Eco 321: Intermediate Macroeconomics 11

Reading List

Jhinang, M. L. (2010). Macroeconomic Theory. 12th Edition. *Published by Vrinda Publications LTD, Delhi*

Topic: *IS-LM* Analytical Apparatus in Discussion of the Relative Effectiveness of Monetary and Fiscal Policy

Money, interest and income are integrated into a general equilibrium model of product and money markets in the Hicks-Hansen diagrammatic framework, known as the *IS-LM* model. The term *IS* is the expression of the equality of investment and saving which represents the product market equilibrium. On the other hand, the term *LM* is the expression of the equality of money demand (*L*) and money supply (*M*) and represents the money market equilibrium.

IS model

The product market is in equilibrium when desired saving and investment are equal. Saving is a direct function of the level of income,

$$S = f(Y) \quad \ldots(1)$$

Investment is a decreasing function of the interest rate,

$$I = f(r) \quad \ldots(2)$$

From (1) and (2), we have *S=I.*

Thus, the *IS* schedule reflects the equilibrium of the product market. It shows the combinations of interest rate and income levels where saving-investment equality takes place so that the product market of the economy is in equilibrium. It is also known as the "*real sector*" equilibrium.

The derivation of the *IS* curve is shown in Figure 1. In Panel (A) of this figure, the saving curve *S* in relation to income is drawn in a fixed position on the Keynesian assumption that the rate of interest has little effect on saving. The saving curve shows that saving increases as income increases, viz., saving is an *increasing* function of income. Investment, on the other hand, depends on the rate of interest and the level of income. Given a level of interest rate, the level of investment rises as the level of income increases. At a 5 per cent rate of interest, the investment curve is *I2* . If the rate of interest is reduced to 4 per cent, the investment curve will shift upward to *I3*. Thus, the investment curve *I3* shows more investment at every level of income. Similarly when the rate of interest is raised to 6 per cent, the investment curve will shift downward to *I1*. In Panel (B) we drive the *IS* curve by marking the level of income at various interest rates. Each point on this *IS* curve represents a level of income at which saving equals investment at various interest rates. The rate of interest is represented on the vertical axis and the level of income on the horizontal axis. If the rate of interest is 6 per cent, the *S* curve intersects the *I1* curve at *E1* in Panel (A) which determines *OY1* income. From this income level which equals Rs 100, we draw a dashed line downward to intersect the extended line from 6 per cent at point *A* in Panel (B). At interest rate 5 per cent, the *S* curve intersects the *I2* curve at *E2* so as to determine *OY2* income (Rs 200). In the lower figure, the point *B* corresponds to 5 per

cent interest rate and Rs 200 income level. Similarly, the point *C* corresponds to the equilibrium of *S* and *I3* at 4 per cent interest rate. By connecting these points *A*, *B* and *C* with a line, we get the *IS* curve. The *IS* curve in Figure 1(B) slopes *downward* from left to right because as the interest rate falls, investment increases and so do income and saving. In other words, there is a negative relationship between income and interest rate in the real sector of the economy. The slope of the *IS* curve depends on two factors: *first*, the sensitiveness (elasticity) of investment and saving to changes in the interest rate, and *second*, on the size of the multiplier. If investment is very sensitive to the rate of interest, the *IS* curve is very *flat*. This is shown by the segment *AB* of the *IS* curve in Figure 2 where a small fall in the rate of interest from *R*1 to *R*2 leads to a large increase in investment and consequently in saving via proportionately large rise in income from *Y*1 to *Y*2. The *IS* curve is *interest elastic* in the *AB* segment of the *IS* curve.

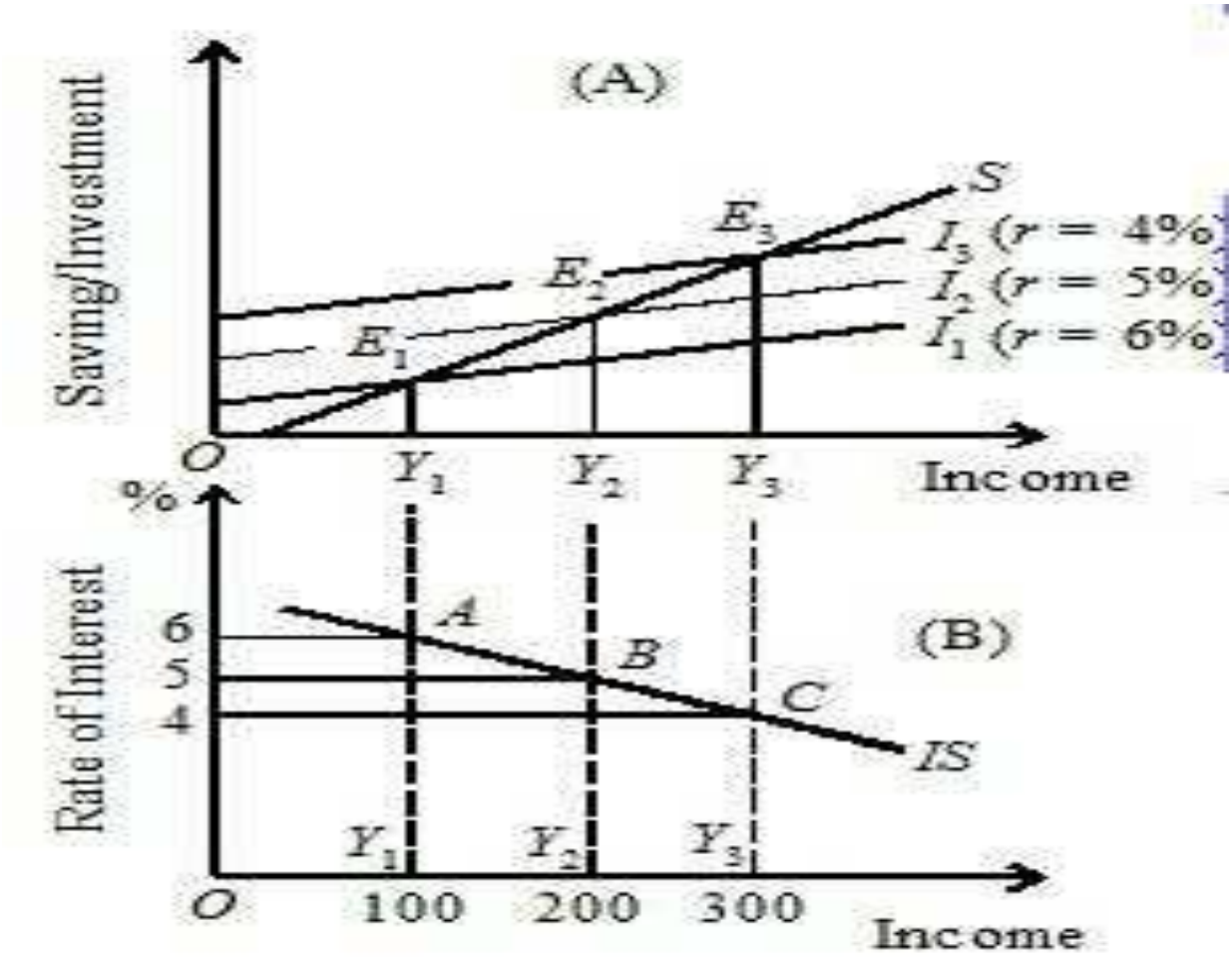

Fig. 1

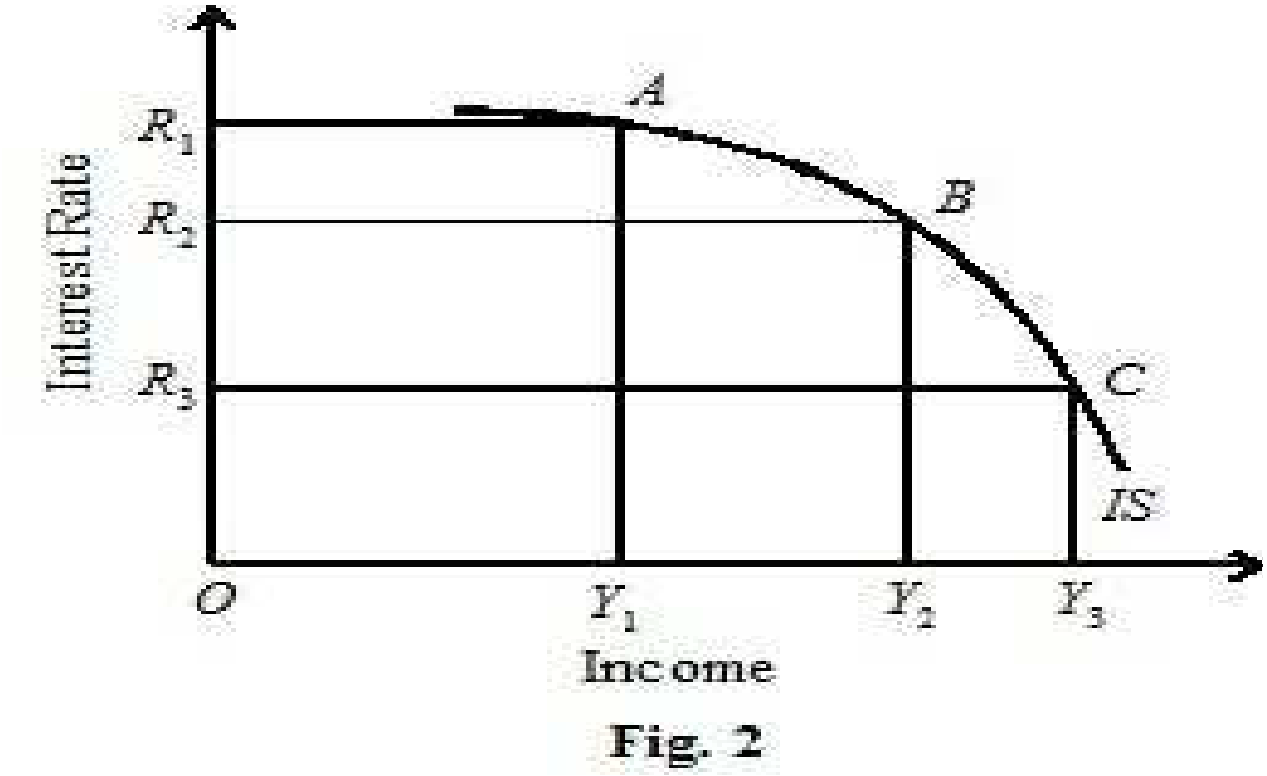

Fig. 2

On the other hand, if investment is not very sensitive to the rate of interest, the *IS* curve is relatively *steep*. In terms of Figure 2, when the rate of interest falls more from *R*2 to *R*3, the increase in investment is small and so do saving and income increase by a relatively smaller amount *Y*2*Y*3. The *BC* segment of the *IS* curve is *less interest elastic*. Any further fall in the rate of interest from *R*3 will lead to no change in income because the *IS* curve is vertical in that range. It is *interest inelastic*. The shape of the *IS* curve also depends upon the size of the multiplier. If the size of the multiplier is large, the larger is the effect on income of a rise in investment and fall in saving. Thus, income is more sensitive to changes in the interest rate and the *IS* curve is flatter.

The *IS* function shifts to the right with a reduction in saving. Reduction in saving may be the result of one or more factors leading to increase in consumption. Consumers may like to buy a new product even by reducing saving. The community's wealth may increase due to government's policy and the wealth holders do not like to save the same amount than before. Consumers may start buying more in anticipation of shortages or price rise thereby reducing saving. The *IS* function also shifts to the right by an autonomous increase in investment. The increase in investment may result from expectations of higher profits in the future, or from innovation, or from expectations concerning increase in the future demand for the product, or from a rise of optimism in general. In all these cases, the *IS* function will shift to the right, equal to the decrease in the supply of saving *times* the multiplier or the increase in the investment *times* the multiplier. With the increase in the autonomous investment (or reduction in saving), the *IS* curve shifts from *IS*1 to *IS*2 and the new equilibrium is established at point *E*2 which indicates a higher level of

income *Y*2 at a higher interest rate *R*2, as shown in Figure 3. In the opposite case when investment falls or saving increases, the *IS* function will shift to the left and the equilibrium will be established at a lower level of income and interest rate. This situation can be explained by assuming *IS*2, as the original curve.

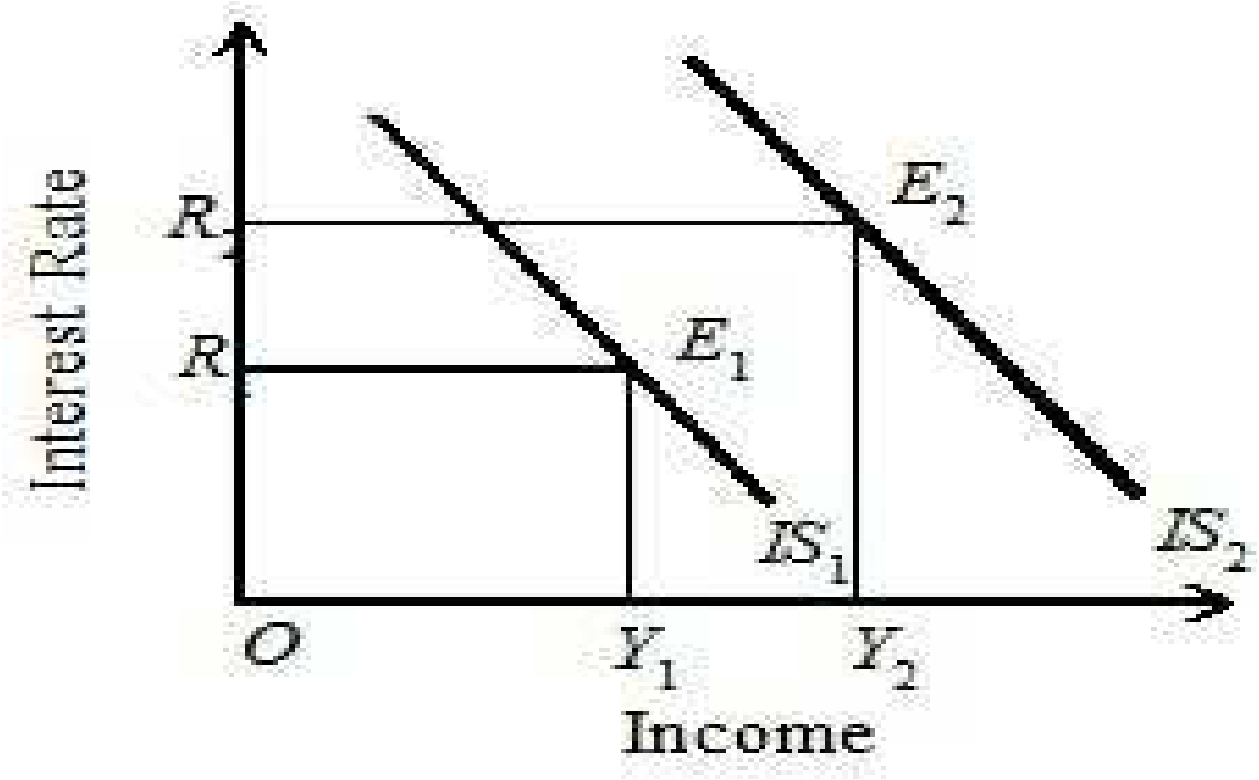

Fig. 3

LM model

The money market is in equilibrium when the demand and supply of money are equal. Denoting *L* for money demand and *M* for money supply, the money market is in equilibrium when *L*=*M*. The demand for money *L*=*LT*+*LS* where *LT* is the transactions demand for money which is a direct function of the level of income, *LT*=*f*(*Y*). *Ls* is the speculative demand for money which is a decreasing function of the rate of interest, *LS*=*f*(*r*). Thus in money market equilibrium, *M*=*LT* (*Y*)+*LS* (*r*).

The *LM* curve shows all combinations of interest rate and levels of income at which the demand for and supply of money are equal. In other words, the *LM* schedule shows the combinations of interest rates and levels of income where the demand for money (*L*) and the supply of money (*M*) are equal such that the money market is in equilibrium. The *LM* curve is derived from the Keynesian formulation of liquidity preference schedules and the schedule of supply of money. A family of liquidity preference curves *L*1*Y*1, *L*2*Y*2 and

L3 Y3 is drawn at income levels respectively in Figure 4 (A). These curves together with the perfectly inelastic money supply curve *MQ* give us the *LM* curve. The *LM* curve consists of a series of points, each point representing an interest-income level at which the demand for money (*L*) equals the supply of money (*M*). If the income level is *Y1*, the demand for money (*L1 Y1*) equals the money supply (*QM*) at interest rate *R1*. At the *Y2* income level, the *L2 Y2* and the *QM* curves equal at *R2* interest rate. Similarly at the *Y3* income level, the *L3 Y3* and *QM* curves at *R3* interest rate. The supply of money, the liquidity preference, and the level of income and the rate of interest provide data for the *LM* curve shown in Figure 4(B).

Suppose the level of income is *Y1* as marked out on the income axis in Figure 4(B). The income generates a demand for money represented by the liquidity preference curve *L1 Y1*. From the point *E1* where the *L1 Y1* curve intersects the *MQ* curve, extend a dashed line horizontally to the right so as to meet the line drawn upward from *Y1* and *K* in Figure 4(B). Points *S* and *T* can also be determined in similar manner. By connecting these points *K*, *S* and *T*, we get the *LM* curve. This curve relates different income levels to various interest rates.

The *LM* curve slopes upward from left to right because given the supply of money, an increase in the level of income increases the demand for money which leads to higher rate of interest. This, in turn, reduces the demand for money and thus keeps the demand for money equal to the supply of money. The smaller the responsiveness of the demand for money to income, and the *larger the responsiveness* of the demand for money to the rate of interest, the *flatter* will be the *LM* curve. This means that a given change in income has a smaller effect on the interest rate. The *LM* curve is steeper, if a given change in income has a larger effect on the rate of interest. In this situation, the responsiveness of the demand for money to income is larger and is smaller for the interest rate. If the demand for money is *insensitive* to the interest rate, the *LM* curve is *vertical* that is, it is *perfectly inelastic*. This is shown in Panel (B) of Figure 4 as the portion from *T* above on the *LM* curve. In this case, a large change in the interest rate is accompanied by almost no change in the level of income to maintain money market equilibrium. If the demand for money is *very sensitive* to the rate of interest, the *LM* curve is *horizontal*. This is shown by the portion of *LM* curve which starts from *H* on the vertical axis in Panel (B) of Figure 4. The *LM* curve is *perfectly elastic* in relation to the rate of interest. In other words, a small change in the interest rate is accompanied by a large change in the level of income to maintain the money market equilibrium. This portion of the *LM* curve at the extreme left is equivalent to the Keynesian liquidity trap, already explained in the Keynes's theory of interest.

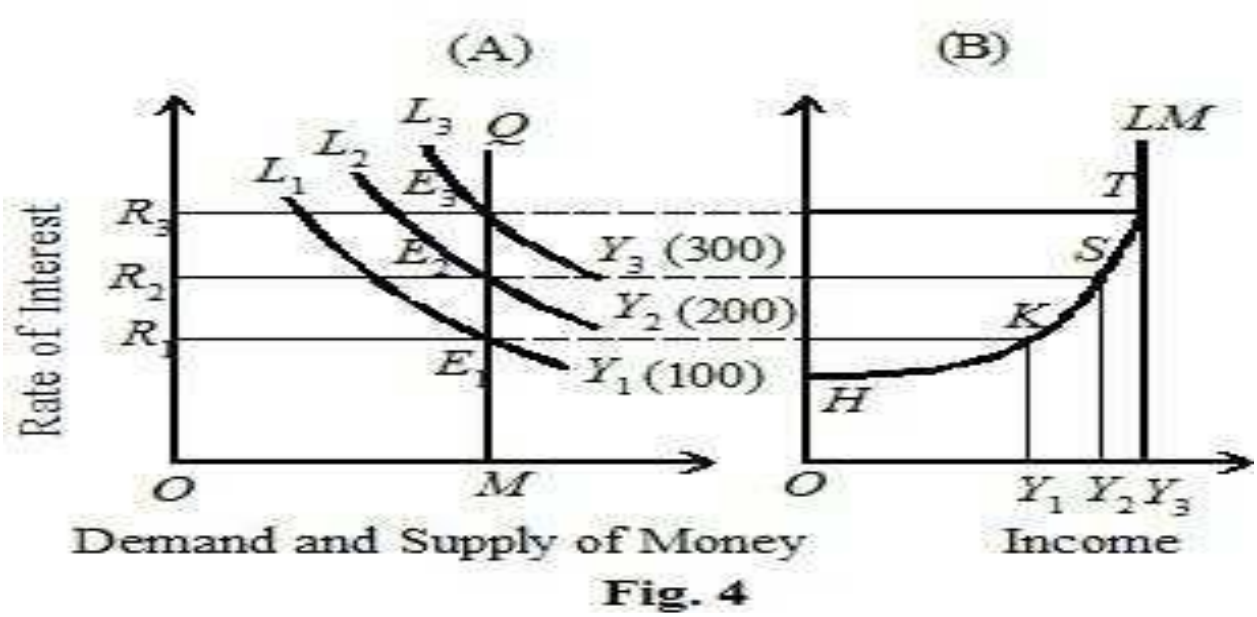

Fig. 4

The *LM* function shifts to the right with the increase in the money supply, given the demand for money, or due to the decrease in the demand for money, given the supply of money. If the central bank follows an expansionary monetary policy, it will buy securities in the open market. As a result, the money supply with the public increases for both transactions and speculative purposes. This shifts the *LM* curve to the right. A decrease in the demand for money means a reduction in the quantity of balances demanded at each level of income and interest rate. Such a decrease in the demand for money balances creates an excess of the money supplied over the money demanded. This is equivalent to an increase in money supply in the economy which has the effect of shifting the *LM* curve to the right. This is depicted in Figure 5. With the increase in the money supply, the *LM*1 curve shifts to the right as *LM*2 which moves the economy to a new equilibrium point *E*2. The increase in the money supply brings down the interest rate to *R*2 in the money market. This, in turn, increases investment thereby raising the level of income to *Y*2. Contrariwise, a decrease in the money supply, or an increase in the demand for money will shift the *LM* function to the left such that a new equilibrium is established at a higher interest rate and lower income level. This case can be explained by assuming *LM*2 as the original curve.

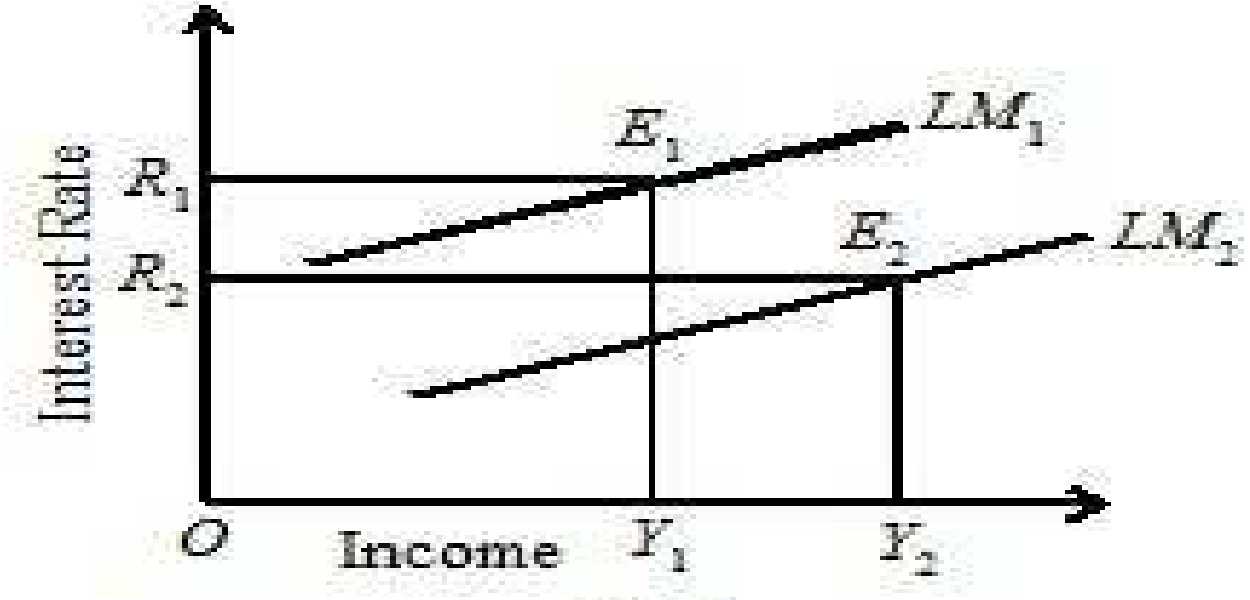

Fig. 5

So far we have analyzed the conditions that have to be satisfied for the general equilibrium of the product and money markets in terms of the *IS* and *LM* functions. Now we study how these markets are brought into simultaneous equilibrium. It is only when the equilibrium pairs of interest rate and income of the *IS* curve equal the equilibrium pairs of interest rate and income of the *LM* curve that the general equilibrium is established. In other words, when there is a single pair of interest rate and income level in the product and money markets that the two markets are in equilibrium. Such an equilibrium position is shown in Figure 6 where the *IS* and *LM* curves intersect each other at point *E* relating *Y* level of income to *R* interest rate. This pair of income level and interest rate leads to simultaneous equilibrium in the real or goods (saving-investment) market and the money (demand and supply of money) market. This general equilibrium position persists at a point of time, given the price level. If there is any deviation from this equilibrium position, certain forces will act and react in such a manner that the equilibrium will be restored. Consider point *A* on the *LM* curve where the money market is in equilibrium at *Y*1 income level and *R*2 interest rate. But the product market is not in equilibrium. In the product market, the interest rate *R*2 is lower. The product market can be in equilibrium at *Y*1 income level only at a higher interest rate *R*1 corresponding to point *B* on the *IS* curve. Consequently at point *A*, there is excess of investment over saving since point *A* lies to the left of the *IS* curve. The excess of *I* over *S* indicates excess demand for goods which raises the level of income. As the level of income rises, the need for transactions purposes increases. In order to have more money for transactions purposes, people sell bonds. This tends to raise the interest rate. This moves the *LM* curve from point *A* upward to point *E* where a combination of higher interest rate *R* and higher income level *Y* exists. On the other hand, rising interest rate reduces investment and an increasing income raises saving. This helps to bring about the equality of *I* and *S*

at point *E* where the general equilibrium is reestablished by the equality of *IS* and *LM*. Now consider point *C* on the *IS* curve in Figure 6 where the product market is in equilibrium at *R*2 interest rate and *Y*2 income level. The money market is not in equilibrium. It can be in equilibrium at *Y*2 income level only at a higher interest rate *R*1 corresponding to point *D* on the *LM* curve. At point *C*, the demand for money (*L*) is greater than the supply of money (*M*) because point *C* reflects lower rate of interest *R*2 than is required for the equality of *L* and *M*. Thus there is excess demand for money at *R*2 interest rate. The excess demand for money leads people to sell bonds but there is less demand for bonds which tends to raise the interest rate. When the rate of interest begins to rise, the product market is thrown into disequilibrium because investment falls. Falling investment leads to falling income which in turn reduces saving. This process

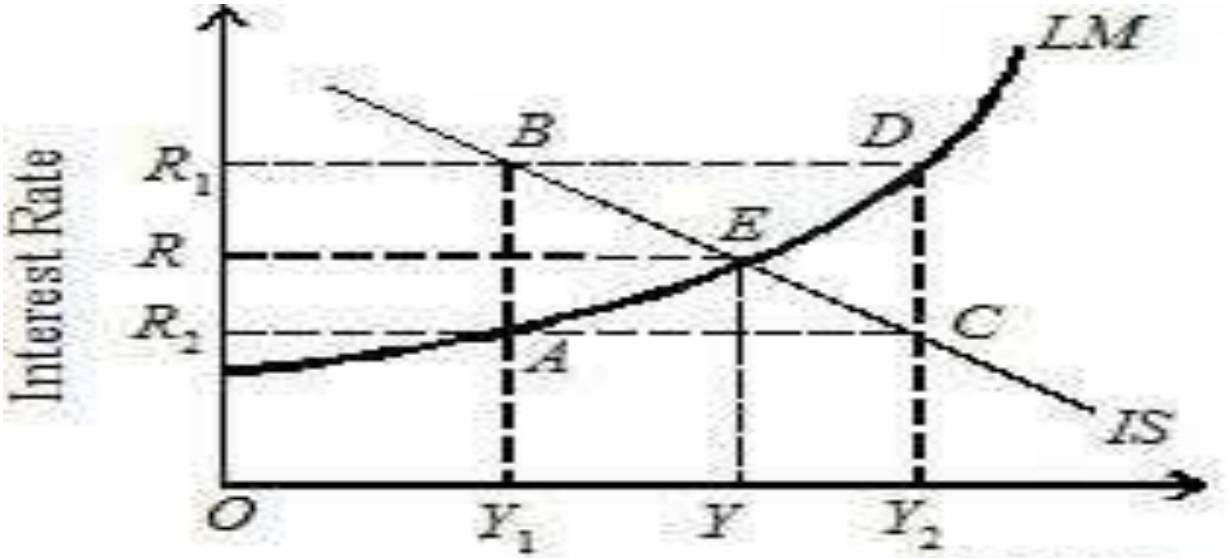

Fig. 6

ultimately brings the equilibrium of the product market when *I=S* at point *E*. On the other hand, falling income reduces the transactions demand for money and ultimately brings about the equality of *LM* at point *E* where the equilibrium is re-established by the equality *IS* and *LM* curves, at *R* interest rate and *Y* income level. The general equilibrium of the product and money markets discussed above is based on the static equilibrium analysis. It started from a point of disequilibrium and again reached the equilibrium point of the equality of *IS* and *LM* functions. But the general equilibrium combination of *Y* income level and *R* rate of interest may change either due to a shift in the *IS* function or the *LM* function, or by both the functions shifting simultaneously. The *IS* function may shift due to changes in the saving function or the investment function. The shifts in the *LM* function may be caused by changes in the money supply or liquidity preference. The shifting of the *IS* curve to the right and the consequent equilibrium with the given *LM* curve is illustrated in Figure 7. With the increase in the autonomous investment (or reduction in saving), the *IS* curve moves from *IS* to *IS*1 and the new equilibrium is

established at point *E*1 which indicates a higher level of income *Y*1 at a higher interest rate *R*1. If the interest rate had not increased but remained at *R* level, the increase in investment would have raised income from *Y* to *Y*2 level. But this much increase in income would not take place. This is because with the increase in income, the demand for money for transactions purposes will raise the interest rate to *R*1 level where the *IS* and *LM* functions intersect at point *E*1. Thus the expansionary effect of increase in investment is dampened by the rise in the interest rate and the income rises by less than the full multiplier.

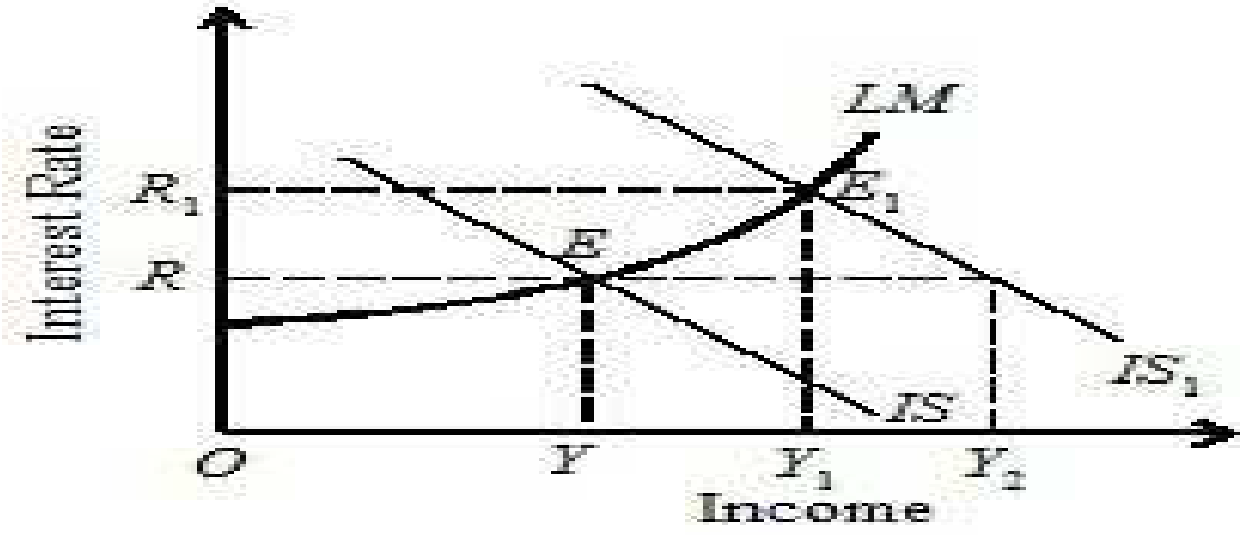

Fig. 7

In the opposite case when investment falls or saving increases, the *IS* function will shift to the left and the equilibrium will be established at a lower level of income and interest rate. This situation has not been depicted in Figure 7. With the increase in the money supply, the *LM* curve shifts to the right as *LM*1 which moves the economy to a new equilibrium point *E*1 where the *IS* curve intersects the *LM* curve in Figure 8. The increase in the money supply brings down the interest rate *R*1 in the money market. This, in turn, increases investment thereby raising the level of income to *Y*1. Thus the effect of the increase in money supply is to shift the *LM* function to the right and a new equilibrium is established at a lower interest rate and higher income level. But how much income will rise as a result of an increase in the money supply depends on (1) how much the interest rate falls which in turn depends on the elasticity of speculative demand for money, and (2) how much investment rises as a result of any given fall in the interest rate which in turn depends on the interest-elasticity of investment demand function. Contrariwise, a decrease in the money supply or an increase in the demand for money will shift the *LM* function to the left such that a new equilibrium is established at a higher interest rate and lower income level. This case has not been depicted in Figure 8.

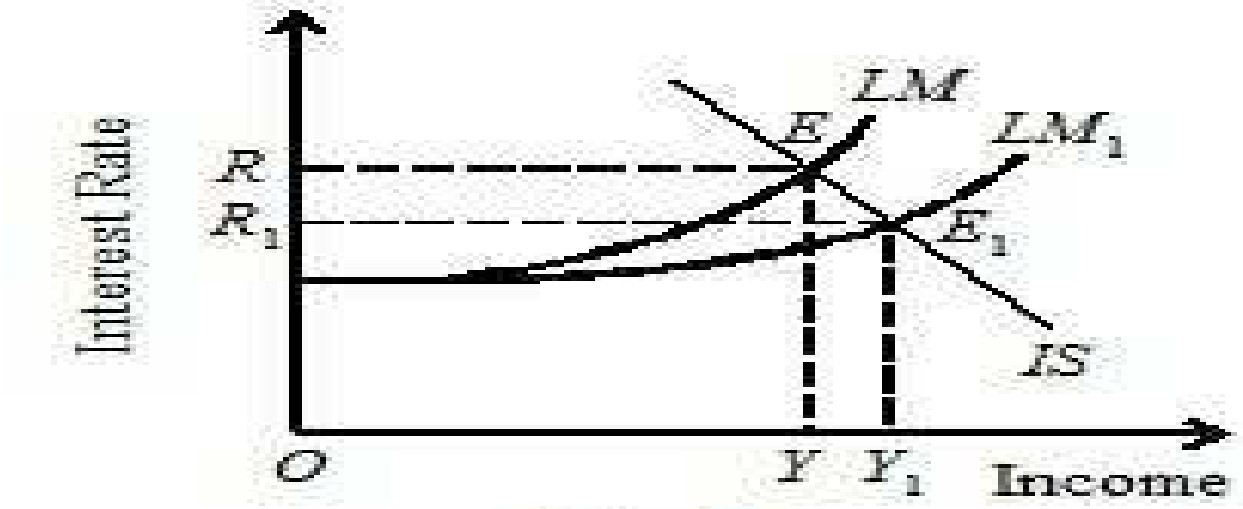

Fig. 8

We have seen above that with the increase in investment when the *IS* curve shifts to the right, both the rate of interest and the level of the income tend to rise, given the *LM* curve. On the other hand, when an increase in money supply shifts the *LM* curve to the right, it lowers the rate of interest and raises the income level, given the *IS* curve. Now suppose both the *IS* and *LM* curves shift to the right simultaneously as a result of the increase in investment and money supply respectively. How will these affect the level of income and the rate of interest? This is illustrated in Figure 9 where the increase in investment shifts the *IS* curve to *IS*1 and the increase in the money supply shifts the *LM* curve to *LM*1. Consequently, the new equilibrium position is *E*1 where the *IS*1 and *LM*1 curves intersect. The rate of interest remains at the old level *R*1 but the income increases from *Y* to *Y*2. Given the money supply with no change in the *LM* curve, an increase in investment would raise both income and the rate of interest. This is shown in the figure when the *IS*1 curve intersects the *LM* curve at *E*2 and the interest rate rises to *R*2 and income to *Y*1. But the rise in income is slowed down because of the rise in the interest rate. If the money supply increases by so much as to prevent the rise in the interest rate, the increase in income will be equal to the full expansionary effect of the rise in investment. This is depicted in the figure by the shifting of the *LM* curve to the right as *LM*1 which intersects the *IS*1 curve at *E*1. The income increases to *Y*2 but the rate of interest remains at the same level *R*1. So there has been full income-expansionary effect of the increase in investment as a result of the simultaneous increase in money supply by just the amount necessary to prevent the rise in the interest rate.

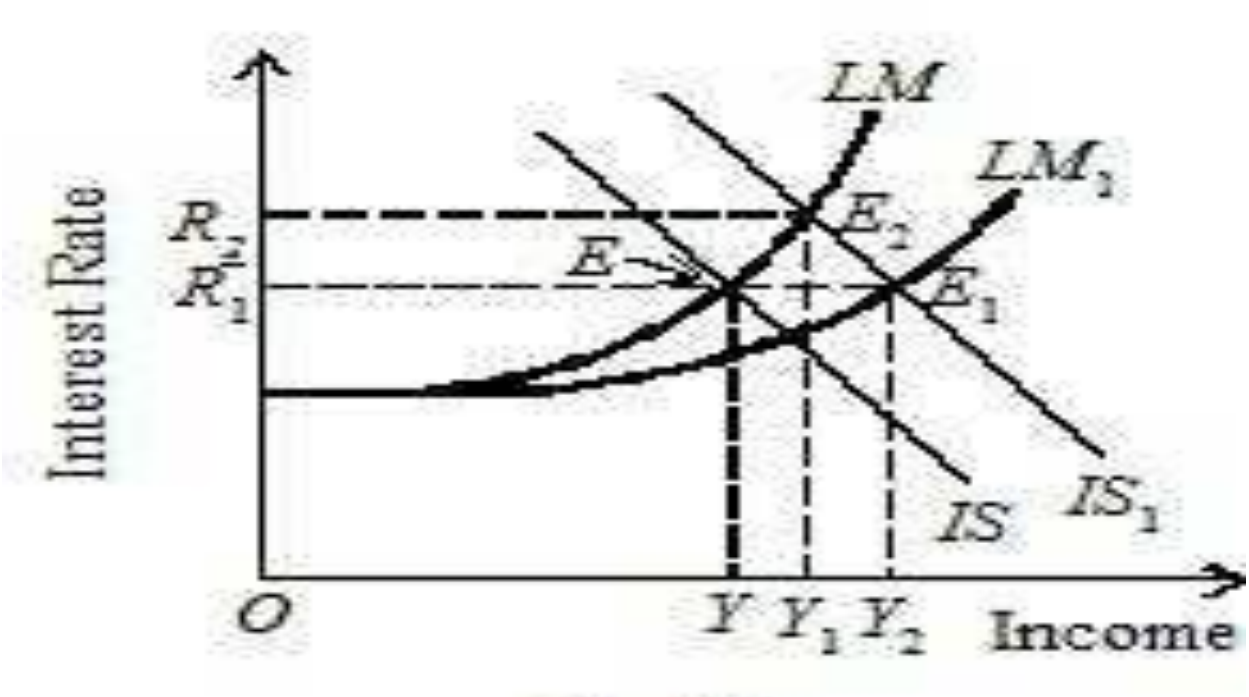

Fig. 9

Effects of changes in monetary and fiscal policies by the Government

The equilibrium levels of national income and interest rate are shown by the intersection of the *IS* and *LM* curves. When the government changes its monetary policy or fiscal policy, either the *LM* curve or the *IS* curve shifts and the equilibrium levels also change. In the *IS-LM* model, monetary policy is represented by the *LM* curve and fiscal policy by the *IS* curve.

Effects of changes in monetary policy

In the *IS-LM* model, monetary policy is represented by the *LM* curve. Suppose the government adopts an expansionary monetary policy to control deflation in the economy. For this, it increases the money supply through its central bank. The increase in the money supply is shown by shifting the *LM* curve to the right as *LM1* curve in Fig. 1. When the money supply increases, the interest falls, given the price level. The fall in the interest rate increases investment demand which causes the income to rise. This in turn, increases consumption demand. The fall in the interest rate and the rise in income jointly increase the aggregate demand and national income. As a result, a new equilibrium is established in the *IS-LM* model with lower interest rate and higher income levels. This is illustrated in Fig. 1 where the initial equilibrium point *E* is at interest rate or and income level *OY*. An increase in the money supply shifts in *LM* curve to the right to *LM1*. It intersects the given *IS* curve at point *E*1 which shows the new equilibrium with fall in the interest rate from *OR* to *OR1* and rise in the national income from *OY* to *OY1*. On the other hand if the government wants to control inflation, it reduces the money supply

which shifts the *LM* curve to the left. As a result, a new equilibrium point will be established at higher interest rate and lower national income level. This will be due to the effects of reduction in the money supply when the interest rate rises, aggregate demand falls and national income declines.

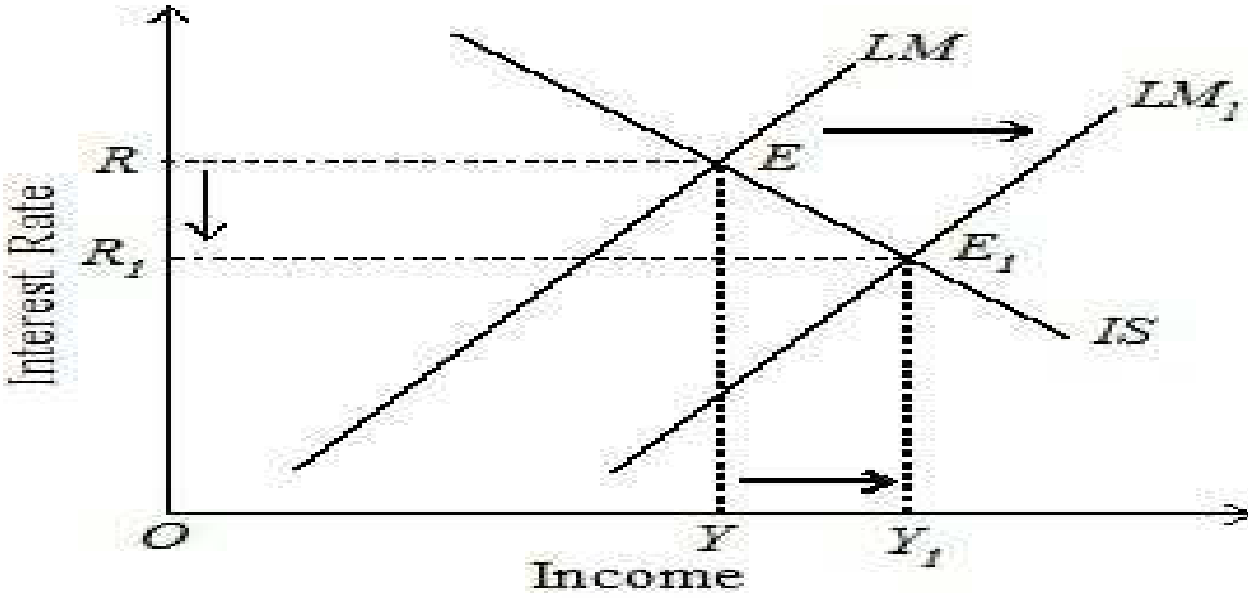

Fig. 1

Effects of changes in fiscal policy

The effects of changes in fiscal policy are related to government expenditure and taxes which are shown by shifts in the *IS* curve. They are explained in the case of an expansionary fiscal policy.

1. Increase in government expenditure

Suppose there is depression in the economy and the government wants to raise the level of employment and income. For this, it increases its expenditure which raises aggregate demand both directly as government demand rises and indirectly when consumer expenditure increases with rise in employment and income of the people. As income rises, the transactions demand for money increases. The money supply being fixed, the increase in transactions demand leads to reduction in the speculative (bonds) demand for money. This causes the interest rate to rise. Thus with the increase in public expenditure the equilibrium levels of income and interest rate rise. This is illustrated in Fig. 2 where the initial equilibrium point is *E* at *OR* interest rate and *OY* income level. The increase in government expenditure shifts the *IS* curve to the right to *IS1* which intersects the given *LM* curve at point *E1*. This results in rise in the interest rate from *OR* to *OR1* and of the national income from *OY* to *OY1*. The figure shows that the horizontal distance by which the *IS* curve shifts when government expenditure increases is equal to $\Delta G \frac{1}{1-c}$, where

ΔG is increase in government expenditure and (1/1–*c*) is the multiplier in the Keynesian model. This leads to increase in equilibrium income from *OY* to *OY2*. But in the *IS-LM* model, income rises to *OY1* which is less than *OY2*. This is because in the *IS-LM* model when the interest rate rises with the increase in government expenditure, it causes *crowding out* (decline) in some private investment. The opposite will be the effects of a decrease in government expenditure when there is inflation in the economy and the government adopts contractionary fiscal policy.

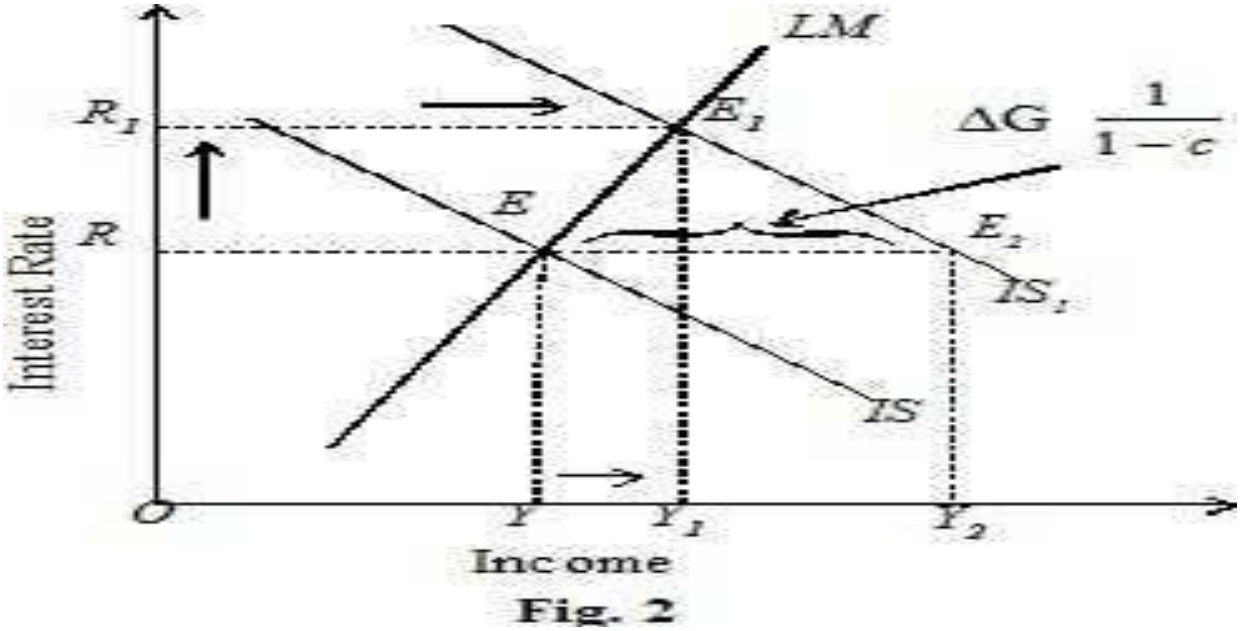

Fig. 2

2. Reduction in Taxes

We now explain the effects of reduction in taxes in the case of expansionary fiscal policy. A reduction in taxes raises the disposable income and increases consumption of the people. As income increases, the demand for money also rises and the demand for bonds declines. This leads to rise in interest rate. Thus the equilibrium levels of income and interest rate rise. Figure 3 illustrates that a reduction in taxes ($-\Delta T$) shifts the *IS* curve to the right to *IS1*. Income increases from *OY* to *OY1* and the interest rate rises from *OR* to *OR1*. The figure also shows that the horizontal distance by which the *IS* curve shifts with increase in taxes which is equal to $-\Delta T\left[\frac{c}{1-c}\right]$, is the tax multiplier in the Keynesian model. This leads to the rise in income by *EE2* (= *YY2*) at the initial interest rate *OR*. But in the *IS-LM* model, the cut in taxes causes the interest rate to rise to *OR1* which reduces investment. As a result, the rise in income by *YY1* is less than *YY2*. This is because in the Keynesian model, investment is assumed to be fixed. In the opposite case of increase in taxes both income and interest rate will decline in contractionary fiscal policy.

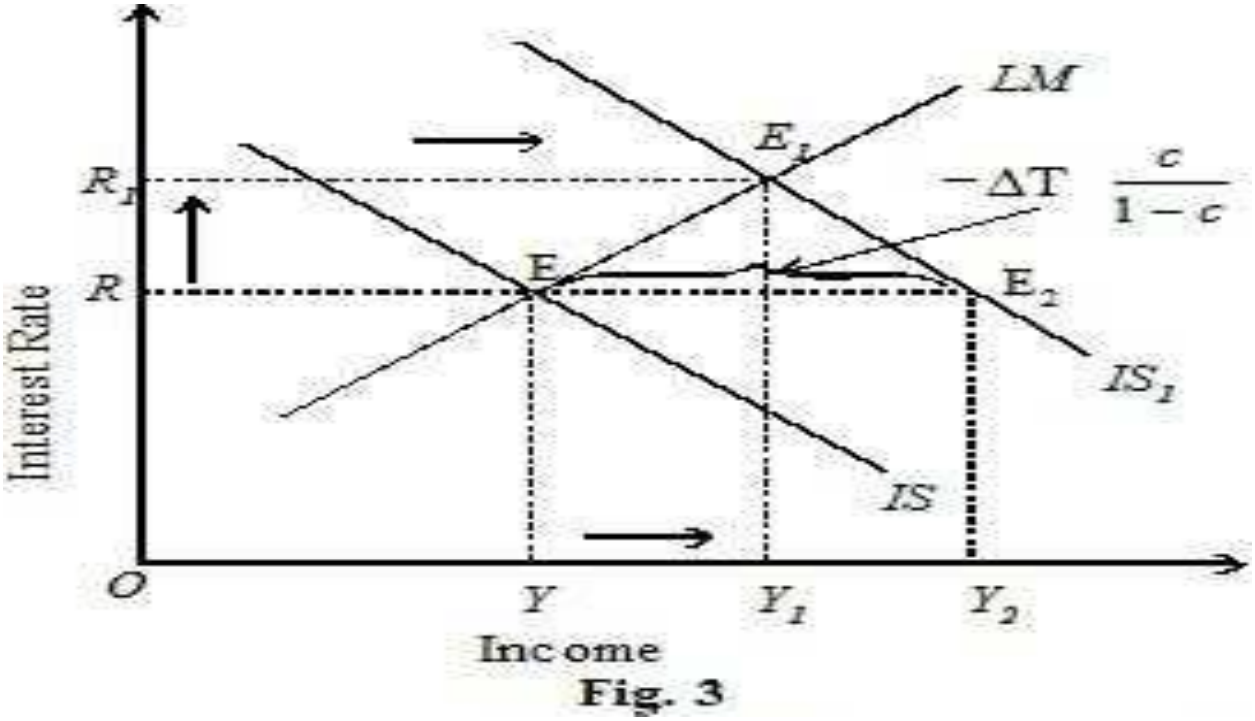

Fig. 3

Monetary-fiscal policy mix

We have been above that both monetary and fiscal policies affect income. But their effects on the interest rate and investment are different. When expansionary monetary policy is adopted, the interest rate declines and investment increases. But in expansionary fiscal policy, when government expenditure is increased or taxes are cut, interest rate rises and investment declines. To keep the interest rate low and to encourage investment, the government adopts a monetary-fiscal mix of an *accommodating monetary policy* along with an expansionary fiscal policy in which the increase in money supply will prevent the interest rate from rising and thus offset the crowding out of private investment. This is illustrated in Fig.4 where the initial equilibrium is at point *E* where the *IS* and *LM* curves intersect and determine *OR* interest rate and *OY* income level. With the increase in government expenditure or tax cut, the *IS* curve shifts to the right as *IS1* curve. It cuts the *LM* curve at point *E1* and the new equilibrium interest rate is *OR1* and income level is *OY1*. But the increase in interest rate leads to the crowding out of some private investment. To prevent this crowding out, the government adopts an accommodating monetary policy in which the money supply is increased sufficiently so that the *LM* curve shifts far enough to the right to *LM1* curve. It cuts the *IS1* curve at point *E2*, the interest rate remains at the original level OR but income rises to *OY2*. Thus this monetary-fiscal mix has raised the income level with the interest rate remaining at *OR* level.

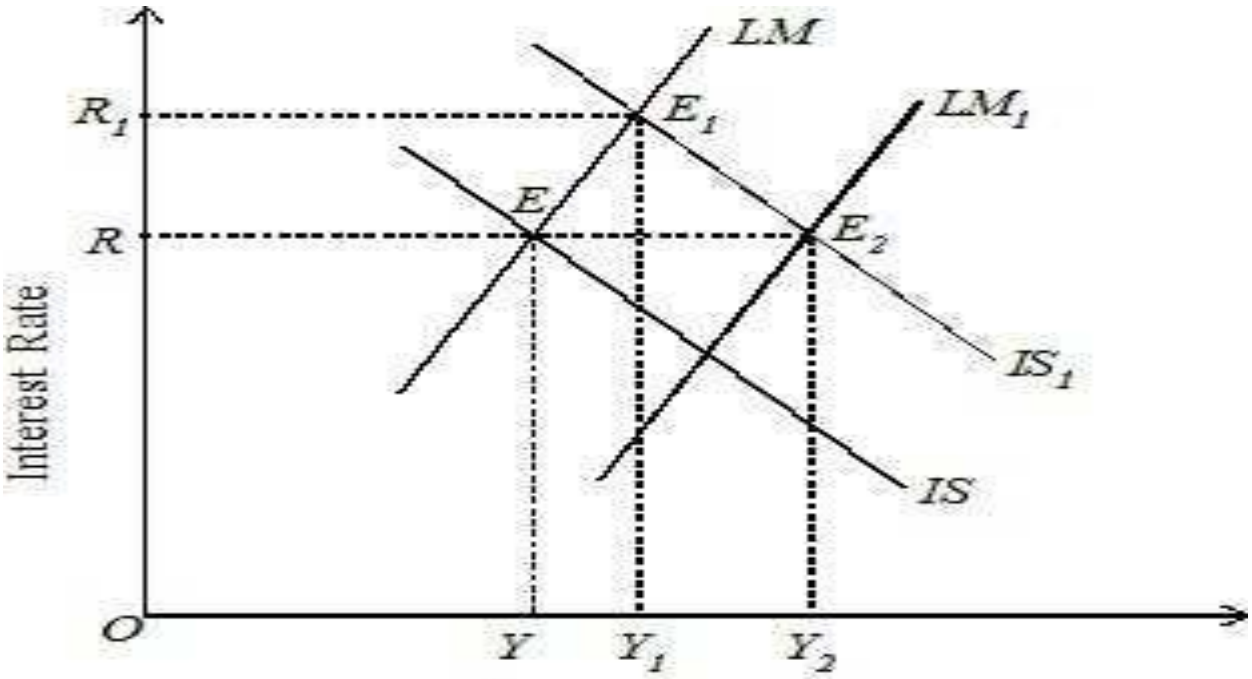

Fig. 4

EFFECTIVENESS OF MONETARY AND FISCAL POLICY

The relative effectiveness of monetary and fiscal policy has been the subject of controversy among economists. The monetarists regard monetary policy more effective than fiscal policy for economic stabilisation. On the other hand, the Keynesians hold the opposite view. Thus, we study the effectiveness of monetary and fiscal policy in terms of shape of the *IS* curve and the *LM* curve. The *IS* curve represents fiscal policy and the *LM* curve monetary policy.

Monetary policy

The government influences investment, employment, output and income through monetary policy. This is done by increasing or decreasing the money supply by the monetary authority. When the money supply is increased, it is an expansionary monetary policy. This is shown by shifting the *LM* curve to the right. When the money supply is decreased, it is a contractionary monetary policy. This is shown by shifting the *LM* curve to the left.

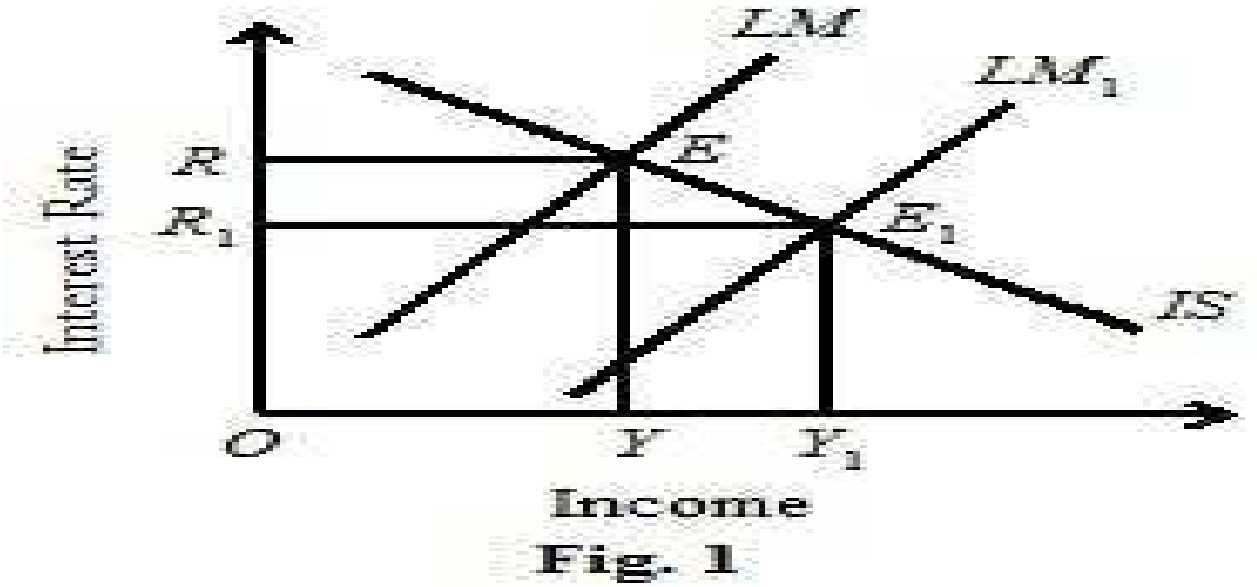

Fig. 1

Figure 1 illustrates an expansionary monetary policy with given *LM* and *IS* curves. Suppose the economy is in equilibrium at point *E* with *OY* income and *OR* interest rate. An increase in the money supply by the monetary authority shifts the *LM* curve to the right to *LM1*, given the *IS* curve. This reduces the interest rate from *OR* to *OR1* thereby increasing investment and national income. Thus the national income rises from *OY* to *OY*1. But the relative effectiveness of monetary policy depends on the shape of the *LM* curve and the *IS* curve. ***Monetary policy is more effective if the LM curve is steeper***. A steeper *LM* curve means that the demand for money is less interest elastic. The less interest elastic is the demand for money, the larger is the fall in interest rate when the money supply is increased. This is because when the demand for money is less elastic to a change in interest rate, an increase in the money supply is more powerful in the bringing about a large fall in interest rate. A large fall in the interest rate leads to a higher increase in investment and in national income. This is depicted in Figure2 where *E* is the original equilibrium position of the economy with *OR* interest rate and *OY* income. When the *steep LM*1 curve shifts to the right to *LMs*, the new equilibrium is set at *E*2. As a result, the interest rate falls from *OR* to *OR*2 and income rises from *OY* to *OY*2. On the other hand, ***the flatter is the LM curve, the less effective is monetary policy.*** A flatter *LM* curve means that the demand for money is more interest elastic. The more interest elastic is the demand for money, the smaller is the fall in interest rate when the money supply is increased. A small fall in the interest rate leads to a smaller increase in investment and income. In Figure 2, E is the original equilibrium position with *OR* interest rate and *OY* income. When the flatter *LM*2 curve shifts to the right to *LM*F the new equilibrium is established at *E*1 which produces *OR*1 interest rate and *OY*1 income level. In this case, the fall in interest rate to *OR*1 is less than *OR*2 of the steeper *LMs* curve and the increase in income *OY*1 is also less than *OY*2 of the steeper curve. This shows that monetary policy is less effective in the case of the flatter *LM* curve and more effective in the case of the steeper curve.

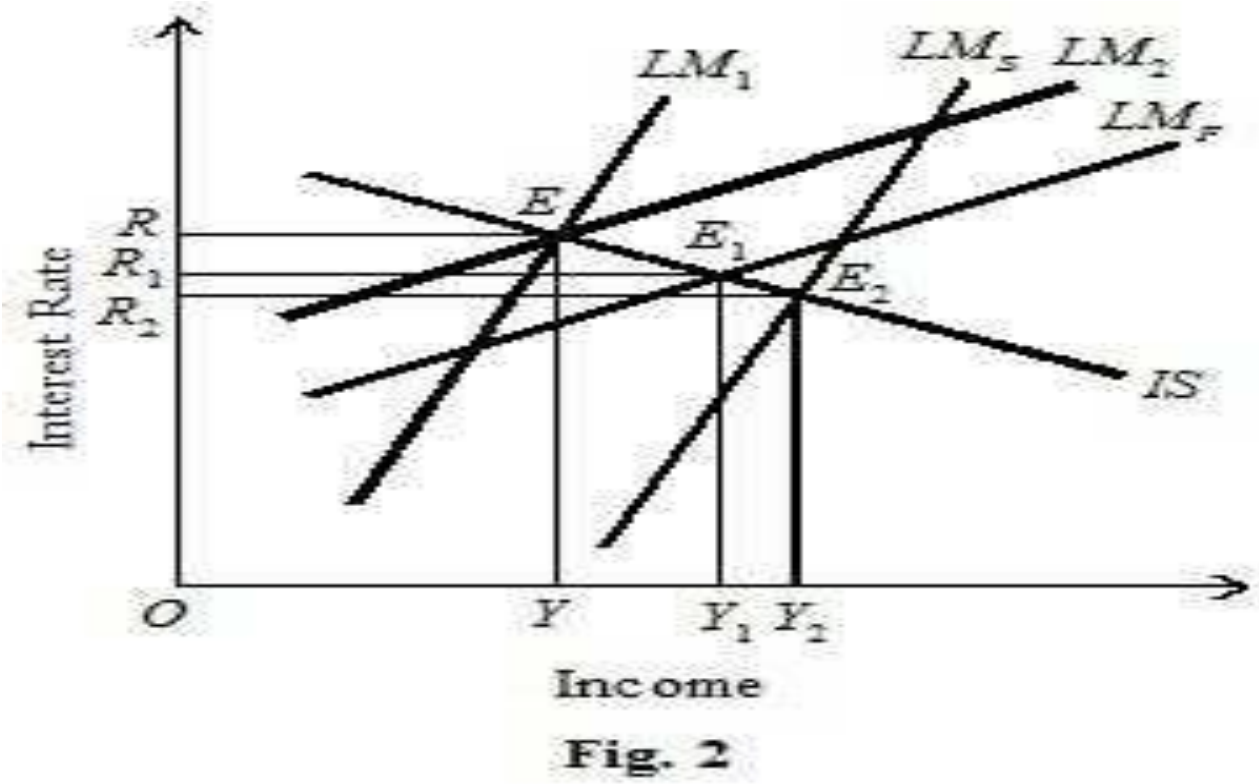

Fig. 2

If ***the LM curve is horizontal, monetary policy is completely ineffective*** because the demand for money is perfectly interest elastic. This is the case of "liquidity trap" shown in Figure 3, where the increase in the money supply has no effect on the interest rate *OR* and the income level *OY*. On the other hand, **if** ***the LM curve is vertical, monetary policy is highly effective*** because the demand for money is perfectly interest inelastic. Figure 4 shows that when the vertical *LM* curve shifts to the right to *LM*1 with the increase in the money supply, the interest rate falls from *OR* to *OR*1 which has no effect on the demand for money and the entire increase in the money supply has the effect of raising the income level from *OY* to *OY*1.

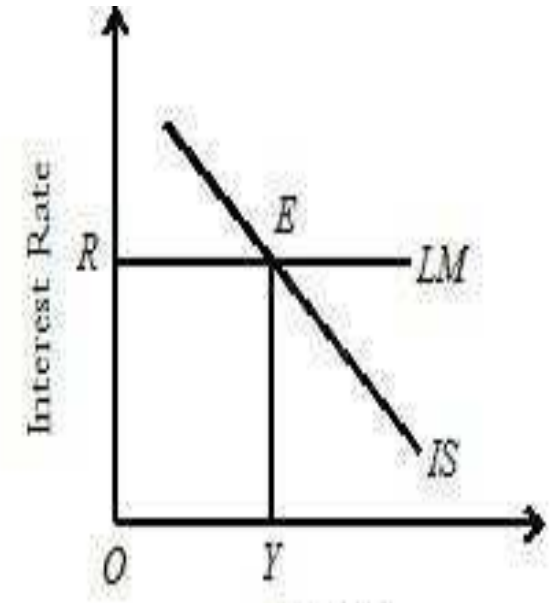

Fig. 3

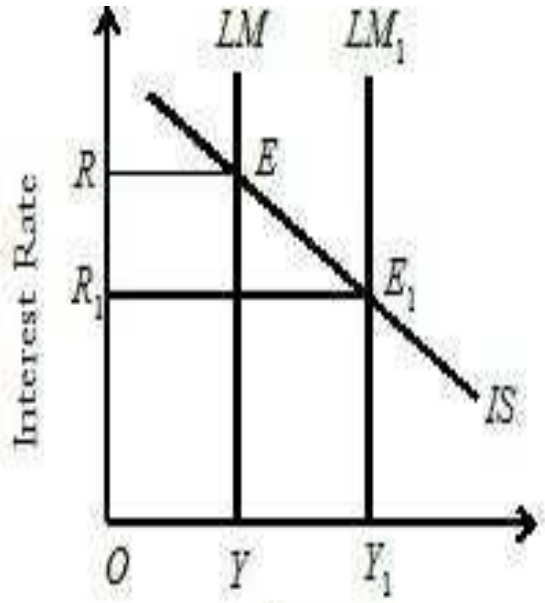

Fig. 4

Now take the slope of the *IS* curve. ***The flatter is the IS curve, the more effective is the monetary policy.*** The flatter *IS* curve means that the investment expenditure is highly interest elastic. When an increase in the money supply lowers the interest rate even slightly, private investment also increases, by a large amount, thereby raising income much. This is depicted in Figure 5 where the original equilibrium is at point *E* with *OR* interest rate and *OY* income level. When the *LM* curve shifts to the right to *LM*1 with the increase in money supply, it intersects the flatter curve *ISF* at *E*2 which produces *OR*2 interest rate and *OY*2 income. If we compare this equilibrium position *E*2 with the *E*1 position where the curve ISs is steeper, the interest rate *OR*1 and the income level *OY*1 are lower than the interest rate and income level of the flatter *ISF* curve. This shows that when the money supply is increased, a small fall in the rate of interest leads to a large rise in private in-vestment which raises income more (by *YY*2) with the flatter *IS* curve as compared to the steep *IS* curve (by *YY*1) thus making monetary policy more effective. **If the *IS curve is vertical, monetary policy is completely ineffective*** because investment expenditure is completely interest inelastic. With the increase in the money supply, the *LM* curve shifts to the right to *LM*1 in Figure 6, the interest rate falls from *OR* to *OR*1 but investment being completely interest inelastic, the income remains unchanged at *OY*. On the other hand, if **the *IS curve is horizontal, monetary policy is highly effective*** because investment expenditure is perfectly interest elastic. Figure 7 shows that with the increase in the money supply, the *LM* curve shifts to *LM*1. But even with no change in the interest rate *OR*, there is a large change in income from *OY* to *OY*1. This makes monetary policy highly effective.

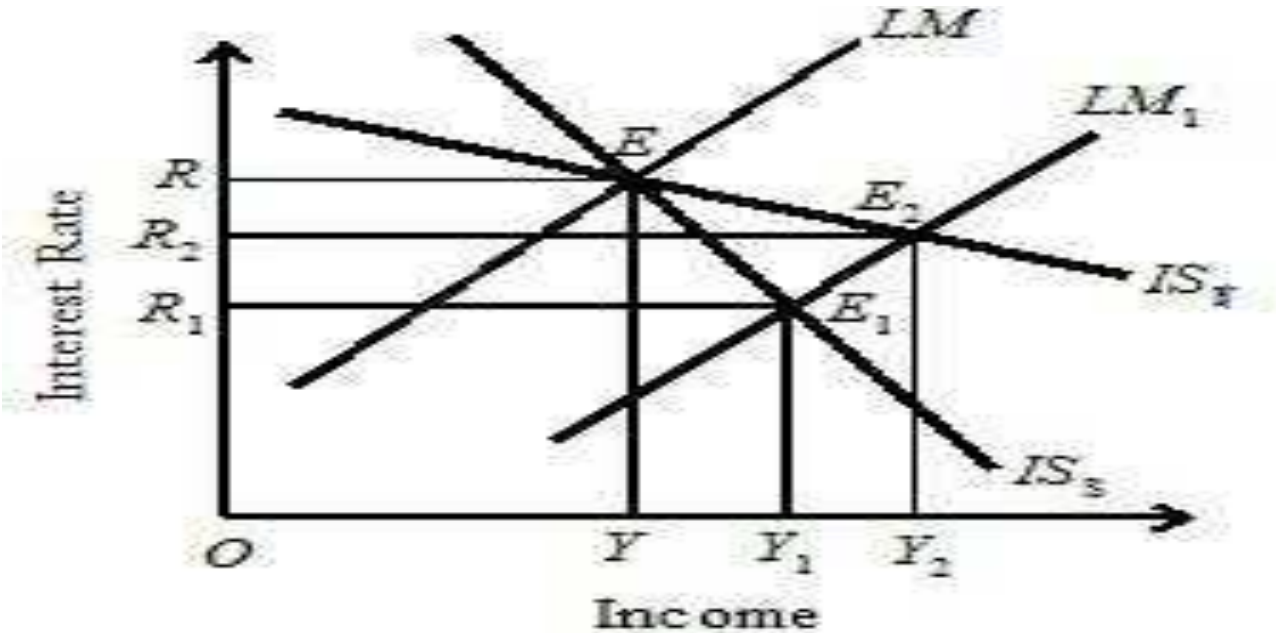

Fig. 5

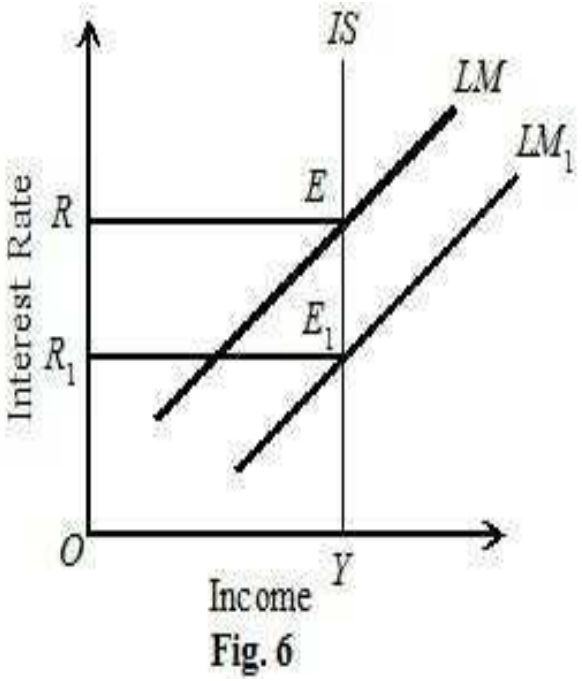

Fig. 6

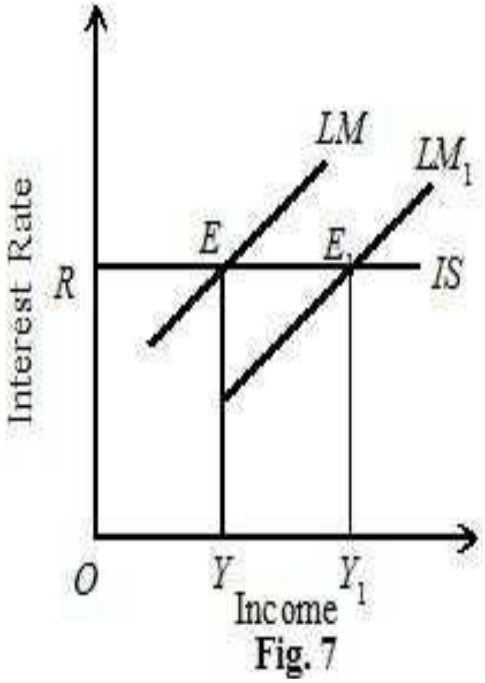

Fig. 7

Fiscal policy

The government also influences investment, employment, output and income in the economy through fiscal policy. For an expansionary fiscal policy, the government increases its expenditure or/and reduces taxes. This shifts the *IS* curve to the right. The government follows a contractionary fiscal policy by reducing its expenditure or/and increasing taxes. This shifts the *IS* curve to the left. Figure 8 illustrates an expansionary fiscal policy with given *IS* and *LM* curves. Suppose the economy is in equilibrium at point

E with *OR* interest rate and *OY* income. An increase in government spending or a decrease in taxes shifts the *IS* curve upwards to *IS*1 which intersects the *LM* curve at *E*1. This raises the national income from *OY* to *OY*1. The rise in the national income increases the demand for money, given the fixed money supply. This, in turn, raises the interest rate from *OR* to *OR*1. The increase in the interest rate tends to reduce private investment expenditure at the same time when the government expenditure is being increased. If the interest rate had not changed with the increase in government expenditure, income would have risen to *OY*2 level. But the acutal increase in income has been less by *Y*2 *Y*1 due to the increase in the interest rate to *OR*1 which has reduced private investment expenditure. The opposite happens in a contractionary fiscal policy.

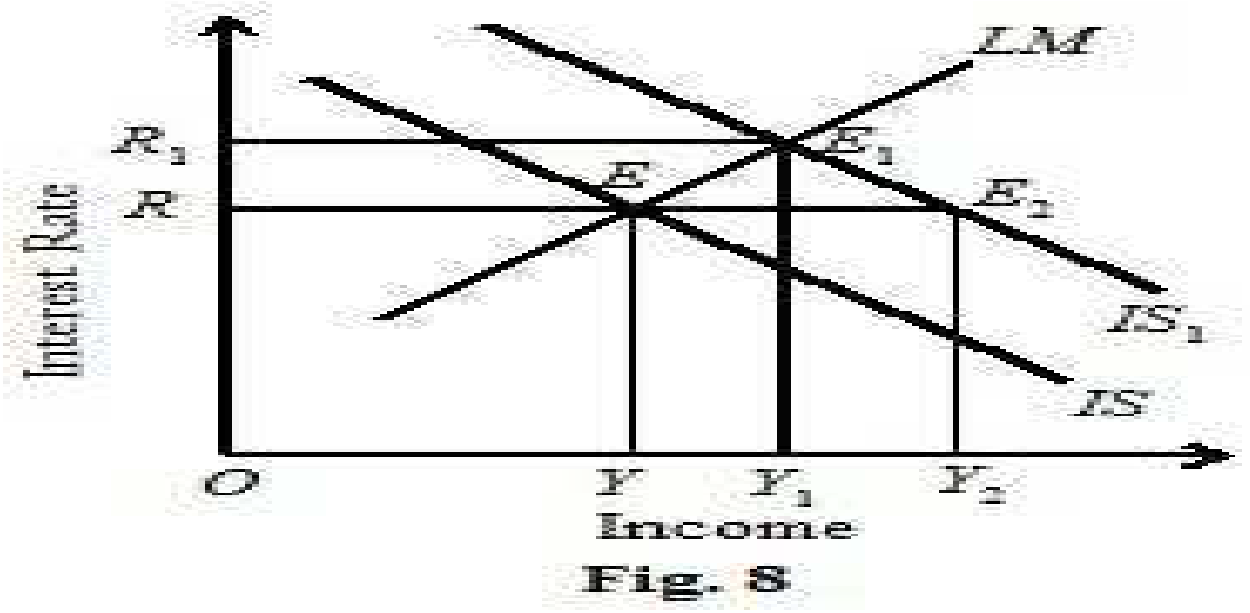

Fig. 8

The relative effectiveness of fiscal policy depends on the slope of the *LM* curve and the *IS* curve. ***Fiscal policy is more effective, the flatter is the LM curve***, and is ***less effective when the LM curve is steeper.*** When the *IS* curve shifts upwards to *IS*1 with the increase in government expenditure, its impact on the national income is more with the flatter *LMF* curve than with the steeper *LMS* curve. This is shown in Figure 9 where the *IS*1 curve intersects the flatter *LMF* curve at point *E*2 which produces *OY*2 income and *OR*2 interest rate. On the other hand, it intersects the steeper *LMS* curve at *E*1 which determines *OY*1 income and *OR*1 interest rate. In the case of the steeper curve *LMS*, the increase in income to *OY*1 leads to a large rise in the demand for money which raises the interest rate to a very high level *OR*1. The large increase in the interest rate reduces private investment despite increase in government expenditure which ultimately brings a small rise in income *OY*1. But in the case of the flatter curve *LMF*, the rise in the interest rate to *OR*2 is relatively small. Consequently, it reduces private investment to a lesser degree and its net effect on national income is relatively large. Thus the increase in national income with the flatter curve *LMF* is more (*YY*2 > *YY*1) as compared with the steeper curve *LMS*.

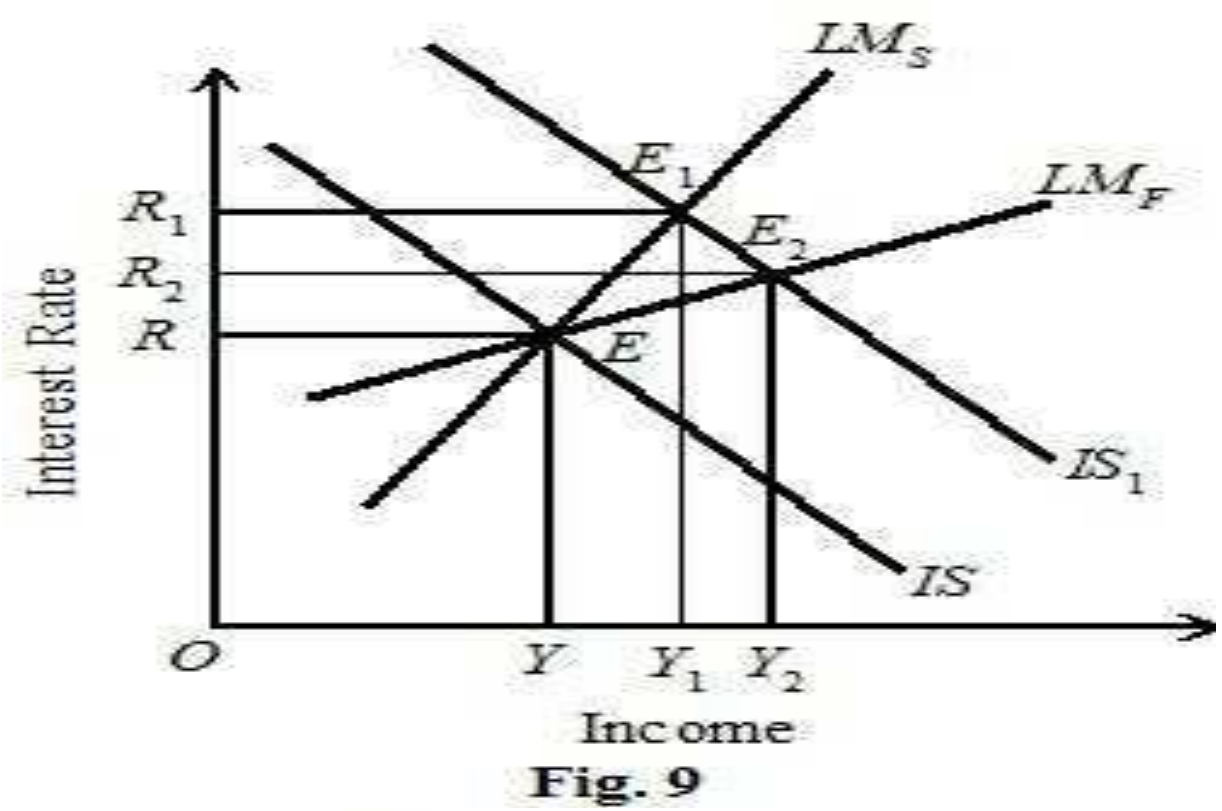

Fig. 9

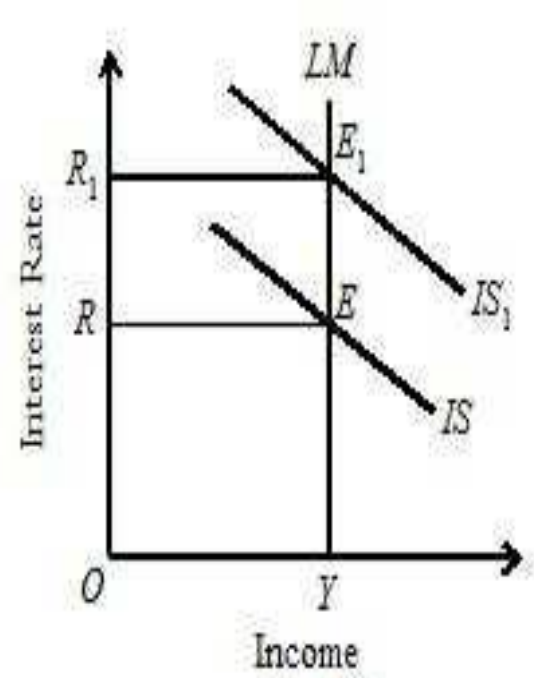

Fig. 10

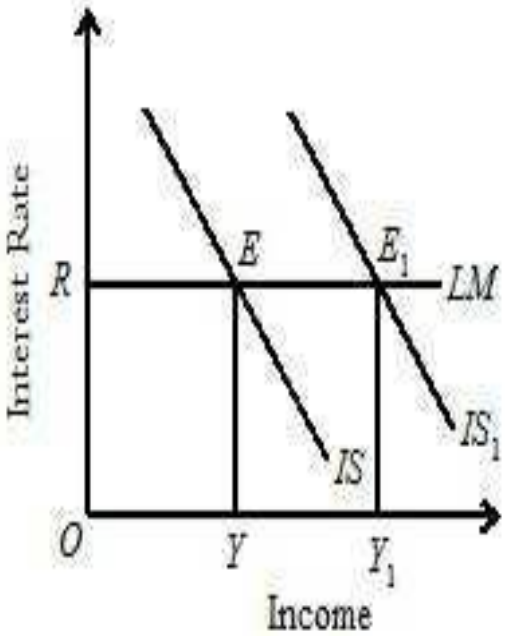

Fig. 11

Fiscal policy is completely ineffective, if the LM curve is vertical. It means that the demand for money is perfectly interest inelastic. This is shown in Figure 10 where the

level of income remains unchanged. When the *IS* curve shifts upwards to *IS*1, only the interest rate rises from *OR* to *OR*1 and increase in government expenditure does not affect national income at all. It remains constant at *OY*. **At the other extreme is the *perfectly horizontal LM curve* where *fiscal policy is fully effective***. This situation implies that the demand for money is perfectly interest elastic. This is shown in Figure 11 where the horizontal *LM* curve is intersected by the *IS* curve at *E* which produces *OR* interest rate and *OY* income. When the *IS* curve shifts to the right to *IS*1 , income rises by the full multiplier of the increase in government expenditure. It rises to *OY*1 but there is no change in interest rate. Now take the slope of the *IS* curve. ***The steeper is the IS curve, the more effective is fiscal policy. The flatter is the IS curve, the less effective is fiscal policy.*** These two cases are illustrated in Figure 12 where *E* is the original equilibrium point with *OR* interest rate and *OY* income level. The increase in government expenditure shifts the flatter curve *IS*1 to *ISF* so that the new equilibrium with *LM* curve at point *E*1 produces *OR*1 interest rate and *OY*1 income level. Similarly, the steeper curve *IS*2 is shifted to *ISS* with the increase in government expenditure and the new equilibrium with *LM* curve at point *E*2 leads to *OR*2 interest rate and *OY*2 income level. The figure shows that the national income increases more with the shifting of the steeper *IS* curve than in the case of the flatter *IS* curve. It rises by *YY*2 in the case of the steeper curve *ISS* and by *YY*1 in the case of the flatter curve *ISF*. This is because investment expenditure is less interest elastic, when the *IS* curve is steeper. The increase in the interest rate to *OR*2 reduces very little private investment with the result that the rise in income is greater. It is *YY*2. On the other hand, the increase in income is smaller in the case of the flatter *IS* curve. It is *YY*1. This is because investment expenditure is more interest-elastic. The increase in the interest rate to *OR*1 reduces large private investment so that the rise in income is smaller. Thus fiscal policy is more effective, the steeper is the *IS* curve and is less effective in the case of the flatter *IS* curve. ***Fiscal policy is completely ineffective, if the IS curve is horizontal.*** An horizontal *IS* curve means that investment expenditure is perfectly interest elastic. This is depicted in Figure 13 where *LM* curve intersects the *IS* curve at *E*. An increase in government expenditure has no effect on the interest rate *OR* and hence on the income level *OY*. **Such a situation is not likely to be in practice**. **On the other extreme is *the vertical IS curve which makes fiscal policy highly effective.*** This is because government expenditure is perfectly interest inelastic. An increase in government expenditure shifts the *IS* curve to the right to *IS*1, raises the interest rate to *OR*1 and income to *OY*1 by the full multiplier of the increase in government expenditure, as shown in Figure 14. This makes fiscal policy highly effective.

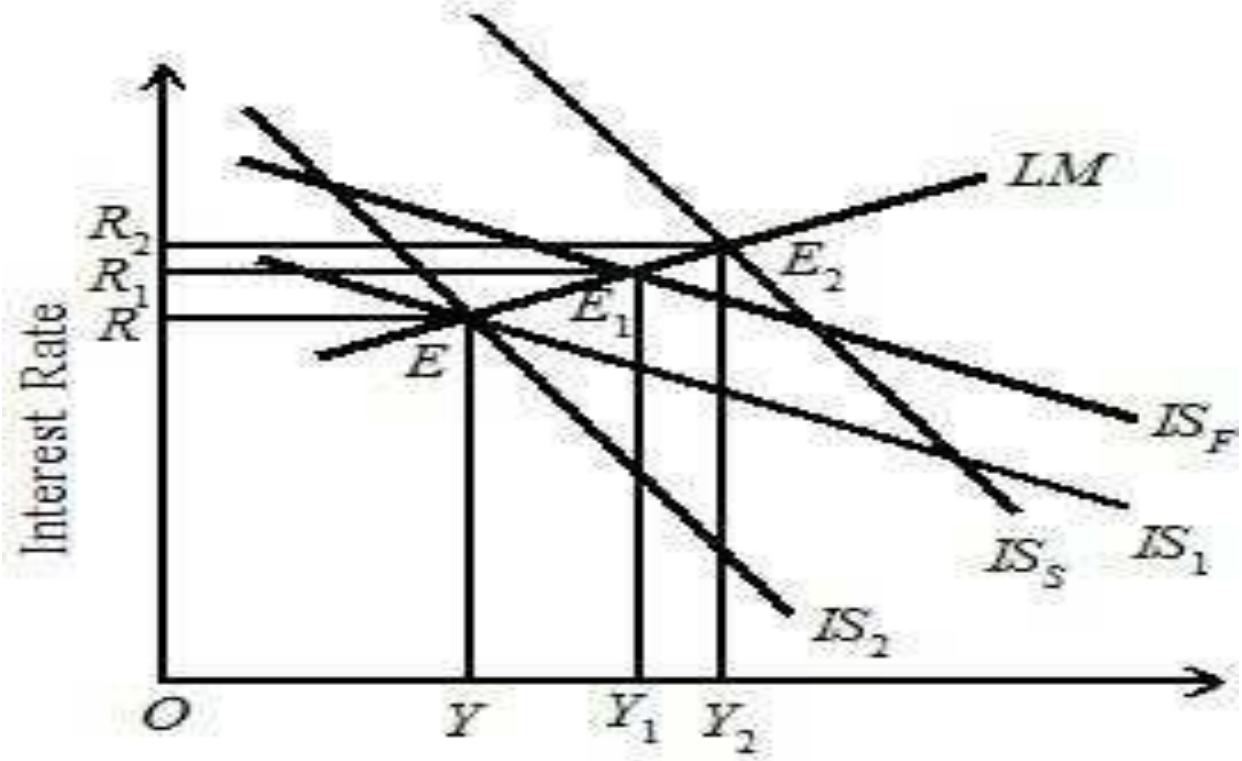

Fig. 12

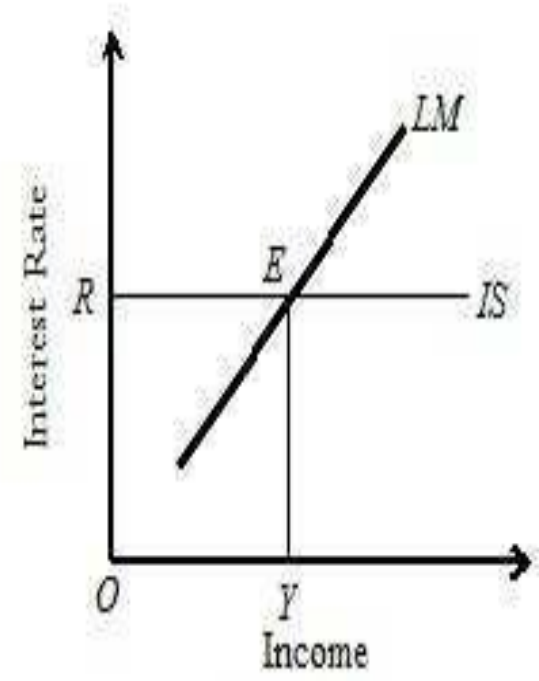

Fig. 13

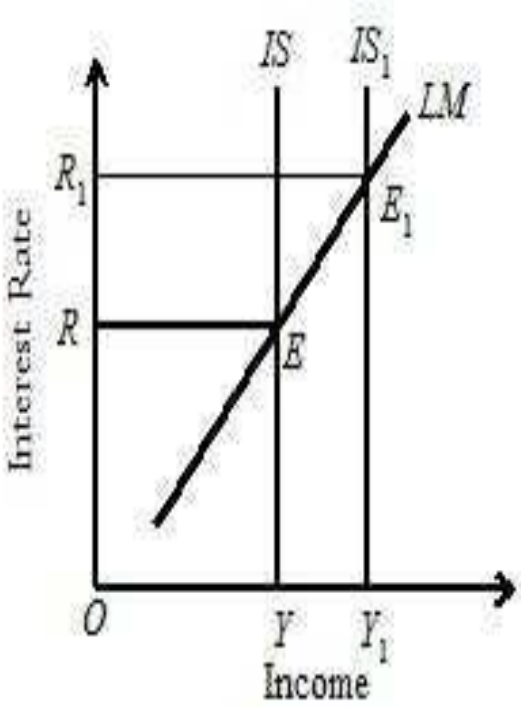

Fig. 14

THE SYNTHESIST VIEW: THREE RANGE ANALYSIS

Economists have explained the effectiveness of monetary and fiscal policies in three ranges in order to reconcile the *extremes* of the Keynesian and monetarist (or classical) views. The *LM* curve slopes upward to the right and has three segments, as shown in Figure 15. Starting from the left it is perfectly elastic, from *R*1 to *A*. This segment is known as "*the Keynesian range*", reflecting the "liquidity trap". At the other extreme to the right, the *LM* curve is perfectly inelastic, from *E* to *LM*2. This segment of the curve is known as "*the classical range*," because the classical believed that money is held only for transactions purposes and nothing is held for speculative purposes. In between these two segments of the curve is "*the intermediate range*". The Keynesian range represents the fiscalist or Keynesian view, the classical range the monetarist view, and the intermediate range the synthesist view. We take expansionary monetary and fiscal policies in order to explain their effectiveness which depend upon the extent to which they affect the level of income and the rate of interest in the Keynesian, the classical and the intermediate ranges. They, in turn, are determined by the responsiveness of the demand for money to changes in the interest rate.

MONETARY POLICY

Monetary policy is explained in Figure 15 where the three-range *LM* curves *LM*1 and *LM*2 are shown with three *IS* curves. The *LM*2 curve emerges after an increase in the money supply.

The Keynesian Range

First, consider the Keynesian range where the *LM* curve is perfectly elastic. This is the Keynesian liquidity trap situation in which the *LM* curve is horizontal from *R*1 to *A*, and the interest rate cannot fall below *OR*1. An increase in the money supply shifts the *LM* curve from *LM*1 to *LM*2. This shift in the curve has no effect on the rate of interest. Consequently, investment is not affected at all so that the level of income remains unchanged at *OY*1. This is because at a very low rate of interest such as *OR*1, people prefer to keep money in cash rather than in bonds (or securities) in the hope of converting it into bonds when the interest rate rises. Thus under the Keynesian assumption of the liquidity trap, the horizontal portion of the *LM* curve is not affected by an increase in the money supply. The *IS* curve intersects the *LM* curve in the flat range at A with little effect on the interest rate, investment and income. Monetary policy is, therefore, totally ineffective in the Keynesian range.

The Classical or Monetarist Range

Consider the classical range where *LM* curve is perfectly inelastic. In the classical range, the system is in equilibrium at *D* where the *IS*3 curve intersects the *LM*1 curve and the interest rate is *OR*5 and income level *OY*4. Suppose the central bank adopts an expansionary monetary policy, it increases the money supply. The increase in money supply shifts the *LM*1 curve to the right to *LM*2 position. As a result, the income level increases from *OY*4 to *OY*5 and the interest rate falls from *OR*5 to *OR*4 when the *IS*3 curve crosses the *LM*2 curve at *E*. The increase in the income level and fall in the interest rate as a result of the increase in the money supply is based on the classical assumption that money is primarily a medium of exchange. When the central bank buys securities in the market, the security prices are bid up and the rate of interest falls. The wealth holders then find other assets more attractive than securities. They, therefore, invest the increased cash holdings in new or existing capital investments which, in turn, raise the level of income. But as long as wealth holders possess more money balances than are required for transactions purposes, they will continue to compete for earning assets. Consequently, the interest rate will continue to fall and investment will continue to rise until the excess money balances are absorbed in such transactions. Ultimately, the equilibrium level of income rises by the full amount of the increase in the money supply. Thus the monetary policy is highly effective in the classical range when the economy is at high levels of income and interest rate and utilises the entire increase in the money supply for transactions purposes thereby raising national income by the full increase in the money supply.

The Intermediate Range

Now consider the intermediate range when the initial equilibrium is at *B* where the *IS*2 curve intersects the *LM*1 curve, and the income level is *OY*2 and the interest rate is *OR*3. The increase in the money supply shifts the *LM*1 curve to *LM*2 position. As a result, the new equilibrium is established at point *C* where the *IS*2 curve crosses the *LM*2 curve. It shows that with the increase in the money supply, the rate of interest falls from *OR*3 to *OR*2 and the income level rises from *OY*2 to *OY*3. In the intermediate range, the

increase in income by Y_2Y_3 is less than that in the classical range, $(Y_2Y_3 < Y_4Y_5)$. This is because in the classical case the entire increase in the money supply is absorbed for transactions purposes. But in the intermediate case, the increased money supply is partly absorbed for speculative purposes and partly for transactions purposes. That which is held for speculative purposes is not invested by wealth holders and remains with them in the form of idle balances. This has the effect of raising the income level by less than the increase in the money supply. Thus *in the intermediate range monetary policy is less effective than in the classical range.*

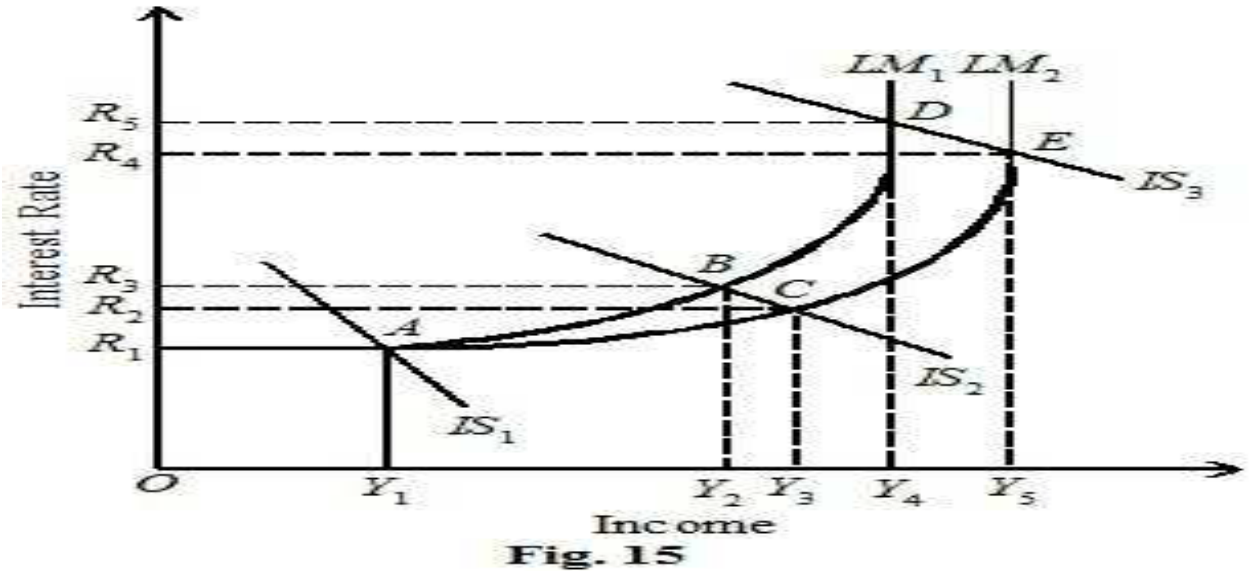

Fig. 15

FISCAL POLICY

Fiscal policy is explained in Figure 16 in which the three range *LM* curve is taken along with six *IS* curves that arise after increase in government expenditure.

The Keynesian Range

Consider first the Keynesian range when the initial equilibrium is at *A* where the IS_1 curve intersects the *LM* curve. Suppose the government expenditure is increased. This brings about new equilibrium at *B* where the IS_2 curve cuts the *LM* curve. Consequently, the income level rises from OY_1 to OY_2 with the interest rate unchanged at *OR*. The increase in income in the Keynesian case is equal to the full multiplier times the increase in government expenditure. This is because with fixed money supply at low levels of interest rate and income, there is lot of idle money with the wealth holders. This can be used to finance higher transactions without raising the interest rate. When the interest rate does not rise the level of investment remains the same as before and the increase in income is equal to the full multiplier times the increase in government expenditure. *Thus in the Keynesian range, the fiscal policy is very effective.*

The Classical Range

In the classical range, the *LM* curve is perfectly inelastic and the IS_5 curve intersects it at *E* so that the interest rate is OR_3 and the income level is OY_5. When the government

expenditure increases for an expansionary fiscal policy, the *IS*5 curve shifts upward to *IS*6. As a result, the *IS*6 curve crosses the *LM* curveat *F* and the interest rate rises to *OR*4 with income remaining unchanged at *OY*5. This is because the classical case relates to a fully employed economy where the increase in government expenditure has the effect of raising the interest rate which reduces private investment. Since the increase in government expenditure exactly equals the reduction in the private investment, there is no effect on the level of income which remains constant at *OY*5. Thus *fiscal policy is not at all effective in the classical range.*

The Intermediate Range

In the intermediate range, the initial equilibrium is at *C* where the *IS*3 curve intersects the *LM* curve. Here *OR*1 is the interest rate with *OY*3 income level. With the increase in the government expenditure, the *IS*3 curve shifts upward to the right to *IS*4 and the new equilibrium between *IS*4 and *LM* curves is established at point *D*. As a result, the increase in government expenditure raises the income level from *OY*3 to *OY*4 and the interest rate from *OR*1 to *OR*2. The increase in both the income level and the interest rate in the intermediate range is due to two reasons. *First*, the increase in income resulting from a rise in government expenditure occurs because additional money balances are available for transactions purposes.

Second, given a fixed money supply, a part of available transactions are held as idle balances by wealth holders which raise the interest rate. As a result of the rise in the interest rate, investment falls and the *fiscal policy is not so effective as in the Keynesian range*. In general, fiscal policy will be more effective the closer equilibrium is to the Keynesian range and less effective the closer equilibrium is to the classical range.

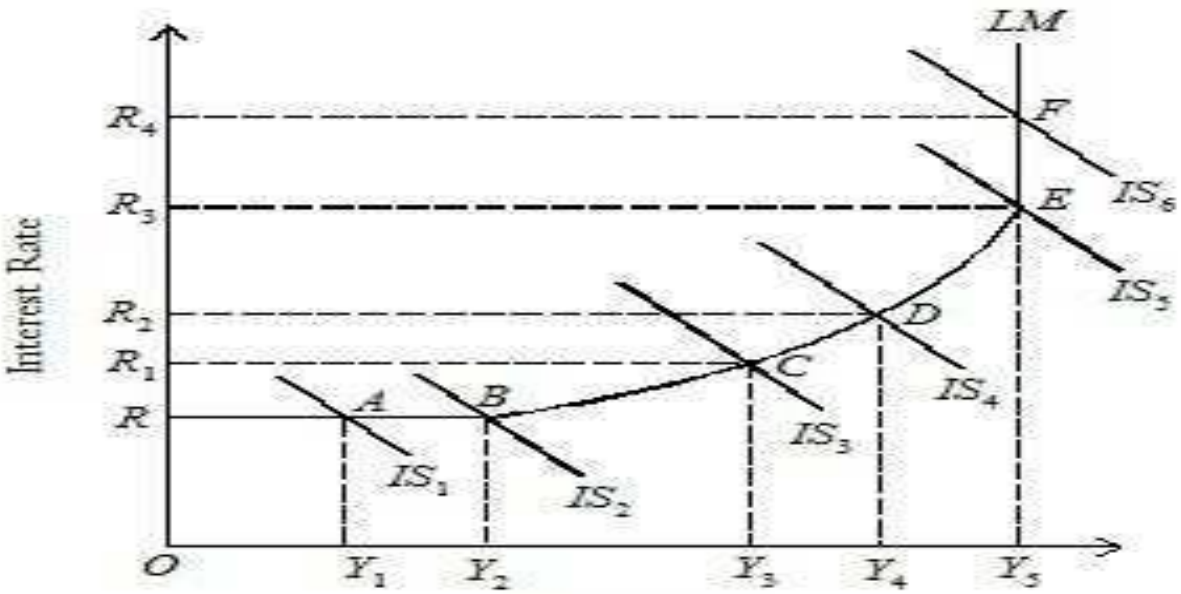

Fig. 16