Elasticity of the LM Function

The elasticity of LM function depends, *firstly*, upon the shape and elasticity of money supply curve; *secondly*, upon the relationship between the liquidity preference for transactions motive and changes in income and ; *thirdly*, upon the expectations regarding future interest rates.

If the money supply function is inelastic, LM function too will be inelastic and in case the former is relatively more elastic, the LM function will also be relatively more elastic. If the money supply function is perfectly elastic so that every increase in the demand for money is perfectly balanced with an equal increase in the supply of money, the LM function will also be perfectly elastic.

The LM function will also be influenced by the nature of relationship between the active balances and the changes in income. Baumol claims that the active balances probably grow at a slower rate than income, while Friedman claims that these grow at a faster rate than income. Keynes, however, maintains that the active balances and income grow proportionately. Baumol's case gives the conclusion that the LM function is the most elastic Friedman's case gives the conclusion that the LM function is the most inelastic. In Keynes' case, the elasticity of LM function will be reasonably high.

The expectations concerning future interest rates are also of considerable significance in determining the shape and elasticity of the LM function. At the minimum possible interest rate (say 2 per cent), all investors expect rise in interest rate creating widespread fear of capital losses. The demand for money, therefore, becomes perfectly elastic. In the state of *liquidity trap*, an increase in the money supply raises only income leaving interest rate unchanged and the LM curve tends to become *perfectly elastic*. When the rates of interest are high, investors expect interest rates to fall. The general expectation of capital gains leaves passive balances as zero and the LM function tends to be perfectly inelastic. An increase in expenditure in this case will cause a rise in the interest rates, while income remains constant.

3. GENERAL EQUILIBRIUM : THE INTERACTION OF THE IS AND LM FUNCTIONS

The goods or real market equilibrium gives us the IS curve that depicts various combinations of income and the rate of interest at which saving and investment are in equilibrium. Similarly the money market equilibrium gives such combinations of income and the rate of interest which bring the demand for money and the supply of money into equality. If there is a simultaneous equilibrium in both the markets, the entire system can be considered in equilibrium. This can be possible if

(*i*) the saving and investment are in equilibrium ($S = I$),

(*ii*) the demand for money is equal to the supply of money ($M_D = M_S$).

In other words, a *determinate solution of the rate of interest or a state of general equilibrium can be achieved through the intersection of the IS and LM functions*. It has been explained through Fig. 5.

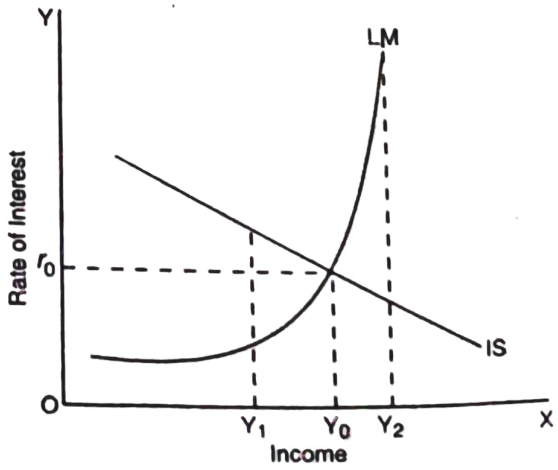

Fig. 5

Fig. 5 shows that there is one unique income-interest rate combination that keeps both the goods and monetary sectors of the economy into equilibrium. This combination is r_0 rate of interest and Y_0 level of income.

If the level of income is less than Y_0, say Y_1, the IS curve lies above the LM curve. It shows that the yield on capital goods (rate of profit) exceeds the money rate of interest (the yield on securities). An excess of profit rate over the rate of interest will stimulate investment which in turn will expand income through the multiplier process. An increase in income will necessitate the release of speculative balances to supplement the transactions balances. This will cause a rise in the rate of interest. On the other hand, increased investment will bring down the rate of profit. Thus, the yield on capital goods and the yield on securities tend to be equal at r_0 with Y_0 level of income and the system is in equilibrium. If we suppose that income (Y_2) of the community is greater than the equilibrium income (Y_0), it means that the rate of profit is less than the rate of interest. In this situation, the investment will be reduced and consequently, the level of income will get scaled down. As the level of income falls, a part of active balances will have to be diverted to increase the speculative balances. This will lower the rate of interest. Finally, the yield on capital goods and the rate of interest are brought into equilibrium at r_0 rate of interest and Y_0 level of income, where both goods or real market and money market are simultaneously in equilibrium.

Simultaneous determination of equilibrium in goods and money market at Y_0 income and r_0 interest rate can also be explained as below :

$$Y = K(C_0 + I_0) + K\,er \qquad \text{(IS Equation)}$$

$$Y = \frac{1}{k}(M_D - M_0) - \frac{1}{k}hr \qquad \text{(LM Equation)}$$

The equilibrium situation can be represented as :

$$K(C_0 + I_0) + K.\,er = \frac{1}{k}(M_D - M_0) - \frac{1}{k}hr$$

$$K.\,er + \frac{1}{k}hr = \frac{1}{k}(M_D - M_0) - K(C_0 + I_0)$$

$$r\left(Ke + \frac{1}{k}h\right) = (1/k)(M_D - M_0) - K(C_0 + I_0)$$

$$r = \frac{1/k(M_D - M_0) - K(C_0 + I_0)}{Ke + (1/k)h} \qquad ...(iii)$$

Thus the equilibrium rate of interest is r (or r_0 in Fig. 5). Now substituting this value of r in either IS equation or LM equation, we can have the equilibrium income Y_0. Substituting r first of all in IS equation :

$$Y_0 = K(C_0 + I_0) + Ke\left[\frac{(1/k)(M_D - M_0) - K(C_0 + I_0)}{Ke + (1/k)h}\right] \qquad ...(iv)$$

Now substituting r in LM equation :

$$Y_0 = \frac{1}{k}(M_D - M_0)\frac{h}{k}\left[\frac{(1/k)(M_D - M_0) - K(C_0 + I_0)}{Ke + (1/k)h}\right] \qquad ...(v)$$

where r may be positive or negative. We assume it to be positive here.

The Keynesian and Neo-classical versions of the determination of general equilibrium differ essentially in the fundamental respect that the equilibrium income and rate of interest correspond with a state of full employment in case of the neo-classical version. On the other hand, the Keynesian version recognises that the equilibrium can take place at any level of employment and not necessarily at the level of full employment. In addition, in the neo-classical version investment and saving functions are

taken as relatively more interest–elastic, whereas in the Keynesian version, these functions are recognised as relatively less interest–elastic. This difference in the two approches can have impact upon the *extent* of changes in the equilibrium income and rate of interest consequent upon the shifts in investment and saving functions.

4. CHANGES IN GENERAL EQUILIBRIUM

The general equilibrium model discussed through Fig. 5 points out that the intersection of IS and LM curves ensures S = I and $M_D = M_S$ simultaneously at r_0 rate of interest and Y_0 equilibrium income. The shifts in IS and LM functions can bring about changes in the equilibrium rate of interest and the level of income. The IS function can shift on account of changes in investment, saving, taxes and government spending. The LM function can shift because of the changes in money supply and liquidity preference. The changes in equilibrium may also be caused by the simultaneous changes in both IS and LM functions. Now we shall investigate how the changes in these variables, influence the equilibrium income and the rate of interest.

(*i*) ***Changes in Investment and Saving*** : If we assume that the liquidity function, money supply and price level remain constant and some autonomous factor like inventions or innovations causes an increase in investment and a reduction in the amount of saving, the IS function will shift to the right of its original position and the equilibrium rate of interest and income will be higher than the earlier levels of income and the rate of interest. Similarly, if there is an increase in saving or a reduction in the volume of investment, the IS function will shift to the left and, consequently, the equilibrium rate of interest and income will undergo a decline.

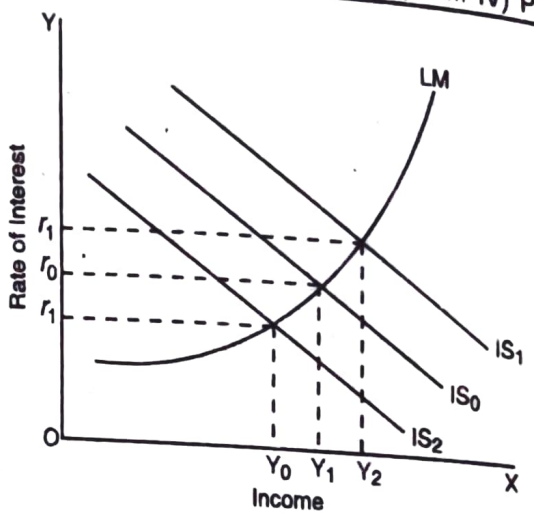

Fig. 6

Given LM and IS_0 functions in Fig. 6, the equilibrium rate of interest is r_0 and level of income is Y_0. If the IS function shifts to IS_1 owing to an increase in investment, there will be an expansion in income because of the operation of investment multiplier. When the level of income increases, more funds are required for carrying out transactions. To meet this demand for cash, the bonds will be offered for sale. As a result the bond prices decline and the rate of interest goes up. The new interest-income combination is determined by an intersection between LM and IS_1 at higher interest rate r_1 and the higher level of income Y_1. If there is a downward shift in the investment demand schedule or an increase in the saving schedule, IS function will shift down to IS_2. The decline in investment or increase in saving sets the contractionary multiplier process in operation so that the income starts falling. When income falls, the active balances are rendered surplus which are likely to be used for the purchases of bonds. This buying activity will raise the bond prices and the yield on bonds (money rate of interest), as a consequence, will decline. Thus a decrease in investment or an increase in savings will bring the entire system into equilibrium at a lower interest rate r_2 and a lower income Y_2 that are determined by the intersection of LM and IS_2 functions.

(*ii*) ***Changes in the Liquidity Preference***: An increase in the demand for idle balances leaves the minimum acceptable interest rate unchanged so that LM function at the minimum rate remains perfectly elastic. At the rates higher than the minimum rate, an increased demand for idle balances will cause a shift in the LM function to the left. An increase in the demand for idle balances means that the actual holding of cash by the community at the initial equilibrium rate of interest and income is less than their planned holding. Some people try to move out of bonds and into money. Therefore, bonds are offered for sale on the market. This causes the bond prices to fall and the interest rate to rise. The real planned investment is choked off by it and the multiplier process lowers the level of income. Thus an increase in liquidity preference for speculative motive is associated with a rise in the rate of interest and a fall in the level of income.

Conversely, if the demand for idle balances decreases, the LM function shifts to the right but at some minimum and maximum rates of interest, it coincides with the original LM function. The decrease in idle balances, given the total demand for money and a fixed money supply, means an increase in active balances. Many people like to buy up bonds with the additional cash. As a result, the bond prices rise and the rate of interest declines. This stimulates the real planned investment and the operation of multiplier ensures an expansion of income. It is thus clear that a decrease in liquidity preference for speculative motive shifts the equilibrium income to a higher level but lowers the rate of interest.

Given the IS and LM functions, the general equilibrium is originally determined at Y_0 level of income and r_0 rate of interest as shown in Fig. 7. If there is an increase in the demand for idle balances, the LM curve will shift to the left to assume the position indicated by LM_1. This curve coincides with the original LM function at the minimum rate of interest. Similarly it becomes inelastic and coincides with the original LM curve at the maximum level of income and at some higher rate of interest. Given the LM_1 curve, the equilibrium is determined at a lower level of income Y_1 but at r_1 rate of interest which is higher than the original rate of interest. Similarly a decrease in the demand for idle balances causes the LM curve to shift to the right to assume a position LM_2 and the intersection between LM_2 and IS determines the general equilibrium at Y_2 income and r_2 rate of interest. In this case new equilibrium is determined at a higher income and lower interest rate as compared to the original equilibrium position.

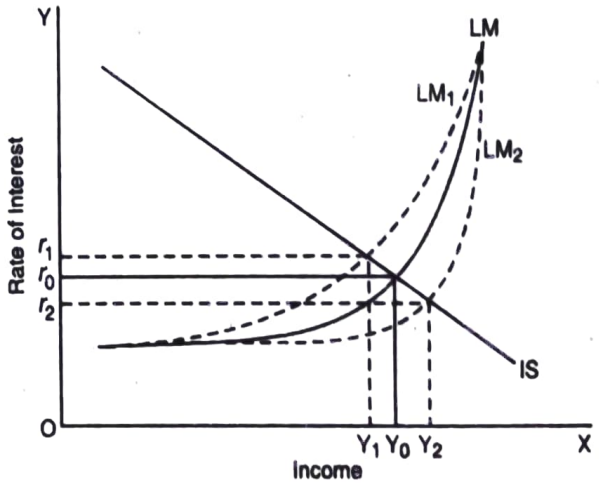

Fig. 7.

(*iii*) ***Changes in the Supply of Money***: If we assume that the central bank is expanding the supply of money through open market purchase of securities, it has the effect of lowering the rate of interest. As the rate of interest falls and the security prices increase, there is a greater inducement to invest and the level of income registers an increase on account of the operation of multiplier. With an increase in income, the transactions demand for money increases. Hence the increase in the demand for passive balances is less than the increase in money supply and therefore fall in the rate of interest in this case is less than what it would have been had the income remained unchanged. On the other hand, if the supply of

money is reduced, it brings about a rise in the rate of interest and a fall in the security prices. Consequently the inducement to invest is adversely affected and through the multiplier process the level of income is reduced. The transactions demand for money decreases which, to some extent, compensates the decrease in idle balances. As a result, the interest rate rises but the increase is less than what it would have been, if the income had not changed. To sum up, given the investment and saving schedules as well as the liquidity preference function, an increase in money supply shifts the entire LM curve to the right and a decrease in supply of money shifts it to the left of original LM curve. But these shifts are relevant only above the minimum rate of interest. An increase in the supply of money ensures equilibrium at a higher level of income with a rate of interest lower than its original equilibrium level. When the supply of money decreases, there is a fall in the equilibrium income and a rise in the equilibrium rate of interest.

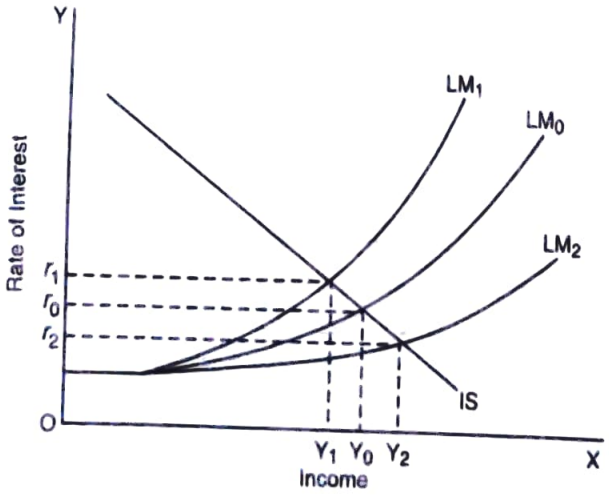

Fig. 8

Fig. 8 shows that the original equilibrium position is determined at Y_0 income and r_0 rate of interest. An increase in the supply of money shifts LM curve from LM_0 to LM_2. As a result, income increases from Y_0 to Y_2 and the rate of interest declines from r_0 to r_2. If the supply of money decreases, the liquidity preference-supply of money curve shifts from LM_0 to LM_1. The equilibrium income, in this case, falls from Y_0 to Y_1 and the rate of interest goes up from r_0 to r_1.

The upshot of this discussion is that the monetary authority is capable of influencing the level of economic activity in a country through monetary variations. But the effectiveness of the monetary policy is conditioned by two important factors— (*a*) the interest-elasticity of the speculative demand function ; and (*b*) the interest-elasticity of the investment demand function.

If both the functions are interest-elastic, an increase in the supply of money will result in a fall in the rate of interest. A lower interest rate will encourage investment and the level of income will register an increase. If, however, the speculative demand function is highly interest-elastic but the investment demand function is interest-inelastic, even a fall in the rate of interest will fail to induce additional investment expenditure. Similarly, if there is a state of liquidity trap and the investment demand function is interest-inelastic, the monetary policy will collapse altogether. There will not be a fall in the interest rate inspite of all efforts to increase the money supply. Further restraint upon the growth of income may be caused by the interest-inelastic investment demand function. Such a complicated situation arises particularly during crises like the one experienced by the world in 1930's.

(*iv*) ***Simultaneous Increase in Investment Spending and the Supply of Money*** : We have so far discussed the effects of changes in investment, saving, liquidity preference, level of income and money supply upon equilibrium income and interest separately, assuming other variables as given. We shall now proceed with the supposition that there are simultaneous increases in investment and the money supply.

Our objective again is to see how the equilibrium magnitudes of income and interest are affected by such simultaneous changes. The increase in investment will shift the IS function to its right and an increase in money supply shifts the LM function to the right of its original position. An increase in investment, with constant money supply, raises the level of income but this rise is dampened by a rise in the interest rate. If the money supply is increased to the extent sufficient to prevent any rise in the rate of interest, the full income expansionary effect will be realised and the income will grow multiplier times an increase in investment, as postulated in simple Keynesian model.

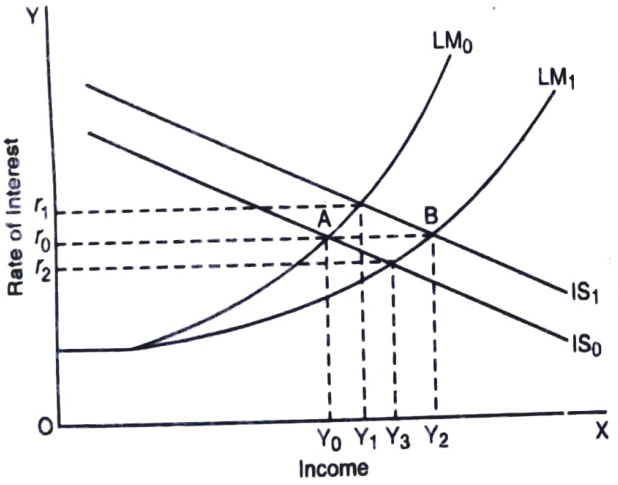

Fig. 9

Fig. 9 shows that the original equilibrium is at A where equilibrium income is Y_0 and the rate of interest r_0. If LM function remains the same, but IS function shifts to IS_1 either due to an increase in investment or a decrease in saving, the equilibrium income will rise upto Y_1 but there is also a rise in the rate of interest from r_0 to r_1. This increase in interest rate prevents the income expansion to the fullest possible extent. Had the rate of interest remained unchanged, the multiplier process would have caused income expansion upto Y_2. Now we assume that investment-saving function remains unchanged at IS_0 and the LM function shifts to LM_1 on account of an increase in the supply of money. Given such a change, the equilibrium is determined with Y_3 income and a lower rate of interest r_2. The increased money supply, undoubtedly, increases the transactions balances and investment spending but there is also some addition to the passive balances so that the rate of interest falls to r_2 and the investment fails to expand as much as it would otherwise have been possible. As a result, the income does not expand beyond Y_3. If the investment-saving function shifts from IS_0 to IS_1 and the liquidity preference-supply of money schedule from LM_0 to LM_1 simultaneously, the equilibrium position shifts from A to B with Y_2 level of income and r_0 rate of interest. With such simultaneous changes in IS and LM, the full expansionary effect of multiplier upon income can be realised.

Questions

Multiple Choice Questions

1. **The product market equilibrium occurs when**

   (*a*) $I > S$ (*b*) $I = S$ (*c*) $I < S$

2. **There is equilibrium in the money market when**

   (*a*) $M_D - M_S = 0$ (*b*) $(M_D - M_S) > 0$ (*c*) $(M_D - M_S) < 0$

3. **The shifts in IS function are caused by**

   (*a*) Changes in investment and saving (*b*) Changes in money demand and money supply

   (*c*) Neither of the two