**Introduction**

IS-LM Model was formed by J.R hicks in his article "Mr. Keynes and the classics" in 1937. Where IS stand for **I**nvestment (I) and **S**aving (S) & LM stands for **L**iquidity Preference or Demand for money (L) and Supply of **M**oney (M). The IS model work in product market whereas LM model works in money market.

IS Model : 'I' represent for investment and 'S' represents for saving. So it is a Investment saving curve which shows the equality between saving and investment.

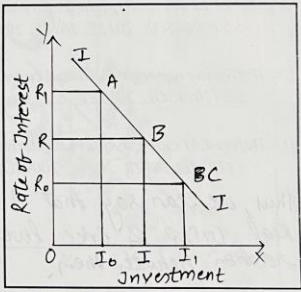
## Q1. What is IS curve? What causes shift in IS curve ? Explain its derivation graphically.

**Ans:** The IS curve is a set of all those points which show combinations of interest rate and equilibrium level of GDP. Where investments and savings are equal to each other. Its slope is negative signifies that there is a negative relationship between interest rate and equilibrium income levels. IS model works in Product market.

**The investment demand function**

***Relation between Rate of Interest and Investment :***

There is a inverse relationship between investment and rate of interest. At a higher rate of interest, the investment expenditure will fall and at lower rate of interest investment will rise. When rate of interest rises, producer will get capital at higher rate of interest, this will increase the cost for producer, due to rise in cost the profits of the producer declining, producer will take less interest in new project. As a result the investment will fall. On the contrary, when the rate of interest falls, producer will get the capital at lower rate of interest, this will decrease the cost for producer, due to fall in cost the profits of the producer starts rising, producer will take more interest in new projects. Thus, we can say that there is a inverse relationship between Rate of Interest and Investment. The curve of investment expenditure will downward sloping.



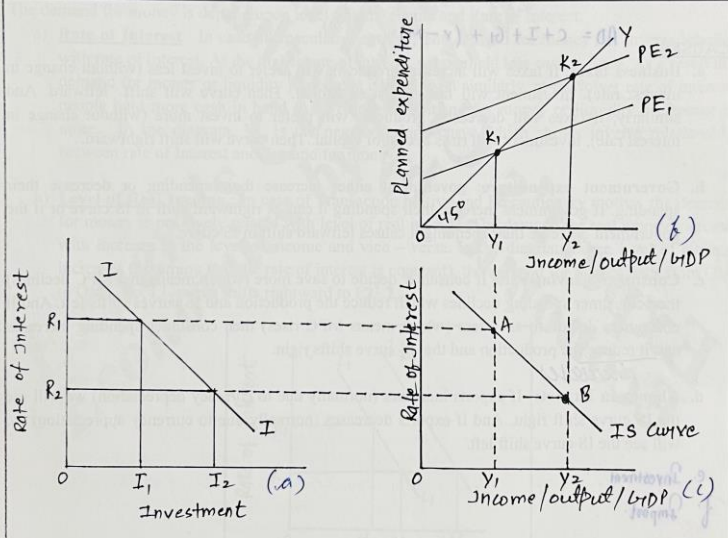

It can be explained with the help of diagram:

In the diagram, Rate of interest is shown on Y-axis and Investment is shown on X-axis. II is the investment curve which is downward sloping showing that there is a negative relation between rate of interest and investment. When the rate of interest is OR the investment is OI. It is shown by point B. When the Rate of interest rises from OR to OR1, the investment falls from OI to OI0. It is shown by point A. And similarly when the rate of interest falls from OR to OR0, investment rises from OI to

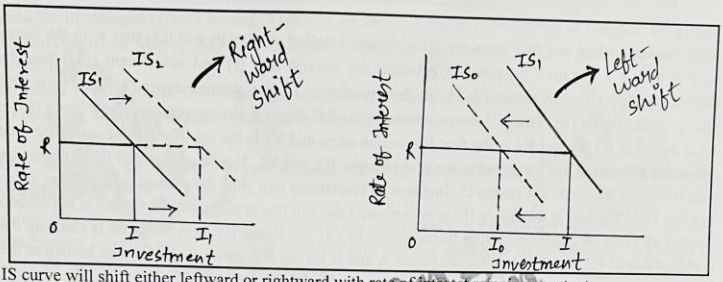
011. It is shown by point C. When we join A, B and C, we get a downward sloping curve calle Investment curve.

## Derivation of IS curve

In the figure you can see that there are three figures labelled as (a), (b) and (c). start with the figur (a) that shows a negative relationship between the interest rate (r) and investment (I). when th interest rate is R1 the investment is I1. At the investment I1, the planned expenditure curve is PE Shown in the figure (b). The PE1 curve intersects the 45° line, i.e. the aggregate supply curve (PE = Y) at the point K1. Hence K1 is the first Keynesian cross and Y1 is the equilibrium income level. The figure (c) plots the point A showing the combination R1 and Y1. Now suppose that the interest rate falls to R2, investment will rise to I2. Increase in investment will shift the planned expenditure curve to PE2. The PE2 line in the figure (b) now intersects the 45o line at the point K2, which is the second Keynesian cross. At K2 equilibrium income level is Y2. The figure (c) plots the point B showing the combination of R2 and Y2. Joining the points A and B we get a downward sloping line known as the IS.



## Shift in IS curve




IS curve will shift either leftward or rightward with rate of interest remains constant.

**CAUSES:** $AD = C + I + G_1 + (x - M)$

a. **Business taxes**: if taxes will increase, producers will prefer to invest less (without change in interest rate). investment will fall at cost of capital. Then curve will shift leftward. And similarly, if taxes will decreases, producers will prefer to invest more (without change in interest rate), investment will rises at cost of capital. Then curve will shift rightward.

b. **Government expenditure**: government either increase their spending or decrease their spending. If government increase their spending it causes rightward shift in IS curve or if the government decrease their spending it causes leftward shift in IS curve.

c. **Consumer's saving rate**: if consumer decide to save more (which means that MPC declines) then consumer spending declines which reduce the production and IS curves shifts left. And if consumers decide to save less (which means MPC rises) then consumer spending increases and it reduce the production and the IS curve shifts right.
increases

d. **Change in Exports:** If exports increases (normally due to currency depreciation) we will see the IS curve shift right. And if exports decreases (normally due to currency appreciation) we will see the IS curve shift left.

e. Investment

f. Import

# LM CURVE

**Q. what is LM Curve? What causes shift in LM curve ? Explain its derivatio graphically.**

Ans: The LM curve is a set of all those points which show interest rate and equilibrium levels income. Its slope is positive which is showing that there is an increase in interest rate which w cause increase in equilibrium level of income.

In other words, it shows the relationship between the rate of interest and level of GDP where th demand of money is equal to the supply of money.

So, the nature of LM curve depends upon the two factor:

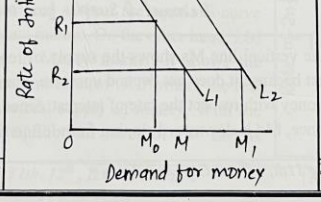
**Demand for money**

People demand money for three reasons: (i) Transaction Motive (2) Precautionary motive and (3) Speculative motive.

The demand for money is depend upon level of real income and Rate of Interest.

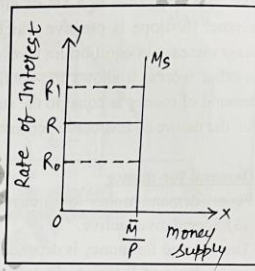
a) **Rate of Interest** : In case of Speculative motive, The demand for money has inverse relati with rate of interest. At the higher rate of interest, people held less cash in hand. As a result t demand for money or liquidity preference is less. And similarly, at the lower rate of intere people held more cash in hand. As a result the demand for money or liquidity preference more. In the diagram, $L_1L_1$ is the negative slope curve which shows inverse relationsl between rate of Interest and demand for money.

b) **Level of Real Income :** In case of Transaction motive and Precautionary motive, the dema for money is positively related with level of real income. The demand for real money incre with increase in the level of income and vice – versa. In the diagram, when level of inco increases (assuming that the rate of interest is constant), the demand for money rises from O to OM1. So, $L_1L_1$ curve shifts rightward to $L_2L_2$



**Supply of Money**

This theory is assumed that the supply of money is constant. Money supply is independent of the Rat of Interest. Because the supply of money is controlled by the central Bank. The money supply i determined by the central bank is nominal money supply. Obviously they determined the nomina money supply. Because it is the supply which is required by the people. But We need to find out the real money supply, which is determined by the following formulae:



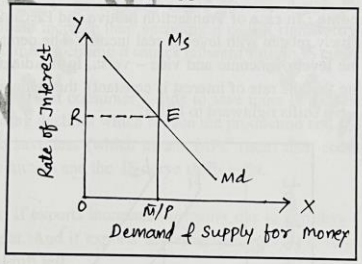

$$\text{Real Money Supply} = \frac{\textit{Nominal money Supply}}{\textit{Price level}}$$

In the diagram, supply of money is equal to M/P. M represent the nominal money supply and P represent the price level. So M/P shows the real money supply on X- axis. And the rate of Interest is shown on Y-axis. As we know that the money supply is independent of rate of interest, so it is constant at all level of rate of interest. It is shown by vertical straight line parallel to Y-axis.

**Money Market Equilibrium**

The equilibrium in money market is determined at the point where the demand for money (Real Demand) is equal to the supply of money (Real Money Supply).

$$M^d = M^s$$




Graphically in the figure, the vertical line Ms shows the supply of real money and it is the vertical line against the rate of interest because it does not depend upon the rate of interest. Apart, the line Md shows the demand for real money with respect the rate of interest. Since, money demand is negatively related to the interest rate, hence, Md is downward sloping from left to right.

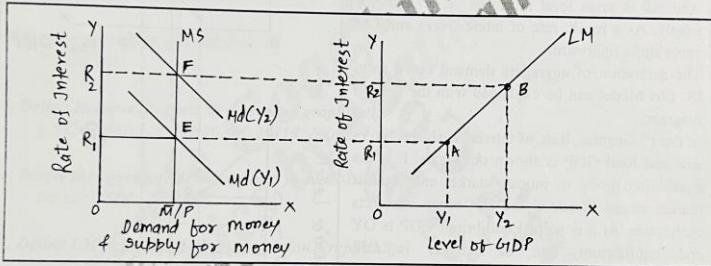
According to Keynes, equilibrium interest rate is determined where the supply of real money is equa to the demand for real money. In the figure, this equality is determined at the point where Md= Ms At this point, interest rate is OR.

## Derivation of LM curve

Now we can derive LM curve easily as follows:

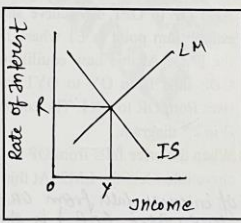
The LM curve can be derived from the demand for money and supply equilibrium in money market. There are two diagrams, figure (a) which shows the relationship between Rate of interest and Demand & Supply of real money and figure (b) which show the derivation of LM curve with the help of first figure.

In the figure (a), Md ($Y_1$) is the demand curve for money, for a given level of income is Y1. This demand curve intersects the real money supply curve at the point E. It is the money market equilibrium. At this point equilibrium interest rate is R1. Corresponding to the point E we have the point A in the figure (b). suppose income increases from $Y_1$ to $Y_2$, then due to positive relationship between income and money demand, the money demand curve shifts upward and becomes Md($Y_2$). This curve intersects the real money supply curve at point F where interest rate is R2. Corresponding to the F we have the point B in the figure (b). on joining the point A and point B, we get an upward sloping line known as LM curve.




***Q3. Explain the equilibrium level of GDP with IS-LM curve. Derive the aggregate demand curve from IS-LM Model.***

**Ans:** In modern economy the equilibrium level of GDP is determined at the point where IS curve and LM curve intersects each other. IS curve shows the combination of rate of interest level of GDP where investment and savings are equal. IS curve shows the equilibrium in Product market. On the other hand, LM curve shows the equilibrium in Money market. It shows the combinations of rate of interest and level of GDP where the real demand of money equal to the real supply of money. With the help of following diagram, equilibrium level of IS- LM is



$MS \uparrow \rightarrow LM(R) \rightarrow ROI \downarrow \rightarrow PI \downarrow$
$MS \downarrow \rightarrow LM(L) \rightarrow ROI \uparrow \rightarrow PI \uparrow$

shown.

In the diagram, Real GDP is shown on X-axis and Rate of Interest is shown on Y-axis. E is the equilibrium point of product market and money market where the IS and LM curve intersects each other. At this point Equilibrium GDP is OY and equilibrium rate of interest is OR.

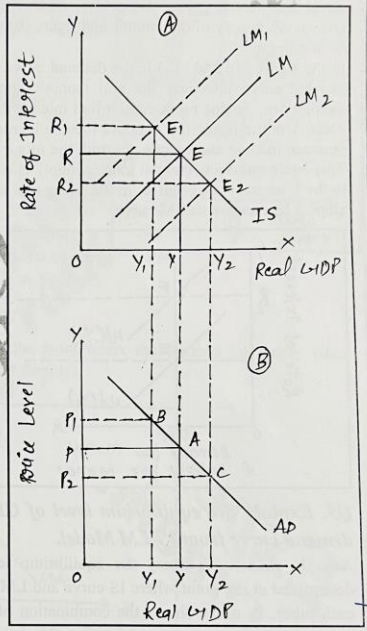
**Derivation of aggregate demand curve from IS-LM Model.**

Aggregate demand curve is the combination of real GDP and Price Level. It is a downward sloping curve implying inverse relationship between price level and real GDP. IS-LM Model offers an alternative technique to derive AD curve. This becomes possible if we allows the effect of changes in price level on the LM curve.

When the price rises, LM curve shifts to the left, and vice- versa. This is because a rise in price level reduces the real money supply. As a result, rate of interest Rises and LM curve shifts leftward. And fall in price level increases the real money supply. As a result, rate of interest falls and LM curve shifts rightward.

The derivation of aggregate demand curve from IS- LM Model can be explained with the help of diagram:

In the 1st diagram, Rate of interest is shown on Y-axis and Real GDP is shown on X-axis. E is the equilibrium point of money market and product market where IS curve and LM curve intersects each other. At this point Equilibrium GDP is OY and equilibrium rate of interest is OR. Corresponding the point E, there is point A in the 2nd diagram. at this point A, real GDP is OY and the price level is OP. When the price increases from OP to OP1, LM curve shifts to LM1. New equilibrium point is E1 where IS curve intersects the LM1. At this new equilibrium point E1, real GDP falls from OY to OY1 and rate of interest rises from OR to OR1. The combination of lower GDP (=OY1) and high price OP1 is shown by point B in 2nd diagram.




When the price falls from OP to OP2, LM curve shifts to LM2. New equilibrium point is E2 where IS curve intersects the LM2. At this new equilibrium point E2, real GDP rises from OY to OY2 and rate of interest falls from OR to OR2. the combination of higher GDP ($OY_2$) & lower Price ($OP_2$) is shown by point (C) in 2nd diagram. In diagram when we joint all points A, B & C we get a downward negatively slope curve, call Aggregate Demand Curve