllabus

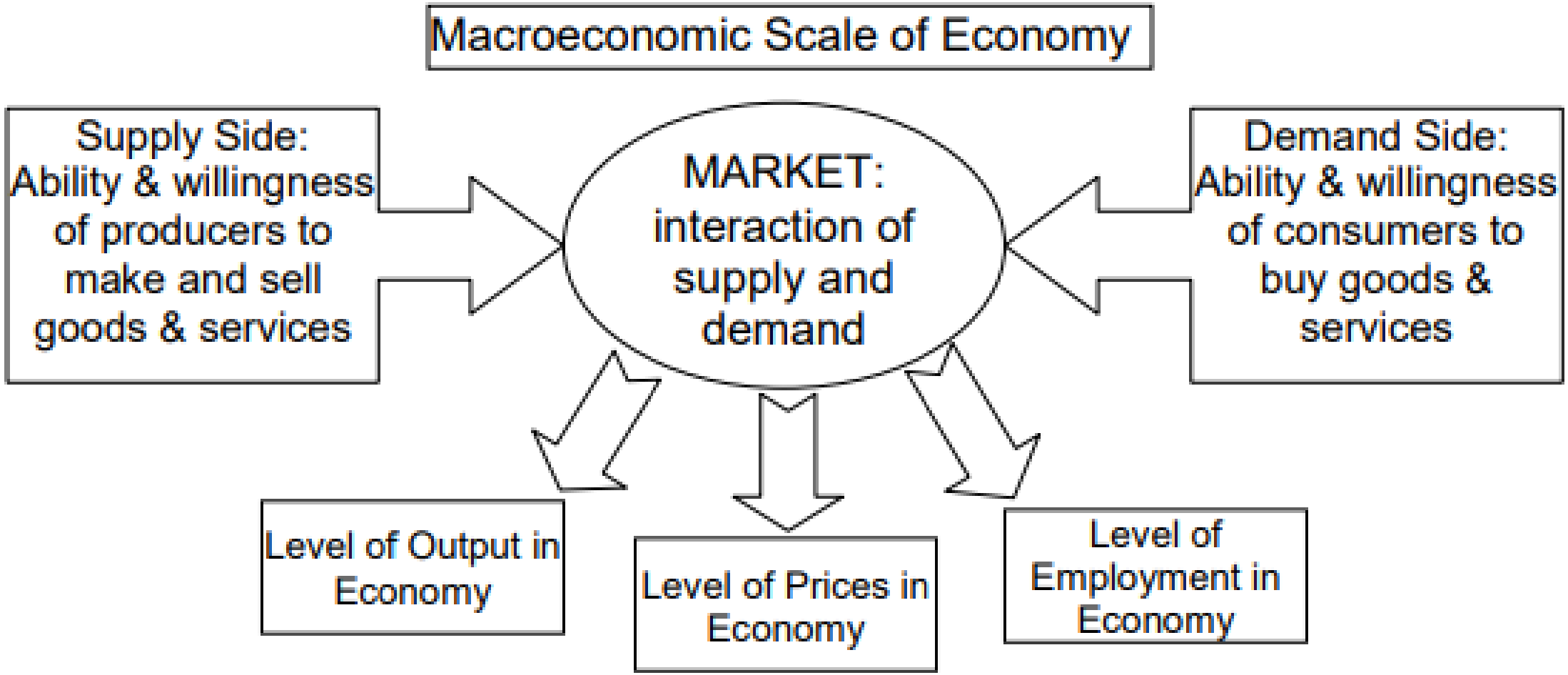
Prices and inflation, Exchange rate, Gross domestic product(GDP) ,components of GDP, the Labor Market, Money and banks, Interest rate, Macroeconomic models- an overview, Growth theory, The classical model, Keynesian cross model, IS-LM-model, The AS-AD-model, The complete Keynesian model, The neo-classical synthesis, Exchange rate determination and the Mundell-Fleming model

Components of GDP , Circular FLow Diagram

Exchange RATE

# Introduction to Macroeconomics

Macroeconomics is the big picture view of an economy. Microeconomics looks at the market for a specific good, like cell phones or bicycles, but macroeconomics deals with ALL goods and services produced in an economy and the AVERAGE PRICE LEVEL of those goods. Macroeconomics is also concerned with inflation/recession, taxes, fiscal/monetary policies, and overall levels of unemployment.


Macroeconomic Scale of Economy
Supply Side: Ability & willingness of producers to make and sell goods & services
MARKET: interaction of supply and demand
Demand Side: Ability & willingness of consumers to buy goods & services
Level of Output in Economy
Level of Prices in Economy
Level of Employment in Economy

- **Gross domestic product** is the *total value of all final goods and services produced* within a country over a given year. Final goods are goods that are consumed and used as is (e.g. loaf of bread), as opposed to intermediate goods which are sold and used for some further stage of production (e.g. wheat, flour to make loaf of bread).
- **Gross national product** is the *total value of income acquired by a country's citizens both domestically and abroad in a given year*, no matter where business production occurs. Measures economic wellbeing of a country's citizens.

# GDP can be calculated two ways

- **Expenditure Approach**: GDP is treated as the sum of goods & services bought by four sectors of the economy: *household consumers, businesses, government and foreign buyers*.
- *Household consumption (C)* is all consumer goods and services bought by individual households.
- Businesses spend money *investing (I)* in equipment, buildings, construction, and product inventory. Also include the purchases of new homes.
- *Government (G)* also purchases goods and services (like health care).
- Foreign buyers purchase *exports (X)* (goods produced domestically and sold abroad), but some of the purchased goods recorded in C, I, and G, are imports (produced abroad), so to accurately account for goods PRODUCED in a country, use the value of *net exports: total exports (X)* minus *total imports (M)*. $GDP = C + I + G + (X - M)$

# Expenditure Approach- An example

| | |
|---|---|
| Personal Consumption Expenditure | $4,000 |
| Gross private domestic investment | $1,000 |
| Exports of goods and services | $600 |
| Indirect business taxes | $400 |
| Depreciation | $500 |
| Imports of goods and services | $900 |
| Government Expenditure on goods and services | $2,000 |

# GDP can be calculated two ways

- **Income Approach**: GDP *is the sum of a country's wages, rent, corporate profit before tax, interest, depreciation and indirect taxes less subsidies.* When GDP is calculated using current prices, it is called *money GDP or nominal GDP*. It is the sum of each good's quantity (output) multiplied by the current price of the good.

$$\text{Money GDP} = \sum[\text{Output}_{\text{current}} \times \text{Prices}_{\text{current}}]$$

- Nominal GDP depends on the current dollar, but the *value of the dollar changes with time*! Using nominal GDP to compare economic growth isn't helpful.
- If overall price levels have risen *(inflation), GDP will appear to have increased* even if the economy isn't actually producing a higher output of goods and services.

# Income approach -example

- https://www.youtube.com/watch?v=b1SEyuk934c

- The **real GDP** (RGDP) *is a measure of productivity that is NOT affected by rising prices (inflation).* To calculate RGDP, take the sum of current output (quantity) evaluated at base year prices. Real GDP= $\sum$ [Output$_{current}$ × Prices $_{base\ year}$]
- Example: Calculate the nominal and real GDP for 2009 and 2010 using 2009 as the base year price level. Remember the older year is the base year.

| Year | Item | Quantity | Price |
|---|---|---|---|
| 2009 | Desks | 100 | $50 |
| | Chairs | 50 | $20 |
| 2010 | Desks | 80 | $60 |
| | Chairs | 70 | $40 |

Solution: Nominal GDP$_{2009}$ = (100 × $50 + 50 × $20) = $6000 RGDP$_{2009}$ = (100 × $50 + 50 × $20) = $6000 (nominal = real GDP for base year)

Nominal GDP$_{2010}$ = (80 × $60 + 70 × $40) = $7600 RGDP$_{2010}$ = (80 × $50 + 70 × $20) = $5400 If we compare nominal GDP, it appears that GDP has increased from 2009 to 2010 by $1600. However, using RGDP, we can see that the value of economic output has in fact decreased from $6000 to $5400.

**Nominal GDP** increases can be due to:

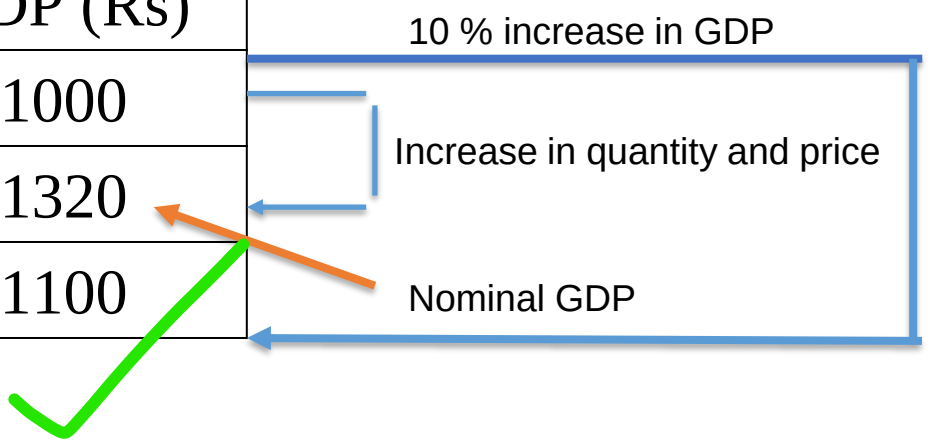
- an increase in output of goods & services and no change in price level or
- an increase in both output of goods & services and price level or
- an increase in price level & no change in output of goods & services.

**Real GDP** increases can only be due to an increase in output quantity of goods & services

- To calculate the economic growth of a country, find the percent change in RGDP using the basic percentage change formula: (new − old)/old.
- Remember since RGDP reflects changing levels of OUTPUT, this % change shows how the productivity of a country changes.
- $\text{RGDP}_{\text{current year}} - \text{RGDP}_{\text{last year RGDP last year}} \times 100 = \%\ growth\ in\ RGDP.$

# Example

| | Quantity | Price (Rs ) | GDP (Rs) |
|---|---|---|---|
| Year 1 | 100 | 10 | 1000 |
| Year 2 | 110 | 12 | 1320 |
| Real GDP | 110 | 10 | 1100 |



# Real GDP vs Nominal GDP

| INDIA | 2015 (in Trillion) | 2016 (in Trillion) | GDP Growth |
|---|---|---|---|
| GDP Nominal (₹) | 136.75 | 152.51 | 11.5% |
| GDP Nominal (US$) | 2.112 | 2.264 | |
| GDP Real (₹) | 113.81 | 121.90 | 7.1% |
| GDP Real (US$) | 2.301 | 2.465 | 7.1% |

# To calculate Nominal GDP and Real GDP

| Year | Price of Guitars | Quantity of Guitars | Price of Drums | Quantity of Drums |
|---|---|---|---|---|
| 2015 | $500 | 100 | $1,000 | 25 |
| 2016 | $520 | 110 | $1,050 | 30 |
| 2017 | $600 | 112 | $1,075 | 32 |

*Base year = 2015*

Nominal GDP: GDP measured in prices of the current year.

Real GDP: GDP measured in prices of the base year or constant dollars.

| Year | Nominal GDP | Real GDP |
|---|---|---|
| 2015 | ($500 x 100) + ($1,000 x 25) = $75,000 | ($500 x 100) + ($1,000 x 25) = $75,000 |
| 2016 | ($520 x 110) + ($1,050 x 30) = $88,700 | ($500 x 110) + ($1,000 x 30) = $85,000 |
| 2017 | ($600 x 112) + ($1,075 x 32) = $101,600 | ($500 x 112) + ($1,000 x 32) = $88,000 |

# Quiz



**1.**Assume you build a new house, buy a used car from a friend, and buy some government bonds. Which of the following is true with respect to aggregate demand (i.e., GDP):

A. investment goes up since you build a new house
B. consumption and government purchases go up since you buy a used car and some government bonds
C. consumption and investment go up since you buy a used car and buy some government bonds
D. consumption and investment go up since you buy a used car and build a new house

**2.** Which statement is correct for nominal GDP?
i. Nominal GDP is calculated based on current prices.

ii. Nominal GDP is calculated based on the base prices.

iii. Data on Nominal GDP shows an accurate picture of the economy as compared to real GDP.

**3.**The value of which work is added in the calculation of GDP?
(a) Housewives' works
(b) A teacher teaching his own child
(c) The value of resale of old shares
(d) Construction of new house by an artisan

# Price Index

- *A price index is a weighted average of the prices of a selected basket of goods and services relative to their prices in some base-year.*
- To construct a price index we start by *selecting a base year.*
- Then we take *a representative sample of goods and services* and calculate their value in the base year and current prices.

$$\textbf{Price index} = \frac{\text{expenditures on the basket of goods at current prices}}{\text{expenditure at the base year prices}}$$

# Price Index

- For example, suppose our basket of goods consists of only three items: shirts, pants and bread with the following prices and quantities in 2006 and 2007:

| Item | Quantity | Price in 2006 | Price in 2007 | Exp. in 2006 | Exp. in 2007 |
|---|---|---|---|---|---|
| Shirts | 10 | $10 | $12 | $100 | $120 |
| Pants | 5 | $20 | $25 | $100 | $125 |
| Bread | 100 | $0.50 | $0.55 | $50 | $55 |
| TOTAL | | | | $250 | $300 |

We're now going to calculate the Market Basket values for 2006 and 2007. Values that indicate **Quantity** will be in **bold**.

Market Basket for 2006 = (**10*** $10) + (**5*** $20) + (**100*** $0.50) = $100 + $100 +$50 = $250

Market Basket for 2007 = (**10*** $12) + (**5*** $25) + (**100*** $0.55) = $120 + $125 + $55 = $300

# Price Index

- Notice that the same quantities were used for both calculations. *Undoubtedly the quantities of good would change year to year, however we want to hold these quantities constant so we can see the impact of the price changes.*
- To calculate the Price Index, take the price of the Market Basket of the year of interest and divide by the price of the Market Basket of the base year, then multiply by 100. In this case we're interested in knowing the price index for 2007 and we plan to use 2006 as the base year.

$$\text{Price Index for 2007} = \frac{\text{Market Basket for 2007}}{\text{Market Basket for 2006}} * 100 = \frac{300}{250} * 100 = 120$$

Note that the Price Index for the base year will allways be 100. This is because you will be dividing the Market Basket in the base year by itself (which will give you a value of 1) and multiplying by 100 (which will then give you a value of 100).

$$\text{Thus the Price Index for 2006} = \frac{\text{Market Basket for 2006}}{\text{Market Basket for 2006}} * 100 = \frac{250}{250} * 100 = 100$$

# "An Example of a Price Index"

- An example of a very particular price index that was used by a supermarket in Thailand to advertise its prices. The store placed *two supermarket carts at the entrance with the same bundle of goods in each*. The one on the left, with the black label, showed the cost of this cartload of goods at the old prices. It used to cost 1,059.50 Thai baht (approximately US$28). The one on the right, with the red label, showed that the cost of this same bundle of goods was now 916.00 Thai baht. The reduction in price for the basket of goods was 143.50 Thai baht, or about 13.5 percent.


*A supermarket in Phuket, Thailand, used an actual basket of groceries to show that its prices had been reduced.*
*This is an example of a price index.*

# Two Methods of Measuring Changing Price Levels

- **GDP Deflator** The GDP Deflator is an index number that *compares the nominal GDP to real GDP for a given year.*
- It is more comprehensive than CPI since it includes *all domestically produced goods and services in a country*.
- *Changes in consumer preference and the arrival of new goods/services in the market* are also reflected in the GDP deflator.
- $GDP\ Deflator = Nominal\ GDP\ /\ Real\ GDP \times 100$.
- If the GDP deflator for 2010 is 105.1 and the base year is 2005, this means that the price level has risen 5.1% since 2005. Another way to say it is that the 2005 dollar could buy 5.1% more than the 2010 dollar.

- GDP deflator (implicit price deflator for GDP) is a measure of the level of prices of all new, domestic goods and services in an economy. The GDP deflator regularly updates the type of goods and services used to measure the implicit price deflator – depending on which goods are being bought.

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

- e.g. If the price of mobile calls increase relative to landline calls, people will spend less on mobiles so the rise in price becomes less significant.

# GDP deflator -example

| GDP Deflator Example | | | | |
|---|---|---|---|---|
| | Nominal GDP | Real GDP | GDP Deflator | |
| 2010 | 7,000 | 7,000 | 100.0 | Base Year |
| 2011 | 8,350 | 7,500 | 111.3 | 11.33% |
| 2012 | 9,740 | 8,355 | 116.6 | 16.58% |
| 2013 | 10,120 | 9,412 | 107.5 | 7.52% |
| 2014 | 11,111 | 10,852 | 102.4 | 2.39% |
| 2015 | 12,582 | 11,473 | 109.7 | 9.67% |

# Quiz



1.GDP deflator

A) Evaluates inflation by utilizing present production basket

B) Shows real GDP growth on the basis of current production

C) The GDP deflator is in real terms while the CPI is in nominal terms

2. Nominal GDP in 2016 is 540. Real GDP in 2016 is 450. Find the GDP deflator.

3. Consider an economy that produces only chocolate bars. In year 1, the quantity produced is 3 bars and the price is $4. In year 2, the quantity produced is 4 bars and the price is $5. In year 3, the quantity produced is 5 bars and the price is $6.

If year 1 is the base year, what is the GDP deflator for year 1, year 2, year 3?

a. 4, 5, 6

b. 400, 500, 600

c. 100, 125, 150

d. 100, 400, 500

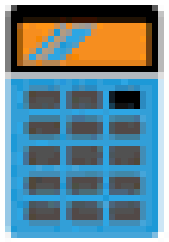
# Two Methods of Measuring Changing Price Levels

- **Consumer Price Index** (CPI) The *CPI is another index number calculated using a specific set or basket of retail goods and services.*
- *Each good in the basket is weighted according to the proportion of average household expenditure accounted for by that good.*
- The *CPI indicates the change in prices of the basket from the base year (which is normalized to 100) to the given year:* a CPI of 98 indicates that price levels have decreased 2% from the base year.
- To calculate CPI, take the ratio of the cost of the CPI basket at current prices to the CPI basket at base year prices. CPI = CPI Basket Cost @ Current Prices/ CPI Basket Cost @ Base Prices × 100

# Two Methods of Measuring Changing Price Levels

CPI has some drawbacks in analyzing price level changes.

- First, CPI is calculated using a *specific set and percentage of CONSUMER goods.*
- It is a fixed basket *not often adjusted to reflect changes in goods available or consumer preferences.* Also, things like machinery and medical equipment are not included.
- CPI also *does not reflect the change in the quality of goods*, only the prices of goods. Although a laptop costs less today than 3 years ago, the quality has improved significantly.



$$\text{Consumer Price Index Formula} = \frac{\text{Value of Market Basket in the Given Year}}{\text{Value of Market Basket in the Base Year}} \times 100$$

# CPI and inflation rate

https://www.youtube.com/watch?v=3ZaeK70dlaY

1. **Computing the CPI**

| Good | Year | 1 | Year | 2 |
|---|---|---|---|---|
| --- | Quantity | Price | Quantity | Price |
| Pizzas | 20 | $ 10 | 30 | $ 11 |
| Rent | 1 | $ 600 | 2 | $ 640 |
| Car | 1 | $ 100 | 4 | $ 120 |
| Phone | 1 | $ 50 | 0.5 | $ 40 |

It is easy to compute the **NOMINAL** spending in each year: multiply prices and quantities and add them up.

YEAR 1:

- Expenditure on pizza = $ 200
- Expenditure on rent = $ 600
- Expenditure on car = $ 100
- Expenditure on phone = $ 50

- Total NOMINAL expenditure = $ 950

YEAR 2:

- Expenditure on pizza = $ 330
- Expenditure on rent = $ 1280
- Expenditure on car = $ 480
- Expenditure on phone = $ 20

- Total NOMINAL expenditure = $ 2110

To compute a CPI, we must first choose a base year. Let's assume Year 1 is the base year.

1. Find the price of the consumption basket in the base year.
2. Next, multiply the prices and **BASE YEAR** quantities in the next year and add them up:

| Good | Price | Quantity | Expenditure |
|---|---|---|---|
| **Pizza** | $ 11 | 20 | $220 |
| **Rent** | $ 640 | 1 | $640 |
| **Car** | $ 120 | 1 | $120 |
| **Phone** | $ 40 | 1 | $40 |
| | | | |
| **SUM** | | | **$1020** |

The CPI for any year is given by the formula:

$$\frac{\text{Price of BASE YEAR consumption basket in any given year}}{\text{Price of BASE YEAR consumption basket in the BASE year}}$$

Applying this formula to the second year, we get

$$\text{CPI} = 1020 / \$\ 950 = 1.0737$$

Note that this CPI would be reported by the Bureau of Economic Analysis as **107.37** , since it is conventional to multiply the ratio of the baskets by 100. You may think of the 107.37 number as saying that the consumption basket in the second year costs 107 percent of the price of the basket in the base year.

The **inflation rate** is the **percent change in the CPI** . Here, it would be **7.37 percent** .

- **Inflation:** *Inflation is an increase in the general level of prices of goods and services.* Deflation is a decrease in the general level of prices of goods and services. From both an individual and government's point of view, inflation is a huge concern.
- The CPI and GDP deflator tell us how high prices are relative to a base year, but the *rate of inflation can be used to express the change in price level between 2 years when neither is the base year.*

- The *rate of inflation* is calculated by using the basic percentage change formula with either *two CPI numbers or two GDP deflator numbers*: (new − old)/old × 100.

  If the CPI last year was 121 and the CPI this year is 125, the rate of inflation is:

$$rate\ of\ inflation = (125 - 121)/(121 \times 100) = 3.3\%$$

- Another statistic used to assess inflation is the real wage rate which basically corrects your current hourly wage (or nominal wage) for the rising cost of inflation.

$$Real\ wage\ rate = nominal\ (or\ current) wage\ rate\ CPI\ or\ GDP\ deflator \times 100$$

# Labour Market



The amount of labor and the amount of capital are important explanatory variables for **total production and GDP.** Another reason for the importance of the amount of labor is that it **is related to the unemployment rate** – a macroeconomic variable which is clearly important.

**Unemployment classification**

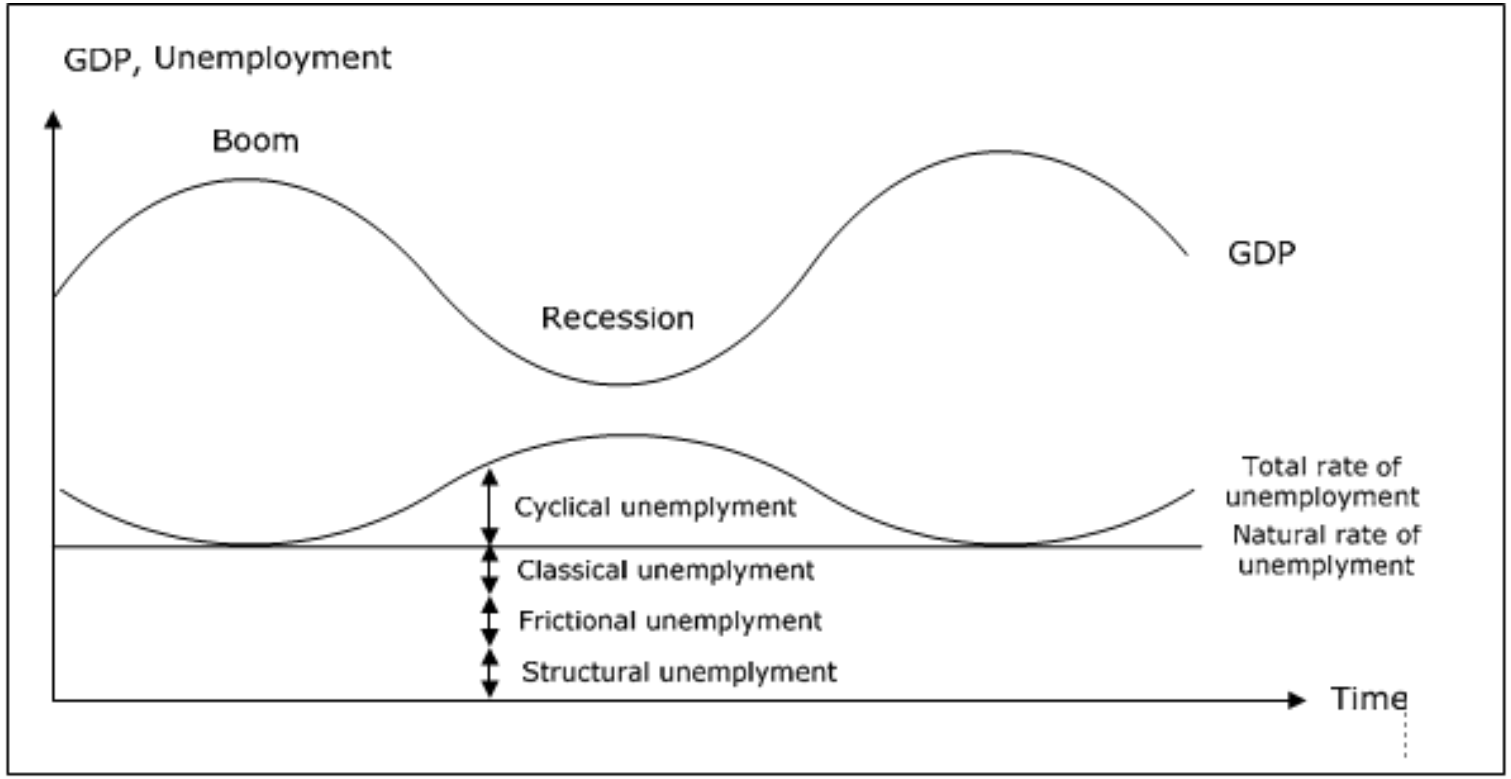
***Frictional unemployment.*** Individuals that are temporarily unemployed while transiting between jobs or just entering the labour market. This kind is typically short in duration but always present in a market economy.

***Structural unemployment.*** Individuals that are unemployed because their *skills are no longer in demand* where they live. This kind typically leads to longer spells and may *require the unemployed to acquire training or to move.*

***Cyclical unemployment.*** Unemployment due *to a recession.*

***Classical unemployment.*** Unemployment due to *real wages being too high* (for example through minimum wage laws).

The *natural rate of unemployment* is defined as the *sum of the rates of frictional, structural, and classical unemployment* (excluding cyclical unemployment). The natural rate of unemployment is sometimes called voluntary unemployment and is assumed to be much more stable than the total unemployment rate.




**Different kinds of unemployment.**

# Wages

## Nominal wages

The *nominal wage* is the *wage per unit of time in the currency used in the country* – what we typically just call wage. When we refer to wage in macroeconomics we almost always mean *gross wage, that is, the wage before income taxes but after employment taxes paid by the employer*. Wage is a flow that we typically measure in *units of currency per hour.*

## Wages and income

*Wage* typically means what you *receive for working one hour*, while *income* is the *total revenue from all sources over a longer time period* (such as a month). Your income depends on the wage but also on the number of hours you work. *An individual may have a very high wage but a low income (say $1000 per hour but only working 1 hour per month) or a low wage but a high income (for example by owning stocks or bonds*).

# Wages

**Nominal wage level**

In macroeconomics, we are normally not interested in the wage for a particular individual but in the *average wage for all employed individuals*. This average is called the wage level but since we typically only care about the wage level, we will almost always use wage when we actually mean the wage level. Thus, a statement such as *"wages increase" should not be interpreted as all wages increasing, but rather that the average is increasing.*

**Real wage:** real wage as the nominal wage divided by a price index (typically CPI).

# Money and banks

"Money" in economics is actually not as simple to understand as you may think and many use the term money in a way inconsistent with how it is defined in economics.

Money is defined as *any commodity or token that is generally accepted as payment of goods and services*.

**Two types of money**

In most countries, one can identify two "types of money":

Currency and coins

Bank deposits

# Economic functions of money

***A medium of exchange.*** This is its most important role. Without money we would live in a *barter economy* where we would have to trade goods and services for other goods and services. If I had rice but wanted bread, I would need to find someone who was in the precise opposite situation. In a monetary economy I can trade rice for money with one individual and money for bread with another. Money solves what is called *the double coincidence of wants*.

***A unit of account.*** In a monetary economy, *all prices may be expressed in monetary units* which everyone may relate to. *Without money, prices must be expressed in units of other goods and comparing prices are more difficult.* You may find that potatoes costs 2 kilos of rice in one place and 4 kilos of strawberries in another. Finding the cheapest potatoes is not easy.

***Store of value.*** If you are a milk and have a temporary *surplus of milk* that you want to store for the future, storing the milk might not be a great idea. Money, on the other hand, stores well. Other commodities, such as *gold,* have this feature as well.

# Central banks

**A central bank** is a *public authority that is responsible for monetary policy for a country or a group of countries.* Two important central banks are the *European Central Bank* (for countries that are members in the European Monetary Union) and the *Federal Reserve* of the United States.

Central banks have a **monopoly** on issuing the national currency and the primary responsibility of a central bank is to *maintain a stable national currency for a country* (or a stable common currency for a currency union). Stability is sometimes specified in terms of *inflation and /or growth rate* in the money supply.

**Other important responsibilities** include *providing banking services to commercial banks and the government and regulating financial markets and institutions*.

In this sense, a central bank is the "*bankers' bank"* – other banks can borrow from or lend money to the central bank. Therefore, all *banks in a country have an account in the central bank*.

Central banks also manage the *country's foreign exchange and gold reserves.*

# Central banks

- https://www.investopedia.com/articles/03/050703.asp

# Commercial banks

**Currency inside banks is not money**

The fact that currency inside commercial banks is not money may strike you as odd, but it is an important principle.

The 100 dollar bill in the ATM will become money only at the instant you withdraw it. The reason is this.

We want the money supply to measure how much is available for immediate consumption. But currency inside a bank cannot be used for consumption and this is why it is not counted in the money supply.

*Cash in the bank is not money, but the binary bits in the bank's computer system representing the balance in your checking account are!*

# Commercial banks

- https://courses.lumenlearning.com/wmopen-macroeconomics/chapter/the-role-of-banks/

# RESERVE REQUIREMENT: 10%

| DEPOSIT | HOLD IN RESERVES | LOAN OUT |
|---|---|---|
| $10,000 | $1000 | $9000 |
| $9000 | $900 | $8100 |
| $8100 | $810 | $7290 |
| $7290 | $729 | $6561 |
| $6561 | $656.10 | $5904.90 |

# How commercial banks "create money"

- Commercial banks obviously cannot influence the amount of currency in the economy or the monetary base, since they are not allowed to print money.
- They can, however, influence the money supply through the second component of the money supply – the deposits. A bank will increase the money supply simply by lending money to a customer.
- In the same way, when a loan is repaid or amortized, the money supply decreases.
- It may sound odd that the money supply increases by 1 million the same instant a bank agrees to lend this amount. The bank has created money but no wealth (keep in mind that these are different concepts).
- The bank has simply converted one asset (cash) into another (the promise of repayment), while there is no change in the individual's net wealth.

# How commercial banks "create money"

- However, after the loan, there is an additional one million available for immediate consumption. It makes no difference if the borrower keeps the money in her account or withdraws them in the form of currency.
- If, for example, the borrower uses the money to buy an apartment, the funds are transferred to the seller of the apartment. This will not affect the money supply – now it is the seller of the apartment that has a million available for consumption. If the seller uses the funds to repay the loan he got when he bought the apartment, the money supply will again decrease.

# Interest rate

When you borrow money, you usually have to pay a fee for the loan. This fee is often called interest, particularly if the fee is proportional to the amount you borrow. The interest rate is commonly expressed as a percentage of the size of the loan per unit of time, typically per year.

If the interest rate is 10% per year, you must, for example, pay 1,000 per year if you borrow 10,000.

The interest rate may be fixed or floating. If it is fixed, you will pay the same percentage for the entire duration of the loan. With a floating interest rate, the interest rate will change regularly depending on market conditions.

Factors such as risk (the probability that the loan will not be repaid), duration of the loan and whether you select a fixed or a floating rate will influence the interest rate.

# Market interest rates



The most important interest rates from a macroeconomic perspective are interest rates that the government pays on the loans they use to finance the national debt.

The government borrows money by issuing government bonds. All such bonds have a fixed nominal amount and a given maturity date.

The government promises to pay exactly the nominal amount (also called the principal or the face amount) to the holder at the maturity date.

In most countries you will find many types of government bonds. An important distinction is the duration of the bond, that is, the difference between the maturity date and the date when the bond was issued. For example, in the United States, government bonds maturing in one year or less are called Treasury bills.

Typically, bonds with a maturity of a year or shorter have no coupons. Instead, they are sold below the nominal amount at what is called the *issue price*.

The issue price for a bond without coupons must be below the nominal amount.

For example, if you pay 23,500 for a bond with a nominal amount of 25,000 maturing in one year, your interest rate is $(25\,000 - 23\,500)/23\,500 = 6.38\%$.

# The real interest rate

**Interest rates and inflation**

Suppose you have 1 million on 1st January 2008. A basket of goods and services similar to the CPI basket costs 100,000. You can then buy exactly 10 such baskets on 1st January 2008.

Say that you can invest your million at a 10% interest rate. On 1st January 2009 you will then have 1.1 million. 1.1 million may not be enough for 11 baskets as prices may have changed. Say that inflation was 4% in 2008. The price of a basket has then increased to 100,000 * 1.04 = 104,000 and you can buy 1,100/104 = 10.58 baskets, which is 5.8% more than last year. Even though your wealth has increased by 10% (in whatever currency you use), your *real* wealth (in baskets) has only increased by 5.8% and we say that the real interest rate is 5.8%.

**Nominal and real interest rates**

To distinguish the real interest rate from the "normal" interest rate, the latter is called the *nominal interest rate*. The nominal interest rate shows the growth of your money while the real rate shows the growth of what your money can buy.

# Macroeconomics model

- To analyze what happens when the government increases consumption, when the central bank increases the target interest rate and when domestically produced goods do well in foreign markets.

✓ cyclical fluctuations in growth,

✓ correlation between unemployment and inflation and

✓ the relationship between interest rates and foreign exchange rates.

- one model may predict that unemployment will fall if the central bank lowers the target interest rate while another may claim that such a change will not affect unemployment.
- One model that is very popular in virtually all basic courses in macroeconomics all over the world is the so-called neo-classical synthesis. As the name suggests, this is a combination or a synthesis of two models, namely the classical model and the Keynesian model

# Common assumptions

- Unemployment and hours worked are directly related
- The central bank has complete control over money supply

- Monetary policy = change in money supply
- There is just one interest rate
- Exchange rate

- Capital Flows

| Macro economics modelsp | | | |
|---|---|---|---|
| Variable | Variable Name | Variable | Variable Name |
| Y | Real GDP | NT | Net tax (real) |
| P | Price level | X | Exports (real) |
| P.Y | Nominal GDP | Im | Imports (real) |
| U | Unemployment | NX | Net exports (real) |
| L | Hours worked | $S_H$ | Household savings (real) |
| K | Amount of capital | $S_G$ | Government savings (real) |
| W | Nominal wage | S R | Rest of the world savings (real) |
| W/P | Real wage | $\pi$ | Inflation |
| M | Money supply (nominal) | $\pi^e$ | expected inflation |
| R | Nominal interest rate | $\pi_w$ | Wage inflation |
| r | Real interest rate | $\pi_M$ | Growth in money supply |
| C | Private consumption (real) | E | Exchange rate |
| I | Investments (real) | $\pi_E$ | Depreciation in exchange |
| G | Government expenditure (real) | | |

# The classical model

- The Classical Model was popular before the Great Depression.
- It says that the economy is very free-flowing, and prices and wages freely adjust to the ups and downs of demand over time.
- In other words, when times are good, wages and prices quickly go up, and when times are bad, wages and prices freely adjust downward.
- The major assumption of this model is that the economy is always at full employment, meaning that everyone who wants to work is working and all resources are being fully used to their capacity.
- if competition is allowed to work, the economy will automatically gravitate toward full employment, or what economists call potential output.
- Classical economists believe that the economy is self-correcting, which means that when a recession occurs, it needs no help from anyone

# Keynesian cross model

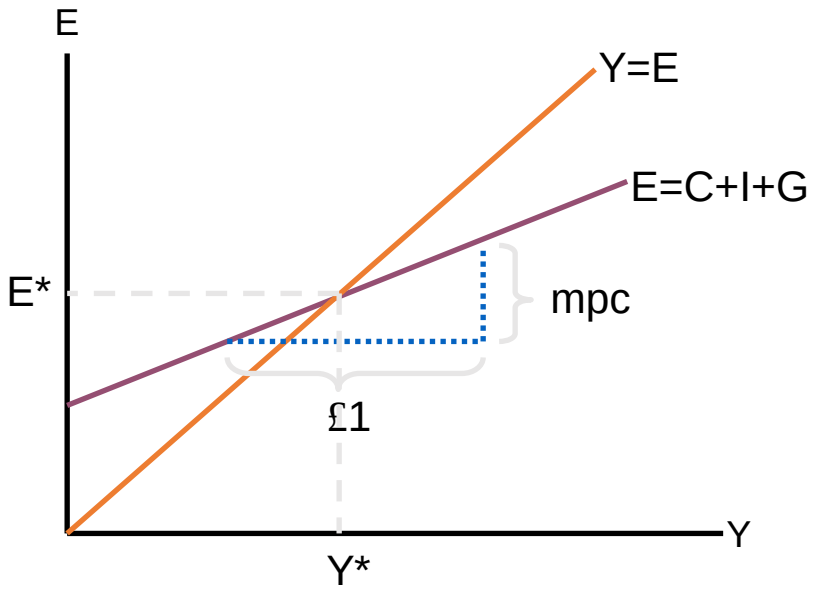
The Keynesian model is slightly more complicated than the classic model and it is developed in four stages by analyzing four separate models. Each model has, however, a value in itself. The models we will consider and the major characteristics of each are:

- *Cross model*: *W, P and R* are constant (and exogenous).
- *IS-LM model*: *W, P* are constant and *R* is endogenous.
- *AS-AD model*: *W* is constant, *P* and *R* are endogenous.
- *The full Keynesian model*: *W* is exogenous (but not constant), *P* and *R* are endogenous.

- The full Keynesian model: W is exogenous (but not constant), P and R are endogenous.
- Once we have developed the full Keynesian model, we will combine it with the classic model which will lead to the neoclassical synthesis.

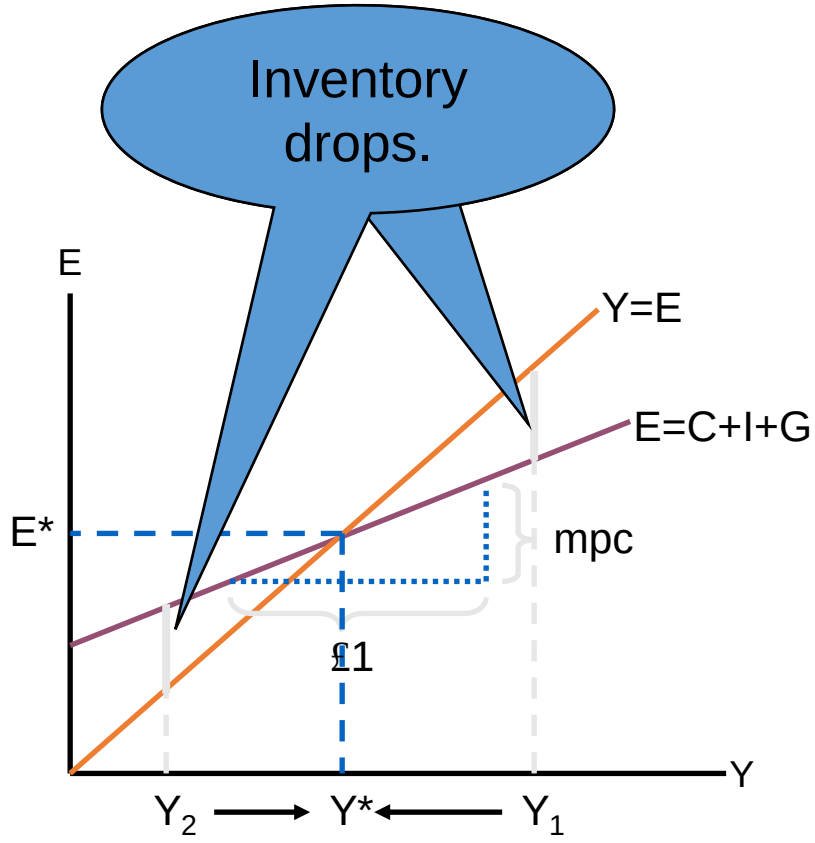
# Constructing the Keynesian Cross model

- Actual expenditure is Y and planned expenditure is
  E = C + I + G.
- I, G and T are assumed exogenous and fixed.
- Our consumption function is C = c(Y–T), where c is the marginal propensity to consume (mpc).
- Mapping out
  E = c(Y–T) + I + G gives us…
- The slope of E is the mpc.
- In equilibrium planned expenditure equals total expenditure or Y=E.



# Constructing the Keynesian Cross model

- Equilibrium is at the point where Y = C + I + G.
- If firms were producing at $Y_1$ then Y > E
- Because actual expenditure exceeds planned expenditure, inventory accumulates, stimulating a reduction in production.
- Similarly at $Y_2$, Y < E
- Because planned expenditure exceeds actual expenditure, inventory drops, stimulating an increase in production.

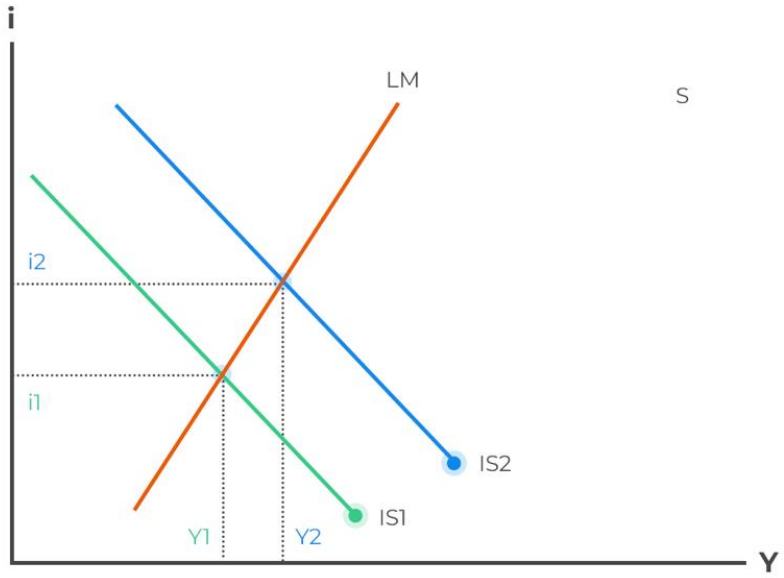


# IS-LM-model

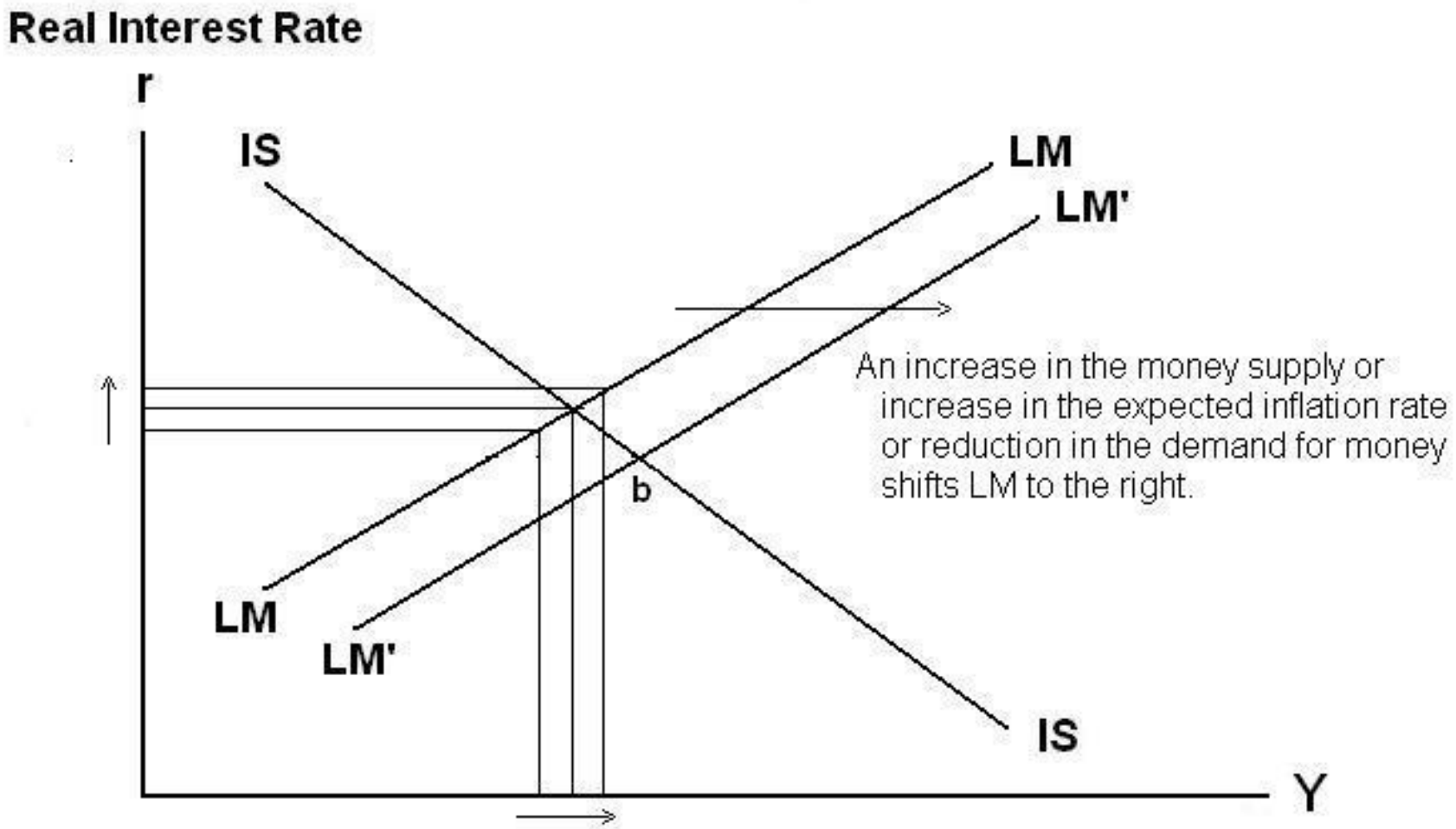
- The IS-LM model, which stands for "investment-savings, liquidity-money," is a Keynesian macroeconomic model that shows how the market for economic goods (IS) interacts with the loanable funds market (LM) or money market.
- It is represented as a graph in which the IS and LM curve intersect to show the short-run equilibrium between interest rates and output.
- The three critical exogenous variables in the IS-LM model are liquidity, investment and consumption. According to the theory, liquidity is determined by the size and velocity of the money supply.
- The IS-LM graph examines the relationship between real output, or GDP, and nominal interest rates. The entire economy is boiled down to just two markets, output and money, and their respective supply and demand characteristics push the economy towards an equilibrium point.
- This is sometimes referred to as "the Keynesian Cross."

# Characteristics of the IS-LM Graph

- In the IS-LM graph, the IS curve slopes downward and to the right.
- This assumes the level of investment and consumption is negatively correlated with the interest rate but positively correlated with gross output.
- By contrast, the LM curve slopes upward, suggesting the quantity of money demanded is positively correlated with the interest rate and with increases in total spending, or income.
- Gross domestic product (GDP) or (Y), is placed on the horizontal axis, increasing as it stretches to the right.
- The nominal interest rate, or (i or R), makes up the vertical axis.



## Figure 2. Stock or Asset Equilibrium: LM Curve




A rise in the real interest rate is associated with an increase in real income along the LM curve.

# Limitations of the IS-LM Model

- Many economists, including many Keynesians, object to the IS-LM model for its simplistic and unrealistic assumptions about the macroeconomy.
- In fact, Hicks later admitted model's flaws were fatal
- Subsequent revisions have taken place for so-called "new" or "optimized" IS-LM frameworks.
- The model is a limited policy tool, as it cannot explain how tax or spending policies should be formulated with any specificity. This significantly limits its functional appeal.
- It has very little to say about inflation, rational expectations or international markets, although later models do attempt to incorporate these ideas. The model also ignores the formation of capital and labor productivity.

# The AS-AD-model



- Aggregate Supply is the total amount of goods and services in the economy available at all possible price levels.
- Aggregate Demand is the amount of goods and services in the economy that will be purchased at all possible price levels.
- In an economy, as the prices of most goods and services change, the price level changes and individuals and businesses change how much they buy. The aggregate supply curve on a graph illustrates the relationship between prices and output supplied whereas the aggregate demand curve shows relationship between price and real GDP demanded.
- When aggregate supply (AS) curve and aggregate demand (AD) curves are put together, it shows the AS/AD equilibrium in the economy. The intersection of the AS and AD1curves indicated an equilibrium price level of P1 and an equilibrium real GDP of Q1.
- Any shift in aggregate supply or aggregate demand has an impact on the real GDP and the price level.

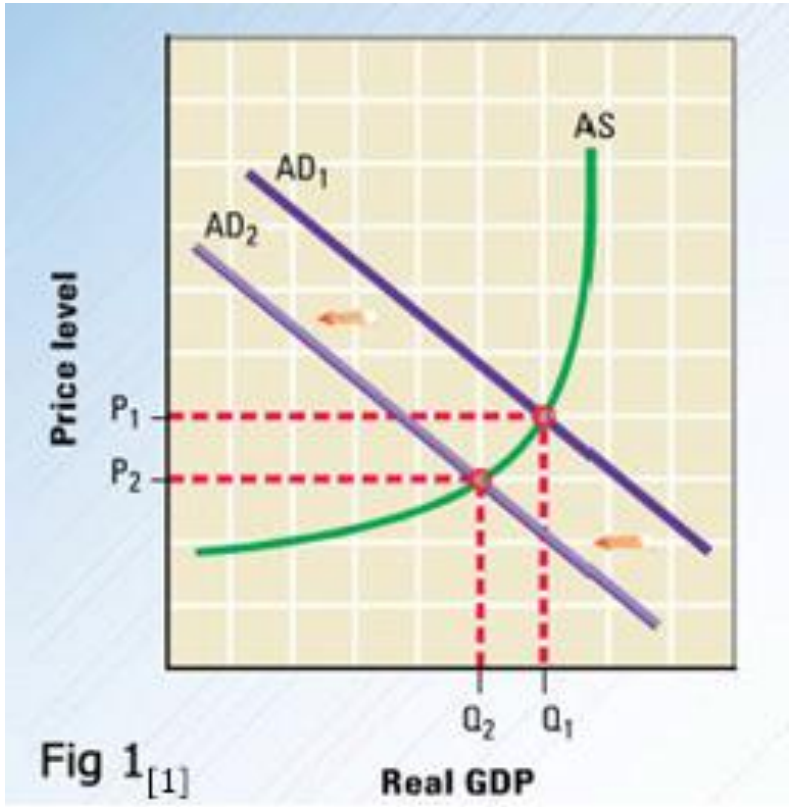



Fig 1[1]

# The AS-AD-model….

- Short-run macroeconomic equilibrium occurs when the quantity of GDP demanded equals the quantity supplied, which is where the AD and short-term AS (SAS) curves intersect.
- The price level adjusts to achieve equilibrium. Short-run equilibrium does not necessarily take place at full employment.
- Long-run macroeconomic equilibrium occurs when real GDP equals potential GDP so that the economy is on the long term AS curve (LAS)

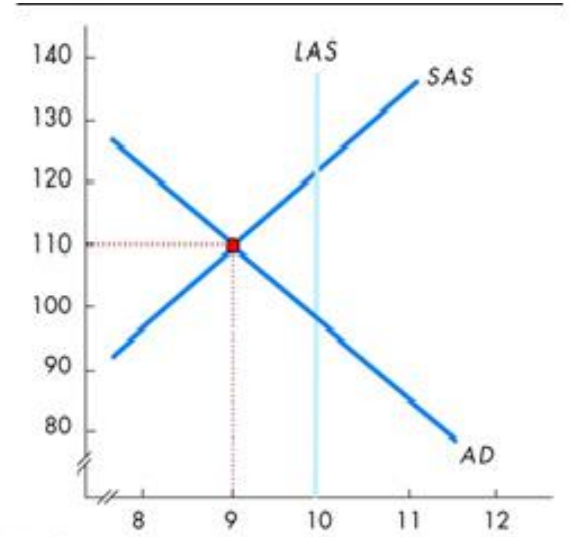



Fig 2[2]

# The AS-AD-model….

- In the short run, the AD curve shifts to the right and the equilibrium moves along the initial SAS curve. Real GDP increases and the price level rises.
- The money wage rate rises to reflect the higher prices, and the SAS curve shifts leftward, decreasing real GDP and further raising the price level.
- In the long run, the SAS curve shifts leftward enough so that real GDP returns to potential GDP. Further adjustments cease. Real GDP is at potential GDP, and the price level is permanently higher than before the increase in aggregate demand.
- The AD/AS model also explains how the economy responds to a decrease in aggregate supply:
- The SAS curve shifts leftward, real GDP decreases and the price level rises. A period of time with combined recession and inflation is known as stagflation. [2]

# The AS-AD-model….



## Factors that Affect AS and AD

- There are multiple activities that can cause shifts in the AS and AD curves. The following are factors that can shake the aggregate supply:
- The increase in nominal wages shifts AS to the left because costs of production increases, which lowers profits.
- The increase in prices of other inputs into manufacturing of products also shifts AS to the left because production costs increase. For example, the rise in the price of oil or electricity would increase costs for producers and lower their profits (so they produce less).
- The usage of technology can shift the AS to the right because it increases the productivity; as a result, firms can produce more output with the same amount of resources (increases in efficiency).

# The neo-classical synthesis

# Exchange rate determination

**Exchange rate system**.

**Floating exchange rate**, the exchange rate is determined as any price, that is, by supply and demand. The central bank never intervenes in the market.

**Fixed exchange rate,** the exchange is completely fixed. In reality, most countries with a fixed rate allow the exchange rate to vary within certain limits. These variations are disregarded and the central bank will always intervene to keep the exchange rate at its fixed value.