

---

## UNIT 12 EQUILIBRIUM IN THE REAL SECTOR\*

---

### *Structure*

- 12.0 Objectives
- 12.1 Introduction
- 12.2 Goods Markets
  - 12.2.1 Interest Rate and Investment
  - 12.2.2 Aggregate Demand and the Interest Rate
- 12.3 Derivation of the IS Curve
  - 12.3.1 Slope of the IS Curve
  - 12.3.2 Position of the IS Curve
- 12.4 Let Us Sum Up
- 12.5 Answers/ Hints to Check Your Progress Exercises

---

### 12.0 OBJECTIVES

---

After going through this Unit, you should be in a position to

- explain how equilibrium in the goods market is achieved;
- explain the relationship between interest rate and investment;
- discuss the aggregate demand in relation to the interest rate;
- derive the IS curve with the help of aggregate demand and interest rate;
- interpret the slope of the IS curve; and
- explain the position of the IS curve and the factors affecting its position.

---

### 12.1 INTRODUCTION

---

In Unit 6 we learnt that equilibrium rate of interest is determined by the demand for and supply of money in the economy. In Unit 10 we learnt that equilibrium output is realized at the level where aggregate demand equals aggregate supply (of goods and services). The classical economists believed in duality of the real and monetary sectors of the economy and an increase in money supply results in proportionate increase in prices, as output cannot be increased (see Unit 9). According to Keynes, however, there is underemployment of resources in an economy and an increase in money supply results in a decline in interest. A decrease in interest rate results in an increase in investment, which in turn results in an increase in output through investment multiplier. Thus monetary variables have an impact on real economic variables.

---

\* Dr. Nidhi Tewathia, Assistant Professor, Gargi College, University of Delhi.

The goods and money markets are interrelated – interest rate influences investment which influences output. Similarly, growth in output influences demand for investment which in turn affects interest rate. Thus studying goods market and money market separately does not give us a correct picture of the economy. For economic stability in the economy, there should be equilibrium in both goods market (equilibrium output) and in money market (equilibrium interest rate). In view of this economists such as J R Hicks (1904-1989) and Alvin Hansen (1887 – 1975) tried to combine the equilibrium in both goods and money markets.

---

## 12.2 GOODS MARKETS

---

Goods market is the one where aggregate demand and aggregate supply interact with each other and equilibrium level of income and output are determined. In the Keynesian model we saw that equilibrium output is realized when saving and investment are equal. A limitation of that model, however, was that the effect of interest rate on saving and investment was ignored.

Goods market equilibrium can be described through the IS curve (IS stands for Investment - Saving) which shows all the positions where investment and saving in the economy are equal. In Unit 11, we considered investment to be autonomous or fixed for simplicity. In reality however investment is not fully exogenous.

As you saw in Unit 11, equilibrium level of output is given by

$$Y_0 = \frac{\bar{A}}{1 - c + ct}$$

where two determinants of equilibrium income are  $\bar{A}$  and marginal propensity to consume (c). Higher *mpc* means higher output level and vice-versa.

### 12.2.1 Interest Rate and Investment

To have a complete picture, we introduce interest rate as a determinant of investment. Thus investment is not exogenously given; it is endogenously determined. We note that investment is lower when the rate of interest is high and *vice versa*. Generally, the firms borrow to invest. When interest rate is high, borrowing cost will increase, which will lower profits of the firms. On the other hand, if rate of interest is low, borrowing cost will be relatively lower and firms will borrow more. Thus, if the rate of interest is high, firms borrow less, which results in lower investment. On a similar logic, if the rate of interest is low, firms will borrow more, which would result in higher investment. Thus we assume that rate of interest and investments are inversely related. The investment spending function can be written as

$$I = \bar{I} - b i \quad \text{where } b > 0 \quad \dots(12.1)$$

$i$  = rate of interest

$b$  = responsiveness of investment to interest rate

$\bar{I}$  = autonomous investment spending

In equation (12.1) we assume that investment consists of two components: (i) an autonomous component which does not depend upon the rate of interest; and (ii) an endogenous component which is influenced by the rate of interest. There are certain types of investments which are mandatory (such as repairs, maintenance, etc.). In Units 10 and 11 we assumed that investment is fixed, or autonomous, or exogenously given. In this Unit we relax this assumption and assume that certain types of investment are carried out for expansion of production capacity, and with a profit motive. The investment function given at equation (12.1) states that lower interest rate means higher investment. The investment function is shown in Fig. 12.1.



Fig. 12.1: Investment Function

The position of the investment curve is dependent on the slope of the investment function, i.e.,  $b$  and the level of autonomous investment,  $\bar{I}$ . The intercept of the investment curve will depend on  $\bar{I}$ , while its slope will depend on  $b$ . If investment is highly responsive (value of 'b' is larger), the investment curve will be flatter (see Fig. 12.2).

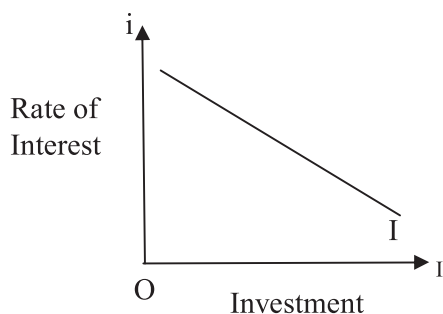


Fig. 12.2: Higher Responsive Investment

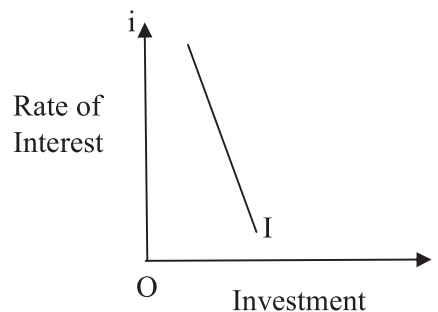


Fig. 12.3: Lower Responsive Investment

In this case, a small decrease in the rate of interest will result in a large increase in investment (see Fig. 12.3). On the other hand, if the responsiveness of

investment to a change in the rate of interest is low (value of ‘b’ is relatively small), the investment curve will be steeper. A change in the level of autonomous investment ( $\bar{I}$ ) will result in a parallel shift in the investment curve (see Fig. 12.4). If  $\bar{I}$  is higher, the investment curve will shift rightwards (from I to I'). It means that for each rate of interest, more is invested. Similarly, a lower level of  $\bar{I}$  would indicate a leftward shift in the investment curve (from I to I'').

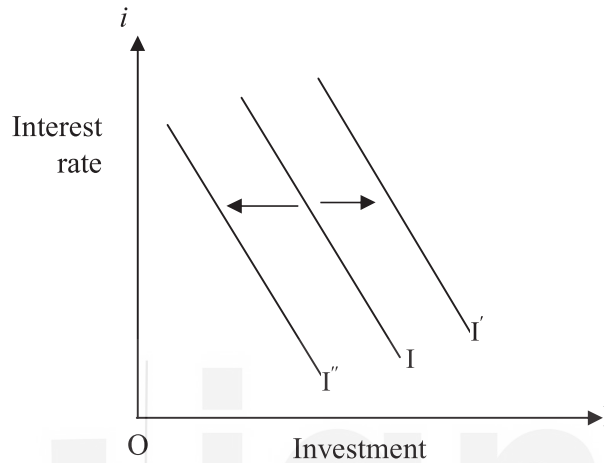


Fig. 12.4: Shift in Investment Curve

12.2.2 Aggregate Demand and the Interest rate

We have seen that investment is influenced by the rate of interest. Since investment has changed its form (it is not considered to be fixed anymore), it will have an impact on the aggregate demand (AD) curve.

$$AD = C + I + \bar{G}$$

$$AD = \bar{C} + c\bar{TR} + c(1 - t)Y + \bar{I} - bi + \bar{G}$$

$$AD = \bar{A} + \bar{c}Y - bi \quad \dots(12.2)$$

where  $\bar{c} = c(1 - t)$  (see Unit 11 for derivation of this)

and  $\bar{A} = \bar{C} + \bar{I} + \bar{G}$

An increase in the rate of interest results in a decrease in AD, while level of income is considered to be given. As pointed out earlier,  $\bar{A}$  is not affected by the increase in the rate of interest. In Fig. 12.5 we describe the effect of change in interest rate on AD curve. At a given rate of interest  $i$ , the term ‘bi’ becomes a constant and hence the vertical intercept of AD curve is  $(\bar{A} - bi)$ .

In Fig. 12.5, we measure AD on the y-axis and output on the x-axis. In the diagram, we depict the impact of a shift in the AD curve on equilibrium output. Initially let the aggregate demand curve be  $AD_1 = \bar{A} + cY - bi_1$  when the rate of interest is  $i_1$ . Here the intercept of the AD curve is  $\bar{A} - bi_1$ . The equilibrium is at point  $E_1$  and equilibrium output is  $Y_1$ .

Suppose there is a decrease in the rate of interest from  $i_1$  to  $i_2$ . The intercept of the AD curve will be  $\bar{A} - bi_2$ . Notice that  $\bar{A} - bi_2$  will be larger than  $\bar{A} - bi_1$ ,

because we are subtracting a smaller quantity from  $\bar{A}$ . Thus there will be an upward shift in the AD curve from  $AD_1$  to  $AD_2$  (see Fig. 12.5).

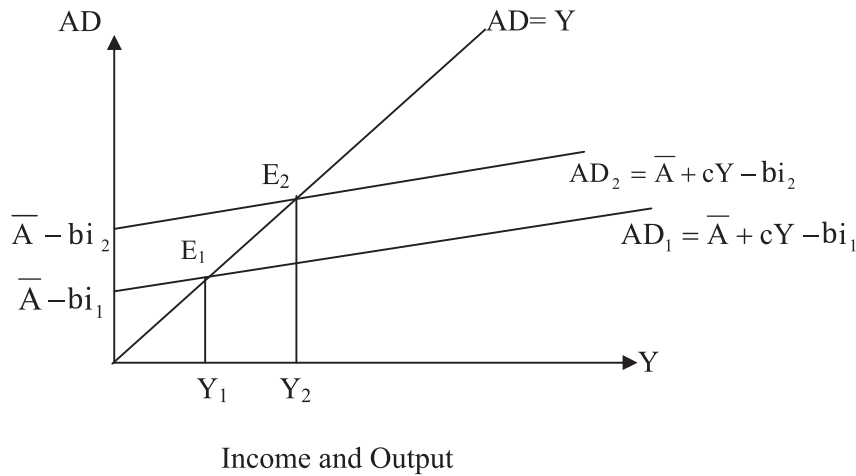


Fig. 12.5: Interest Rate and AD

If you see logically, a decrease in interest rate will lead to an increase in investment. An increase in investment will lead to an increase in aggregate demand. Thus the upward shift in the AD curve due to decrease in interest rate is valid. As per Fig. 12.5, initial equilibrium was at  $E_1$  and equilibrium output level was  $Y_1$ . Because of the shift in the aggregate demand curve, the new equilibrium occurs at  $E_2$  and the equilibrium level of output is  $Y_2$ .

**Check Your Progress 1**

- 1) Draw an investment curve when the investment is not autonomous and justify its shape.

.....

.....

.....

.....

.....

.....

- 2) In what way the investment curve is affected when the sensitivity of investment to the interest rate increases?

.....

.....

.....

.....

.....

- 3) Explain the impact of a change in the interest rate on the AD curve and the resulting equilibrium.

.....

.....

.....

.....

.....

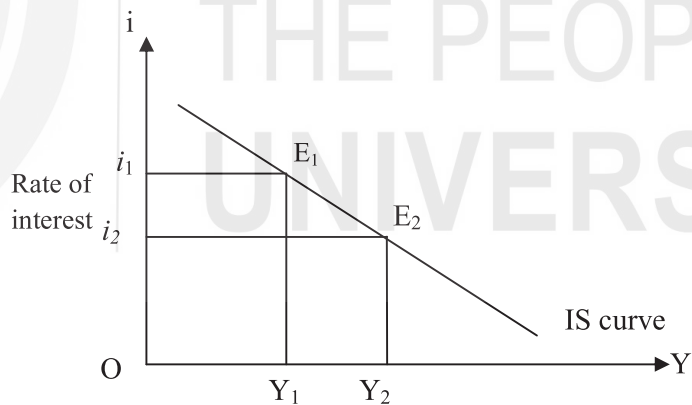
.....

---

### 12.3 DERIVATION OF THE IS CURVE

---

We continue with Fig. 12.5 for derivation of the IS curve. The ground work is already done in the previous section where we learnt that the AD curve shifts due to change in the interest rate. Further, there is a change in equilibrium output in response to change in the AD curve. Thus, in Fig. 12.5, we have various combinations of interest rate and equilibrium output levels. If we plot such combinations in a diagram, we get the IS curve. As we observed in Fig. 12.5, when the rate of interest decreased from  $i_1$  to  $i_2$ , the equilibrium level of output increased from  $Y_1$  to  $Y_2$ . Thus we find that interest rate and equilibrium output are negatively related. The IS curve is shown in Fig. 12.6. You should note that on each and every point of the IS curve the real sector of the economy is in equilibrium.



Income and Output

**Fig 12.6: IS Curve**

All the points on the IS curve represent the goods market equilibrium because this curve is made up of those combinations of rate of interest and output where savings is equal to investment (or, its equivalent, aggregate demand is equal to aggregate supply). Fig. 12.6 shows that the IS curve is downward sloping.

Another issue to discuss is the points which are not on the IS curve. Any such point indicates that there is disequilibrium in the goods market.

Point 'c' and 'd' in Fig. 12.7, for example, show disequilibrium in the real sector, while points 'a' and 'b' show equilibrium in the goods market.

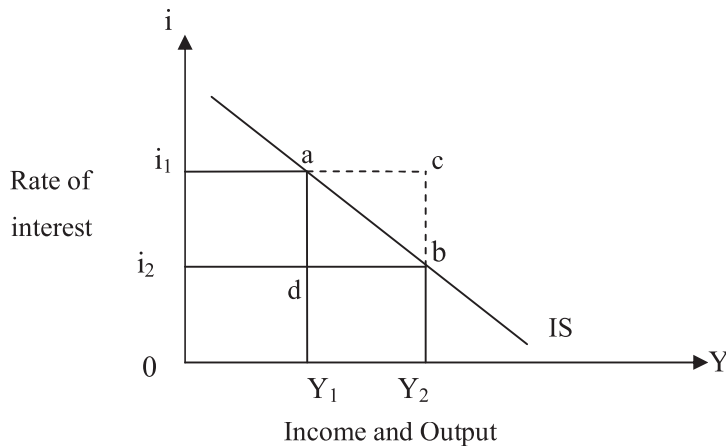


Fig 12.7: Points off the IS Curve

At point 'd' in Fig. 12.7, income is at  $Y_1$  but the rate of interest is at  $i_2$ . At lower rate of interest, demand for investment will increase. Such increase in demand for investment will push the rate of interest upward. So, at point 'd' there is excess demand for goods. We can generalize that at any point below and to the left of the IS curve, there is excess demand for goods.

At point 'c' in Fig. 12.7, interest rate is  $i_1$  while output is  $Y_2$ . You should observe that the equilibrium rate of interest corresponding to  $Y_2$  level of output is  $i_2$  (equilibrium point on the IS curve is 'b') which is lower than  $i_1$ . Thus there is a tendency for interest rate to decline. An implication of the above is that there is excess supply in the market. We can generalize that any point which is above and to the right of the IS curve, indicates excess supply of goods.

### 12.3.1 Slope of the IS Curve

Let us derive the equation for the IS curve by using the goods market equilibrium condition. We know that equilibrium is achieved when  $Y = AD$ . Substituting the value of AD from equation (12.2), we obtain

$$\begin{aligned}
 Y &= \bar{A} + \bar{c} Y - bi \\
 \text{Or, } Y - \bar{c} Y &= \bar{A} - bi \\
 \text{Or, } (1 - \bar{c})Y &= \bar{A} - bi \\
 \text{Or, } Y &= \frac{1}{(1 - \bar{c})} (\bar{A} - bi) \\
 \text{Or, } Y &= \alpha_G (\bar{A} - bi) \quad \dots(12.3)
 \end{aligned}$$

where  $\alpha_G = \frac{1}{1 - \bar{c}} = \frac{1}{1 - c + c}$  is the multiplier in the presence of the government sector and  $\bar{c} = c(1 - t)$ .

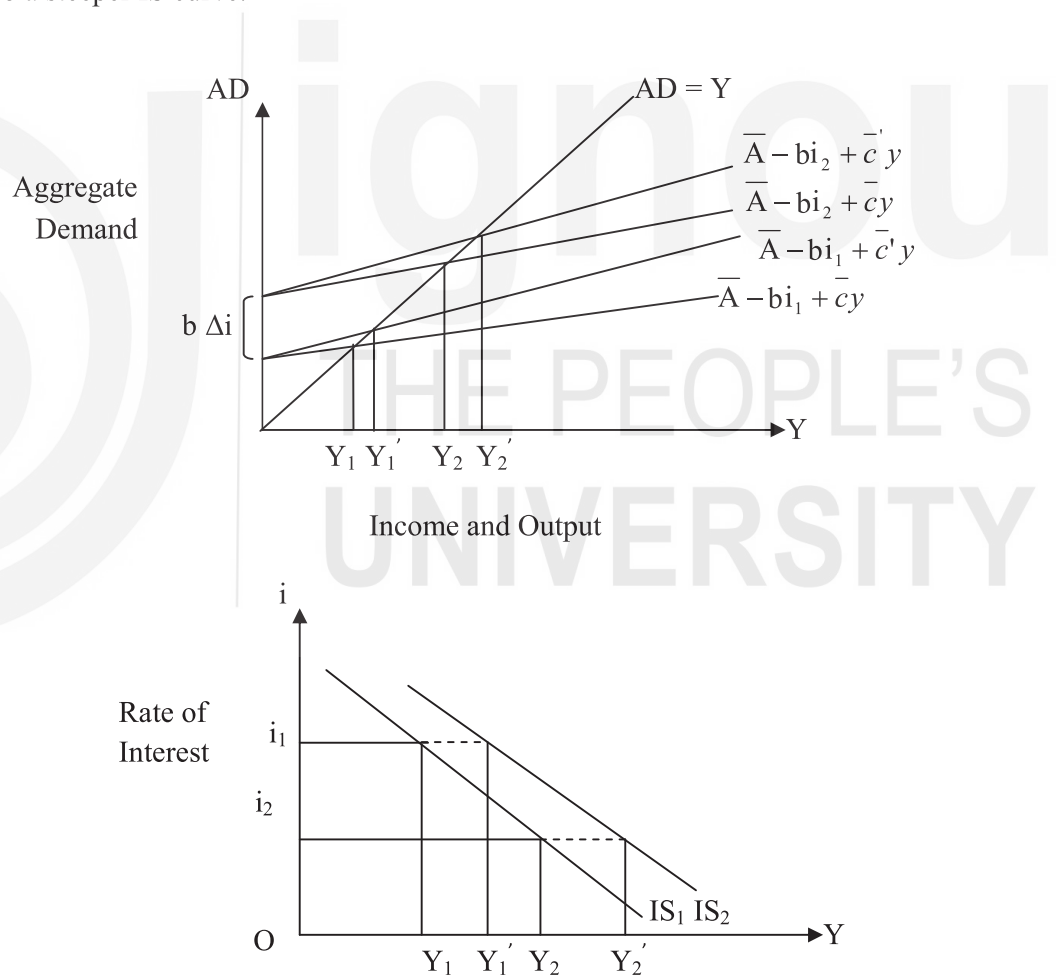
Equation (12.3) above is the IS equation. The slope of the IS curve is defined as the rate of change in income due to change in interest rate. The slope of the IS

**IS-LM Analysis**

curve is given by  $\frac{\Delta Y}{\Delta i}$ , where  $\Delta$  represents a small change in a variable. The slope of the IS curve is  $(-)\text{b} \cdot \alpha_G$ .

Those of you who are familiar with differential calculus, can see that we take derivative of (12.3) to find the slope of the IS curve. Thus,  $\frac{dY}{di} = -\text{b} \cdot \alpha_G$ . The slope being negative reinforces the fact that  $Y$  and  $i$  are negatively related. The steepness of the curve depends on the two factors, viz.,  $\text{b}$  and  $\alpha_G$ . Recall that  $\text{b}$  represents the sensitivity of investment to changes in the interest rate, and  $\alpha_G$  represents the value of the multiplier in the presence of the government sector.

Suppose there is certain decrease in interest rate and  $\text{b}$  is relatively large (responsiveness of investment to interest rate is high). It implies that the equilibrium income will change by a large amount through a large upward shift in the AD curve. This will produce a flatter IS curve. On the other hand, when  $\text{b}$  is relatively small, responsiveness of investment to interest rate is low. This leads to a steeper IS curve.



**Fig 12.8: Multiplier and IS Curve**

In Fig. 12.8 we present the effect of the multiplier ( $\alpha_G$ ) on the IS curve. We know that  $\alpha_G$  depends on the marginal propensity to consume,  $\bar{c}$ .



Let us consider two different values of mpc, such that  $\bar{c}' > \bar{c}$ . We know that  $\bar{c}'$  will produce a steeper AD curve (since  $\bar{c}'$  represents the slope AD curve). We consider a decrease in the interest rate by an amount  $\Delta i$  (from  $i_1$  to  $i_2$  such that  $i_2 < i_1$ ), and see the impact of the change in interest rate on equilibrium income in both the cases. When interest rate decreases by  $\Delta i$ , the AD curve shifts upward by  $g\Delta i$ .

In Fig. 12.8,  $AD_1$  is represented by the equation with mpc  $\bar{c}$  and  $AD_2$  is represented by the equation with mpc  $\bar{c}'$  where  $\bar{c}' > \bar{c}$ . When interest rate decreases from  $i_1$  to  $i_2$  (such that  $i_2 < i_1$ ), we observe parallel shifts in both  $AD_1$  and  $AD_2$ , by the same amount. As a result of the shift in the AD curve, the equilibrium point changes and equilibrium output shifts from  $Y_1$  to  $Y_2$  in the case of  $AD_1$  and from  $Y_1'$  to  $Y_2'$  in the case  $AD_2$ . Notice that the change in interest rate is the same, in both the cases. However, the horizontal distance between  $Y_2'$  and  $Y_1'$  is more as compared to the distance between  $Y_2$  and  $Y_1$ . Thus the change in output is larger in case the AD curve is steeper (and the mpc is higher).

We plot the combinations of interest rate and equilibrium output in the lower panel of Fig. 12.8, to obtain the IS curve. We see in the lower panel of Fig. 12.8 that the  $IS_2$  curve turns out to be flatter which is corresponding to the higher  $\bar{c}$  or  $\bar{c}'$ . We can say that higher  $\bar{c}$  leads to higher  $\alpha_G$ , and therefore a larger increase in the equilibrium level of income and output.

### 12.3.2 Position of the IS Curve

In the previous sub-section we discussed about the slope of the IS curve. Now let us look into the position of the IS curve. In other words, we should be in a position to identify the factors that determine the position of the IS curve. Let us once again look at the IS equation.

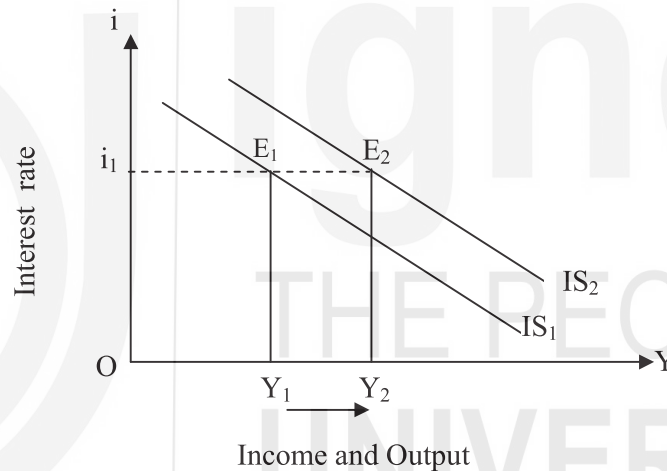
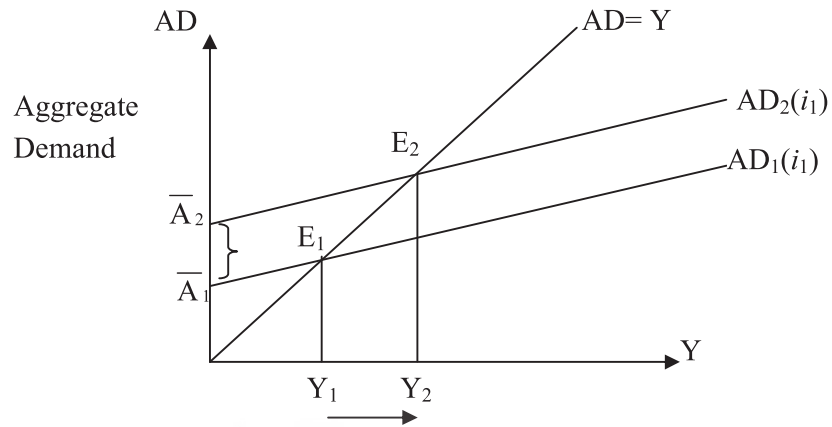
$$Y = \alpha_G(\bar{A} - bi)$$

We already know that  $\alpha_G$  and  $b$  are responsible for the slope of the IS curve. This leaves us with  $\bar{A}$  which plays an important role in the IS curve formation. In case  $\bar{A}$  shifts, it leads to a shift in AD curve and hence shows an impact on the position of the IS curve. Fig. 12.9 shows how this process takes place. The upper panel of Fig. 12.9 shows the impact of change in autonomous spending ( $\bar{A}$ ) on the AD curve. For a given rate of interest  $i_1$ , equilibrium level of income and output shifts from  $Y_1$  to  $Y_2$  due to  $\Delta \bar{A}$ .

Now, in the lower panel of Fig. 12.9, at the same interest rate ( $i_1$ ), we have equilibrium a higher level of output ( $Y_2$ ). This shows that the shift in  $IS_1$  to  $IS_2$  is as a result of  $\Delta \bar{A}$ . We have a new goods market equilibrium, i.e.,  $(i_1, Y_2)$  instead of the old one  $(i_1, Y_1)$ .

**IS-LM Analysis**

The next question is, what is the magnitude of the shift in the IS curve? The shift in the equilibrium level of income and output can be easily calculated with the help of the multiplier.  $\Delta Y = \alpha_G \cdot \Delta \bar{A}$



**Fig 12.9: Shift in IS Curve**

The change in equilibrium output is equal to the multiplier times the change in  $\bar{A}$ . The components of  $\bar{A}$  are equally responsible for the shifts in the IS curve. Let us look at these components,

$$\bar{A} = c\bar{TR} + \bar{T} + \bar{G} + \bar{C}$$

In case the government spending decreases, the AD curve will experience a parallel shift downwards and this will decrease the level of income. It leads to a leftward shift in the IS curve. Similarly, if  $\bar{I}$ ,  $\bar{TR}$  and  $\bar{C}$  decrease, the IS curve will shift leftwards.

**Check Your Progress 2**

1) Derive the IS Curve with the help of the Keynesian Cross.

.....  
.....  
.....  
.....

2) Which are the factors that determine the slope of the IS Curve?

.....  
.....  
.....  
.....

3) Identify the factors that affect the position of an IS Curve.

.....  
.....  
.....  
.....

---

**12.4 LET US SUM UP**

---

In this unit, we explained the role of interest rate in determining the investment level. We dropped the assumption that the investment is fixed, autonomous or exogenous. As the investment gets affected due to interest rate, the aggregate demand and the equilibrium output experience a change. This process of change in interest rate and its impact on equilibrium level of income and output helps us to derive the IS curve. All the points on the IS curve show the goods market equilibrium and all the points off the IS curve show disequilibrium. The slope of the IS curve is dependent upon the sensitivity of the investment to the interest rate ( $b$ ) and the multiplier ( $\alpha_G$ ). The position of the IS curve is determined by the autonomous spending,  $\bar{A}$ .

---

**12.5 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES**

---

**Check Your Progress 1**

- 1) Refer to Sub-Section 12.2.1 and Fig. 12.1
- 2) It becomes flatter.
- 3) Refer to Sub-section 12.2.2.

## IS-LM Analysis

### Check Your Progress 2

- 1) Refer to the Fig. 12.5 and Fig. 12.6.
- 2) Refer to Sub-Section 12.3.1.
- 3) Refer to Sub-Section 12.3.2.



---

## UNIT 13 EQUILIBRIUM IN THE MONETARY SECTOR\*

---

### *Structure*

- 13.0 Objectives
- 13.1 Introduction
- 13.2 Real and Nominal Demands
- 13.3 Demand for and Supply of Money
- 13.4 Money Market Equilibrium
- 13.5 LM Curve
  - 13.5.1 Slope of the LM Curve
  - 13.5.2 Position of the LM Curve
- 13.6 Let Us Sum Up
- 13.7 Answers/Hints to Check Your Progress Exercises

---

### 13.0 OBJECTIVES

---

After going through this Unit, you should be in a position to

- explain nominal and real demand for money;
- derive the LM curve with the help of demand for and supply of money;
- explain the slope of the LM curve and the factors affecting it; and
- explain the position of the LM curve and the factors affecting it.

---

### 13.1 INTRODUCTION

---

In the previous Unit we discussed about the equilibrium in the goods market. Knowledge of the goods market and its equilibrium alone however is not sufficient to understand how the economy works. The money market or the assets market is equally important.

The assets market affects the level of income and output. As you might have observed, large volume of trading occurs every day in the assets market. For simplicity, we group all the assets into two categories, viz., a) money (cash in hand), and b) interest-bearing assets such as bonds. A bond is a promise to pay an agreed amount of money to its holder at some future date. For example, suppose a borrower (usually the government or a corporate firm) borrows Rs.100 in the form of a bond. She promises to pay Rs.4 each year to the lender (who actually owns the bond) and will repay Rs.100 to the lender at a future specified date, say after 2 years. The interest rate is 4 per cent per year.

---

\* Dr. Nidhi Tewathia, Assistant Professor, Gargi College, University of Delhi.

Wealth of an individual is allocated between various types of assets. If an individual decides to have more number of bonds, she will receive more amount of interest income accordingly. Holding more money grants her liquidity and she can make transactions to purchase anything she wants. In the case of bonds, her liquidity is compromised. Such decisions are called portfolio decisions. The total wealth of an individual would either be held in the form of money or in the form of bonds. In other words, the wealth of an individual should add up to the money held in different types of assets.

State of the economy depends on both goods market and assets market, and there is an important link between the two. The complete picture emerges only after we study both goods and assets markets. In the present Unit we will be largely discussing about money, bonds, stocks, houses, etc., as forms of wealth. In Unit 14 we will combine both the goods and the assets markets to find out equilibrium rate of interest and equilibrium level of output.

---

### 13.2 REAL AND NOMINAL DEMANDS

---

Let us begin with the distinction between ‘the nominal demand for money’ and ‘the real demand for money’. Nominal demand for money is the amount of money (in India, for example, the number of rupees) demanded by an individual. The real demand for money is also the demand for money but in terms of the number of units of goods that money will buy. This real demand is equal to the nominal demand for money divided by the price level. For example, nominal demand for money (also called *Nominal Wealth*, WN) is Rs.500, and the price level is Rs.5. Then the real demand for money will be equal to 100 units of goods (= 500/5). It is important to note that if the nominal demand for money and the price level doubles, then the real demand for money remains unchanged. Real demand for money is also known as ‘demand for real money balances’ or *real balances*. Real bond holdings will be equal to the sum of money and the bond holding divided by the price level. Real financial wealth of an individual should be equal to the sum of demand for real balances (L), and real bond holdings (BH). Also, another way to look at the real financial wealth is the nominal wealth (WN) divided by the price level (P).

Thus,

$$L + BH = \frac{WN}{P} \quad \dots(13.1)$$

Decision of holding more real balances would mean a decision to hold less real wealth in the form of bonds. It means, if we consider the money market only, we can have understanding on the assets market.

If the money market is in equilibrium, the bond market will also be in equilibrium because real wealth is distributed in these two markets only.

The real financial wealth available at a given time, in an economy, will be the sum of the real money balances and the available real bonds. So, the total financial wealth will be equal to:

$$\frac{WN}{P} = \frac{M}{P} + SB \quad \dots(13.2)$$

where M is the stock of nominal money balances, SB is the real value of the supply of bonds and P is the price level.

The amount of real wealth an individual wish to hold should be equal to the amount of real wealth available in the economy. We equate (13.1) and (13.2) to obtain

$$L + BH = \frac{M}{P} + SB$$

$$\text{Or, } \left( L - \frac{M}{P} \right) + (BH - SB) = 0 \quad \dots(13.3)$$

If the demand for real balances (L) is equal to the existing stock of the real balances, we find that  $\left( L - \frac{M}{P} \right) = 0$ . This leads to the interesting observation, i.e., BH should be equal to SB. If the real money demand is equal to the real money supply, then the demand for real bonds should be equal to the supply of real bonds. Now, let us consider a situation where the money market is not in equilibrium, and see its implications for the asset market. Suppose real money demand is more than real money supply. Given the wealth budget constraint given at equation (13.3), the excess demand in the money market (i.e.,  $L > \frac{M}{P}$ ) there needs to be neutralized by excess supply in the bond market (i.e.,  $BH < SB$ ). With this behaviour, we reinforce the fact that studying only the money market would help us in comprehending the bond market also.

---

### 13.3 DEMAND FOR AND SUPPLY OF MONEY

---

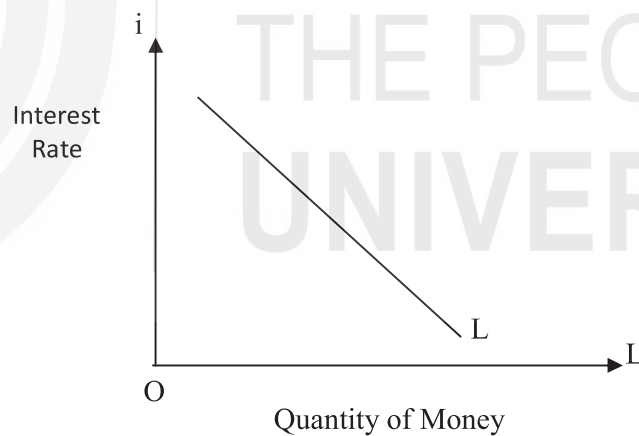
Individuals require money to make transactions such as purchase of goods and services. At a given time, people will hold some cash in hand which is known as ‘money balances’. The amount of physical units that money can buy, tells us the ‘real balances’ an individual demands at that point of time. If the price level rises, an individual will require more (nominal) money balances to keep continuing to afford the same amount of goods and services.

The decision of how much money to be held as nominal balance or in the form of cash is dependent on the income or real income of an individual and the interest rate on various assets available for investment. The cost of holding money is nothing but the foregone interest rate on the assets in which the investor could have invested. Higher interest rate increases the cost of holding money. Individuals make transfers from money to bonds whenever their money holdings become large. But if an individual holds her majority of wealth in the form of bonds, then she needs to be ready for the inconvenience which low level of liquidity brings. We can say that at high levels of income, an individual demands more of money (means more liquidity) and at high rate of interest, the individual demands more bonds (means less money or less liquidity).

Keeping the above in view, we can write the money demand function as

$$L = kY - h i \quad k, h > 0 \quad \dots(13.4)$$

where  $k$  is the sensitivity of money demand to the level of income ( $Y$ ) and  $h$  is the sensitivity of money demand to the interest rate ( $i$ ). An increase in the income by Re.1 increases the real money demand ( $L$ ) by Rs.  $k$ . An increase in the interest rate by 1 per cent decreases the real money demand by Rs.  $h$ . The quantity demanded is a decreasing function of the rate of interest and increasing function of the income. In Fig. 13.1 we depict such a demand curve for money.



**Fig. 13.1: Demand for Money**

The supply of money is generally taken as fixed. The nominal quantity of money supply is controlled by the Central Bank of the country. So, we take it as given at  $\bar{M}$ . We also assume that the price level is constant ( $\bar{P}$ ). Thus, the real money supply would be  $(\frac{\bar{M}}{\bar{P}})$ .

In Fig. 13.2 we show that money supply in the economy is constant; represented by a vertical line.



An implication of the vertical money supply curve is that it is independent of interest rate. Thus any change in interest rate does not lead to a change in money supply.

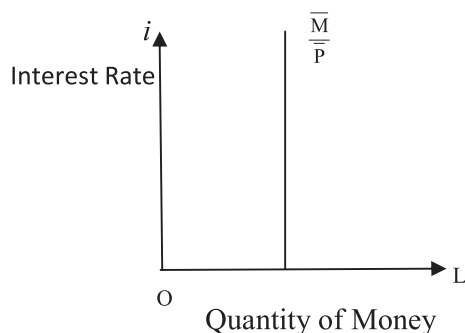


Fig. 13.2: Money Supply

### 13.4 MONEY MARKET EQUILIBRIUM

When demand equals supply in the money market, we achieve equilibrium in the money market. In Fig. 13.3 we combine the money demand curve given at Fig. 13.1 and money supply curve given at Fig. 13.2. The money demand curve is downward sloping while the money supply curve is vertical. The equilibrium takes place at  $E_1$ . This equilibrium is achieved at a given income level ( $Y_1$ ). The rate of interest is  $i_1$ .

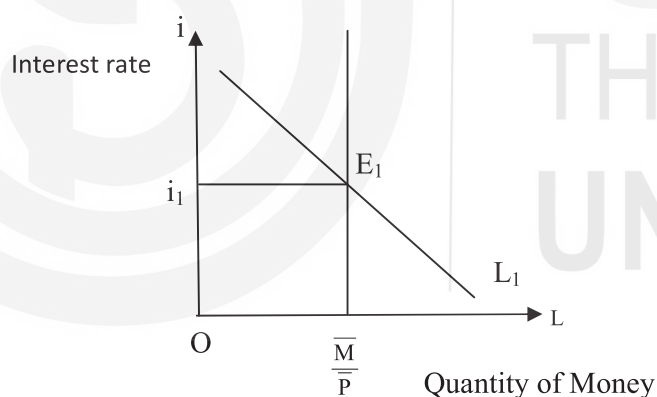
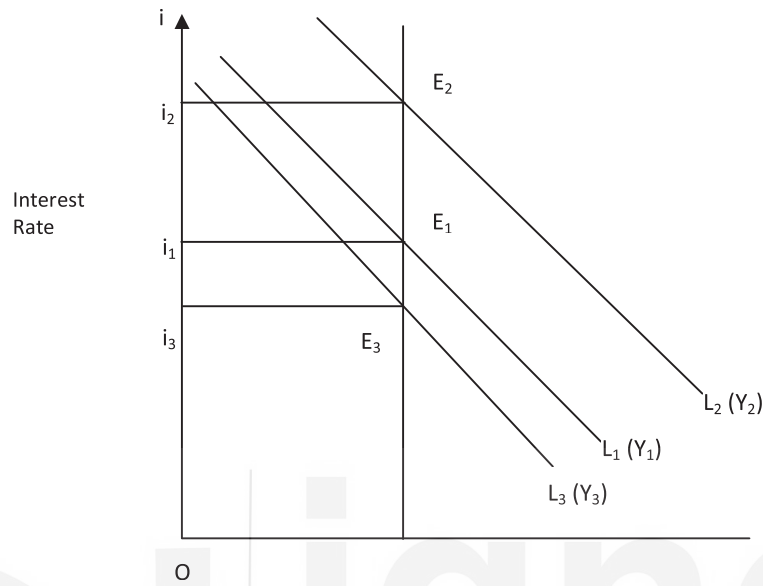


Fig. 13.3: Money Market Equilibrium

Now suppose that the level of income increases from ( $Y_1$ ) to ( $Y_2$ ). From equation (13.4) we find that money demand ( $L$ ) will increase. Accordingly, the money demand curve will observe a rightward shift from  $L_1(Y_1)$  to  $L_2(Y_2)$  and the equilibrium point will shift from  $E_1$  to  $E_2$ . In Fig. 13.4, the new equilibrium is at  $E_2$  which corresponds to the equilibrium level of income,  $Y_2$ , and the interest rate,  $i_2$ .

With the new equilibrium, we have received another combination of income and rate of interest where money market is in equilibrium. At the rate of interest  $i_1$ , there exists excess demand for money due to increase in income level ( $Y$ ).

This excess demand pushes up the rate of interest to  $i_2$  to achieve the new equilibrium where demand for money equals supply of money.



**Fig. 13.4: Change in Money Market Equilibrium**

If the income level decreases to  $Y_3$ , the money demand curve will shift leftwards (see Fig. 13.4) and this will lead to excess supply of money. This excess supply of money pushes the interest rate down and the equilibrium rate of interest is realized at  $i_3$  so that the supply of and the demand for money are equal. We observe that a lower level of income ( $Y_3$ ) is associated with a lower rate of interest ( $i_3$ ).

**Check Your Progress 1**

- 1) Distinguish between real and nominal demands for money.
  - .....
  - .....
  - .....
  - .....
  
- 2) Write down the equation of the demand for money and interpret it.
  - .....
  - .....
  - .....
  - .....

## 13.5 LM CURVE

The combinations of income ( $Y$ ) and interest rate ( $i$ ) which we discussed in the previous sections are important for understanding the LM curve. A series of such combinations eventually generates the LM curve. The LM curve shows the combinations of interest rates and levels of income such that the demand for real balances is equal to the supply of real balances. All the points on the LM curve indicate the money market equilibrium and all the points outside the LM curve indicate the disequilibrium in the money market. The LM curve is positively sloped, i.e., as  $Y$  increases, the rate of interest increases.

In Fig. 13.4 we obtained three equilibrium points, as the level of income changed, viz.,  $E_1$ ,  $E_2$  and  $E_3$  corresponding to  $(Y_1i_1)$ ,  $(Y_2i_2)$ , and  $(Y_3i_3)$  respectively. We plot these points in Fig. 13.5. In Fig. 13.5 we take output on the x-axis and interest rate ( $i$ ) on the y-axis. When we plot the three combinations  $(Y_1i_1)$ ,  $(Y_2i_2)$ , and  $(Y_3i_3)$  we obtain an upward sloping curve. It is called the LM curve; 'L' representing liquidity and 'M' representing money supply.

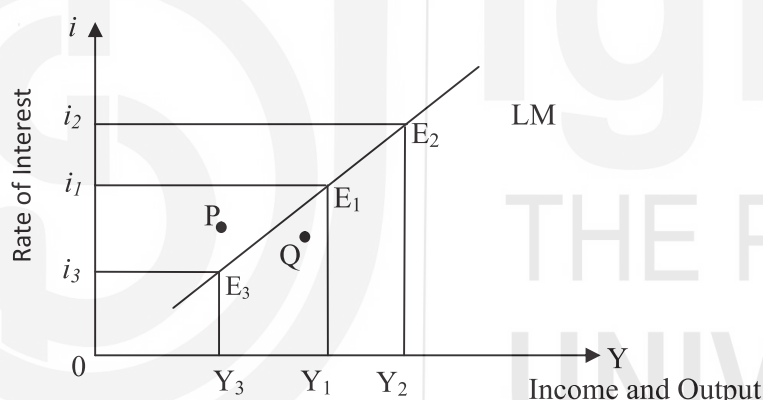


Fig 13.5: LM Curve

You should note that on each and every point of the LM curve, the demand for real balances is equal to the supply of real balances. Thus the money market is in equilibrium if the economy is operating at any combination of output and interest rate, which are on the LM curve. An implication of the above is that the money market is not in equilibrium condition if the economy is operating at any point outside the LM curve. Let us consider two such points, P and Q in Fig. 13.5. At point P, which is to the left and above the LM curve, there is excess supply of money for given level of income. This will push the interest rate down and the money market will be in equilibrium. At point Q, which is to the right and below the LM curve, there is excess demand for money. This will push the interest rate up so that there is equilibrium in the money market.

Now let us derive the equation for the LM curve. In equation (13.4) we have the demand for real balances.

The supply of real balances is given by  $\frac{\bar{M}}{P}$ . By equating the demand for real balances with the supply of real balances we obtain the equation for the LM curve. Algebraically it can be shown as follows:

$$\frac{\bar{M}}{P} = kY - hi$$

$$\text{Or, } hi = kY - \frac{\bar{M}}{P}$$

$$\text{Or, } i = \frac{1}{h} \left( kY - \frac{\bar{M}}{P} \right) \quad \dots(13.5)$$

where,  $h$  = the responsiveness of the demand for money to income, and  $k$  = the responsiveness of the demand for money to the interest rate.

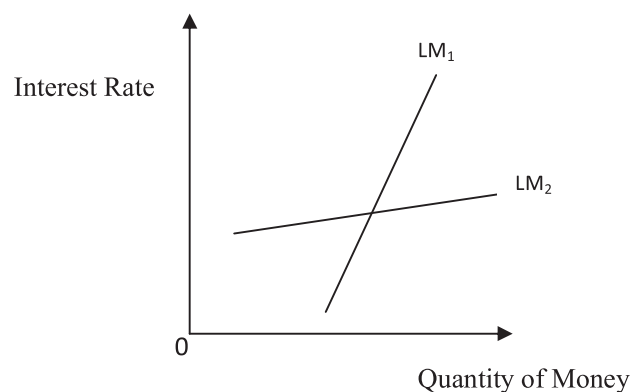
### 13.5.1 Slope of the LM Curve

The slope of LM curve can be derived from the LM equation, given by (13.5). You should note that the slope of the LM curve denotes the change in rate of interest due to change in income, i.e.,  $\frac{\Delta i}{\Delta y}$ , where ‘ $\Delta$ ’ represents a small change in a variable. Thus,

$$\frac{\Delta i}{\Delta y} = \frac{k}{h} \quad \dots(13.6)$$

Those of you, who are familiar with the concept of differentiation, will find that slope of a curve is given by the first derivative of a function. We obtain the slope of the LM curve by taking partial derivative of equation (13.5) such that  $\frac{\partial i}{\partial y} = \frac{k}{h}$ .

From (13.6) we find that the slope of the LM curve is given by the ratio of  $k$  and  $h$ . An implication of the above is that greater the responsiveness of the demand for money to income ( $k$ ) and lower the responsiveness of the demand for money to the interest rate ( $h$ ), the steeper will be the LM curve.



**Fig. 13.6: Slope of LM Curve**

In Fig. 13.6 we present two LM curves with different slopes. If the demand for money is relatively insensitive to the interest rate (i.e.,  $h$  is close to zero), then the LM curve will be nearly vertical ( $LM_1$ ). On the other hand, if the demand for money is very sensitive to the interest rate (i.e.,  $h$  is large), then the LM curve will be nearly horizontal ( $LM_2$ ).

### 13.5.2 Position of the LM Curve

Along the LM curve, the real money supply  $\left(\frac{\bar{M}}{\bar{P}}\right)$  is held constant. So if there is a change in real money supply, the LM curve will shift. If the real money supply increases, LM curve will shift to the right. Remember that an increase in real money supply can take place in three ways, viz., (i) there is an increase in nominal money supply while price level is unchanged, (ii) there is a decrease in price level while nominal money supply is constant, and (iii) there is such change in both  $M$  and  $P$  that the ratio  $\frac{M}{P}$  increases. In this Unit, for simplicity, we assume that the price level is constant so that an increase in nominal money supply implies an increase in real money supply.

Let us describe a situation where real money supply increases from  $\frac{\bar{M}}{\bar{P}}$  to  $\frac{\bar{M}'}{\bar{P}}$ . This will shift the money supply curve (the vertical line in Fig. 13.3). Such a shift in the money supply curve will result in a decrease in the rate of interest for each level of income. Thus there will be a rightward shift in the LM curve.

In Fig. 13.7 the rate of interest changes from  $i_1$  to  $i_2$  for each level of income. We have kept the income level unchanged at  $Y_1$  to highlight the fact that at each level of income, the equilibrium interest rate has to be lower to induce people to hold larger real balances. Similarly, at each level of the interest rate, the level of income has to be higher so as to raise the transactions demand for money ( $kY$ ) and thereby absorbing the higher real money supply.

If there is a decrease in real money supply, the LM curve will shift to the left.

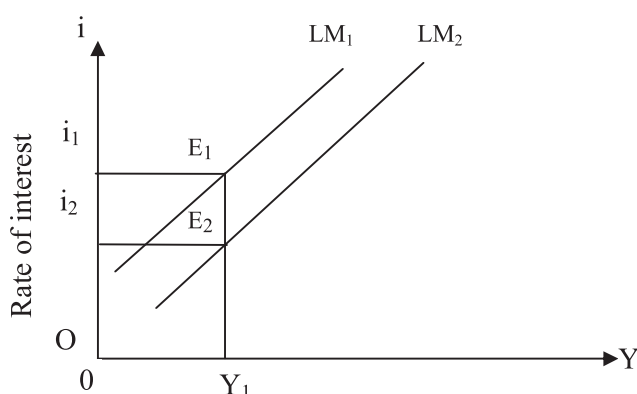


Fig 13.7: Shift in the LM Curve

**Check Your Progress 2**

1) Explain how the LM curve is derived.

.....  
.....  
.....  
.....

2) Interpret the slope of an LM curve.

.....  
.....  
.....  
.....  
.....

3) Explain how the position of LM curve is determined.

.....  
.....  
.....  
.....  
.....

4) Draw a suitable diagram to show the impact of a decrease in money supply. Explain why the rate of interest will increase.

.....  
.....  
.....  
.....  
.....

---

**13.6 LET US SUM UP**

---

We began the unit with a discussion on the options for individuals to hold money. We assumed that an individual holds money either in the form of cash or in terms of interest-bearing assets i.e., bonds. Further, we showed that if we study the money market, the bond market is also understood side by side. So the focus was laid on the money market. The demand for and supply of real balances was explained with the help of diagrams. The LM curve was derived in terms of equation and diagram.

The movements in the rate of interest due to change in the money demand and money supply were explained. The impact of such movements on the LM curve was discussed.

Further, the slope and position of the LM curve was discussed. It was observed that the change in nominal money supply is the major factor that affects the position of the LM curve.

---

## **13.7 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES**

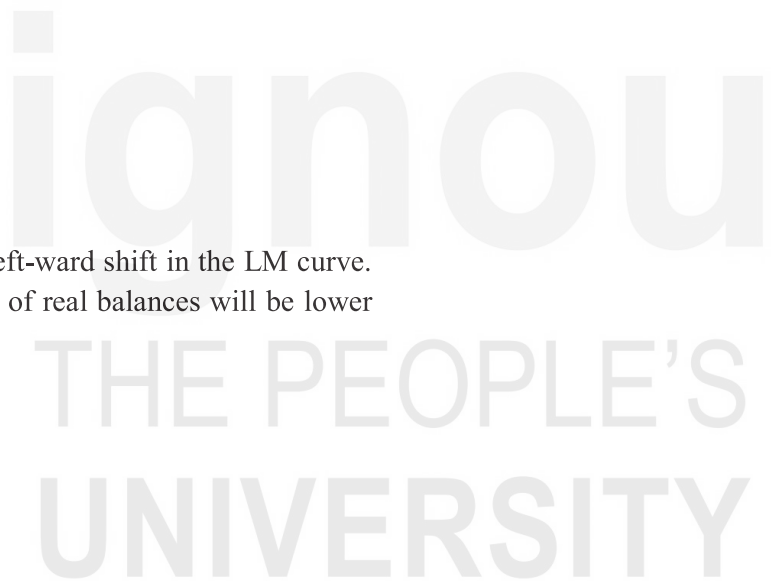
---

### **Check Your Progress 1**

- 1) Refer to Section 13.2.
- 3)  $L = kY - h i$

### **Check Your Progress 2**

- 1) Refer to Section 13.5.
- 2) Refer to Sub-section 13.5.1.
- 3) Refer to Sub-section 13.5.2.
- 4) Refer to Fig 13.7 and draw a diagram with left-ward shift in the LM curve. Rate of interest will increase because supply of real balances will be lower compared to demand.



---

## UNIT 14 NEOCLASSICAL SYNTHESIS\*

---

### *Structure*

- 14.0 Objectives
- 14.1 Introduction
- 14.2 Simultaneous Equilibrium
- 14.3 Equilibrium and Adjustment Process
- 14.4 Classical and Keynesian Zones
- 14.5 Let Us Sum Up
- 14.6 Answers/Hints to Check Your Progress Exercises

---

### 14.0 OBJECTIVES

---

After going through this Unit, you should be in a position to

- describe the simultaneous equilibrium in goods market and money market;
- explain the adjustment process in the equilibrium output and interest rate; and
- distinguish between the classical and the Keynesian zones in the IS-LM model.

---

### 14.1 INTRODUCTION

---

In Unit 12 we derived the IS curve which indicates the points on which there is equilibrium in the goods market. In Unit 13 we derived the LM curve, which indicates the equilibrium in the money market. Now, the problem at hand is to bring about equilibrium, simultaneously in both the markets. In this unit, we will discuss the interaction of the IS and the LM curves, shifts in these curves, and the adjustment process in case disequilibrium exists.

---

### 14.2 SIMULTANEOUS EQUILIBRIUM

---

For simultaneous equilibrium in the goods market and the money market, there needs to be a single combination of interest rate and income level which satisfies the equilibrium in both goods and money markets simultaneously. In Fig. 14.1 we super-impose the IS and the LM curves. In the figure, we represent income/output level ( $Y$ ) on the x-axis and the interest rate ( $i$ ) on the y-axis.

In Fig. 14.1 we find that the goods market and the money market clear at point  $E_1$ . The equilibrium rate of interest is  $i_1$  and the equilibrium level of income and output is  $Y_1$ . You should remember that we assume the price level to be constant

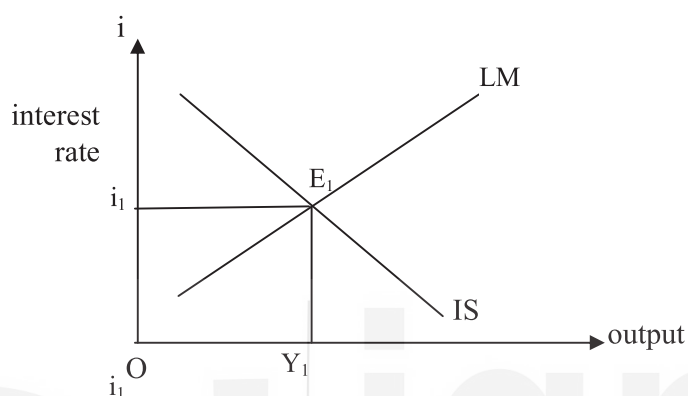
---

\* Dr. Nidhi Tewathia, Assistant Professor, Gargi College, University of Delhi.



( $\bar{P}$ ). An implication of the above is that firms are willing to supply any amount of goods and services at that price. At  $E_1$ , the economy is in equilibrium as both goods and money markets are in equilibrium.

Thus, the firms are willing to supply  $Y_1$  level of output and equilibrium interest rate is  $i_1$ . Firms are producing their planned amount of output and individuals have their portfolio composition according to their plan. There is no unplanned inventory accumulation or rundown of inventories.

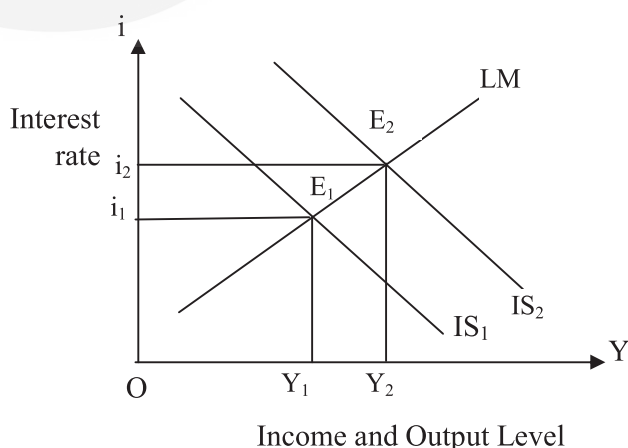


**Fig. 14.1: Simultaneous Equilibrium in Goods and Money Markets**

If any of the two curves (viz., IS and LM) changes, there will be a change in the equilibrium levels of income and interest rate. The impact of the shifts in the IS and the LM curves on equilibrium output and interest rate, however, will be different.

#### 14.2.1 Shift in the IS Curve

In Fig. 14.2 we describe a situation where the IS curve shifts to the right. Let us consider the changes an economy goes through if such a shift takes place.



**Fig. 14.2: Shift in the IS Curve**

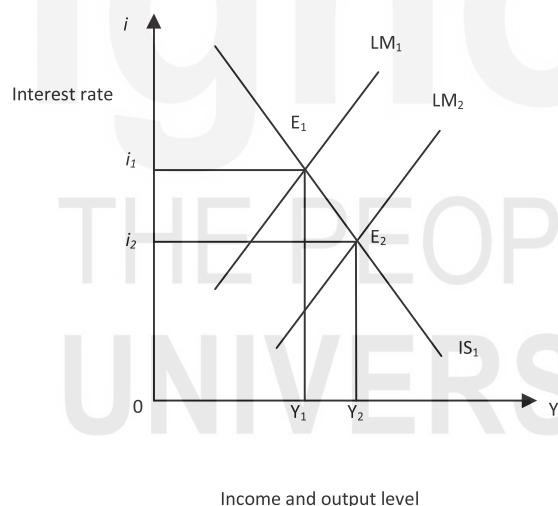
## IS-LM Analysis

Let us assume that there is an increase in the autonomous investment. This results in an increase in the autonomous spending ( $\bar{A}$ ) and hence there is a parallel shift in the IS curve from  $IS_1$  to  $IS_2$  (see Unit 12). Correspondingly, the equilibrium shifts from  $E_1$  to  $E_2$  which indicates higher equilibrium level of income and output, and higher rate of interest. In Fig. 14.2 you can see that output increases from  $Y_1$  to  $Y_2$ , and interest rate increases from  $i_1$  to  $i_2$ .

You should observe that the extent of change in the level of income ( $= \alpha_G \Delta \bar{A}$ ) is not the same as the extent of shift in the IS curve. This is because we are dealing with the money market also. Increase in  $\Delta \bar{A}$  leads to increase in income, which affects the demand for money. Supply of money remains fixed while the demand for money increases. Consequently the rate of interest increases in the money market. This has a negative impact on the investment spending. As interest rate rises, investment falls to some extent. Hence, the final change in the income is less than  $\alpha_G \Delta \bar{A}$ .

### 14.2.2 Shift in the LM Curve

In Fig. 14.3 we describe a situation where the LM curve shifts to the right. Let us consider the changes an economy goes through if such a shift takes place.



**Fig. 14.3: Shift in the LM Curve**

Let us assume that there is an increase in the money supply in the economy. Consequently there is a right-ward parallel shift in the LM curve from  $LM_1$  to  $LM_2$  (see Unit 13). Consequently, the equilibrium changes from  $E_1$  to  $E_2$ . As we can see from Fig. 14.3, interest rate decreases from  $i_1$  to  $i_2$  while output level increases from  $Y_1$  to  $Y_2$ .

Since we assume price level to be constant, an increase in money supply results in an increase in the supply of real balances as a consequence of which there is a decline in the rate of interest.

A decline in the rate of interest leads to an increase in the level of investment in the economy as a result of which there is an increase in the level of output.

**Check Your Progress 1**

- 1) Explain the simultaneous equilibrium in the goods market and the money market.

.....

.....

.....

.....

- 2) Explain the impact of a leftward shift in the IS curve through appropriate diagram.

.....

.....

.....

.....

- 3) Explain the impact of a leftward shift in the LM curve through appropriate diagram.

.....

.....

.....

.....

---

**14.3 EQUILIBRIUM AND ADJUSTMENT PROCESS**

---

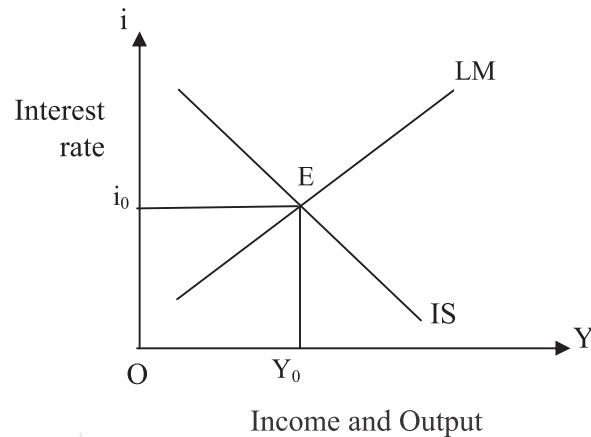
In the previous Section we found that equilibrium output and interest rate are realized at the intersection of the IS and the LM curves. In this Section we will show that there is a tendency of the market to reach back to the equilibrium. If the economy is outside the IS and the LM curves (when there is no equilibrium in the economy), an adjustment process in the economy takes place and the economy moves to a new equilibrium point. Let us appreciate the following two points:

- a) If there is an excess demand for money, the interest rate will increase. The interest rate will fall in case we observe excess supply in the money market.
- b) Excess demand for goods leads to an increase in output and excess supply of goods leads to a decline in output. The former involves run down of inventory with the firms while the latter leads to accumulation of inventories.

Let us consider Fig. 14.4, which shows the adjustment process that market follows to regain equilibrium if there is some shock/ disturbance.

## IS-LM Analysis

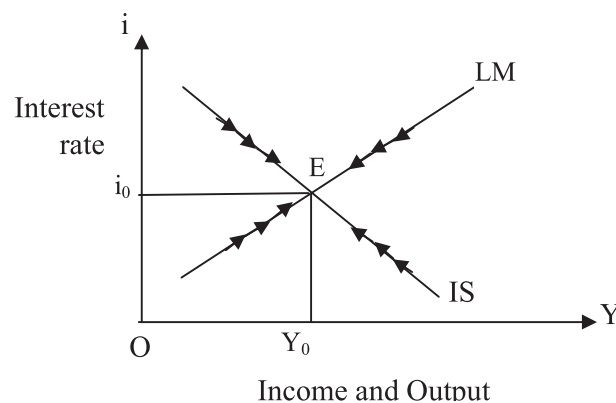
Let us assume that the economy is operating at a point which is not on the IS and LM curves. In other words, Fig. 14.4 shows few points (for example F, G, H and K) which do not reflect the equilibrium in the money market as well as the goods market. From such points, how does the economy reach towards equilibrium?



**Fig. 14.4: Adjustment towards Equilibrium**

Any point to the left of the LM curve shows excess supply of money (see Unit 13). On the other hand, any point to the right of the LM curve shows excess demand for money. Similarly, any point to the left of the IS curve shows excess demand for goods (see Unit 12). On the other hand, any point to the right of the IS curve shows excess supply of goods.

Let us take any random point G (it represents excess demand for money and excess supply of goods). The arrows given at point G specify the direction in which adjustment takes place. Excess demand for money will cause interest rate to rise. This is because assets are sold off for money and price of assets decline. Upward pointing arrow represents rising interest rate. Excess supply of goods leads to involuntary accumulation. So the firms start reducing the output. The leftward pointing arrow represents the declining output. Points F, H and K in Fig. 14.4 are similarly points of disequilibrium where adjustment takes place and eventually the economy reaches at E, the point of equilibrium. Even if only one of these two markets is observing disequilibrium, the economy reaches back to equilibrium after the adjustment process.



**Fig. 14.5: Adjustment Process in the Economy**

In Fig. 14.5 we have indicated the direction of change by arrow marks. Any point on the IS curve, apart from E, shows equilibrium in goods market but a disequilibrium in the assets market.

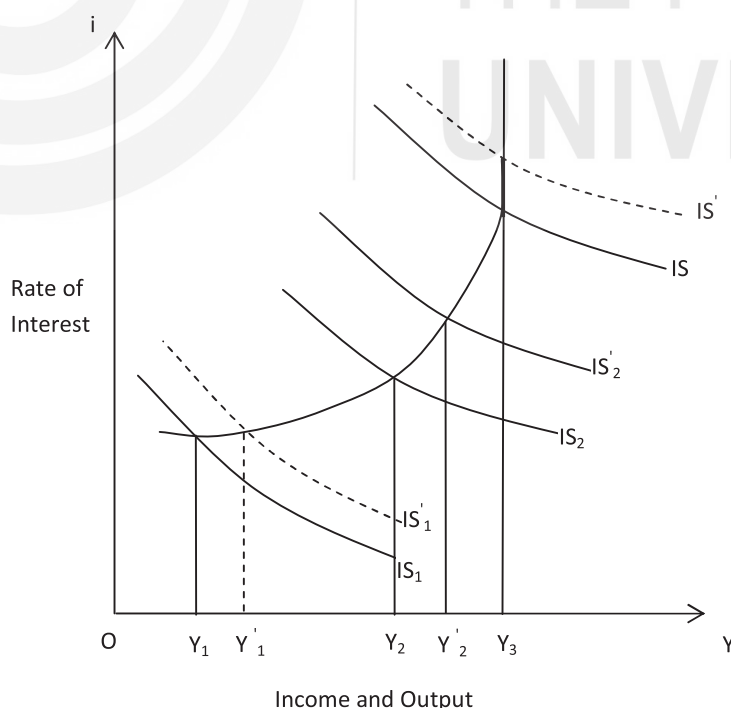
Similarly, any point on the LM curve, except point E, shows disequilibrium in the goods market (see Fig. 14.5). In case we are above the IS curve and on the LM curve, then the movement towards the equilibrium point E would mean lowering interest rates and the lowering of output too. Assets market does not take time to clear and hence the equilibrium is attained immediately. This kind of adjustment process will lead to an equilibrium position which is stable till the concerned economic variables do not change.

## 14.4 CLASSICAL AND KEYNESIAN ZONES

In Unit 13 we discussed about the slope of the LM curve which shows the sensitivity of money supply on interest rate and output level.

There could be two extreme cases with respect to the LM curve, viz., i) the LM curve is horizontal, and ii) the LM curve is vertical. We will see the implications of both the situations.

In the first situation, when the LM curve is horizontal, the public is prepared to hold all the money at a given interest rate. It reflects a situation known as *liquidity trap*. In such a case, monetary policy has no effect on the rate of interest and the level of output. A condition of liquidity trap exists when the rate of interest is very low (for example, nearly zero). Public would not want to hold bonds at such low interest rate.



**Fig. 14.6: Classical and Keynesian Ranges**

**IS-LM Analysis**

Let us now learn about classical and Keynesian positions through the IS–LM model. Fig. 14.6 shows the classical and the Keynesian ranges in the LM curve

Let us assume that the economy is operating at  $Y_1$ . The LM curve is infinitely elastic at  $Y_1$ . In case the government exercises an expansionary fiscal policy, which means government expenditure increases, then the  $IS_1$  curve shifts to  $IS'_1$ . There is nearly no increase in the rate of interest but income level has risen from  $Y_1$  to  $Y'_1$ . Rate of interest does not increase because sufficient idle money is available in the economy. This is the **Keynesian range** as individuals are in a situation of liquidity trap. Under such circumstance monetary policy is ineffective and government should take up fiscal measures.

If we see the other extreme in Fig. 14.6, where economy is operating at  $Y_3$  level, we realise that the LM curve is nearly vertical. Rate of interest is too high for people to hold money. The interest bearing assets are lucrative to invest the money. Hence, the real money balances are low. When government borrows (with an intention of increasing the level of investment), in such a situation, government investment becomes a competitor of private investment and there is no increase in total investment in the economy. Due to this high competition, the rate of interest rises but not the income level. This range of the LM curve is known as the **classical range**. Under such circumstances, fiscal policy is not much effective. We have already discussed the distinction between classical and Keynesian views in Unit 9.

The moderate range seems to be more realistic vis-à-vis the Keynesian and the classical ranges of the IS-LM model. Such a moderate range is depicted in Fig. 14.6 by the income level  $Y_2$ . When government investment increases, the complete ‘crowding out’ of the private investment does not take place. There is an increase in the rate of interest but there is an increase in the level of output also. In Fig. 14.6 we find that the output level increases from  $Y_2$  to  $Y'_2$  due to the shift in the IS curve from  $IS_2$  to  $IS'_2$ .

**Check Your Progress 2**

- 1) Explain how the adjustment process takes place in the IS-LM model.  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....
- 2) In what respects the classical range of the LM curve is different from the Keynesian range?  
.....  
.....  
.....  
.....  
.....

---

## 14.5 LET US SUM UP

---

We started this unit with a discussion on the simultaneous equilibrium in the goods market and the money market. It led to the unique combination of interest rate and the output level which indicates simultaneous equilibrium in both the markets. Any point away from the IS curve and/or the LM curve indicates the state of disequilibrium. In case of any disequilibrium, the adjustment process starts and the equilibrium in both the markets are restored.

Further, we discussed about the Classical and Keynesian ranges with respect to the LM curve. When the LM curve is vertical, it reflects a situation similar to the classical model where the output level does not change as a result of government borrowing. On the other hand, when the LM curve is nearly flat, it reflects a situation similar to the Keynesian model because the public investment leads to shifts the income level only and not the interest rate.

---

## 14.6 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

---

### Check Your Progress 1

- 1) Refer to Section 14.2.
- 2) Refer to Section 14.2.1.

### Check Your Progress 2

- 1) Refer to Section 14.3.
- 2) Refer to Section 14.4.
- 3) Refer to Section 14.5.
- 4) Refer to Section 14.6.

ignou  
THE PEOPLE'S  
UNIVERSITY

---

## GLOSSARY

---

<b>Aggregate Supply Curve</b>	: According to classical economists, the aggregate supply curve is vertical, implying that total output is always at the full employment level. In the short run, according to Keynes, the aggregate supply curve will be horizontal if the economy has under-utilised resources.
<b>Automatic Stabilizers</b>	: Revenue and expenditure items in the budget that automatically change with the state of the economy and tend to stabilize GDP.
<b>Autonomous Investment</b>	: Investment spending which is not dependent on income or interest rate.
<b>Autonomous Spending</b>	: A part of AD that is independent of the income and output level.
<b>Average Propensity to Consume</b>	: The ratio of consumption expenditure (C) to income (Y).
<b>Balance of Trade</b>	: It refers to exports and imports of visible items.
<b>Balanced Budget Multiplier</b>	: Equilibrium income rises by the same amount by which the government spending rises. It is assumed that the change in government spending is equal to the change in taxes. Taxes are taken as autonomous taxes.
<b>Bank Rate</b>	: Rate at which the central bank lends funds to the commercial banks.
<b>Bond</b>	: In economics, it is an instrument of indebtedness. It is a promise to pay its holder certain agreed upon amount of money at specified dates in the future.
<b>Broad Money</b>	: M3 is known as 'broad money' since it includes time deposits as well.
<b>Budget Deficit</b>	: When government receipts fall short of government expenditure, we encounter the problem of budget deficit.
<b>Budget Surplus</b>	: Excess of government revenue over government spending.
<b>Business Cycle</b>	: Periodical ups and downs in economic activity in an economy. There are four phases of a business cycle, viz., expansion, recession, depression, and recovery. During expansion phase the economy grows while during recession there is a deceleration in growth rate. Depression is much severe and the economy may



witness negative economic growth. During recovery, as the name suggests, the economy recovers from depression.

- Capital Goods** : These are goods which help in further production of goods. Example could be machineries.
- Cash Reserve Ratio (CRR)** : It is the percentage of bank deposits that the banks are required keep with the central bank. In India, in 2019 the CRR is 4 percent. Thus, if Rs. 100 is deposited in a bank, the bank needs to keep Rs. 4 with the RBI. The RBI can vary the CRR between 3 per cent and 15 per cent.
- Change in Inventories** : Inventories are stocks of finished goods/ semi-finished goods/ intermediate goods. Change in inventories is total inventories at the end of the year minus total inventories at the beginning of the year for an economy.
- Circular Flow** : It is a flow of goods or services or money from one (set of) transactor to another (set).
- Classical Economists** : Economists who subscribe to classical point of view. Eminent classical economists include Adam Smith, David Ricardo, J B Say, and A C Pigou.
- Classical Model** : A model of the economy derived from ideas of the pre-Keynesian economists. It is based on the assumption that prices and wages adjust instantaneously to clear markets and that monetary policy does not influence real variables such as output and employment.
- Classical Model** : It is a model based on the assumption that prices and wages adjust quickly to clear the markets.
- Cold Turkey** : It is the policy prescription of bring down inflation rate rapidly.
- Compensation of Employees** : Remuneration given by enterprises to employees for rendering labour services.
- Consumer Price Index** : Consumer Price Index represents the rate of increase in the consumer prices of a basket of goods and services.
- Core Inflation** : Core inflation is a measure of inflation that excludes items that face volatile price movement, notably food and energy.
- Cost-push inflation** : Cost-push inflation is a sustained rise in the general price level due to a rise in the cost of production in the economy.
- Cost-push inflation** : Cost-push inflation is a sustained rise in the general price level due to a rise in the cost of production in the economy.

<b>Crowding Out</b>	: It reflects a situation when increase in public investment is possible at the cost of private investment.
<b>Deflation</b>	: Deflation is a sustained decrease in the general price level.
<b>Demand-pull inflation</b>	: Demand-pull inflation is a sustained rise in the general price level due to an increase in aggregate demand.
<b>Departmental Enterprises</b>	: Part of the government sector. It consists of those enterprises, which run as a part of government departments producing goods and services. Examples could be railways, Post and Telegraph, etc.
<b>Depreciation</b>	: It is the loss in the value of capital asset because of normal wear and tear and expected obsolescence.
<b>Direct Personal Taxes</b>	: These are the taxes imposed on households in the form of income tax or wealth tax. Those on whom they are imposed pay them.
<b>Disposable income</b>	: Amount of income received by the households after taxes $Y_d = Y - T$
<b>Double Counting</b>	: It refers to the problem of counting the same good more than once. In order to avoid the problem, we consider the final goods and services only.
<b>Economic Agents</b>	: These are groups of transactors, which indulge in economic activities like production/ income generation/ addition to capital stock. Economic agents can be classified into producers, households, capital sector, rest of the world, and government.
<b>Economic Transactions</b>	: These are the transactions consisting of production, income generation and addition to capital stock.
<b>Enterprises</b>	: These are economic agents, which employ factors of production to generate a flow of goods and services in the economy.
<b>External Commercial Borrowings (ECB)</b>	: ECB are loans which are raised by a country's corporate sector from external financial organizations on commercial terms.
<b>Factor Cost</b>	: It is the total cost incurred to employ factors of production to give rise to a flow of goods and services in an economy. It is equal to value of market price minus Net Indirect Taxes.
<b>Factor Services</b>	: These are the services rendered by factors of production such as land, labour, capital and enterprise.

- Final Consumption Expenditure** : This is an expenditure incurred by households, enterprises and rest of the world to purchase final consumer goods, capital goods and net exports respectively.
- Financial Sector** : This sector of the economy mops up savings of various sectors and uses it for lending to other sectors of the economy.
- Fiscal Policy** : Government's taxes and spending behaviour.
- Fractional Reserve Banking System** : Under this system, banks are required to hold a certain fraction of their demand and time liabilities in the form of cash balances with the central bank.
- Goods Market Equilibrium** : When AD and AS interact with each other. All points on the IS curve reflects equilibrium in the goods market.
- Government Final Consumption Expenditure** : It is the expenditure incurred by government on the purchase of intermediate goods plus compensation of government employees. This expenditure is incurred to meet the collective consumption of the economy.
- Government Sector** : It is the sector, which produces goods and services that are not sold at a price. Such goods are meant to meet collective consumption requirements of an economy. The expenses of these goods are met by tax and non-tax revenue of the government.
- Great Depression** : The time duration when the over production and unemployment made it impossible for the world economies to operate at equilibrium. It started in 1929 and went on for a good 7-8 years.
- Gross Domestic Product (GDP)** : It is the sum of final goods and services produced in a country during a period of time, usually a year. We do not include intermediate goods and income acquired through illegal activities in the GDP. In most countries, including India, estimated value of GDP is available on a quarterly basis as well as on a yearly basis.
- Gross National Product (GNP)** : It is the value of goods and services produced in an economy over a year, without duplication but gross of depreciation. It is the goods and services produced by the normal residents of an economy.
- High-powered Money** : M0 is known as monetary base or central bank money or high-powered money.

- Hot Money** : Money which quickly moves from one nation to another in search of speculative gains.
- Household Sector** : It is the sector that supplies factor services to firms or enterprises. The factor incomes received by households are used to meet their final consumption requirements and the balance is used for savings, which are passed on to the capital sector.
- Hyper-Inflation** : Inflation is a persistent increase in general price level. When the rate of inflation is very high, it is said to be hyper-inflation. Many countries have seen episodes of hyper-inflation. In recent years, for example, Zimbabwe has witnessed inflation rate to the extent of 175 per cent per year.
- Hyper-inflation** : Hyper-inflation is a very rapid growth in the rate of inflation in which money loses its value to a point where alternative mediums of exchange.
- Income from Domestic Product accruing to Private Sector** : It is the factor income enjoyed by households and private sector over a year in an economy.
- Income-Leisure Trade-Off** : Change in income leading to a change in leisure/labour due to change in the wage rate.
- Inflation** : Inflation is a persistent increase in the general level of prices.
- Inflation Targeting** : The objective of the monetary policy in many countries is inflation targeting, where the central bank targets to achieve certain inflation rate. For example, in India, the Reserve Bank of India targets an inflation rate of 4 per cent with a tolerance band of 2 per cent.
- Inflation Tax** : Financing government expenditure by printing money increases prices for everyone, reducing their spending power just as a tax to finance the spending would. This is called an inflation tax.
- Intermediate Consumption** : It is the purchase of raw materials and services by a firm from other firms to produce goods or services.
- Inventories** : The stock of goods maintained by producers to tide over unexpected fluctuation in demand.
- Inventory** : Demand varies periodically but production is fixed. Thus a firm maintains certain stock of goods to meet uncertainties in demand, supply and movement of

goods. If demand exceeds current production there is decline in the stock. Similarly, if demand falls short of production there is accumulation of inventory.

- Investment** : It is the creation of capital goods in an economy over a year. It can be for replacement of worn out capital or for addition to total capital stock of an economy.
- Investment Multiplier** : It is the multiple by which income or output of an economy increase when investment increases by certain amount. It is given by the formula  $\alpha = \frac{1}{1-c}$  where  $c$  stands for marginal propensity to consume.
- Invisible Hand** : The term coined by Adam Smith, meant that government should not intervene in the running of an economy too often and too strongly.
- Involuntary Unemployment** : It indicates a situation where unemployment is not voluntary; a person is looking for a job but cannot find one.
- IS Curve** : Investment-Saving curve showing the inverse relationship between interest rate and income.
- Keynesian Model** : A model based on the ideas contained in Keynes' General Theory. It assumes that demand creates its own supply so long as unemployment exists, and that prices and wages do not adjust instantaneously to clear markets.
- Liquidity Preference Region** : People are willing to hold whatever amount of money is supplied to them such that the monetary policy becomes completely ineffective.
- Liquidity Trap** : At a very low rate of interest (nearly zero), people wish to hold any amount of money and not interested in the interest-bearing assets.
- LM Curve** : Locus of the points which show the money market equilibrium at various combinations of income and rate of interest.
- Marginal Product of Labour** : Change in the output due to an additional unit of labour employed.
- Marginal Propensity to consume (mpc)** : The increase in consumption due to one-rupee increase in income. It is arrived at by calculating  $\frac{\Delta Y}{\Delta C}$ .
- Marginal Propensity to Save** : Increase in saving due to one-rupee increase in the income. It is usually denoted by 's' or mps.

<b>Market Price</b>	: It is the price at which a commodity or service is actually purchased by a households or a firm.
<b>Mixed Income of Self-employed</b>	: It is the factor income generated by unincorporated enterprises where it is not possible to distinguish between compensation of employees and operating surplus.
<b>Money</b>	: It is the stock of assets which is used for transaction purposes.
<b>Money Flows</b>	: These are the flows, which are normally a consequence of real flows between various sectors of an economy.
<b>Money Multiplier</b>	: The money multiplier is the ratio of the stock of money to the stock of high powered money.
<b>Money Transactions</b>	: These are the transactions between one transactor and another or between one group of transactors and another in terms of money to money without being backed by real transactions.
<b>Multiplier</b>	: The amount by which the equilibrium output changes when autonomous spending increases by one unit.
<b>Narrow Money</b>	: M1 is also known as ‘narrow money’.
<b>National Income</b>	: It is the same aggregate as net national product at factor cost ( $NNP_{FC}$ ).
<b>National Wealth</b>	: Total wealth of the residents of a country.
<b>Net Current Transfers from the Rest of the World</b>	: It is the difference between unrequited transfers from the rest of the world, over a year, and such transfers from the economy to the rest of the world.
<b>Net Domestic Capital Formation</b>	: It is that part of total production of capital goods and inventories which are meant to add to total capital stock of an economy over a year in an economy.
<b>Net Domestic Product (NDP)</b>	: It is the value of goods and services produced in an economy, over a year, without duplication, net of depreciation. This concept is related to the concept of domestic territory.
<b>Net Exports (NX)</b>	: It is the difference between total value of exports and imports over a year.
<b>Net Factor Income from Abroad</b>	: It is the difference between factor incomes earned by the normal residents of an economy stationed abroad temporarily and the factor incomes earned by normal residents of the rest of the world stationed in the economy temporarily.

- Net Indirect Taxes** : It is the difference between indirect taxes and subsidies.
- Net National Disposable Income (NNDP)** : It is the total income at the disposal of a country by way of factor income as well as transfer incomes from the rest of the world. It is identical to NNP at market price plus net current transfers from abroad.
- Non-departmental Enterprises** : These are the government enterprises for which autonomous corporations are set up. The goods or services produced by these enterprises are sold for a price. They are the profit making enterprises set up in the public sector.
- Normal Residents** : They are the households or institutions, which have their centre of interest in the economy but some of them may temporarily be stationed abroad.
- Open Economy** : It is an economy, which has economic transactions with the rest of the world.
- Open Market Operations** : Sale/ purchase of government securities by the central bank to/ from the public and the banks.
- Operating Surplus** : It is the factor income generated by ownership and management of property. It consists of rent, interest, and profits.
- Per Capita GDP** : The ratio of Gross domestic Product (GDP) to total population of a country.
- Personal Disposable Income** : It is the factor income and transfer incomes left at the disposal of the households after paying direct personal taxes and miscellaneous receipts of government administrative departments from personal income.
- Personal Income** : It is the factor income and transfer incomes enjoyed by the households of an economy over a year.
- Phillips Curve** : It shows the relationship between inflation and unemployment. Phillips curve is downward sloping in the short-run, implying a trade-off between the two. In the long-run the Phillips Curve is vertical, implying that unemployment rate cannot be brought down below natural rate of unemployment.
- Price Level** : It is the average of prices of all the goods and services produced in a country.

<b>Private Final Consumption Expenditure</b>	: It is the expenditure incurred by the households of an economy, over a year, on the purchase of goods and services meant for final consumption.
<b>Private Income</b>	: It is the factor income and transfer incomes enjoyed by households and private sector of an economy over a year.
<b>Production Function</b>	: It is the relationship between factors of production (inputs) and the available technology with the quantity of output produced.
<b>Quantity Theory of Money</b>	: The quantity theory of money states that there is a direct relationship between the quantity of money in an economy and the level of prices of goods and services sold.
<i>quid pro quo</i>	: It is a Latin phrase which means an exchange relationship between persons/ economic agents. When you get something from a transactor in return for (in exchange of) something, it is called quid-pro-quo.
<b>Rate of Gross Domestic Capital Formation</b>	: It is defined as gross domestic capital formation divided by $GDP_{MP}$ multiplied by 100.
<b>Rate of Gross Domestic Saving</b>	: It is equal to gross domestic savings divided by GDP at MP multiplied by 100.
<b>Rate of Net Domestic Capital Formation</b>	: It is net domestic capital formation divided by NDP at market price (MP) multiplied by 100.
<b>Rate of Net Domestic Saving</b>	: It is equal to net domestic savings divided by NDP at MP multiplied by 100.
<b>Rate of Net Foreign Capital Inflow</b>	: It is the difference between rate of gross domestic capital formation and rate of gross domestic savings.
<b>Real Flows</b>	: These are the flows of goods or services from one set of economic agents to another..
<b>Real Money Balances</b>	: Quantity of nominal money divided by the price level.
<b>Real Transactions</b>	: Those transactions, which are related to exchange of goods and services between two transactors (economic agents) or two groups of transactors.
<b>Recession</b>	: In business cycle, recession indicates the phase when there is an economic slowdown; economic growth is in a decelerating phase.



- Replacement Investment** : It is that part of currently produced capital goods, which are meant to replace the capital stock arising out of normal wear and tear, and expected obsolescence.
- Repo Rate** : Rate at which the central bank lends funds to the commercial banks against submission of collateral such as securities by the banks.
- Residential Investment** : Investment incurred on construction of new houses and buildings is called as residential investment.
- Rest of the World Sector** : This sector deals with economic transactions of an economy with the rest of the world.
- Reverse Repo Rate** : Rate at which the commercial banks can deposit their excess liquidity with the central bank, by purchasing securities.
- Sacrifice Ratio** : It refers to the percentage loss of output for bringing down inflation by one per cent.
- Simultaneous Equilibrium** : Equilibrium in the goods market as well as in the money market at the same time.
- Slope of Investment Function** : It indicates the sensitivity of investment to changes in the interest rate.
- Stagflation** : Stagflation refers to economic condition where economic growth is very slow or stagnant and prices are rising.
- Statutory Liquidity Ratio (SLR)** : Banks are required to hold a certain percentage of their demand and time deposits in the form of government securities. Currently (in 2019) the SLR is 19.5 per cent in India.
- Structural theory of Inflation** : The supporters of structural theories believed that inflation arises due to structural maladjustments in the country or due to certain institutional features of the business environment.
- Transfer Payments** : One-way payment of money for which no goods or services are received in exchange.
- Value of Money** : The value of money is its purchasing power, the amount of goods and services it can buy. Value of money is inversely related to price level. When price level increases, value of money declines.
- Velocity of Money** : The number of times the money stock of turns over per year in order to finance the annual flow of transactions or income.

- Wealth Budget Constraint** : Sum of individual's demand for money and demand for bonds is the individual's total financial wealth.
- Wholesale Price Index** : Wholesale Price Index represents the rate of increase in the wholesale prices of products.

---

## **SOME USEFUL BOOKS**

---

Abel Andrew B, Ben Bernanke, and Dean Croushore, 2017, *Macroeconomics*, Ninth Edition, Pearson Education

Case Karl E., Ray C. Fair, and Sharon E. Oster, 2017, *Principles of Economics*, Twelfth Edition, Pearson Education

Dornbusch Rudiger, Stanley Fisher, and Richard Startz, 2018, *Macroeconomics*, Thirteenth Edition, McGraw Hill

Froyen Richard T., 2012, *Macroeconomics: Theories and Policies*, Tenth Edition, Person Education

Sikdar Shoumyen, 2011, *Principles of Macroeconomics*, Second Edition, Oxford University Press