**Chapter- 5: The IS- LM Curve Model**

**Introduction:**

* According to Prof. J. M. Keynes, national income is determined at the level where aggregate demand (i.e., aggregate expenditure) for consumption and investment goods (C + I) equals aggregate supply.
* Keynes in his simple analysis of equilibrium in the goods market, he considers that investment is determined by the rate of interest and marginal efficiency of capital and it is independent of the level of national income.
* According to Prof. Keynes, rate of interest is determined in the money market equilibrium by the demand for money and the supply of money.
* There is one flaw in this Keynesian model of money market equilibrium. In this model whereas the changes in the rate of interest in the money market affect investment and therefore the level of income and output in the goods market, there is seemingly no inverse influence of changes in goods market (investment and income) on the money market equilibrium.
* Hicks, Hansen, Lerner and Johnson have put forward a complete and integrated model based on the Keynesian framework where investment, national income, rate of interest, demand for and supply of money are interrelated and mutually interdependent and can be represented by the two curves called *IS* and *LM* curves.
* The *IS- LM model* shows how the level of national income and rate of interest are jointly determined by the simultaneous equilibrium in the two interdependent goods and money markets.
* By Goods Market, we mean all the buying and selling of goods and services.
* By Money Market, we mean the interaction between demand for money and the supply of money

**Goods Market Equilibrium: The Derivation of the IS Curve**

* The goods market is in equilibrium when aggregate demand is equal to income.
* The aggregate demand is determined by consumption demand and investment demand.
* In the Keynesian goods market equilibrium we also introduce the rate of interest as an important determinant of investment.
* When the rate of interest falls the level of investment increases and vice versa.
* When the rate of interest falls, it lowers the cost of investment projects and thereby raises the profitability of investment. The businessmen will therefore undertake greater investment at a lower rate of interest.
* The increase in investment demand will bring about increase in aggregate demand which in turn will raise the equilibrium level of income.
* The IS curve seeks to find out the equilibrium level of national income as determined by the equilibrium in goods market by a level of investment determined by a given rate of interest.
* The IS curve shows different equilibrium levels of national income with various rates of interest.
* The lower the rate of interest, higher will be the equilibrium level of income.
* The IS curve is the locus of those combinations of rate of interest and the level of national income at which goods market is in equilibrium.

**Derivation of IS Curve:**



**Why does IS Curve Slope Downward?**

The decrease in the rate of interest bring about to increase in the planned investment which increases the aggregate demand (upward shift of aggregate demand) therefore leads to the increase in the equilibrium level of national income. This makes the IS curve to slope downward.

**The steepness of the IS curve depends on:**

1. the elasticity of investment demand curve; and
2. the size of the multiplier.

**Shift in the IS Curve:**

* It is the autonomous expenditure which determines the position of the IS curve and changes in the autonomous expenditure causes a shift in it.
* By autonomous expenditure we mean the expenditure (investment expenditure, government expenditure, consumption expenditure) which does not depend on the level of income and the rate of interest.

**Money Market Equilibrium: Derivation of LM Curve**

* The LM curve can be derived from the Keynesian theory from its analysis of money market equilibrium.
* According to Keynes, demand for money to hold depends on transactions motive and speculative motive.
* Demand for money can be written as: Md = f(Y, r)
* The intersection of various money demand curves corresponding to different income levels with the supply curve of money fixed by the monetary authority would give us the LM curve.
* The LM curve relates the level of income with the rate of interest which is determined by money- market equilibrium corresponding to different levels of demand for money.
* The LM curve tells what the various rates of interest will be (given the quantity of money and the family of demand curves for money) at different levels of income.

**Derivation of LM Curve:**

* We have derived the LM curve from a family of demand curves for money. As income increases, money demand curve shifts outward and therefore the rate of interest which equates supply of money with demand for money rises.



* LM curve slopes upward to the right. This is because with higher levels of income, demand curve for money (Md) is higher and consequently the money market equilibrium (that is, the equality of the given money supply with money demand curve occurs at a higher rate of interest).
* This means that rate of interest varies directly with income.

**The slope of LM curve:**

* The slope of LM curve depends on two factors:
1. The responsiveness of demand for money to changes in income. (Md = f(Y)); and
2. The elasticity or responsiveness of demand for money to the changes in rate of interest.
* The lower the elasticity of liquidity preference for speculative motive with respect to the changes in the rate of interest, the steeper will be the LM curve. On the other hand, if the elasticity of liquidity preference (money demand function) to the changes in the rate of interest is high, the LM curve will be flatter or less steep.

**Shift in the LM Curve:**

* Factors that determine the position of LM curve: LM curve is drawn by keeping the stock or money supply fixed. Therefore, when the money supply increases, given the money demand function, it will lower the rate of interest at the given level of income. This is because with income fixed, the rate of interest must fall so that demand for money for speculative and transactions motive rises to become equal to the greater money supply. This will cause the LM curve to shift outward to the right.
* The other factor which causes a shift in the LM curve is the change in liquidity preference for a given level of income.
* If the liquidity preference function for a given level of income shifts upward, this, given the stock of money, will lead to the rise in the rate of interest for a given level of income. This will bring about a shift in the LM curve to the left.
* If the money demand function (liquidity preference) for a given level of income declines, it will lower the rate of interest for a given level of income and will therefore shift the LM curve to the right.

**The LM Curve: The Essential Features**

* The LM curve is a schedule that describes the combinations of rate of interest and level of income at which money market is in equilibrium.
* The LM curve slopes upward to the right.
* The LM curve is flatter if the interest elasticity of demand for money is high. On the contrary, the LM curve is steep if the interest elasticity demand for money is low.
* The LM curve shifts to the right when the stock of money is increased and it shifts to the left if the stock of money supply is reduced.
* The LM curve shifts to the left if there is an increase in the money demand function which raises the quantity of money demanded at the given interest rate and income level. On the other hand, the LM curve shifts to the right if there is a decrease in the money demand function which lowers the amount of money demanded at given levels of interest rate and income.

**Simultaneous Equilibrium of the Goods and Money Market:**

* The IS- LM curves relate the two variables: income and the rate of interest.
* The equilibrium rate of interest is determined at the point where IS and LM curves cut to each other.



**Effect of Changes in Supply of Money on the Rate of Interest and Income Level:**

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**The Criticisms of the IS- LM Model:**

1. It is based on the assumption that the rate of interest is quite flexible.
2. The model is based on the assumption that investment is interest- elastic that is, investment varies with the rate of interest. If investment is interest – inelastic, then the IS- LM model breaks down.
3. Don Patinkin and Milton Friedman have criticised by saying that the division of the economy into two sectors- monetary and real is artificial and unrealistic. These sectors are quite interwoven and act and react on each other.
4. Further, Patinkin has pointed out that the IS- LM model has ignored the possibility of changes in the price level of commodities. According to him, the various economic variables such as supply of money, propensity to consume or save, investment and the demand for money not only influence the rate of interest and the level of national income but also the prices of commodities and services.

**IS- LM Model: Algebraic Analysis**

***The derivation of Equation for IS Curve:*** The IS curve is derived from goods market equilibrium. The IS curve shows the combinations of levels of income and interest at which goods market is in equilibrium.

Aggregate demand consists of consumption demand, investment demand, government expenditure on goods and services and net exports. Consumption demand is a function of disposable income. Investment is negatively related to rate of interest. Thus,

C = a + bY (Consumption function)

I = Ia – dr (Investment function)

AD = C + I + G + NX

Where, AD = Aggregate demand,

C = Consumption expenditure,

A = Autonomous consumption,

B = Marginal propensity to consume (MPC),

Y = Income,

I = Investment expenditure,

Ia = Autonomous investment,

D = Sensitivity of investment to the change in rate of interest,

G = Government expenditure

NX = Net Exports

Product market is in equilibrium when

Y = AD = C(Y) + I(r) + G + NX

Or, Y = a + bY + Ia – dr + G + NX

Or, Y – bY = a + Ia – dr + G + NX

Or, Y(1-b) = a + Ia – dr + G + NX

Or, Y = $\frac{1}{1-b}$(a + Ia + G + NX) - $\frac{dr}{1-b}$

The above equation describes IS curve. Terms in the brackets are all autonomous expenditure and are independent of both income and rate of interest. If we denote all these autonomous expenditures by $Ā$, then the above equation can be written as –

Y = $\frac{1}{1-b}$($Ā$) - $\frac{1}{1-b}$.$ dr$

Or, *Y =* $\frac{1}{1-b}(Ā- dr)$

$\frac{1}{1-b} $is the income multiplier and b is marginal propensity to consume. Given the value of autonomous expenditure, we can obtain value of Y at different rates of interest to draw an IS curve. The value of autonomous expenditure ($Ā$) determines the intercept of the IS curve, d in the term *dr* shows the sensitivity of investment to the changes in rate of interest and determines the slope of IS curve. Since fall in investment rate increases investment spending, it will raise aggregate demand and thus the equilibrium level of income. The slope of the IS curve depends on the size of the income multiplier.

***Problem 1:*** The following equations describe an economy:

C = 10 + 0.5Y;

I = 190 – 20r. Derive the equation for IS curve.

**Solution:** IS curve describes the equation for product market equilibrium at various combinations of level of income and rate of interest.

Y = AD = C + I

Y = 10 + 0.5Y + 190 – 20r

Y – 0.5Y = 200 – 20r

Y (1- 0.5) = 200 – 20r

½ Y = 200 – 20r

Y = 400 – 40r.

Thus IS curve is: **Y = 400 – 40r.**

***Problem 2:*** The following equations describe an economy

C = 100 + 0.75Yd

I = 50 – 25r

T = G = 50

Where *C* is aggregate consumption, *Yd* is disposable income, *I* is aggregate investment. *T* is taxes, *G* is government purchases and *r* is the rate of interest. Derive the *IS* curve for the economy.

**Solution:** Y = C + I + G

Now, C = 100 + 0.75Yd = 100 + 0.75 (Y- T) = 100 + 0.75 (Y – 50)

 I = 50 – 25r; G = T = 50

Hence, Y = C + I + G

Y = 100 + 0.75 (Y – 50) + 50 – 25r + 50

Y = 200 + 0.75Y – 37.5 – 25r

Y – 0.75Y = 162.5 – 25r

0.25Y = 162.5 – 25r

Y = 650 – 100r

Thus, IS equation will be: **Y = 650 – 100r**

***The derivation of Equation for LM Curve:***LM curve is a curve that shows combinations of interest rates and levels of income at which money market is in equilibrium. That means demand for money is equal to supply of money. We explain the derivation of LM curve in two steps. First, we show how money demand depends on interest rate and level of income. It is important to note that in their demand for money people care more about the purchasing power of money, that, people’s demand is for real money balances rather than nominal money balances. Real money balances are given by *M/P* where *M* stands for nominal money demand and *P* for price level.

The demand for real money balances depends on the level of real income and interest rate. Thus Md = L(Y, r). Demand for real money balances increases with the rise in level of income and decreases with rise in rate of interest. Let us assume that money demand function is linear. Then

L(Y, r) = kY – hr; where k, h > 0

Parameter *k* represents how much demand for real money balances increases when level of income rises. Parameter *h* shows how much demand for real money balances decreases when rate of interest rises. The equilibrium in the money market is established where demand for real money balances equals supply of real money balances and is given by

$\frac{M}{P}$ = kY – hr

Money supply (*M*) is set by the central bank of a country and we assume it to remain constant for a period. We also assume the price level (*P*) to remain constant.

Solving the above equation for interest rate, *r*, we have

***r =*** $\frac{1}{h}$***(kY –*** $\frac{M}{P}$***)***

The above equation describes the equation for LM curve. This equation gives us the equilibrium rate of interest for any given value of level of income (Y) and real money balances. Thus LM curve describes money market equilibrium for different values of income and rate of interest, given a fixed value of real money balances (M/P), we obtain a rate of interest for different values of income.

In the above equation for LM curve, the coefficient (k) of income (Y) is positive, LM curve will slope upward. That is, higher income requires higher interest rate for money market to be in equilibrium, given the supply of real money balances. Since the coefficient of real money balances is negative, the expansion in real money balances will cause a shift in the LM curve to be right, and decrease in the real money balances will shift LM curve to the left.

Form the coefficient of income k/h, we can know whether LM curve is steep or flat. If demand for money is not much sensitive to level of income, then k will be small. Therefore, in case of small k (that is, low sensitivity of interest with respect to change in income), small change in interest rate is required to offset a small increase in money demand caused by a given increase in income.

***Problem 3:*** Given the following data about the monetary sector of the economy:

Md = 0.4Y – 80r

Ms = 1200 million

Where, *Md* is demand for money, *Y* is the level of income, *r* is the rate of interest and *Ms* is the supply of money.

Derive the equation for LM curve and give the economic interpretation of this curve.

***Solution:*** For money market to be in equilibrium,

Md = Ms

0.4Y – 80r = 1200

80r = 0.4Y – 1200

r = $\frac{1}{200}$Y - 15

Thus we get the following LM curve: r = $\frac{1}{200}$Y – 15

LM curve means what would be rate of interest when money market is in equilibrium, given the level of income. Thus, if level of national income is SR 4000 million, then using LM equation, we have:

r = $\frac{1}{200}$× 4000 – 15

r = 20 – 15 = 5%

Thus, at income of SR 4000 million, rate of interest will be 5 per cent when money market is in equilibrium.

Now, if level of income is SR 4400 million, equilibrium rate of interest will be:

r = $\frac{1}{200}$Y - 15

r = $\frac{1}{200}$× 4400 – 15

r = 22 – 15 = 7%

Thus, at income of SR 4400 million, rate of interest will be 7 per cent when money market is in equilibrium.

***Problem 4:*** the following data is given for the monetary sector of the economy:

Transaction demand for money, Mt = 0.5Y, Speculative demand for money, Msp = 105 – 1500r and money supply Ms = 150. Derive LM equation from the data.

**IS- LM Model: Algebraic Analysis**

**(Joint Equilibrium of Income and Interest Rate)**

The intersection of IS and LM curves determines joint equilibrium of income and interest rate. We can obtain the equilibrium values by using the equations of IS and LM curves:

Equation for IS curve: *Y =* $\frac{1}{1-b}(Ā- dr)$

Equation for LM curve: *r =* $\frac{1}{h}$*(kY –* $\frac{M}{P}$*)*

To find equilibrium values we substitute the interest rate from the LM equation into the IS equation. By doing so, we have

 *Y =* $\frac{1}{1-b}[Ā- d( \frac{1}{h}\left(kY – \frac{M}{P}\right)]$

*Y =* $\frac{1}{1-b}[Ā- \frac{d}{h}\left(kY – \frac{M}{P}\right)]$

*Y =* $\frac{1}{1-b}[Ā- \frac{d}{h}\left(kY)+ \frac{d}{h}(\frac{M}{P}\right)]$

*The equation shows that the equilibrium level of income depends on exogenously given autonomous variables (*$Ā$*) such as autonomous consumption, autonomous investment, government expenditure on goods and services, and the real money supply (*$\frac{M}{P}$*) and further on the size of multiplier (*$\frac{1}{1-b}$*). It is noticed that higher the autonomous expenditure, the higher the level of equilibrium income and the greater the real money supply, the higher the level of national income.*

***Problem 5:*** For an economy the following functions have been given:

C = 100 + 0.8Y

S = -100 + 0.2Y

I = 120 – 5r

Ms = 120

Md = 0.2Y – 5r

Find out (1) IS equation, (2) LM equation, (3) equilibrium level of income and interest rate.

***Solution:***

***(1) IS curve:*** *Y =* $\frac{1}{1-b}(Ā- dr)$

*Y =* $\frac{1}{1-b}[(a+Ia)- dr)]$

Where *b* *= MPC*, *a* and *Ia* are autonomous consumption and autonomous investment respectively, *d* is sensitivity of investment demand to changes in rate of interest (*r*).

Substituting these values in IS equation, we have

*Y =* $\frac{1}{1-0.8}[(100+120)- 5r)]$

*=* $\frac{1}{0.2}(220- 5r)$

*=* $5(220- 5r)$

***Hence, IS equation: Y = 1100 – 25r***

***(2) LM curve:***

For money market equilibrium;

Md = Ms

0.2Y – 5r = 120

5r = 0.2Y – 120

r = $\frac{0.2}{5}$Y – 24

***Hence, LM equation: r =*** $\frac{0.2}{5}$***Y – 24***

***(3) Equilibrium level of income and interest rate:***

Substituting the value of r in the IS equation we have

***Y = 1100 – 25r***

Y = 1100 – 25($\frac{0.2}{5}$*Y – 24*)

Y = 1100 – (1Y - 600)

Y = 1100 – Y + 600

2Y = 1700

Y = 850

Thus the equilibrium level of income is 850. To obtain the equilibrium rate of interest we substitute the value of Y in LM equation and we get

r = $\frac{0.2}{5}$Y – 24

r = $\frac{0.2}{5}$ × 850 – 24

r = 34 – 24 = 10

Thus equilibrium rate of interest is 10 per cent.

***Problem 6:*** Consider the following economy:

C = 100 + 0.8Yd

I = 50 – 25r

G = T = 50

$\frac{M'}{P}$ = 200

Md = Y – 25r

1. Calculate the IS and LM curves.

2. Calculate the equilibrium levels of output (national income) and interest.

**Review Questions**

**Multiple Choice Questions:**

**1. Who developed the concept of IS- LM model?**

a. Hicks and Hansen

b. J. M. Keynes

c. Adam Smith

d. None of the above.

**2. When rate of interest falls, level of investment will—**

a. increase

b. decrease

c. no effect on investment

d. both a & b

**3. The curve which shows different equilibrium levels of national income with various rates of interest is called-**

a. LM curve,

b. IS curve

c. Income curve

d. None of the above

**4. IS curve slopes—**

a. upward

b. downward

c. horizontal

d. vertical

**5. The steepness of IS curve depends on---**

a. the elasticity of investment demand curve;

b. the size of the multiplier;

c. demand for money

d. both a & b

**6. The position of IS curve depends on---**

a. rate of interest,

b. rate of investment,

c. autonomous expenditure

d. none of the above

**7. The curve which relates the level of income with the rate of interest which is determined by money- market equilibrium corresponding to different levels of demand for money is known as-**

a. IS curve

b. LM curve

c. Income curve

d. None of the above.

**8. LM curve slopes—**

a. downward to the right

b. upward to the right

c. vertical

d. horizontal.

**9. The LM curve is flatter if the interest elasticity of demand for money-**

a. high

b. low

c. both may be possible

d. none of the above

**10. The LM curve shifts to the right when the stock of money is-**

a. decreased

b. increased

c. constant

d. none of the above.

**11. Which of the following is the correct definition of the IS curve?**

a. The IS curve represents the single level of output where financial markets are in equilibrium.

b. The IS curve represents the combinations of output and the interest rate where the money market is in equilibrium.

c. The IS curve represents the single level of output where the goods market is in equilibrium.

d. The IS curve represents the combinations of output and the interest rate where the goods market is in equilibrium.

**12. Suppose the economy is operating on the LM curve but not on the IS curve. Given this information, we know that:**

a. the money market and bond markets are in equilibrium and the goods market is not in equilibrium.

b. the money, bond and goods markets are all in equilibrium.

c. neither the money, bond, nor goods markets are in equilibrium.

d. the goods market is in equilibrium and the money market is not in equilibrium.

**13. Which of the following statements is consistent with a given (i.e., fixed) LM curve?**

a. A reduction in the interest rate causes investment spending to increase.

b. A reduction in the interest rate causes money demand to decrease.

c. An increase in output causes an increase in demand for goods

d. An increase in output causes an increase in money demand.

**14. A reduction in government spending will cause:**

a. an upward shift in the LM curve.

b. a leftward shift in the IS curve.

c. a downward shift in the LM curve.

d. a rightward shift in the IS curve.

**15. Suppose investment spending is NOT very sensitive to the interest rate. Given this information, we know that:**

a. the IS curve should be relatively steep.

b. the IS curve should be relatively flat.

c. the LM curve should be relatively flat.

d. the LM curve should be relatively steep.

**16. An increase in the aggregate price level, P, will most likely have which of the following effects?**

a. a rightward shift in the IS curve.

b. a leftward shift in the IS curve.

c. an upward shift in the LM curve.

d. a downward shift in the LM curve.

**17. Which of the following will occur if there is an increase in taxes?**

a. The IS curve shifts and the economy moves along the LM curve.

b. The LM curve shifts and the economy moves along the IS curve.

c. Output will change causing a change in money demand and a shift of the LM curve.

d. Neither the IS nor the LM curve shifts.

e. Both the IS and LM curves shift.

**18. Suppose the current level of output and the interest rate are such that the economy is operating on neither the IS nor LM curve. Which of the following is true for this economy?**

a. Production does not equal demand.

b. The quantity supplied of bonds does not equal the quantity demanded of bonds.

c. The money supply does not equal money demand.

d. Financial markets are not in equilibrium.

e. all of the above.

**19. Suppose the economy is currently operating on both the LM curve and the IS curve. Which of the following is true for this economy?**

a. Financial markets are in equilibrium.

b. The quantity supplied of bonds equals the quantity demanded of bonds.

c. Production equals demand.

d. The money supply equals money demand.

e. all of the above.

**20. The IS curve will NOT shift when which of the following occurs?**

a. a reduction in government spending.

b. a reduction in consumer confidence.

c. a reduction in the interest rate.

d. all of the above.

e. none of the above.

**21. Based on our understanding of the IS-LM model that takes into account dynamics, we know that a reduction in the money supply will cause:**

a. a gradual increase in r and gradual reduction in Y.

b. an immediate increase in r and no initial change in Y.

c. an immediate drop in Y and immediate increase in r.

d. none of the above.

**22. Which of the following best defines the LM curve?**

a. illustrates the effects of changes in r on desired money holdings by individuals.

b. illustrates the effects of changes in r on investment.

c. the combinations of r and Y that maintain equilibrium in the goods market.

d. the combinations of r and Y that maintain equilibrium in financial markets.

**23. A reduction in consumer confidence will likely have which of the following effects?**

a. a rightward shift in the IS curve.

b. a leftward shift in the IS curve.

c. an upward shift in the LM curve.

d. a downward shift in the LM curve.

**24. For this question, assume that investment spending depends only on output and no longer depends on the interest rate. Given this information, an increase in the money supply:**

a. will cause investment to increase.

b. will cause an increase in output and have no effect on the interest rate.

c. will cause a reduction in the interest rate.

d. will cause investment to decrease.

e. will have no effect on output or the interest rate.

**25. Which of the following statements is consistent with a given (i.e., fixed) IS curve?**

a. An increase in government spending causes an increase in demand for goods.

b. A reduction in the interest rate causes investment spending to increase.

c. A reduction in the interest rate causes money demand to decrease.

d. A reduction in the interest rate causes an increase in the money supply.

e. An increase in taxes causes a reduction in demand for goods.

**26. Which of the following best defines the IS curve?**

a. the combinations of i and Y that maintain equilibrium in the goods market.

b. illustrates the effects of changes in i on investment.

c. the combinations of i and Y that maintain equilibrium in financial markets.

d. illustrates the effects of changes in i on desired money holdings by individuals.

**27. Which of the following is the definition for the real supply of money?**

a. the stock of money measured in terms of goods, not dollars.

b. the stock of high powered money only.

c. the actual quantity of money, rather than the officially reported quantity.

d. the ratio of the real GDP to the nominal money supply.

e. the real value of currency in circulation only.

**28. Which of the following is true for a given point on the LM curve?**

a. The goods market is in equilibrium.

b. Production is equal to demand.

c. No inventory investment equals zero.

d. all of the above.

e. none of the above.

**29. Based on our understanding of the IS-LM model that takes into account dynamics, we know that a reduction in government spending will cause:**

a. a gradual reduction in r and an immediate reduction in Y.

b. an immediate reduction in r and no initial change in Y.

c. an immediate drop in Y and immediate increase in r.

d. a gradual reduction in r and gradual reduction in Y.

**30. Assume that investment does NOT depend on the interest rate. A reduction in the money supply will cause which of the following for this economy?**

a. an increase in investment.

b. no change in the interest rate.

c. no change in output.

d. a reduction in investment.

**Answer:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| a | a | b | b | d | c | b | b | a | b |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| d | a | d | b | a | c | a | e | e | c |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| b | d | b | c | b | a | a | e | d | c |

**Write down *T* for true statement and *F* for false statement for the following statements:-**

1. Prof. J. M. Keynes developed the concept of IS- LM model in economics.

2. According to Prof. J. M. Keynes, national income is determined at the level where aggregate demand equals aggregate supply.

3. According to Prof. Keynes, rate of interest is determined in the money market equilibrium by the demand for money and the supply of money.

4. By goods market, we mean the interaction between demand for money and the supply of money.

5. The money market is in equilibrium when aggregate demand is equal to income.

6. When the rate of interest falls the level of investment increases and vice versa.

7. The increase in investment demand will bring about increase in aggregate demand which in turn will raise the equilibrium level of income.

8. The LM curve seeks to find out the equilibrium level of national income as determined by the equilibrium in goods market by a level of investment determined by a given rate of interest.

9. The IS curve shows different equilibrium levels of national income with various rates of interest.

10. The lower the rate of interest, lower will be the equilibrium level of income.

11. The LM curve is the locus of those combinations of rate of interest and the level of national income at which goods market is in equilibrium.

12. It is the autonomous expenditure which determines the position of the IS curve and changes in the autonomous expenditure causes a shift in it.

13. The IS curve can be derived from the Keynesian theory from its analysis of money market equilibrium.

14. According to Keynes, demand for money to hold depends on transactions motive and speculative motive.

15. The LM curve relates the level of income with the rate of interest which is determined by money- market equilibrium corresponding to different levels of demand for money.

16. The IS curve tells what the various rates of interest will be (given the quantity of money and the family of demand curves for money) at different levels of income.

17. The LM curve slopes upward to the right.

18. The IS curve slopes upward to the right.

19. The LM curve is flatter if the interest elasticity of demand for money is high.

20. The LM curve is steep if the interest elasticity demand for money is low.

21. The LM curve shifts to the right when the stock of money is decreased.

22. The LM curve shifts to the right when the stock of money is increased.

23. The LM curve shifts to the right if there is a decrease in the money demand function.

24. The LM curve shifts to the left if there is an increase in the money demand function.

25. The IS- LM curves relate the two variables: income and the rate of interest.

**Answer:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| F | T | T | F | F | T | T | F | T | F |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| F | T | F | T | T | F | T | F | T | T |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| F | T | T | T | T | - | - | - | - | - |

**Match the following:**

|  |  |
| --- | --- |
| **Match - I** | **Match- II** |
| A. The LM curve shifts to the right | 1. when the stock of money is increased. |
| B. The LM curve shifts to the left | 2. when the stock of money supply is reduced. |
| C. The LM curve shifts to the left if | 3. there is an increase in the money demand function. |
| D. The LM curve shifts to the right if | 4. there is an decrease in the money demand function. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Match - I** | A | B | C | D |
| **Match - II** | 1 | 2 | 3 | 4 |

|  |  |
| --- | --- |
| **Match - I** | **Match- II** |
| A. IS curve shows  | 1. goods market equilibrium. |
| B. LM curve shows | 2. money market equilibrium. |
| C. IS curve shifts to the right | 3. when autonomous expenditure increases. |
| D. IS curve shifts to the left | 4. when autonomous expenditure decreases. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Match - I** | A | B | C | D |
| **Match - II** | 1 | 2 | 3 | 4 |

**Questions with Answer:**

**1. Who developed the concept of IS- LM model in economics?**

Hicks, Hansen, Lerner and Johnson have developed the concept of IS- LM model in economics.

**2. What is shown by IS- LM model?**

The *IS- LM model* shows how the level of national income and rate of interest are jointly determined by the simultaneous equilibrium in the two interdependent goods and money markets.

**3. Define goods market and money market.**

By *Goods Market*, we mean all the buying and selling of goods and services.

By *Money Market*, we mean the interaction between demand for money and the supply of money.

**4. What is IS (Investment- Saving) curve?**

The IS curve shows different equilibrium levels of national income with various rates of interest. It is the locus of those combinations of rate of interest and the level of national income at which goods market is in equilibrium. IS curve always slopes downward to the right (negative slope).

**5. Derive the IS curve through diagram.**



6. **Why does IS Curve Slope Downward?**

The decrease in the rate of interest bring about to increase in the planned investment which increases the aggregate demand (upward shift of aggregate demand) therefore leads to the increase in the equilibrium level of national income. This makes the IS curve to slope downward.

**7. What are the factors on which the steepness of the IS curve depends on?**

There are two factors on which the steepness of the IS curve depends on:-

1. the elasticity of investment demand curve; and
2. the size of the multiplier.

**8. What are the factors which determine the position/ shift in the IS curve?**

It is the autonomous expenditure which determines the position of the IS curve and changes in the autonomous expenditure causes a shift in it.

**9. What do you mean by autonomous expenditure?**

By autonomous expenditure we mean the expenditure (investment expenditure, government expenditure, consumption expenditure) which does not depend on the level of income and the rate of interest.

**10. What is LM curve?**

The LM curve relates the level of income with the rate of interest which is determined by money- market equilibrium corresponding to different levels of demand for money. The LM curve tells what the various rates of interest will be (given the quantity of money and the family of demand curves for money) at different levels of income.

**11. Derive the LM curve diagrammatically.**



We have derived the LM curve from a family of demand curves for money. As income increases, money demand curve shifts outward and therefore the rate of interest which equates supply of money with demand for money rises.

**12. Why LM curve slopes upward to the right?**

This is because with higher levels of income, demand curve for money (Md) is higher and consequently the money market equilibrium (that is, the equality of the given money supply with money demand curve occurs at a higher rate of interest). This means that rate of interest varies directly with income.

**13. Write down the equation for IS curve.**

*Equation for IS curve: Y =* $\frac{1}{1-b}(Ā- dr)$

**14. Write down the equation for LM curve.**

*Equation for LM curve:*r = $\frac{1}{h}$(kY – $\frac{M}{P}$)

**15.** ***Problem:*** The following equations describe an economy:

C = 10 + 0.5Y;

I = 190 – 20r. Derive the equation for IS curve.

**Solution:** IS curve describes the equation for product market equilibrium at various combinations of level of income and rate of interest.

Y = AD = C + I

Y = 10 + 0.5Y + 190 – 20r

Y – 0.5Y = 200 – 20r

Y (1- 0.5) = 200 – 20r

½ Y = 200 – 20r

Y = 400 – 40r.

Thus IS curve is: **Y = 400 – 40r.**

***16 Problem:*** The following equations describe an economy

C = 100 + 0.75Yd

I = 50 – 25r

T = G = 50

Where *C* is aggregate consumption, *Yd* is disposable income, *I* is aggregate investment. *T* is taxes, *G* is government purchases and *r* is the rate of interest. Derive the *IS* curve for the economy.

Solution: Y = C + I + G

Now, C = 100 + 0.75Yd = 100 + 0.75 (Y- T) = 100 + 0.75 (Y – 50)

 I = 50 – 25r; G = T = 50

Hence, Y = C + I + G

Y = 100 + 0.75 (Y – 50) + 50 – 25r + 50

Y = 200 + 0.75Y – 37.5 – 25r

Y – 0.75Y = 162.5 – 25r

0.25Y = 162.5 – 25r

Y = 650 – 100r

Thus, IS equation will be: **Y = 650 – 100r**

***17. Problem:*** Given the following data about the monetary sector of the economy:

Md = 0.4Y – 80r

Ms = 1200 million

Where, *Md* is demand for money, *Y* is the level of income, *r* is the rate of interest and *Ms* is the supply of money.

Derive the equation for LM curve and give the economic interpretation of this curve.

***Solution:*** For money market to be in equilibrium,

Md = Ms

0.4Y – 80r = 1200

80r = 0.4Y – 1200

r = $\frac{1}{200}$Y - 15

Thus we get the following LM curve: r = $\frac{1}{200}$Y – 15

LM curve means what would be rate of interest when money market is in equilibrium, given the level of income. Thus, if level of national income is SR 4000 million, then using LM equation, we have:

r = $\frac{1}{200}$× 4000 – 15

r = 20 – 15 = 5%

Thus, at income of SR 4000 million, rate of interest will be 5 per cent when money market is in equilibrium.

Now, if level of income is SR 4400 million, equilibrium rate of interest will be:

r = $\frac{1}{200}$Y - 15

r = $\frac{1}{200}$× 4400 – 15

r = 22 – 15 = 7%

Thus, at income of SR 4400 million, rate of interest will be 7 per cent when money market is in equilibrium.

***18. Problem:*** The following data is given for the monetary sector of the economy:

Transaction demand for money, Mt = 0.5Y, Speculative demand for money, Msp = 105 – 1500r and money supply Ms = 150. Derive LM equation from the data.

***19. Problem:*** For an economy the following functions have been given:

C = 100 + 0.8Y

S = -100 + 0.2Y

I = 120 – 5r

Ms = 120

Md = 0.2Y – 5r

Find out (1) IS equation, (2) LM equation, (3) equilibrium level of income and interest rate.

***Solution:***

***(1) IS curve:*** *Y =* $\frac{1}{1-b}(Ā- dr)$

*Y =* $\frac{1}{1-b}[(a+Ia)- dr)]$

Where *b* *= MPC*, *a* and *Ia* are autonomous consumption and autonomous investment respectively, *d* is sensitivity of investment demand to changes in rate of interest (*r*).

Substituting these values in IS equation, we have

*Y =* $\frac{1}{1-0.8}[(100+120)- 5r)]$

*=* $\frac{1}{0.2}(220- 5r)$

*=* $5(220- 5r)$

***Hence, IS equation: Y = 1100 – 25r***

***(2) LM curve:***

For money market equilibrium;

Md = Ms

0.2Y – 5r = 120

5r = 0.2Y – 120

r = $\frac{0.2}{5}$Y – 24

***Hence, LM equation: r =*** $\frac{0.2}{5}$***Y – 24***

***(3) Equilibrium level of income and interest rate:***

Substituting the value of r in the IS equation we have

***Y = 1100 – 25r***

Y = 1100 – 25($\frac{0.2}{5}$*Y – 24*)

Y = 1100 – (1Y - 600)

Y = 1100 – Y + 600

2Y = 1700

Y = 850

Thus the equilibrium level of income is 850. To obtain the equilibrium rate of interest we substitute the value of Y in LM equation and we get

r = $\frac{0.2}{5}$Y – 24

r = $\frac{0.2}{5}$ × 850 – 24

r = 34 – 24 = 10

Thus equilibrium rate of interest is 10 per cent.

***20. Problem:*** Consider the following economy:

C = 100 + 0.8Yd

I = 50 – 25r

G = T = 50

$\frac{M'}{P}$ = 200

Md = Y – 25r

1. Calculate the IS and LM curves.

2. Calculate the equilibrium levels of output (national income) and interest.