Chapter 8

Inflation

Chapter Outline

8.1 INFLATION: MEANING AND CAUSES

Inflation is a situation of persistent and appreciable rise in prices, leading to fall in purchasing power of money. **Deflation** is just the opposite of inflation. Deflation is a situation of decrease in the overall level of prices. **Disinflation** is a situation of reduction in the rate at which prices are rising.

A **sustained inflation** occurs when the overall price level continues to rise over some fairly long period of time.

Causes of Inflation

Two main causes of rising and falling inflation are:

1. **Cyclical Unemployment:** The deviation of unemployment from its natural ratio leads to rising or falling inflation. In case of low unemployment, inflation ratio goes up and *vice versa.*
2. **Supply Shocks:** A supply shock is a disturbance in an economy whose first impact is to shift the aggregate supply curve. For example, two major oil shocks of 1970s, increased the world oil prices. It caused rise in inflation. A beneficial supply shock, for example, oil glut in the 1980's, led to fall in oil prices and fall in inflation.

The other causes are discussed below under demand-pull and cost-pull inflation.

8.2 TYPES OF INFLATION

8.2.1 Demand Pull Inflation

Demand-pull inflation arises when there is an excess of demand for goods over their supply. When there is persistent increase in demand and supply does not increase proportionately, then price tends to rise. The concept of demand-pull inflation is normally explained when there is full employment in an economy (it is because, in a full employment situation resources are fully employed and aggregate supply cannot increase).

The main causes of demand-pull inflation are:

1. **Growth of population**

   Increase in population by every year means constant increase in demand for food stuff and other materials. The continuously rising population is responsible for the widening gap between demand and supply in almost all consumer goods and services. It results in demand-pull inflation.

2. **Rise in employment and income**

   There has been a steady rise in employment rate. This has resulted in higher income and consequently greater demand for goods. The result has been a continuous rise in prices and demand-pull inflation.

3. **Increasing pace of urbanisation**

Rate of urbanisation has been rising. This raises the demand for superior goods by the migrant population due to demonstration effect of urban areas.

4. **Rising levels of government expenditure**

Public expenditure rises due to rise in population, national income and employment. In India, it is almost 40 per cent of our national income. About 40 per cent of the public expenditure is on non-developmental activities. It has led to demand-pull inflation.

5. **Deficit financing**

The government has frequently resorted to deficit financing in order to tide over the gap between public revenue and public expenditure. A small amount of deficit financing makes fund available for growth of the country, but a large amount results in demand-pull inflation.

Demand-pull inflation is shown graphically in Fig. 8.1.

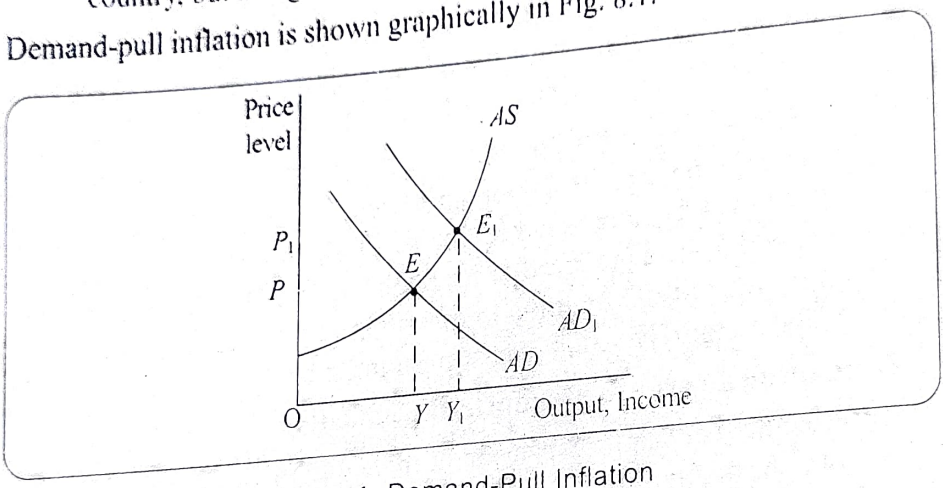


Fig. 8.1 Demand-Pull Inflation

where

AS = Aggregate supply curve which rises initially when the resources are not fully employed. It becomes almost vertical at OY level of output.

AD and AD_1 = These are aggregate demand curves. Increase in demand is shown by rightward shift of AD curve to AD_1 curve.

OP and OP_1 = These are equilibrium prices given by intersection of AD and AS curves. Price rises from OP to OP_1. This rise in price shows demand-pull inflation.

8.2.2 Cost-push Inflation

Cost-push inflation occurs when rise in price is due to rise in the cost of production. In this type of inflation, demand factor remains unchanged and supply factor plays an important role. Once this type of inflation sets in one industry, it spreads to all other industries of an economy.

Main causes of cost-push inflation are:

1. **Irregular agricultural supply**

   There has been irregular agricultural supply due to natural factors like drought and flood situations. When there is scarcity of agricultural supply, their prices rise which lead to cost-push inflation.

2. **Hoarding of essential goods**

   It is generally observed that big farmers and traders hoard foodgrains. This creates scarcity and continuous increase in their prices. Likewise, even in industrial products like oil, medicines, etc. traders hoard them and this results in cost-push inflation.

3. **Rise in administered prices**

   There are a number of important agricultural commodities for which price level is administered by the government. Many of these commodities are produced in the public sector. The government keeps on raising prices from time to time in order to cover the losses in the public sector. The result is cost-push inflation.

4. **Inadequate growth of industrial production**

   There has been large expansion of money supply creating big demand for industrial goods. The rise in industrial growth has been inadequate, which has pushed up the prices of industrial products and this has led to cost-push inflation.

5. **Agricultural price policy**

   The government has Minimum Support Price policy for agricultural products. Through this policy, the government announces the price at which it would be buying agricultural products. This ensures minimum price to farmers and completely eliminates risk. This policy largely benefits big farmers who have been pressurising the government to raise support prices. The result is cost-push inflation.

6. **Rising prices of imports**

   During the last two-three decades, India has not been freely allowing imports. Rise in import prices of raw materials, machines, etc., have risen the cost of production. This has pushed up prices and resulted in cost-push inflation.

   Cost-push inflation is graphically illustrated in Fig. 8.2.

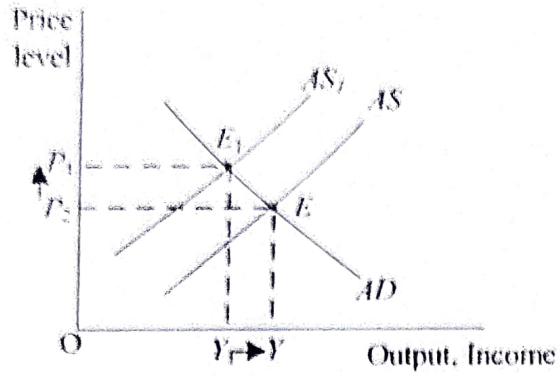


Fig. 8.2 Cost-push Inflation

where

AD = The aggregate demand curve is given by AD.

AS and AS_1 = There is a **fall** in aggregate supply due to rise in cost of production. It is shown by leftward shift of the aggregate supply curve from AS to AS_1.

OP and OP_1 = Equilibrium price is given by intersection of AD and AS curves. Equilibrium price rises from OP to OP_1 due to decrease in aggregate supply. This rise in price shows cost-push inflation.

8.3 THE FISHER EQUATION ON INFLATION AND INTEREST RATES

8.3.1 The Fisher Equation

Irwing Fisher has linked inflation with interest rate. Fisher relationship shows the tendency of inflation and nominal interest rate to move together. It is shown by the following equation:

$$\boxed{r^e \equiv i - \pi^e} \qquad (1)$$

or $$\begin{bmatrix}\text{Expected real}\\ \text{rate of interest}\end{bmatrix} \equiv \begin{bmatrix}\text{Nominal}\\ \text{rate of interest}\end{bmatrix} - \begin{bmatrix}\text{Expected rate of}\\ \text{inflation}\end{bmatrix}$$

Equation (1) is known as **Fisher equation** which states that expected real interest rate is the nominal interest rate less the expected inflation rate.

Equation (1) can be written as:

$$i \equiv r^e + \pi^e \qquad (2)$$

In the **short-run** when adjustment process takes place, equation (2) implies that changes in real interest rate plus changes in expected inflation rate are shown in changes in nominal rate.

8.3.2 THE LONG-RUN IMPLICATION

In the **long-run**, the economy returns to full employment level of output, $\pi = \pi^e$ and $r^e = r^*$ (r^* refers to full employment level). Substituting these values in equation (1), we get:

$$r^* \equiv i - \pi \qquad (3)$$

or

$$i \equiv r^* + \pi$$

In the **long-run**, monetary changes do not affect real interest rate. Thus, when r^* is given, a very crucial result of equation (3) is that **in the long-run an increase in inflation is shown fully in nominal interest rate. It is called Fisher Effect or Expectations Effect.**

The assumption about expected inflation rate will decide the adjustment path of both real and nominal interest rate to a change in money growth. One possible path of interest rate and Fisher effect is graphically shown in Fig. 8.3.

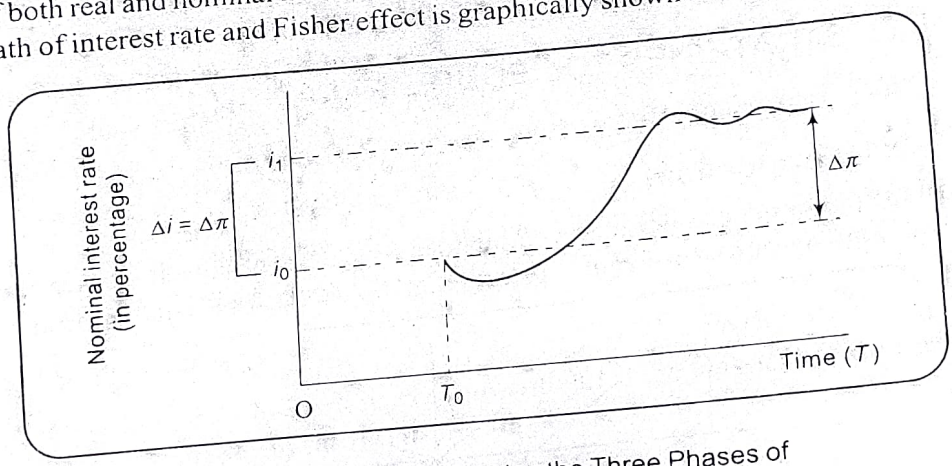


Fig. 8.3 Fisher Effect showing the Three Phases of Adjustment as Money Grows

The figure shows **three phases of adjustment as the economy faces rise in money growth and slowly adjusts to it**. These phases or effects are:

1. **Liquidity Effect:** Liquidity effect shows that sustained increase in money growth leads to fall in nominal interest rate. At time T_0, there is growth in nominal money. It raises real balance or liquidity which reduces the nominal interest rate. The nominal interest rate is declining showing the liquidity effect of rise in real balance on the nominal interest rate.
2. **Income Effect:** Income effect shows that rise in output and inflation gradually raises the nominal interest rate. It covers the phase which shows rising nominal interest rate. In this phase, increasing nominal income raises interest rates by raising the quantity of real balances demanded.

3. **Expectations Effect:** Expectations effect is also called Fisher effect. It gives positive association between inflation and nominal interest rate. In other words, Fisher effect shows that in the **long-run**, the nominal interest rate increases by the same amount as money growth and inflation (that is, $\Delta\pi = \Delta i$). A five percentage point rise in money growth will raise nominal interest rate by five percentage points in the long-run.

The explanation is given by the Quantity Theory of Money and Fisher Equation. That is, the **two steps of reasoning** for Fisher effect are:

(*a*) According to Quantity Theory, a five percentage point rise in money growth will raise rate of inflation by five percentage.

(*b*) According to Fisher Equation, a five percentage point increase in inflation will raise nominal interest rate by five percentage point.

Thus, the one-for-one relation between the inflation rate and nominal interest rate is called the Fisher Effect.

8.3.3 Real Balances and Inflation

Figure 8.4 shows the demand for real balances as a function of nominal interest rate.

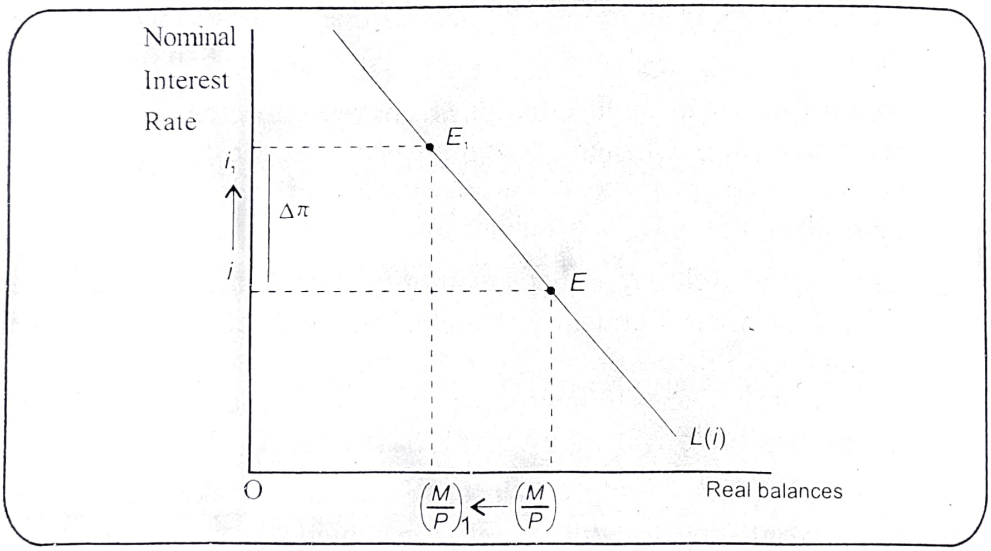


Fig. 8.4 The Demand for Real Balances

Figure 8.4 shows that rise in inflation (π) and accordingly in nominal interest rate (i) will lead to fall in equilibrium stock of real balances. As interest rate rises from i to i_1 in **long-run**, real balances fall from $[M/P]$ to $[M/P]_1$

Thus, **the results are**:

1. In the long-run, a **sustained** rise in money growth raises inflation and the nominal interest rate by the **same account** (or $\Delta m = \Delta\pi = \Delta i$).
2. **A sustained rise in money growth and in inflation reduces the real money stock.**

8.4 SOCIAL COSTS OF INFLATION

There are some social problems that result from inflation. It turns out that the costs of inflation are subtle. It is important to distinguish between perfectly anticipated inflation and imperfectly anticipated inflation.

8.4.1 The Costs of Perfectly Anticipated Inflation

Perfectly anticipated inflation is inflation that people expect. In other words, when inflation rate is steady, perfectly expected and predictable, (for example, every month the price level rises by 2 per cent) it is called perfectly anticipated inflation. It imposes certain costs. These are:

1. **Shoeleather Cost:** The cost to the individual of holding money is the interest foregone by not holding an interest-bearing asset. When inflation rate rises, nominal interest rate rises and the interest lost by holding money rises. Thus, the cost of holding money rises. In other words, demand for money balances fall. People must make more frequent trips to the bank to withdraw smaller cheques. It involves shoeleather cost of inflation, because walking to the bank more often causes one's shoes to wear out more quickly.
2. **Menu Cost:** With high inflation, firms are expected to change their announced prices. It requires changing cash registers, catalogues, etc. These costs are called menu costs, because the higher the rate of inflation, the more often firms have to print new menus.
3. **The Cost of Relative Price Variability:** Firms facing menu costs do not change prices frequently. A higher rate of inflation implies greater variability in relative prices. This variability in relative price imposes a cost—that is, it leads to microeconomic inefficiencies in the allocation of resources.
4. **Tax Distortions:** Most of the tax provisions do not take into account the effects of inflation. Inflation can change individuals' tax liability since tax code measures nominal income rather than the real capital gain. Thus, inflation distorts how taxes are levied.
5. **Inconvenience of Making Inflation Corrections:** Money is the yardstick with which we measure economic transactions. With inflation, this yardstick is changing. For example, when the value of dollar is continuously changing, then dollar is a less useful measure. Thus, inflation imposes a cost in terms of inconvenience of making inflation corrections.

8.4.2 The Costs of Imperfectly Anticipated Inflation

Imperfectly anticipated inflation is inflation that people do not expect. It imposes certain costs. These are:

1. **Adverse Effect on Efficient Decision Making:** With inflation, some

are gainers and others are loosers. Unanticipated inflation introduces an extra element of risk. Such extra risk eliminates some attractive exchanges among both businesses and consumers. This is a cost which arises because of unexpected inflation.

2. **Arbitrary Wealth Redistribution:** Inflation changes the real value of assets fixed in nominal term. Unexpected inflation leads to arbitrary wealth redistribution of all assets fixed in nominal terms like money, bonds, saving accounts, insurance contracts, and pensions.

   With unexpected inflation, realised real interest rates are lower than nominal interest rates. It hurts individuals on fixed pensions. It can wipe out the purchasing power of a lifetime saving.

   Most loan agreements specify a nominal interest rate which is based on the rate of inflation prevailing at that time. If inflation is on the higher side than expected, then debtors win and the creditors lose as debtors repay the loan with less purchasing power. This shows how inflation redistributes wealth between debtors and creditors.

8.5 STRATEGIES TO REDUCE INFLATION

Strategies to reduce inflation are:

8.5.1 Gradualism

In the policy of gradualism, recommended by the Keynesian efforts are made to bring slow and steady return to low inflation. Gradualism is shown in Fig. 8.5.

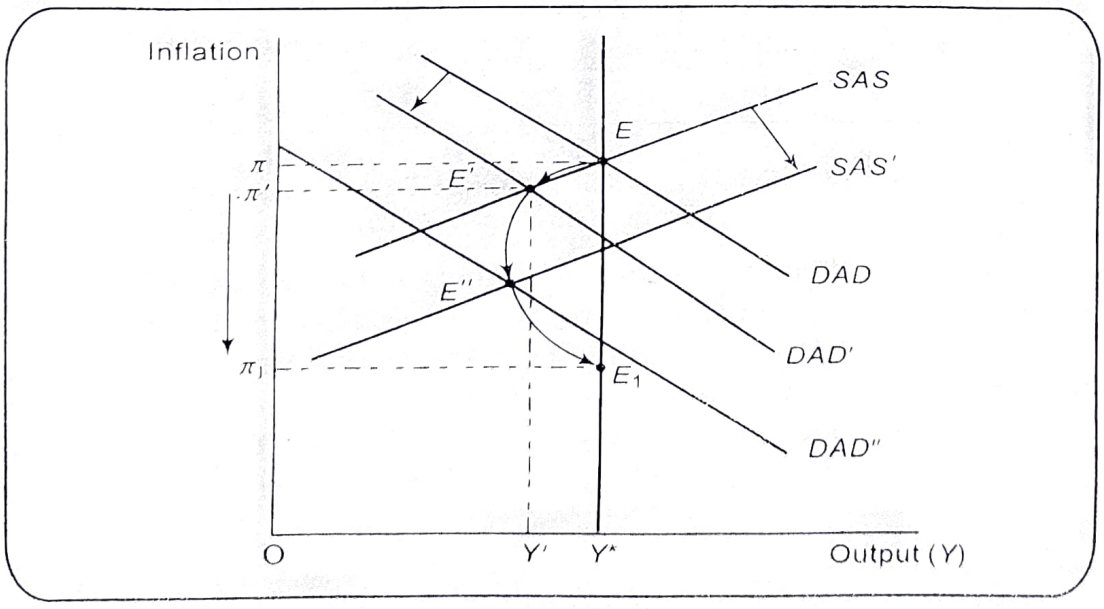


Fig. 8.5 Gradualism

where

SAS = Short-run aggregate supply curve. It is upward sloping.

DAD = Dynamic aggregate demand curve. It is downward sloping.

Point E = It is the initial point of equilibrium where $SAS = DAD$. It gives the equilibrium rate of inflation as π.

Point E_1 = The objective of policy is to reduce the inflation rate from π to π_1 and to keep output to its potential level (Y^*). Point E_1 gives the required lower inflation rate at full employment level of output.

Point E' = The adjustment process in the policy of gradualism starts with **small cut in money growth monetary policy**. It reduces dynamic aggregate demand. It is shown by leftward shift of DAD curve to DAD' curve. The new equilibrium occurs at point E'. Inflation rate falls to π' and output level falls to Y'.

Point E'' = Since inflation rate falls to π', short-run aggregate supply shifts downward to SAS'. A little more reduction in money growth, shifts DAD' to DAD''. The new equilibrium is at E''. The economy is gradually moving towards desired inflation rate of π_1, and full employment level of output Y^*.

Thus, in the policy of Gradualism:

1. There is slow and persistent effort to reduce the inflation rate.
2. It begins with a small cut in the growth rate of money.
3. There is no massive recession.
4. In the adjustment process, unemployment occurs.
5. There is slow reduction in inflation.

8.5.2 Cold Turkey

In the policy of Cold Turkey, recommended by the classical economists, efforts are made to cut the inflation rate fast.

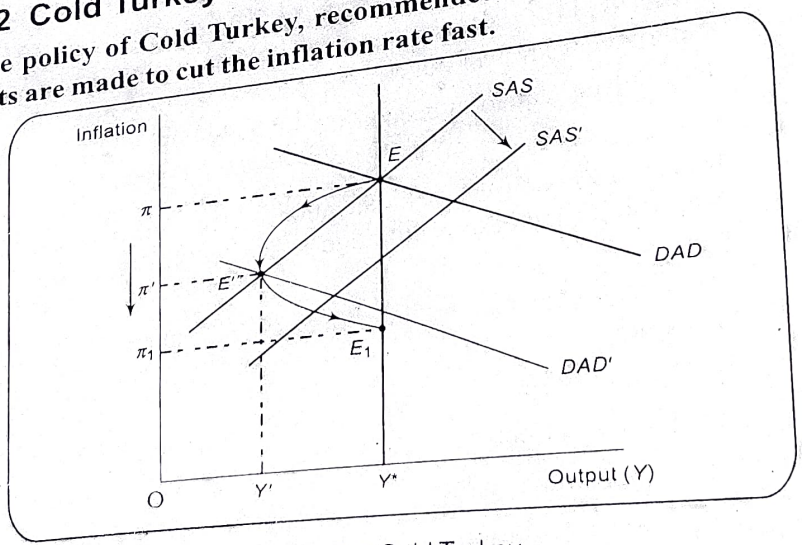


Fig. 8.6 Cold Turkey

Cold Turkey is shown in Fig. 8.6, where:

SAS = Short run aggregate supply curve which is upward sloping.

DAD = Dynamic aggregate demand curve which is downward sloping.

Point E = It is the initial equilibrium point where $DAD = SAS$. It gives inflation rate as π and full employment output as Y^*.

Point E_1 = The objectives of the policy is to attain point E_1 which shows reduced inflation rate of π_1 at potential level of output, Y^*.

Point E' = The adjustment process in the policy of Cold Turkey starts **with massive cut in money growth monetary policy.** It shifts DAD curve leftwards to DAD'. The economy is in equilibrium at point E'. Inflation rate falls to π' and output level falls to Y'. Fall in output level (or recession) and inflation rate is more in Cold Turkey as compared to gradualist policy.

Due to greater fall in inflation rate, the SAS shifts downward (increases) to SAS'. The adjustment process stops when economy return to point E_1 with desired reduced inflation rate at π_1 and full employment at Y^*.

Thus, in the policy of Cold Turkey:

1. There is fast cut in inflation rate.
2. It begins with a massive cut in the growth rate of money.
3. There is massive but shorter recession.
4. In the adjustment process, larger unemployment occurs.
5. There is rapid reduction in inflation.

Comparison between Gradualism and Cold Turkey is shown in Table 8.1.

Table 8.1. Comparison between Gradualism and Cold Turkey

Gradualism	*Cold Turkey*
1. In this policy there is slow and steady return to low inflation.	1. In this policy there is fast return to low inflation.
2. It involves small cut in growth rate of money.	2. It involve massive cut in the growth rate of money.
3. There is no massive recession.	3. There is massive but shorter recession
4. In the adjustment process, lesser unemployment occurs.	4. In the adjusting process, larger unemployment occurs.
5. There is slow reduction in inflation.	5. There is rapid reduction in inflation.

8.5.3 Creditability

A credible policy is defined as one that the people believe will be kept up and will succeed. For example, the Cold Turkey policy is a credible policy. A credible policy earns a creditability bonus while reducing inflation.

In this policy, when money growth rate is cut, people instantly adjust their expected inflation rate (π^e). As a result *SAS* shifts down. The economy moves immediately to a new equilibrium point showing reduced inflation rate. There is direct link between credibility of a policy and disinflation rate. That is, more credibility implies more disinflation.

8.5.4 Sacrifice Ratio

Sacrifice ratio is defined as the ratio of the cumulative percentage loss of output to the actual reduction in inflation. In other words, sacrifice ratio is the **cost of disinflation**. Economists calculate sacrifice ratio of the disinflation policy before implementing the policy.

Factors that lead to less costly disinflation or sacrifice ratio (as given by IMF study paper) are:

1. Announcement of policy in advance.
2. Gradual fall in inflation.
3. More credibility of the policy.
4. Greater relative importance of expected inflation in determining current inflation.
5. Greater responsiveness of prices and wages to demand conditions.

Summary

Inflation: Meaning

Inflation is a situation of persistent and appreciable rise in prices, leading to fall in purchasing power of money.

Causes of Inflation

Two main causes of inflation are:

1. Cyclical unemployment
2. Supply shocks.

Types of Inflation

1. Demand Pull Inflation

Demand-pull inflation arises when there is an excess of demand for good over their supply.

Chapter 9

Unemployment

Chapter Outline

9.1 NATURAL RATE OF UNEMPLOYMENT

9.1.1 Meaning of Natural Rate of Unemployment

Full employment is not possible in the real world. In reality, all economies experience some unemployment. Unemployment means low standard of living, psychological distress, mental agony and hardship. Every economy has to calculate its natural rate of unemployment. ***Natural rate of unemployment is defined as the average rate of unemployment around which the economy fluctuates in the long run.*** It is calculated by the formula:

$$\begin{bmatrix}\text{Natural rate of unemployment}\\ \text{for any year}\end{bmatrix} = \begin{bmatrix}\text{Average of unemployment rate}\\ \text{for ten years earlier to ten years later}\end{bmatrix}$$

Many economist prefer the term NAIRU (Non-Accelerating Inflation Rate of Unemployment) to the term natural rate of unemployment.

9.1.2 Determinants of Natural Rate of Unemployment

A model of labour force dynamics can be expressed by the following relations:

E = Total number of employed workers

U = Total number of unemployed workers

L = Total labour force

s = Rate of job separation

f = Rate of job finding which is assumed to be not instantaneous.

Using the above notations, the results/relationships we get are:

$$L = E + U \quad (1)$$

$$\text{Rate of unemployment} = \frac{U}{L} \quad (2)$$

$$f \,.\, U = s \,.\, E \quad (3)$$

$$\frac{U}{L} = \frac{s}{s+f} \quad (4)$$

Analysis of each of the above four equations is as follows:

$$\boxed{L = E + U} \quad (1)$$

It shows that total labour force (L) in a country can be divided into two kinds:

(a) the number of employed workers, E and

(b) the number of unemployed workers, U

$$\boxed{\text{Rate of unemployment} = \frac{U}{L}} \quad (2)$$

The rate of unemployment in an economy is the ratio of number of unemployed workers (U) to the total labour force (L).

$$\boxed{fU = sE} \qquad (3)$$

In every economy, a continuous transition between employment and unemployment takes place. It is shown in Fig. 9.1.

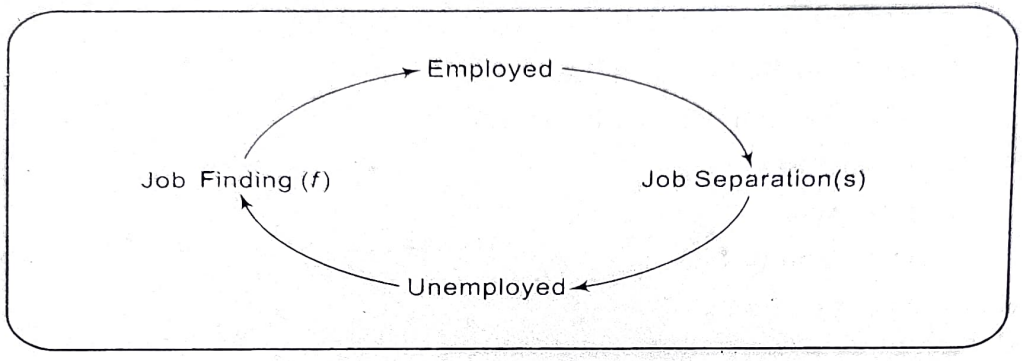


Fig. 9.1 Transition between Employed and Unemployed

A fraction of people who are employed lose their job or are laid-off. Their percentage is denoted by s and is called rate of ***job separation***. They are unemployed. These unemployed people start searching for a job. The percentage of people who find a job is denoted by f and is called the rate of ***job finding***. Rate of unemployment is determined by both f and s.

Steady-state condition occurs when:

[Number of unemployed people finding jobs]

= [Number of employed people losing jobs]

or $$fU = sE$$

In such a situation, rate of unemployment is in a steady state—it is neither rising nor falling.

$$\boxed{\frac{U}{L} = \frac{s}{s+f}} \qquad (4)$$

The rate of unemployment depends upon rate of job separation(s) and rate of job finding (f) by the formula $\frac{U}{L} = \frac{s}{s+f}$.

The equation is derived as follows:

$$L = E + U \qquad (1)$$

or $$E = L - U$$

Substituting the value of E in Eq. (3), we get: (3)

$$f \cdot U = s \cdot E$$

$$f \cdot U = s(L - U)$$

Dividing the equation by L, we get

$$f\frac{U}{L} = s\left(1 - \frac{U}{L}\right)$$

$$\Rightarrow \quad s\frac{U}{L} + f\frac{U}{L} = s$$

$$\Rightarrow \quad \frac{U}{L}(s + f) = s$$

$$\Rightarrow \quad \frac{U}{L} = \frac{s}{s + f}$$

Two *results* that emerge from the above equation are:

(a) Higher the value of s (rate of job separation), higher will be the unemployment rate $\left(\frac{U}{L}\right)$.

(b) Higher the value of f (rate of job finding), lower will be the unemployment rate $\left(\frac{U}{L}\right)$.

9.1.3 Policies to Reduce Natural Rate of Unemployment

The government must formulate such policies for reducing natural rate of unemployment which will either reduce the rate of job separation or raise the rate of job finding. The policies will involve structural labour market policies. Some policies to reduce natural rate of unemployment are:

1. Unemployment benefits should be reduced. Unemployment benefits allow longer job search. Unemployment benefits reduce the urgency for an unemployed person to take a job.
2. Minimum wages should be reduced. It will reduce teenage unemployment rate.
3. Incentives should be given so that a worker takes up technical training. It will make the worker more productive and reduce natural rate of unemployment.
4. If unemployment displays ***hysteresis***, with extended periods of high unemployment, it will raise the natural rate of unemployment. In other

words, unemployment hysteresis is a theory that argues that recessions may permanently affect the natural rate of unemployment. So, efforts should be made to control recession.

9.2 FRICTIONAL UNEMPLOYMENT

9.2.1 Meaning of Frictional Unemployment

Frictional unemployment is defined as unemployment caused by the time it takes for the workers to search for a job that best suits their individual skills and tastes when the economy is at full-employment. Neither all workers are identical nor all jobs are identical. It is difficult to match worker's skills, preferences, abilities with the job profile. Thus, no economy can escape some extent of frictional unemployment. (*Note: Cyclical* unemployment is unemployment in excess of frictional unemployment. It occurs when output is below its full employment level.)

9.2.2 Causes of Frictional Unemployment

Main causes of frictional unemployment are as follows:

1. **Sectoral Shift:** Sectoral shift is shift or change in the composition of demand among industries or regions. In real life, sectoral shifts are taking place all the time with advancement of technology and new inventions. For example, as price of a good falls, its demand rises. This, in turn, brings about a rise in the demand for labour in this particular industry. If the demand for labour rises, more workers will be shifting to this industry from another industry. This takes time. The time gap causes frictional unemployment.
2. **Workers are Unexpectedly Out of Work:** It occurs when a particular skill in which a worker expertises is no longer needed. It may also occur when a firm fails and lays off workers. At times the performance of the worker may not be satisfactory in which situation he is unexpectedly out of work.

9.2.3 Policies to Reduce Frictional Unemployment

If frictional unemployment is reduced, natural rate of unemployment reduces. Some steps taken to reduce frictional unemployment are:

1. Government employment agencies collect information on workers profile and job profile and make an effort to match jobs and workers.
2. Retraining programmes are designed to make the workers efficient in those areas or skills where there is demand for them.
3. Unemployment insurance programme's terms should not be so soft and generous to encourage workers to turn down unattractive job offers. The programme has the benefit of reducing workers' uncertainty about their

income. But at the same time, it has the drawback of raising the level of frictional unemployment. The reforms proposed by economists to reduce the level of unemployment include:

(*a*) *100 per cent experience rated system*: In this system, the firm that lays off a worker bears ***full*** cost of that worker's unemployment benefits.

(*b*) *Partially experienced rated system:* In this system, the firm that lays off a worker **partially** bears the burden of the worker's unemployment benefits.

9.3 WAIT OR STRUCTURAL UNEMPLOYMENT

9.3.1 Meaning of Wait or Structural Unemployment

Wait or structural unemployment is defined as unemployment caused by wage rigidity above equilibrium level and job rationing. Job rationing means that the supply of labour is more than the demand for labour at the going wage rate. The workers are waiting for jobs to be available. The extent of wait unemployment is shown in Fig. 9.2.

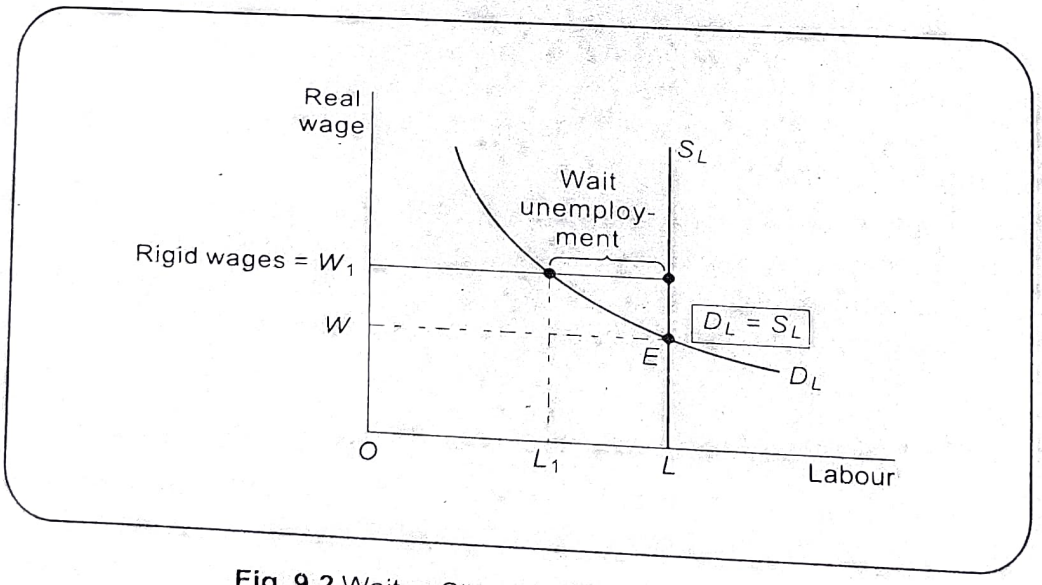


Fig. 9.2 Wait or Structural Unemployment

where

OL = Number of labourers willing to work.

S_L = S_L is the supply curve of labour which is perfectly inelastic at OL level of labour.

D_L = D_L is the demand curve for labour. It is downward sloping.

OW = At point E, equilibrium takes place where $D_L = S_L$. It gives OW as the equilibrium wage rate.

OW_1 = Let the real wage level be rigid or stuck at OW_1. At this wage, demand is for OL_1 labour and supply is of OL labour. The supply of labour exceeds the demand for labour by L_1L. Excess supply of labour leads to unemployment. This is wait unemployment or structural unemployment since L_1L units of labour are actively searching and waiting for jobs to become available. At OW_1 wage rate, OL_1 units of labour are hired.

9.3.2 Causes of Wait Unemployment

The main causes of wait unemployment (or real wage rigidity) are:

1. **Minimum-Wage Laws**

   The government has passed the Minimum Wage Laws to protect and safegaurd the interest of workers against the exploitation of employers. In this the government fixes the minimum wage or floor wage for certain industries and categories of workers, through legislation, above the equilibrium wage.

   The law has been adopted worldwide. It is particularly relevant for unskilled and inexperienced workers, as this type gets the lowest wage rate. For other workers, the minimum wage in **not binding** because they earn more than the minimum wage. One of the major objective of Minimum Wage Laws is to promote equitable distribution of income. In India, the Minimum Wage Act was passed in 1948 and has been revised many times since then. The law has been able to give higher wage to unskilled and some semi-skilled workers. Higher wages does improve the productive efficiency of these workers.

   The effect of rise in legal wage rate is to add to already existing unemployment. The unemployment gap rises. There are workers who are laid off at higher wages as there is no demand for them at higher wage rate. They become worse off.

   Many economists and policy makers believe that ***tax credit is*** a better way to raise the income of the poor working class. In this scheme, the government gives payment or credit to low income families which is more than the tax they owe to the government. That is, for a low income family the credit exceeds its tax. In India, people with income upto ₹ 2.5 lakhs are exempted from tax. However, a senior citizen is not chargeable to tax upto ₹ 3 lakhs 85 thousand and a women tax payer is not chargeable to tax upto ₹ 2.5 lakhs.

2. **Monopoly Power of Union**

   Union is organisation of workers who represent the collective preferences of its members. The goals of union reflect the goals of its members. The

aim of unions is to improve the terms of employment—both wages and working conditions—for its employee members. Unions have become a strong force affecting the social, political and economic life of industrialised countries including many underdeveloped countries. Most firms dislike unions.

The impact of unions cannot be evaluated until we have a theory of what unions try to do. Unions do not have a single goal. They want to maximise both employment and wage rate. However, given the downward sloping demand curve of labour, a higher wage rate implies lower level of employment. In other words, unions cannot have both higher wages and employment. They have to decide their objectives and the particular trade-off between these two goals.

Generally, unions use a variety of methods to improve wages and working conditions of its employees including restrictions on labour supply and ***direct negotiation with employers (called collective bargaining)***. The effect of any bargaining process on wages and employment depends crucially on the relative influence of union leaders and firm management. Often the final agreement raises the wages above the equilibrium level and allows the firm to decide how many workers to employ. The result is a fall in employment rate, a lower rate of job finding, and a rise in wait unemployment.

3. **Efficiency Wages**

Efficiency wage theory postulates that high wages, above the level that balances demand and supply, make workers more efficient and productive. That is, there is direct relationship between wage rate and productivity. As a result, the firms do not cut wages even when there is an excess supply of labour. If a firm reduce wages, it will lead to lower productivity and lower profits for the firm.

There are **four different explanations** of efficiency wage theory as given by different economists. The details are as follows:

1. The efficiency wage theory, which is applied to poor countries, holds that higher wages means better living standard and more nutritive food. A mentally and physically sound body and mind are essential to give efficient results.
2. The efficiency wage theory, which is applied to advanced countries, holds that higher wages reduce labour turnover, thereby reducing the time spent by firms in hiring and training new labourers. High wages are an incentive for workers to stay with the firm and not look for other alternative opportunities.
3. Economists maintain that paying higher wage reduces adverse selection (Adverse selection is a situation which arises when products of different

qualities are sold at a single price). In this situation, when people with different capabilities are given same wages, the better skilled labourer quits the job. The firm is left with lesser skilled labourers which reduces the productivity. Thus, higher wages reduces adverse selection.

4. Economists maintain that paying higher wages reduces the problem of moral hazard (moral hazard arises when a party whose actions are unobserved affect the magnitude of payment associated with an event). In this situation, the firm is unable to perfectly monitor the work effort of the workers. The workers can choose to be work shirkers, in which case they will be fired. Once fired the workers will calculate the magnitude of loss of wages. Economists maintain that if wages are more, it will induce a sense of responsibility in the workers and they would like to produce results.

9.4 OKUN'S LAW

Okun's Law was given by **Arthur M Okun** in 1962 in his work ***"Potential GDP: Its measurement and Significance"***. Okun's law gives the relationship between unemployment and losses in a country's production. It states that there is ***negative relationship between unemployment and real GDP.***

In a country facing recession, unemployment rises. When unemployment rises, it means more and more labourers are sitting idle in their home and not adding to production of goods and services in the economy. It means real GDP falls, showing inverse relationship between unemployment and real GDP.

Summary

Natural Rate of Unemployment

1. Full employment is not possible in the real world.
2. Natural rate of unemployment is the average rate of unemployment around which the economy fluctuate in the long-run.
3. Model of labour force dynamics can be expressed by the following equations:

$$L = E + U$$

$$\text{Rate of unemployment} = \frac{U}{L}$$

$$fU = sE \qquad \text{[steady state condition]}$$

$$\frac{U}{L} = \frac{s}{s+f}$$

Chapter 10

Phillips Curve and the Dynamics of Inflation and Unemployment

Chapter Outline

10.1 INTRODUCTION

This chapter develops the aggregate supply curve of an economy from the relationships between wages, prices, employment and output. It will also help us in analyzing the effects of fiscal policy and monetary policy on the output level and the prices. Many models have been developed on the aggregate supply curve, though all have as their basis the phenomenon that output adjusts very slowly to changes in demand. The classical theory suggests that:

1. An economy will always operate at full employment, though at times there may exist some frictional unemployment due to the shifting of workers between jobs. However, empirical evidence proves that the rate of unemployment which exists in any economy is much more than just frictional unemployment. Also the labour market is not always in equilibrium at the full-employment level of output.
2. There cannot exist any relationship between unemployment and wages. The productivity of labour and the effect of money on prices alone determine the wage rate. However, facts show that there does exist a

systematic relationship between unemployment and the rate of change of wages.

The chapter further derives dynamic aggregate supply curve, dynamic aggregate demand curve and the level of inflation and output.

10.2 THE PHILLIPS CURVE

The Phillips curve is named after **A.W. Phillips** who, in 1958, presented a study based on the behaviour of wages in the United Kingdom for the time period 1861 to 1957. **It shows an inverse relationship or trade-off between the unemployment rate and the rate of increase in money wages or wage inflation.** The higher the unemployment rate, the lower is the rate of wage inflation.

According to the Phillips curve, the nominal wages change slowly in conformity with the level of unemployment. Wages have a tendency to increase when employment is high and to decrease when employment is low. The rate of wage inflation, g_w, can be written as:

$$g_w = \frac{W - W_{-1}}{W_{-1}} \qquad (1)$$

where

g_w = rate of wage inflation

W = wage in the current period

W_{-1}=wage in the preceding period.

The natural rate of unemployment is the amount of frictional unemployment that exists at the level of full employment. We denote it by μ^*. The Phillips curve can be presented as:

$$g_w = -\varepsilon(\mu - \mu^*) \qquad (2)$$

where

ε = It measures the responsiveness of wages to unemployment

μ = the unemployment rate

μ^* = Natural rate of unemployment

$\mu - \mu^*$ = Unemployment gap.

The **results** emerging from above equation are:

1. If $\mu > \mu^*$, the unemployment rate is greater than the natural rate and therefore wages fall.
2. If $\mu < \mu^*$, the unemployment rate is lower than the natural rate and therefore wages rise.

The Phillips curve suggests that wages and prices adjust slowly to changes in the aggregate demand. Suppose an economy is in a situation of equilibrium where prices are stable and unemployment is at its natural rate. An increase in the money supply will necessitate an increase in wages and prices to get back to equilibrium. However, according to the Phillips curve, wages will increase only if there is a decrease in the rate of unemployment. This will further lead to a rise in the rate of wage increase, thus causing an increase in wages and prices making the economy return to the full employment level of output and unemployment. From equations (1) and (2), we get:

$$W = W_{-1}\{1 - \varepsilon(\mu - \mu^*)\} \qquad (2a)$$

The equation shows that wages will increase only if unemployment falls below the natural rate.

Although the Phillips curve shows negative relationship between the rate of increase in wages and unemployment rate, **it later came to be described as a relationship between the rate of increase in prices and the unemployment rate.**

The original Phillips curve is graphically shown in Fig. 10.1. In the figure, on the x-axis unemployment percentage is shown, and on the y-axis rate of change in money wage in percentage is shown. The original Phillips Curve (for the United Kingdom) is downward sloping and quite flat showing inverse relationship between wage inflation and unemployment.

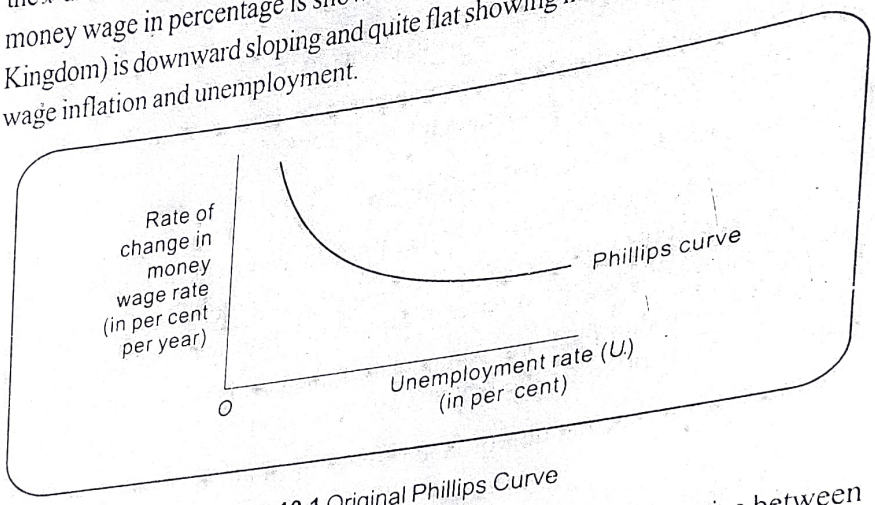


Fig. 10.1 Original Phillips Curve

The Phillips curve suggests that policy makers could make a choice between different combinations of the inflation rate and the rate of unemployment. They could maintain low inflation but at the cost of high unemployment, or they could have low unemployment but only at the cost of a high inflation. However, empirical evidence for many countries goes against the findings of the Phillips curve.

10.2.1 The Policy Trade Off

Few important points to note here are as follows:

1. Gradually, instead of wage inflation, price inflation or simply inflation was used. That is, Phillips curve started relating rate of inflation to the rate of unemployment.
2. Every economic policy has two goals low inflation and low unemployment. The goals are conflicting. That is, there is a trade off between the two objectives of low inflation and low unemployment. This trade off exist only in short-run. In other words, there is no permanent inflation-unemployment trade off.
3. Policy makers can choose different combinations of unemployment and inflation as given by downward sloping (**quite flat**) Phillips curve.

10.2.2 The Relationship between Wages and Employment

In the classical theory, both wages and prices are completely flexible, and this ensures that an economy will always produce an output which is at the full-employment level. But the Phillips curve implies that there is a slow adjustment of wages to the changes in the level of unemployment, and to shifts in demand. In other words, **wages are sticky and move slowly overtime.**

The Phillips curve, in equation (2), can be expressed as a relationship between the rate of change of wages, g_w, and the level of employment.

$$\mu = \frac{N^* - N}{N^*} \tag{3}$$

where

μ = the unemployment rate

N^* = the full employment level

N = the actual level of employment

The unemployment rate can be defined as that part of the full employment labour force which is unemployed.

Equation (3) implies that when $N = N^*$, the unemployment rate is zero at the full employment level. However, there exists a positive frictional unemployment even at the full employment level. Since the unemployment rate is relative to the natural rate of unemployment, we can mentally substitute equation (3*a*) for equation (3), we get :

$$\mu - \mu^* = \frac{N^* - N}{N^*} \tag{3a}$$

To find the relationship in terms of the Phillips curve between the unemployment level and the rate of change in wages, we substitute equation (3*a*) in equation (2), we get:

$$g_w = -\varepsilon \left[\frac{(N^* - N)}{N^*} \right] \qquad (3b)$$

Also equation (2*a*) can now be written as:

$$W = W_{-1} \left[1 + (-\varepsilon) \frac{(N^* - N)}{N^*} \right] \qquad (4)$$

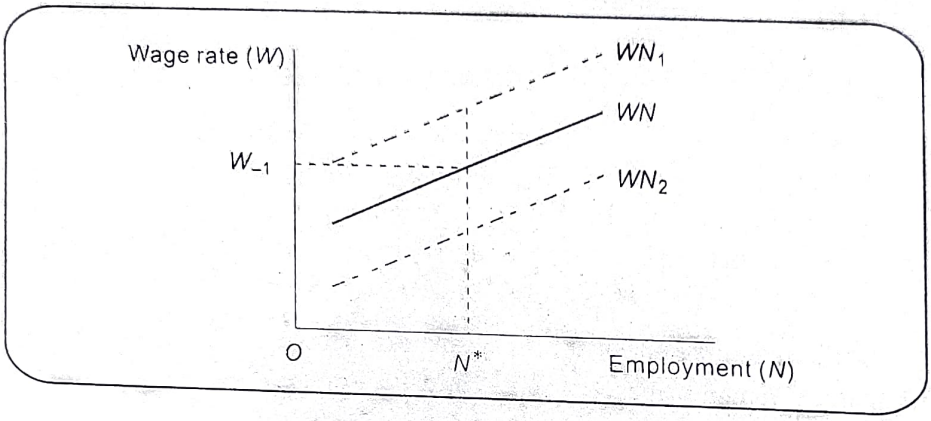


Fig. 10.2 The Wage Employment Relationship

The wage employment relationship, *WN*, of equation (4) can be shown diagrammatically in Fig. 10.2. **It shows that as the employment level increases the wage rate increases**. The wage in the current period is equal to the wage in the previous period adjusted for the level of employment.

The **results** emerging from equation (4) are:

1. When $N = N^*$, employment is at the full employment level or at its neo classical equilibrium level. Then $W = W_{-1}$ or in other words, the wage in the current period is equal to the wage in the previous period.

   The Phillips curve relationship suggests that the *WN* curve shifts overtime if the level of employment differs from the full employment level.

2. When $N > N^*$, employment is above the full employment level. Then , $W > W_{-1}$, or in other words, the wage in the current period increases above the previous periods wage. The *WN* curve will shift upwards in the next period to WN_1.

3. When $N < N^*$, the economy is below the full employment level. Then, $W < W_{-1}$, or in other words, the wage in the current period falls below the wage in the previous period. The *WN* curve will shift downwards in the next period to WN_2.

The responsiveness of wages to employment depends on the parameter ε. A large ε implies that unemployment has a significant effect on the wage rate. Thus, the line ***WN* is steep.**

Hence, the changes in the aggregate demand which influence the unemployment rate in the current period affect wages in the next period. In other words, the adjustments to the changes in the employment take place overtime, or are dynamic.

10.3 DERIVATION OF THE AGGREGATE SUPPLY CURVE

The aggregate supply curve can be derived in **four steps:**

Step 1: The Production Function

In this step, we relate the level of output to employment through the production function

$$\boxed{Y = lN} \tag{5}$$

where

Y = Level of output produced

N = Employment (measured in hours of work)

l = Input coefficient or labour productivity

Labour productivity is the ratio of output to the labour input, Y/N, or it is the output produced per unit of labour employed.

Step 2: The Price-cost Relation

We now relate the prices charged by the firms to their costs. A firm will supply output such that the price at least covers the cost. It is prevented from charging too high a price due to the existence of competition from the other existing firms.

We assume that the main component of the cost is the labour cost. Thus, firms base their price on the labour cost of production.

Production by each unit of labour = l units of output

The labour cost of production or the per unit labour cost = $\frac{W}{l}$

(where W = wages in the current period.)

Given W, the firms set the price of the output as a mark up over labour costs.

or
$$\boxed{P = \frac{(1+z)W}{l}} \tag{6}$$

where

z = the markup over labour costs.

The markup, z, includes the costs of the other factors of production employed by the firm like raw materials and also provides for the firm's normal

profits. Under imperfect competition, the markup may also include monopoly profits.

Illustration: Suppose the wage rate is rupees 10 per hour and the coefficient l = 2. Then, the unit labour cost will be 10/2, or rupees 5 per unit.

Step 3: The Phillips Curve

Equation (4) lays emphasis on the fact that the price level in the current period is linked to the wages in the previous period and to the level of employment.

Step 4: Aggregate Supply Curve

$$W = W_{-1}\left[1 + \varepsilon\left(\frac{N - N^*}{N^*}\right)\right] \qquad (4)$$

Substituting equation (4) in equation (6), we get the relationship between level of employment and price level as:

$$P = \left(\frac{(1+z)}{l}\right)W_{-1}\left[1+\varepsilon\left(\frac{N-N^*}{N^*}\right)\right] \qquad (7)$$

But, $$P_{-1} = \left[1+\frac{z}{l}\right]W_{-1}$$

Thus equation (7) becomes

$$P = P_{-1}\left[1+\varepsilon\left(\frac{N-N^*}{N^*}\right)\right] \qquad (7a)$$

But from the production function, equation (5), we have

$$N = \frac{Y}{l} \text{ and } N^* = \frac{Y^*}{l}$$

Thus equation (7a) can be written as

$$P = P_{-1}\left[1+\varepsilon\left(\frac{Y-Y^*}{Y^*}\right)\right]$$

Suppose we describe $\alpha = \dfrac{\varepsilon}{Y^*}$

we get,

$$P = P_{-1}\,[1 + \alpha\,(Y - Y^*)] \qquad (8)$$

Equation (8) represents the **aggregate supply curve** and is shown

diagrammatically in Fig. 10.3. **The properties of aggregate supply curve are the same as those of the wage employment curve on the basis of which it has been drawn.** This is because of the **two assumptions**:

1. The markup is fixed at z.
2. The level of output is proportional to the employment level.

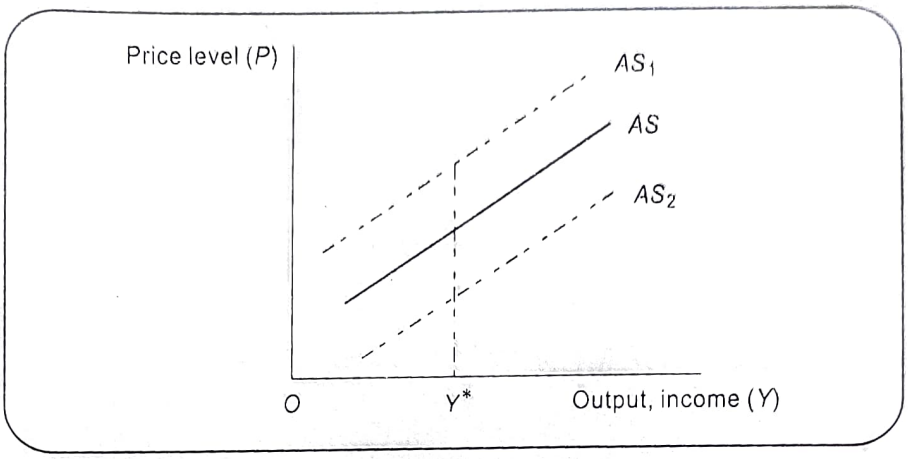


Fig. 10.3 The Aggregate Supply Curve

In this fig. :

AS = The aggregate supply curve is upward sloping and may shift over time.

AS_1 = If output in the current period is above the full employment level, Y^* then in the next period, the aggregate supply curve will shift upwards to AS_1. It assumes that wages are not fully flexible. It is upward sloping implying that a higher output is supplied only at a higher price. This is because an increased output is possible only with increased employment (or reduced unemployment). This in turn involves increased wages or higher labour costs.

AS_2 = If output in the current period is below the full employment level Y^*, then in the next period, the aggregate supply curve will shift downwards to AS_2.

10.4 CHARACTERISTICS OF THE AGGREGATE SUPPLY CURVE

10.4.1 Shape

If changes in the level of output and employment have a small effect on the current wages, then the aggregate supply curve will be relatively flat. This link between employment and changes in the wage is represented by the co-efficient, α in equation (8).

10.4.2 Position

This depends on the previous level of prices. The aggregate supply curve passes through Y^*, the full employment level of output, at $P = P_{-1}$. For any output greater than Y^*, there will be over employment, leading to higher labour costs and therefore higher prices today as compared to those in the last period. On the other hand, for lower levels of employment and therefore lower labour costs, prices will be lower today than those in the last period.

10.4.3 Shifts

If output is greater than the full employment level, Y^*, then, overtime wages will increase leading to an increase in prices.

10.5 EFFECTS OF MONETARY EXPANSION

To examine the effects of an increase in the supply of money, we use the aggregate supply curve. In Fig. 10.4, the aggregate supply curve passes through the full employment level of output Y^*, with prices at P_{-1}. The aggregate demand and supply curves intersect at point E depicting an economy which is in full employment equilibrium.

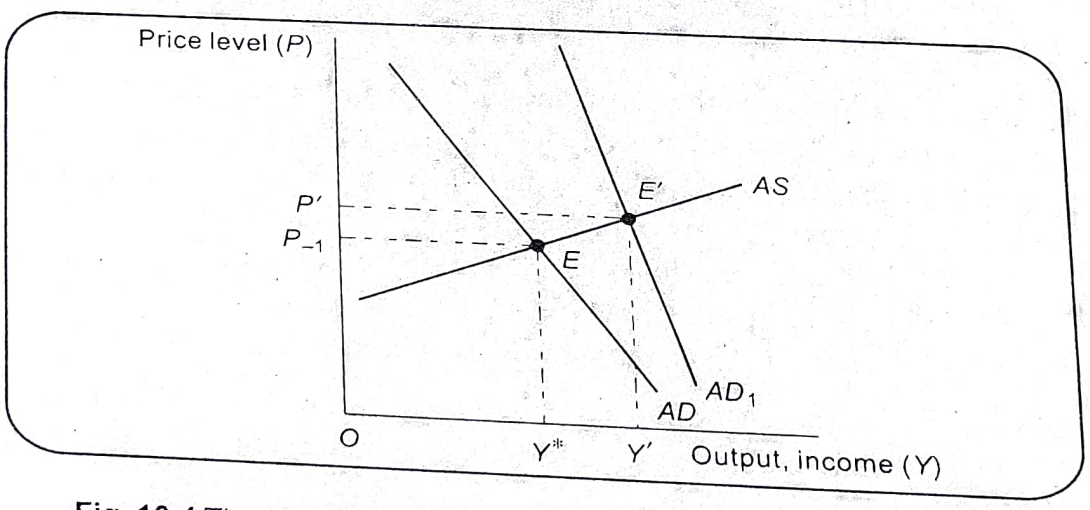


Fig. 10.4 The Short Run Effect of an Increase in the Supply of Money

It is assumed here that changes in output and employment have a very small effect on wages. Hence the aggregate supply curve is relatively flat.

10.5.1 Effects in the Short-run

Suppose there is an increase in the supply of money. Hence, at each price level the real balances will be higher, the interest rates will be lower and the demand for output will increase.

In Fig. 10.4, the aggregate demand curve will shift outwards from AD to AD_1. Therefore, there will be an excess demand for goods, at the initial equilibrium

price level P_{-1} leading to a run-down on inventories. Firms hire more labour to produce more output until the output level is Y', and the short-run equilibrium is at point E'. Hence, **a monetary expansion leads to short-run equilibrium at E'** which is characterised by:

(a) **a short-run increase in output**

(b) **an increase in prices** caused by the increase in wages which occur as a result of the increase in production and therefore in employment.

10.5.2 Adjustments in the Medium-Term

The short-run equilibrium output E' is above the full employment level. In medium-term, the adjustment process will start, and prices will keep on increasing. The aggregate supply curve will shift upward.

To see as to what occurs in the second period, we consider Fig. 10.5. The price in the previous period was P' and the equilibrium point was E'. In the second period the AS curve will shift upwards to AS_1. The new equilibrium will be determined by the intersection of the aggregate demand and supply curves, AS_1 and AD_1, at point E''.

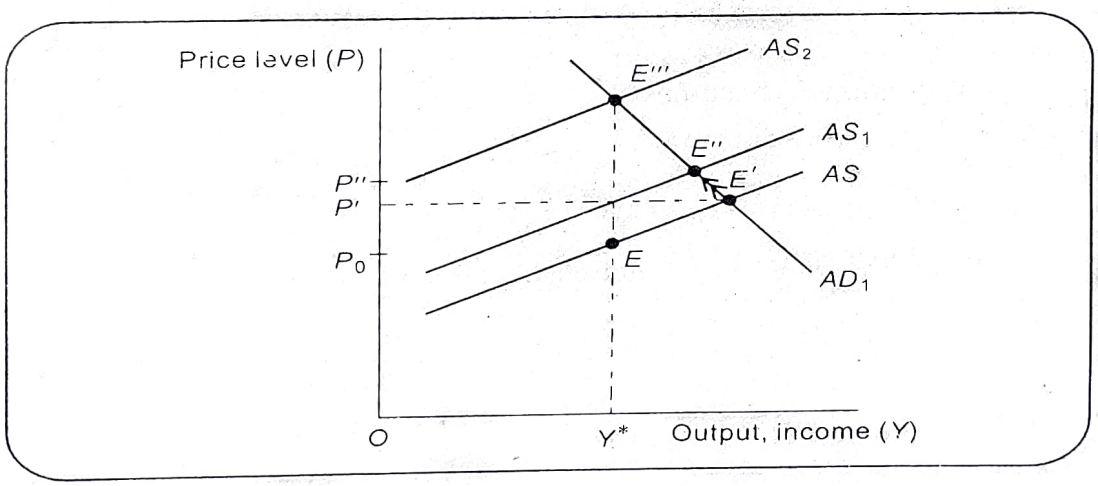


Fig. 10.5 The Long Term Effects of an Increase in the Supply of Money

On comparing E' and E'', we observe that **there is a reduction in output and an increase in prices as compared to those in the previous period**. The decrease in output occurs because the increasing prices reduce the real money balances, increase the interest rates and thus decrease aggregate demand and therefore the equilibrium level of output.

Hence, the adjustments in the second period are such that the initial expansion in output begins a reversal, though, the output in the second period is still above Y^*, the full employment level. Because of this aspect, the adjustments continue into the long term.

10.5.3 Adjustments in the Long-Term

Since output and therefore employment are above normal, and wages and prices are increasing, the aggregate supply curve will continue to shift upwards from AS_1 to AS_2 and so on. In the whole adjustment procedure the short and medium term equilibrium positions are such that they are to the right of the full employment output, Y^*. In other words, the output is above that of the full employment level and prices are increasing. This will continue till the AS_2 curve intersects the AD_1 curve at E''', the full employment level.

At E''', the real money supply, M/P is back to its initial level because prices have increased in the same proportion as the increase in the nominal supply of money. **Since the real money balances and the interest rates are at their initial levels, aggregate demand, output and employment will also be at their initial levels.**

10.5.4 Neutrality of Money

As far as the long run is concerned, money is neutral, and any change in it leads to no real affects, except on the price level. However, in the short run money is not neutral. Both the output and the prices adjust, though very slowly. This is a very important aspect of macroeconomics and one on which the different groups of economists are in agreement.

10.6 MODERN PHILLIPS CURVE

The original Phillips curve could not explain the behaviour of inflation and unemployment in Britain and in the United States after the 1960s. Something was missing. The missing point was the concept of **expected inflation**.

Incorporation of expected inflation gave the modern Phillips curve.

10.6.1 Role of Expected Inflation

Firms and workers take into consideration the **expected increase in the price level** when they are fixing wages and prices.

Milton Friedman and Edmund Phelps have pointed out that the original Phillips curve ignores the effect of expected inflation on wage fixing.

They maintained that workers are concerned with real wages (and not nominal wages) and want nominal wages to fully indicate the inflation they expect. In other words, workers want compensation for expected inflation. Firms agree to pay higher wages since they can afford to pay them as goods will be sold at higher prices.

The Friedman-Phelps theory maintains that inflation adjustment compensates for expected inflation (and not past inflation). Inflation adjustment will be part of rise in wages. When we incorporate the concept of expected inflation in the original wage-inflation Phillips curve (equation 2), which is:

$$g_w = -\varepsilon (\mu - \mu^*) \quad (2)$$

Including expected inflation, we get:

$$(g_w - \pi^e) = -\varepsilon (\mu - \mu^*) \quad (12)$$

Since real wages are assumed to be constant, actual inflation will be equal to rate of wage inflation.

or $$\pi = g_w \quad (13)$$

Substituting equation (13) in equation (12), we get:

$$\therefore \quad \pi - \pi^e = -\varepsilon (\mu - \mu^*)$$

or $$\pi = \pi^e - \varepsilon (\mu - \mu^*) \quad (14)$$

Equation (14) shows that actual inflation (π) is determined by both expected inflation (π^e) and unemployment level.

The equation is known as **expectations augmented Phillips curve** or **modern version of the Phillips curve**.

Two main **features** of modern Phillips curve are:

1. Expected inflation is passed one for one into actual inflation.
2. When $\pi = \pi^e$, then unemployment is at its natural rate ($\mu = \mu^*$).

10.6.2 Short-Run Modern Phillips Curve

Modern Phillips curve is shown in Fig. 10.6.

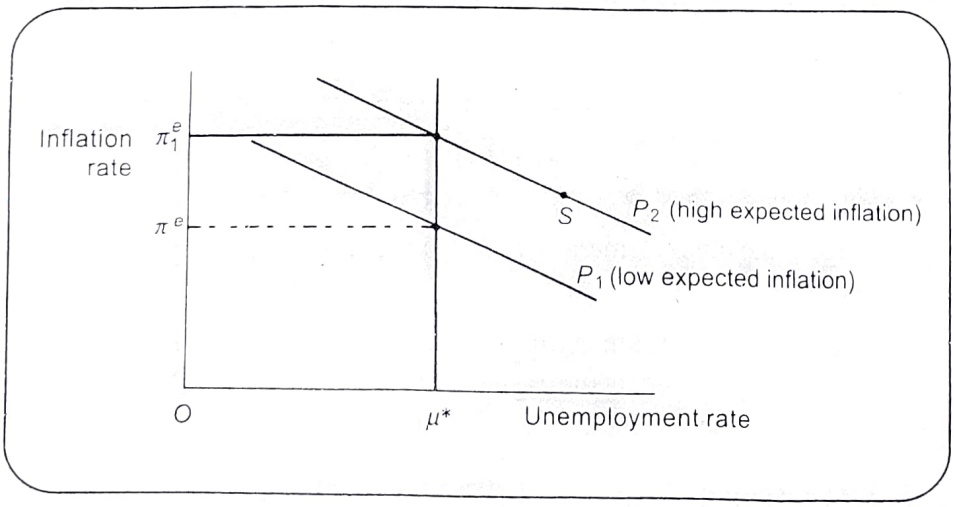


Fig. 10.6 Short-run Modern Phillips curve

where

μ^* = Natural rate of unemployment.

P_1 and P_2 = These are **short-run** modern Phillips curve which are quite flat. They are downward sloping showing negative relationship between inflation and unemployment in the short-run. The slopes of two curves are equal showing same short-run trade off. The height of the short-run Phillips curve depends upon level of expected inflation. If π^e rises (from π^e to π^e_1), then Phillips curve shifts up (from P_1 to P_2). Higher curve shows that inflation is higher for any level of unemployment.

Pont S = It is a **stagflation point. Stagflation means high unemployment and high inflation**. To see how it occurs, let the economy be on Phillips curve P_2 that shows expected inflation of π^e_1. When the economy faces recession, actual inflation falls below expected inflation. It is shown by point S on P_2, ***Thus, stagflation occurs when there is recession along a short-run modern Phillips curve based on high expected inflation.***

10.6.3 Long-run Modern Phillips Curve

The long-run modern Phillips Curve (and the corresponding long-run aggregate supply curve) is vertical.

10.7 DYNAMIC AGGREGATE SUPPLY CURVE

10.7.1 Link between Phillips Curve and Aggregate Supply Curve

The short-run aggregate supply curve is derived from the Phillips curve in Section 10.3. The steps in derivation of aggregate supply are:

1. Output is assumed to be proportional to employment.
2. Wage is the main element of cost, wage adjusts according to the Phillips curve.
3. Short-run aggregate supply is transformation of Phillips curve relationship between the wage (or price) and unemployment into a relationship between the price level and output.

10.7.2 Modified Aggregate Supply Curve Showing the Relationship between Output and the Inflation Rate

Aggregate supply curve which gives the relationship between output and the price level is given by the equation:

$$P = P_{-1}[1 + \alpha (Y - Y^*)] \qquad (8)$$

where

P = Price level in current time period

P_{-1} = Price level in the previous period

Y = Output

Y^* = Full employment level of output (or potential output)

Like equation (1) rate of inflation (π) is given as:

$$\pi = \frac{P - P_{-1}}{P_{-1}} \qquad (9)$$

Substituting equation (9) in equation (8), we can derive aggregate supply curve in the following steps:

$$P = P_{-1} + P_{-1}\alpha(Y - Y^*)$$

or $$P - P_{-1} = P_{-1}\alpha(Y - Y^*)$$

or $$\frac{P - P_{-1}}{P_{-1}} = \alpha(Y - Y^*)$$

or $$\pi = \alpha(Y - Y^*) \quad \text{... Modified aggregate supply curve } \textbf{(10)}$$

Equation (10) gives that inflation (π) is high when output (Y) exceeds full employment level of output (Y^*) and *vice versa*. The equation shows that **modified aggregate supply gives the relationship between output and the inflation rate** rather than output and the price level.

10.7.3 Dynamic Aggregate Supply and Role of Expected Inflation

The dynamic aggregate supply includes expected inflation. Including the concept of expected inflation in modified aggregate supply equation (10), we get:

$$\pi = \pi^e + \alpha(Y - Y^*) \quad \text{... Dynamic aggregate supply curve } \textbf{(11)}$$

where

π^e = Expected inflation

Equation (11) shows that actual inflation is determined both by expected inflation and output level. The equation is known as **expectations-augmented or dynamic aggregate supply** curve.

10.7.4 Short-Run Dynamic Aggregate Supply Curve

The short-run dynamic aggregate supply curve shows the relationship between inflation rate (π) and the level of output (Y) when the expected rate of inflation is constant. Short-run dynamic aggregate supply (SAS) curves are upward sloping and quite flat. They are graphically shown in Fig. 10.7.

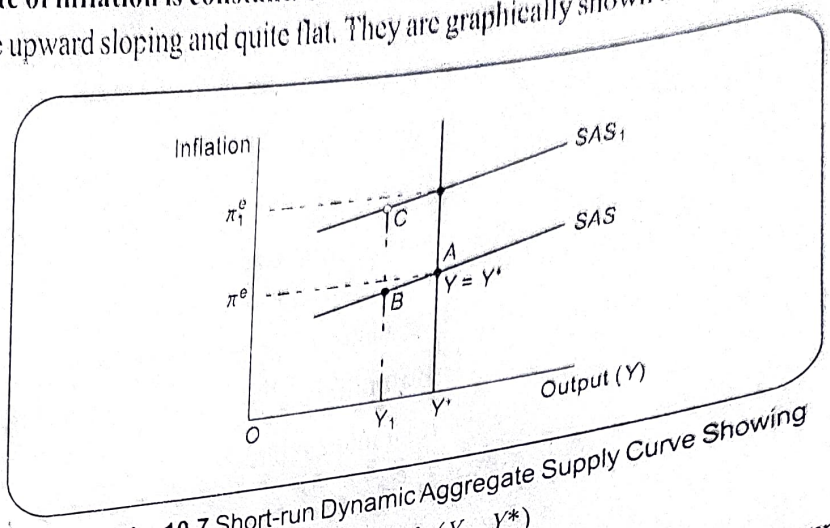


Fig. 10.7 Short-run Dynamic Aggregate Supply Curve Showing

$$\pi = \pi^e + \lambda (Y - Y^*)$$

where

SAS = It is expectations-augmented short-run dynamic aggregate supply curve. Each point on dynamic SAS curve shows constant expected rate of inflation. π^e which is derived by point A where $Y = Y^*$. At point A, expected inflation rate (π^e) is equal to actual inflation rate (π) (since when $Y = Y^*$, then $\pi = \pi^e$].

At all other points $\pi \neq \pi^e$. For example, at point B on SAS curve, actual inflation rate is lower than expected inflation rate. SAS curve is quite flat—it means only large change in output can bring noticeable change in inflation.

SAS_1 = The SAS curve shifts with changes in π^e. If expected inflation **rises** from π^e to π_1^e, then dynamic aggregate supply curve will have parallel upward shift (decrease) by the **same** amount. It is shown by upward shift of SAS curve to SAS_1 curve. Along SAS_1 curve, the expected inflation rate is constant at π_1^e.

Y_1 = If the level of output is Y_1 which is less than full employment level of Y^*, then the economy will face low inflation at point B on SAS curve and high inflation at point C on higher short-run aggregate supply curve, SAS_1.

Following results emerge from dynamic SAS curve:

1. **Dynamic *SAS* curve shows that to reduce inflation, output level has to be reduced.** The economic logic is that reduced output level will lead to recession and unemployment. These will, in turn, lead to fall in wages which implies low inflation.

2. Dynamic *SAS* curve is quite flat since short-run changes in output do not have much affect on price.
3. The dynamic aggregate supply curve includes expected inflation. Dynamic *SAS* curve will **shift** when:
   (*a*) *Expected rate of inflation changes*: If π^e rises, dynamic *SAS* curve shifts upward (decrease) by the same magnitude and *vice versa*.
   (*b*) *Supply shock takes place:* It will shift dynamic *SAS* curve.
4. The process through which a change in the expected inflation rate works its way into the dynamic aggregate supply curve may be quite slow. That is why, the inflation process is often said to show **inflation inertia**.
5. At a given level of output, higher the expected inflation rate more will be the actual inflation rate.

10.7.5 Long-Run Dynamic Aggregate Supply Curve

The long-run dynamic aggregate supply curve describes that there is no long-run tradeoff between inflation and output when actual and expected inflation rates are equal. That is, level of output is independent of the rate of inflation.

If actual inflation rate does not change for a long period, then workers and firms expect that rate to continue, and the expected rate will become equal to actual rate. That is, in the long-run:

$$\pi = \pi^e$$

In equation $\pi = \pi^e + \alpha (Y - Y^*)$, if $\pi = \pi^e$, then $Y = Y^*$. Thus, the long-run dynamic aggregate supply curve shows:

$$\boxed{Y = Y^*} \qquad (12)$$

Long-run dynamic aggregate supply curve is graphically shown in Fig. 10.8.

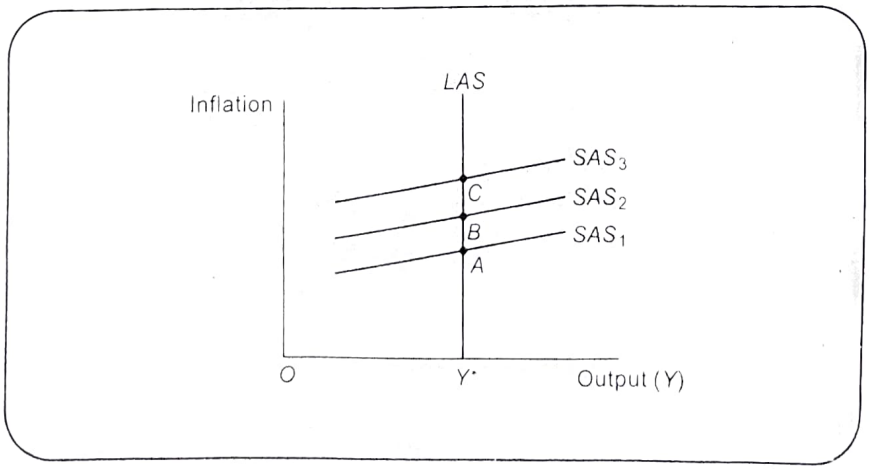


Fig. 10.8 Long-run Dynamic Aggregate Supply Curve Showing since $\pi = \pi^e$, $Y = Y^*$

where

SAS_1, SAS_2, SAS_3 = These are short-run dynamic aggregate supply curves. On each SAS curve, π^e is constant. At points A, B and C, $Y = Y^*$ and thus $\pi = \pi^e$. At other points on each SAS curve, π is not equal to π^e. Higher SAS curve (say, from SAS_1 to SAS_2 to SAS_3) curve shows rise in π^e. There are parallel upward shifts (decrease) in SAS curves. The magnitude of shift in dynamic SAS curve is equal to magnitude of change in π^e.

Y^* = This is full employment level of output. Output level is shown on the x-axis.

LAS = This is long-run dynamic aggregate supply curve which is vertical at full employment level of output, Y^*. At each point on dynamic LAS curve, $\pi = \pi^e$. In other words, each point on dynamic LAS curve is a point on dynamic SAS curve where $\pi = \pi^e$.

10.8 DYNAMIC AGGREGATE DEMAND CURVE

10.8.1 Aggregate Demand Curve Showing the Relationship between Output and the Inflation Rate

The **aggregate demand curve** shows the relationship between price level and the output level. The **dynamic aggregate demand curve** shows the relationship between the rate of inflation and output level.

The dynamic aggregate demand curve is given as:

$$Y = Y_{-1} + \phi (m - \pi) + \sigma f \qquad (13)$$

where

Y = Output or aggregate demand

Y_{-1} = Aggregate demand in the past year

$Y - Y_{-1}$ = Change in aggregate demand

m = Growth rate of nominal money stock

π = Inflation rate

ϕ = Money multiplier

$(m - \pi)$ = Rate of change of real balance

σ = Fiscal multiplier

f = Changes in fiscal policy

10.8.2 Derivation of Dynamic Aggregate Demand Curve

The derivation of dynamic aggregate demand curve is done in three steps, using the *IS-LM* model, as follows:

Step 1: Goods market equilibrium condition is given as:

$$Y = \alpha(\bar{A} - br) \tag{14}$$

where

$\bar{A}$ = Autonomous spending

α = Multiplier

r = Real interest rate

since $r = i - \pi^e$ (15)

i = Nominal interest rate

Substituting equation (21) in equation (20), we get:

$$\therefore \quad Y = \alpha[\bar{A} - b(i - \pi^e)]$$

$$Y = \alpha[\bar{A} - bi + b\pi^e] \tag{16}$$

The goods market equilibrium condition shows that rise in π^e raises Y. That is, there is direct positive relation between expected inflation rate and output level.

Step 2: Money market equilibrium condition is given as:

$$i = \frac{1}{h}\left(kY - \frac{M}{P}\right) \tag{17}$$

Substituting equation (23) in equation (22), we get:

$$Y = \alpha\left[\bar{A} - \frac{b}{h}\left(kY - \frac{M}{P}\right) + b\pi^e\right] \tag{18}$$

Results that follow are:

Result 1: Equation (18) shows that aggregate demand (Y) is determined by:

(*a*) autonomous demand ($\bar{A}$)

(*b*) real balance $\left(\frac{M}{P}\right)$

(*c*) expected inflation rate (π^e)

Result 2: An increase in any of these three factors will raise aggregate demand.

Result 3: Change (or shift) in aggregate demand, ΔY (where $\Delta Y = Y - Y_{-1}$) is determined by:

(*a*) Changes in autonomous spending. It is assumed that fiscal policy alone can change autonomous demand. An expansionary fiscal policy (that is, rise in G or fall in T) will raise the level of aggregate demand.

(*b*) Changes in real balances. It is given by $(m - \pi)$, *i.e.*, when M is P growing faster than prices, then $\frac{M}{P}$ is rising. It implies lower interest rate. Aggregate demand level rises. There is direct relationship between level of real balances and aggregate demand.

(*c*) Changes in expected inflation rate. An increase in π^e will shift aggregate demand curve upward and to the right. However, it is ignored to simplify the analysis of dynamic aggregate demand.

Step 3: Incorporating result 3 in equation (13) we get dynamic aggregate demand curve as:

$$\Delta Y = \sigma f + \phi (m - \pi)$$

since $\Delta Y = Y - Y_{-1}$, we get:

$$Y = Y_{-1} + \sigma f + \phi (m - \pi)$$

The dynamic aggregate demand curve is simplified by ignoring expected rate of inflation and fiscal policy changes.

It is given as:

$$Y = Y_{-1} + \phi (m - \pi) \quad \text{Dynamic aggregate demand} \qquad \textbf{(19)}$$

or

$$Y = Y_{-1} + \phi m - \phi \pi$$

or

$$\phi \pi = \phi m - Y + Y_{-1}$$

or

$$\pi = m - \frac{1}{\phi}[Y - Y_{-1}] \qquad \textbf{(20)}$$

The equation shows that, given the growth rate of money, a lower rate of inflation (π) means higher real balances (M/P). This, in turn reduces interest rate (nominal interest rate). The result is rising aggregate demand. Thus, **the dynamic aggregate demand curve shows inverse relationship between rate of inflation and output level.**

Dynamic aggregate demand is graphically shown in Fig. 10.9, where

DAD = It is dynamic aggregate demand curve which is negatively sloping. It shows inverse relationship between the rate of inflation and the level of output. *DAD* curve is drawn for a given growth rate of money

and lagged output level ($Y - Y_{-1}$).

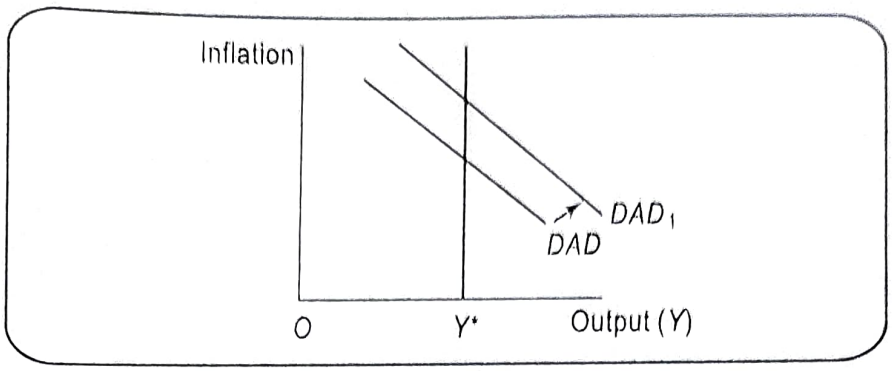


Fig. 10.9 Dynamic Aggregate Demand Curve showing $\pi = m - \frac{1}{\phi}[Y - Y_{-1}]$

DAD_1 = The position of DAD curve will change when growth rate of money and/or lagged output level changes. An increase in growth rate of money will shift DAD curve vertically upwards (say to DAD_1) by exactly the same magnitude.

10.9 INFLATION AND OUTPUT

Inflation rate and output level are determined where dynamic aggregate demand and dynamic aggregate supply curves intersect each other.

10.9.1 Determination of Inflation and Output in the Short-Run

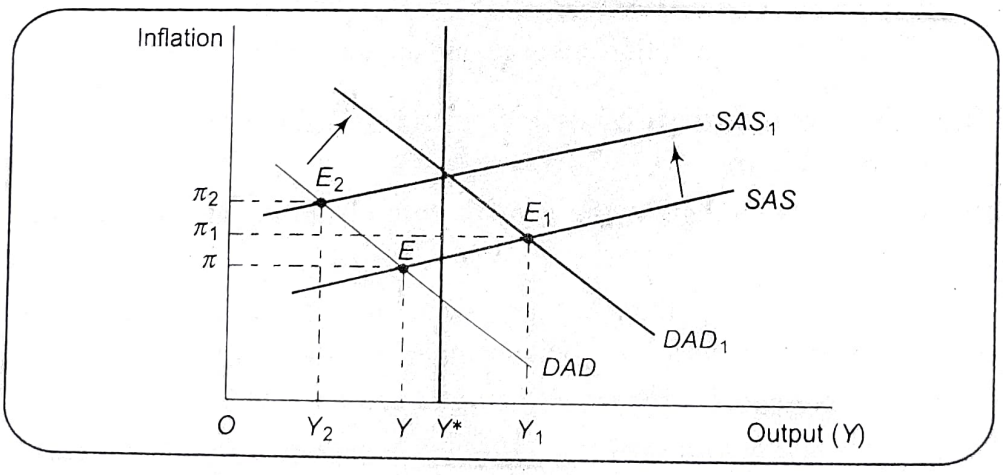


Fig. 10.10 Inflation and Output in the Short-run

where

Point E = It is the point of equilibrium where downward sloping DAD curve intersects the upward sloping dynamic SAS curve. At point E:

$$DAD = SAS$$

It gives π as the current rate of inflation and OY as the level of output.

Point E_1 = An increase in the growth rate of money will bring about a rightward shift (increase) in DAD curve to DAD_1 curve by exactly the same amount. The new equilibrium occurs at point E_1, where $DAD_1 = SAS$. It raises the inflation rate to π_1 and income level to OY_1. It is important to note that rise in inflation ($\pi\pi_1$) is less than the rise in growth rate of money (vertical distance between DAD and DAD_1). One reason for this is that some effect of rise in growth rate of money is seen in rise in the level of output.

Point E_2 = A rise in expected inflation rate will bring about an upward shift (decrease) in SAS curve to SAS_1 curve by exactly the same amount. The new equilibrium occurs at point E_2 when $DAD = SAS_1$. It raise the inflation rate to π_2 and reduces the level of output to OY_2.

Thus, in the **short-run** following **results** hold:

1. Intersection of DAD and SAS curves determines the current rate of inflation and output level.
2. If DAD increases, both inflation and output level rises and *vice versa.*
3. When DAD increases, the rise in inflation is less than rise in growth rate of money.
4. If SAS decreases, inflation rate rises and output level falls and *vice versa.*

10.9.2 Determination of Inflation and Output in the Long-Run

In the long-run, a change in the growth rate of money affects only the inflation rate.

We examine the hypothetical longest-run situation where an economy tends to move to **steady-state** relationship. A **situation is called a steady state where:**

(*a*) **growth rate of money is constant**

(*b*) **expectations have adjusted to actual inflation**

(*c*) **output and inflation are constant.**

The effect of steady-rate relationships on inflation and output is as follows: Aggregate demand equation is:

$$\pi = m - \frac{1}{\phi}(Y - Y_{-1}) \qquad (20)$$

Since output is constant, implies:

$$Y = Y_{-1}$$

$$\Rightarrow \quad \pi = m - \frac{1}{\phi}(Y - Y)$$

$$\therefore \quad \pi = m \qquad (21)$$

That is, **inflation rate equals growth rate of money.**

Aggregate supply equation is:

$$\pi = \pi^e + \alpha (Y - Y^*) \qquad (11)$$

Since inflation is constant, it implies:

$$\pi = \pi^e$$

$$\therefore \quad Y = Y^* \qquad (22)$$

That is, **output is at its full-employment level.**

Thus, **in the long-run following result holds:**

1. **An economy tends to move to steady state relationships.**
2. **Since $Y = Y_{-1}$, growth rate of money affects only the inflation rate (and not the level of output).**
3. **Since $\pi = \pi_e$, output is at its full employment level.**
4. **In reality, there are always shocks and disturbances affecting aggregate demand and supply and the economy never reaches a steady state.**

Summary

Introduction

In the real world, there exists some level of frictional unemployment as workers shift between jobs. The frictional unemployment that exists at the level of full employment is the natural rate of unemployment.

The Phillips Curve

1. The Phillips curve shows that wages and prices adjust slowly to changes in the aggregate demand. Wages tend to increase when there is a high level of employment and decrease when there is a low level of employment.
2. The Phillips curve suggested that policy makers could make a choice between different combinations of the inflation rate and the rate of unemployment. They could maintain low inflation but at the cost of high unemployment, or they could have low unemployment but only at the cost of a high inflation.

Chapter 11

International Flows of Goods and Capital and Exchange Rates

Chapter Outline

11.1 DIFFERENCE BETWEEN CLOSED ECONOMY AND OPEN ECONOMY

In previous chapters, a closed economy was assumed. Such an economy is not engaged in International transactions. In reality, all economies are open having international transactions. They export and import goods and services. They borrow and lend in financial markets of other countries. In macroeconomic terms, a closed economy has its spending in a given year equal to its output of goods and services. But since an open economy can borrow or lend in world's financial markets, its spending in a given year may not be equal to its output of goods and services. **But since an open economy can borrow or lend in world's financial markets, its spending in a given year may not be equal to its output of goods and service.**

Open economy may be small or large. In this chapter we are analysing 'small' open economy which means that this economy is a small part of the world market. In the next chapter, we will analyse large open economy.

11.2 MACRO ECONOMIC VARIABLES THAT MEASURE INTERNATIONAL FLOWS OF GOODS AND CAPITAL

11.2.1 Net Exports

Net export is the difference between exports and imports. Net export is defined as the difference between what our country produces and what it demands.

An open economy's output *(Y)* expenditure can be divided into two parts:

1. Domestic spending on domestic goods and services
2. Foreign spending on domestic goods and services.

Domestic spending on domestic goods and services has three sub-parts namely:

(*a*) C^D = Consumption of domestic goods and services

(*b*) I^D = Investment in domestic goods and services

(*c*) G^D = Government purchase of domestic goods and services.

Thus $\begin{bmatrix}\textbf{domestics spending on}\\ \textbf{domestic goods and services}\end{bmatrix} = C^D + I^D + G^D$

Foreign spending on domestic goods and services occurs when there are exports of domestic goods and services. It is given by the symbol X.

Combining the two parts we have the following identity:

$$\boxed{Y = C^D + I^D + G^D + X} \quad (1)$$

We know that:

$$C = C^D + C^F$$

where

C = Total consumption

C^F = Consumption on foreign goods and services.

Also $I = I^D + I^F$

where

I = Total investment

I^F = Investment on foreign goods and services.

And $G = G^D + G^F$

where

G = Total government expenditure

G^F = Government purchases of foreign goods and services.

In other words,

$$\boxed{\textbf{Domestic Spending} = C^D + I^D + G^D} \quad (2)$$

Equation (1) becomes:

$$Y = (C - C^F) + (I - I^F) + (G - G^F) + X$$

or $$Y = C + I + G + X - (C^F + I^F + G^F)$$

or $$Y = C + I + G + X - M$$

where

M = Imports which is equal to $C^F + I^F + G^F$

or $$\boxed{Y = C + I + G + NX} \quad (3)$$

where NX = Net exports or $X - M$

or $$\boxed{NX = Y - (C + I + G)} \quad (4)$$

Net Exports = Output – Domestic Spending

Three situations that an economy can experience from equation (4) are:

(i) ***Trade Surplus:*** It occurs when output is more than domestic spending (that is, $Y > C + I + G$). In that case, net exports are positive. That is, exports are more than imports.

(ii) ***Trade Deficit:*** It occurs when output is less than domestic spending (that is, $Y < C + I + G$). In that case, net exports are negative. That is, imports are more than exports.

(iii) ***Balanced Trade:*** It occurs when output is exactly equal to domestic spending (that is, $Y = C + I + G$). In that case, net exports are zero. That is, exports are exactly equal to imports.

11.2.2 Trade Balance

Trade balance is nothing but net exports (*NX*). Trade balance is defined as the amount received for our net exports of goods and services.

National income accounts equation (3) can be interpreted differently as:

$$Y = C + I + G + NX$$

or $$Y - C - G = I + NX$$

or $$S = I + NX$$

where,

S = National saving
= Private Saving + Public Saving
= $(Y - T - C) + (T - G)$
= $Y - C - G$

or $$\boxed{S - I = NX} \qquad (5)$$

or Net Capital Outflow = Trade Balance

where

$S - I$ = It is called Net Capital Outflow. It shows the excess of domestic savings over domestic investment. It is obtained by subtracting the amount that foreigners are lending to us from the amount domestic residents are lending abroad. It is showing **international flow of funds**. It is also called net **foreign investment.**

(*Note*: Students can draw Fig. 11.6 here to show that net foreign investment ($S - I$) always equals trade balance (NX) in a small open economy.)

Three situations that can occur are:

(*i*) If $S > I$, then net capital outflow is positive and we are lending to foreigners.

(*ii*) If $S < I$, then net capital outflow is negative and we are borrowing from foreigners to finance this extra investment.

(*iii*) If $S = I$, then net capital outflow will be zero.

NX = It is called Trade Balance which is net exports of goods and services. It shows international flow of goods and services.

Three situations that an economy can experience from equation (5) are:

(*i*) **Trade Surplus:** It occurs when savings are more than investment or $S - I$ and NX are positive. It implies that:

(*a*) We are net lenders to financial markets of the world, and

(*b*) Our exports are more than our imports.

(*ii*) **Trade Deficit:** It occurs when saving are less than investment or $S - I$ and NX are negative. It implies that:

(*a*) We are net borrowers from financial markets of the world, and

(*b*) Our exports are less than our imports.

(*iii*) **Balanced Trade:** It occurs when savings are equal to investments or $S - I$ and NX are zero. It implies that:

(*a*) Our borrowings are equal to our lendings in the financial markets of the world, and

(*b*) Our exports are equal to our imports.

11.3 SAVING AND INVESTMENT IN A SMALL OPEN ECONOMY

11.3.1 Concept of World Interest Rate

In the case of small open economy we assume that there is *perfect capital mobility*. It means that residents of the country can fully lend or borrow from world financial markets.

It implies that:

$$\begin{bmatrix}\text{Real interest rate prevailing in small open economy}\end{bmatrix} = \begin{bmatrix}\text{World interest rate or real interest rate prevailing in world financial market}\end{bmatrix}$$

or $$\boxed{r = r^*} \qquad (6)$$

The world interest rate determines the real interest rate in our small open economy because:

(*i*) Small open economy can always get loan at world interest rate so it need not pay more interest rate than r^*.

(*ii*) Also, small open economy can always earn world interest rate on its lendings so it need not lend at lesser interest rate than r^*.

11.3.2 Determinants of S and I in Terms of National Income Accounts Identity

Assumptions

Assumptions of the small open economy are:

1. $Y = \bar{Y}$

   That is, the small open economy's output is fixed by the factors of production and the production function.

2. $C = C(Y - T)$

   That is, consumption is directly related to disposable income $(Y - T)$.

3. $I = I(r)$

   That is, investment is a negative function of real interest rate.

We bring in equations (4) and (5):

$$NX = Y - C - G - I$$

$$NX = S - I$$

Substitute values given in equation (6) and the three assumptions, we get:

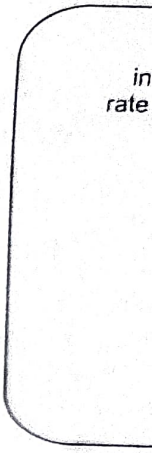
$$NX = [\bar{Y} - C(\bar{Y} - T) - G] - I(r^*)$$

$$\therefore \quad \boxed{\textbf{Trade Balance or } NX = \bar{S} - I(r^*)} \qquad (7)$$

The **result** that follows from equation (7) are:

1. Trade balance is determined by the difference between saving and investment at the world interest rate.
2. Saving depends on consumption function and fiscal policy. Policy which can raise savings will lead to trade surplus and *vice versa*. Savings can rise with lower government purchases (G) or higher taxes (T).
3. Investment depends on investment function and the world interest rate. Policy which can lower investment will lead to trade surplus (since $NX = S - I$) and *vice versa*. Investment can be made unprofitable when world interest rate rises.

Equation (7) is graphically shown in Fig. 11.1.



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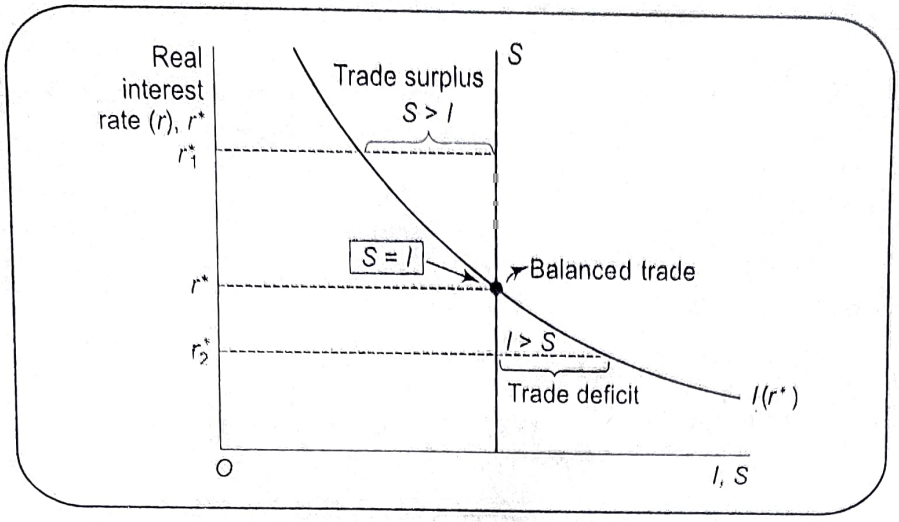


Fig. 11.1 Trade Balance or *NX*

where

S = It is the saving curve which is a vertical line because saving does not depend on the interest rate (in this model). The vertical line shows the supply of loanable funds.

$I(r)$ = It is the investment curve which is downward sloping because at high interest rate, few investment projects are profitable.

r_1^* = If the world interest rate is r_1^*, savings are more than investment. The excess is lent to other countries. The net capital outflow is positive. There is **trade surplus.**

r_2^* = If the world interest rate is r_2^* savings are less than investment, the shortage is borrowed from abroad. The net capital outflow is negative. There is **trade deficit.**

r^* = If the world interest rate is r^* then trade balance is equal to net capital outflow, which is equal to zero. There is balanced trade.

11.4 EFFECT OF POLICIES ON TRADE BALANCE IN A SMALL OPEN ECONOMY

11.4.1 Case 1: Effect of Expansionary Fiscal Policy at Home

If the home country follows an expansionary fiscal policy then government purchases (G) will increase, or consumption (C) will increase or taxes (T) will reduce. As a result, national saving (S) will reduce (as $S = Y - C - G$). Since the world interest rate (r^*) remains the same, investment does not change.

It is graphically shown in Fig. 11.2.

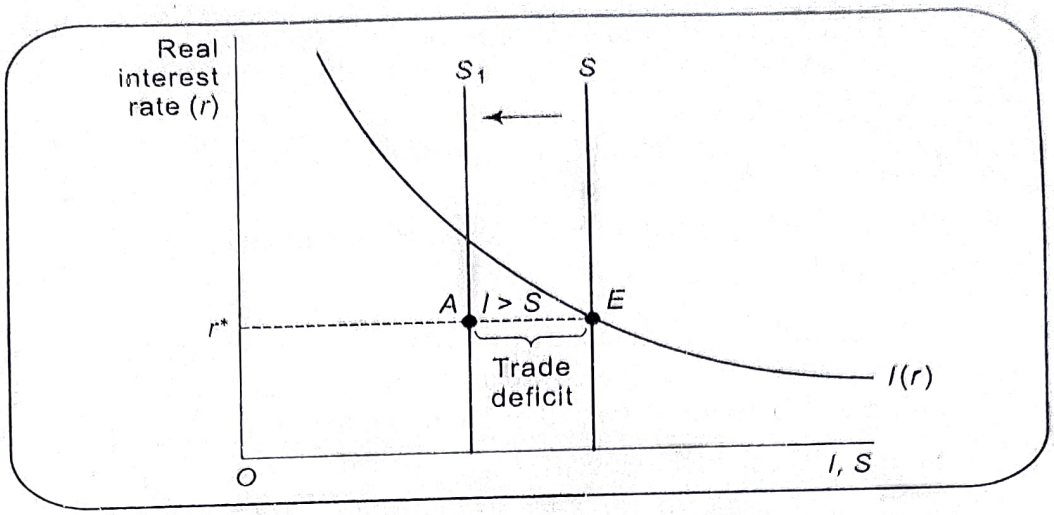


Fig. 11.2 Effect of Expansionary Fiscal Policy at Home

where

Point E = It is the initial point of balance trade where $S = I$.

S_1 = It is the new saving curve. Reduction in national saving is shown by leftward shift of S curve to S_1 curve.

r^* = At this unchanged world interest rate, investment exceeds saving. **Trade deficit** occurs (to the extent of AE).

11.4.2 Case 2: Effect of Expansionary Fiscal Policy Abroad

If the foreign countries follow an expansionary fiscal policy in terms of expansion in government purchases, then world savings will reduce and consequently world interest rate will rise. It will, in turn raise the cost of borrowing and thus, investment in our small open economy will fall. It is graphically shown in Fig. 11.3.

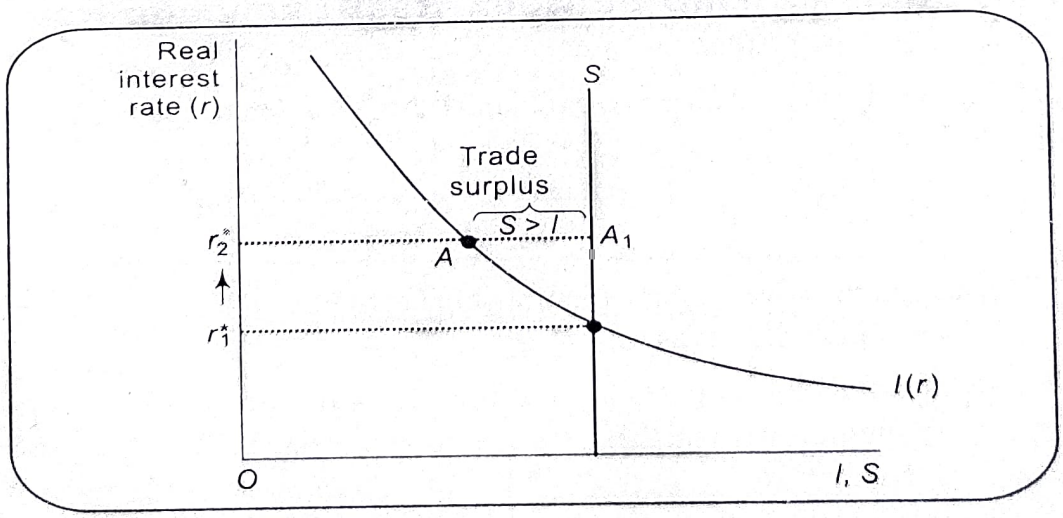


Fig. 11.3 Effect of Expansionary Fiscal Policy Abroad

where

r_1^* = It is the initial world interest rate where $S = I$ and balance trade occurs.

r_2^* = Due to fiscal expansion abroad there is fall in world saving. The world interest rate rises to r_2^*. There is no change in domestic S and I curves. At r_2^* interest rate, saving exceeds investment. There is a trade surplus (equal to AA_1).

11.4.3 Case 3: Effect of Shift in Investment Demand Curve

If the government formulates such policies that increases investment then investment schedule will shift rightward and consequently trade deficit will take place. The reverse situation will also hold. It is graphically shown in Fig. 11.4.

where

r^* = Initial world interest rate where $S = I(r)$.

$I(r)_1$ = This is the new increased investment schedule in a small open economy. At the existing world interest rate r^*, investment exceeds saving. There is a trade deficit (equal to AA_1).

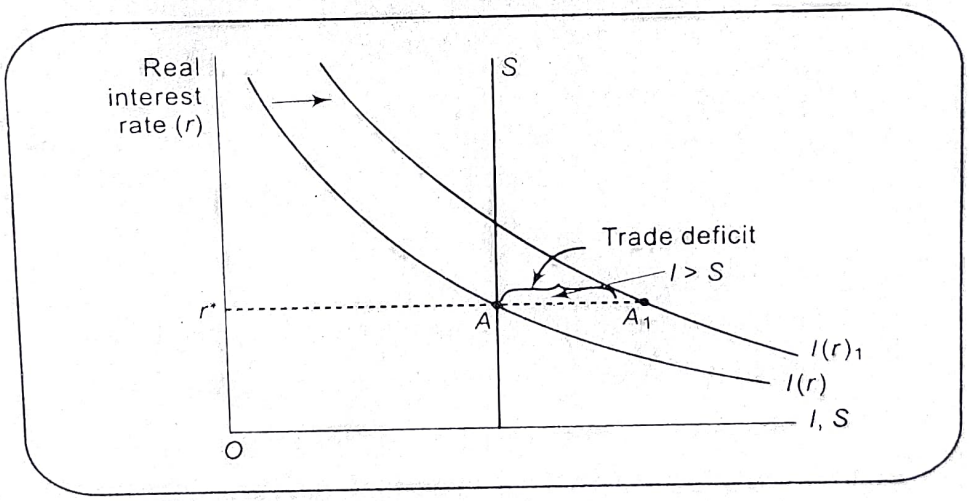


Fig. 11.4 Effect of Increase in Investment Demand

11.5 EXCHANGE RATES

11.5.1 Meaning of Exchange Rate

The exchange rate between two countries is defined as the price at which residents of one country trade with residents of the other country.

11.5.2 Types of Exchange Rates

There are two types of exchange rates. They are:

1. **Nominal Exchange Rate:** It is defined as the rate at which people trade the currency of one country for the currency of another country. In other words, it is the relative price of the currency of two countries. For example, the exchange rate between the U.S. dollar and Indian rupee is 100 rupees per dollar. It means anyone can exchange one dollar for 100 rupees in world markets for foreign currency. An Indian who wants a U.S. dollar would pay 100 rupees for each dollar.
2. **Real Exchange Rate:** It is defined as the rate at which people trade the goods produced by the two countries. It is also called the terms of trade. In other words, it is the relative price of the goods of two countries.

11.5.3 Determinants of Real and Nominal Exchange Rates

Real exchange rate is given in the formula:

$$\begin{bmatrix}\text{Real}\\ \text{Exchange}\\ \text{Rate}\end{bmatrix} = \frac{\text{Nominal Exchange Rate} \times \text{Price of Domestic Goods}}{\text{Price of Foreign Goods}}$$

or
$$\varepsilon = \frac{e \times p}{P^*} \qquad (8)$$

where

ε = Real exchange rate

e = Nominal exchange rate (say, number of rupees per dollar)

P = Domestic price level (say, in India in terms of rupees)

P^* = Foreign price level (say, in America measured in dollar)

Thus, **the real exchange rate equals the nominal exchange rate multiplied by the ratio of the price levels in the two countries.**

From the formula, real exchange rate depends upon:

(*a*) Nominal exchange rate, and

(*b*) Ratio of price level.

There is direct relationship between real exchange rate and domestic price level and also between real exchange rate and nominal exchange rate. There is an inverse relationship between real exchange rate and foreign price level.

We can rewrite equation (8) as:

$$\boxed{e = \varepsilon \times \frac{P^*}{P}} \qquad (9)$$

or $$\begin{bmatrix}\text{Nominal}\\ \text{Exchange Rate}\end{bmatrix} = \text{Real Exchange Rate} \times \frac{\text{Price of Foreign Goods}}{\text{Price of Domestic Goods}}$$

Equation (9) shows that nominal exchange rate depends upon:

(*a*) Real exchange rate, and

(*b*) Price levels in the two countries. There is direct relationship between nominal exchange rate and foreign price level. There is inverse relationship between nominal exchange rate and domestic price level.

(*c*) Equation (9) can also be written as:

% change in e = % change in ε + % change in P^* – % change in P

or $$\begin{bmatrix}\text{Change in}\\ \text{nominal}\\ \text{exchange}\\ \text{rate}\end{bmatrix} = \begin{bmatrix}\text{Change in}\\ \text{real}\\ \text{exchange}\\ \text{rate}\end{bmatrix} + \begin{bmatrix}\text{Foreign}\\ \text{country's}\\ \text{inflation}\\ \text{rate } \pi^*\end{bmatrix} - \begin{bmatrix}\text{Domestic}\\ \text{country's}\\ \text{inflation}\\ \text{rate } \pi\end{bmatrix}$$

or $$\%\text{ change in } e = \%\text{ change in } \varepsilon + [\pi^* - \pi]$$

There is inverse relationship between domestic inflation rate (p) and nominal exchange rate. **It means that if a country has high inflation rate relative to the foreign country, then it will lower the nominal exchange rate.**

11.6 EFFECT OF REAL EXCHANGE RATE ON NET EXPORTS

11.6.1 Relationship between Real Exchange Rate and Net Exports

The relationship between the real exchange rate (ε) and net exports (NX) may be expressed as:

$$\boxed{NX = NX(\varepsilon)} \qquad \textbf{(10)}$$

The equation shows inverse relationship between real exchange rate and net exports. The explanation is as follows:

If real exchange rate (ε) is high, it implies domestic goods are expensive relative to foreign goods. The demand for foreign goods will be high by domestic residents and demand for our goods will be low by foreigners. The result will be high imports and low exports. Net exports will be low. The reverse situation will also hold.

The inverse relationship between real exchange rate and net exports is graphically shown in Fig. 11.5.

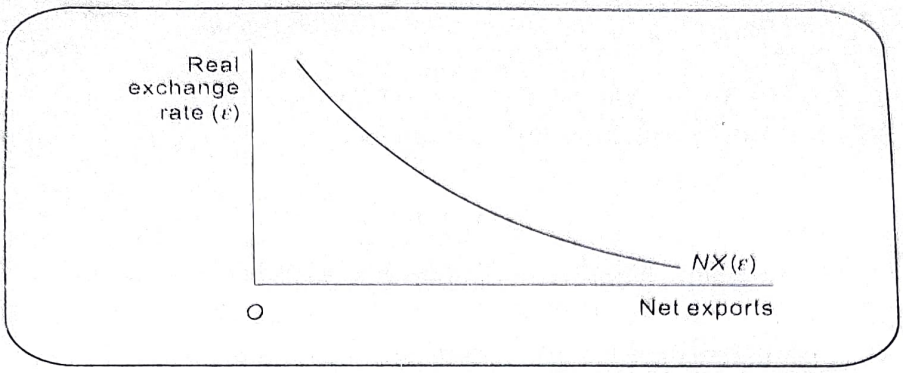


Fig. 11.5 Relationship between Real Exchange Rate and Net Exports

where

$NX(\varepsilon)$ = It is the net exports curve. It shows that if real exchange rate (e) falls, exports rises and imports falls. As a result net exports rise. NX can be negative when imports are more than exports.

11.6.2 Determination of Real Exchange Rate

Equilibrium real exchange rate takes place where supply of rupees available from the net capital outflow equals the demand for rupees by foreigners buying our net exports.

Real exchange rate determination is graphically shown in Fig. 11.6.

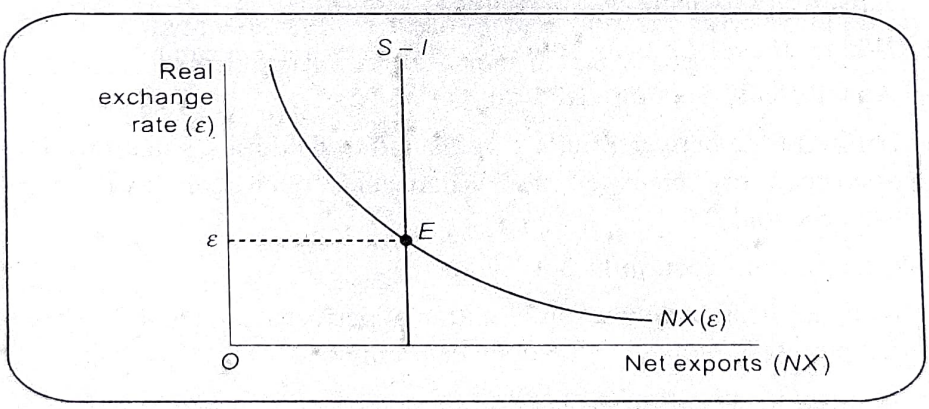


Fig. 11.6 Determination of Equilibrium Real Exchange Rate

where

NX = It is net exports curve. It is downward sloping showing inverse relationship between real exchange rate and net exports. It shows net demand for rupees by foreigners buying our net exports.

$S-I$ = It is the net capital outflow curve. It is a vertical line since both S

and I do not depend upon real exchange rate. $S - I$ curve shows the supply of rupees available to be exchanged into foreign currency and invested abroad.

Point E = It is the point of equilibrium where $NX = S - I$. At this point demand for rupees by foreigners buying our net exports is equal to supply of rupees available from the net capital outflow. It gives O_e as the real exchange rate.

Summary

Difference between Closed and Open Economy

In a closed economy, spending in a given year is equal to output of goods and services. But in an open economy, the equality does not hold since an open economy can borrow or lend in world's financial markets.

Macroeconomic Variables that Measure International Flows of Goods and Capital

- **Net Exports**
  1. It is difference between exports (X) and imports (M).
  2. An open economy's output (Y) expenditure is given as

$$Y = \text{Domestic spending on domestic goods and services} + \text{Foreign spending on domestic goods and services}$$

or $$Y = [C^D + I^D + G^D] + [X]$$

or $$Y = C + I + G + NX$$

or $$NX = Y - (C + I + G)$$

  3. Trade surplus occurs when $Y > C + I + G$
     Trade deficit occurs when $Y < C + I + G$
     Balanced trade occurs when $Y = C + I + G$

- **Trade Balance**
  1. It is also called Net Exports (NX)
  2. $$Y = C + I + G + NX$$

or $$NX = S - I$$

or $$\text{Trade balance} = \text{Net Capital Outflow}$$

  3. Trade surplus occurs when $S > I$

Chapter 12

Effect of Policies in a Large Open Economy

Chapter Outline

12.1 FEATURES OF A LARGE OPEN ECONOMY

The features of a 'large' open economy are:

1. A 'large' open economy is large enough to **affect the world interest rate**. More the large economy lends abroad, more will be the supply of loans in the world economy and the lower will be the world interest rate. The reverse situation also holds.
2. Capital is **not perfectly mobile** in a large open economy. It means that residents of the country may show their choice for domestic assets rather than foreign assets. It could be due to lack of knowledge about foreign assets or the government's policy which discourages international borrowing and lending. Its' implication is that *interest rates in all countries will not equalise.*
3. **Net Capital Outflow** is negatively related to domestic real interest rate, r, in a large open economy. Symbolically,

$$CF = CF(r) \qquad (1)$$

where

CF = It is net capital outflow. It is the amount that domestic investors lend abroad minus the amount that foreign investors lend in our country.

$CF(r)$ = It means CF is negatively related to domestic real interest rate, r. If r rises, then domestic investment will rise. It will lead to fall in net capital outflow. CF can be positive or negative.

Net capital outflow curve in a large open economy is graphically given in Panel A of Fig. 12.1. Panel B and Panel C gives net capital outflow in a closed and 'small' open economy respectively.

where

$CF(r)$ = Net capital outflow curve is downward sloping showing net capital outflow is inversely related to real interest rate in a **large open economy**. When r is more, CF is negative since it encourages borrowing from abroad. When r is less, CF is positive since it encourages lending abroad.

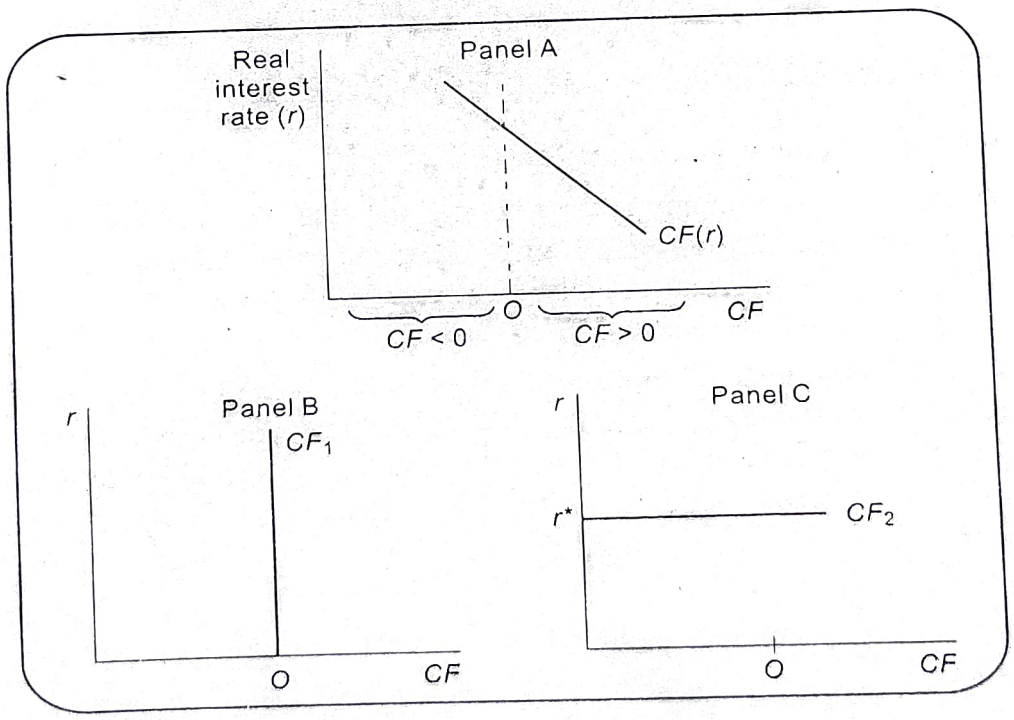


Fig. 12.1 (A) $CF(r)$ Curve in a Large Open Economy, (B) CF Curve in a Closed Economy, (C) CF Curve in a Small Open Economy

CF_1 = Net capital outflow curve is zero in a closed economy for all interest rates. International borrowing and lending do not take place in a closed economy. CF_1 is shown by a vertical line at zero level.

CF_2 = Net capital outflow curve is a horizontal line in a **small open economy** with perfect capital mobility. The horizontal line occurs at the level of fixed world interest rate, r^*. At r^* level, capital freely flows in and out of a country.

12.2 KEY MARKETS IN A LARGE OPEN ECONOMY

Two key markets in a large open economy are:

12.2.1 The Market for Loanable Funds

In an open economy, saving S has two components. Symbolically,

$$\boxed{S = I + CF} \quad (2)$$

where

I = Domestic investment. It depends on domestic interest rate r.

CF = Net capital outflow. It depends on domestic interest rate, r.

S = National Saving. It depends on output, consumption function and fiscal policy.

Equation (2) can be written as

$$\bar{S} = I(r) + CF(r) \quad (3)$$

Figure 12.2 graphically shows loanable funds market.

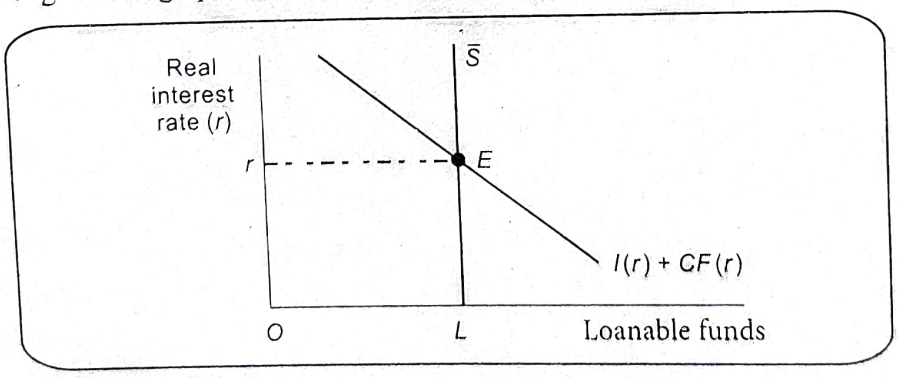


Fig. 12.2 Determination of Equilibrium Real Interest Rate

where

$\bar{S}$ = It is national saving curve which shows supply of loanable funds. It is a vertical line because savings do not depend upon real interest rate.

$I(r) + CF(r)$ = It shows demand for loanable funds. It is obtained by adding domestic investment and net capital outflow.

Point E = It is the point of equilibrium where $\bar{S} = I(r) + CF(r)$. It gives Or as the equilibrium real interest rate and OL as the equilibrium amount of loanable funds demanded and supplied.

12.2.2 The Market for Foreign Exchange

In the previous chapter, we studied that:

$$NX = S - I$$

or

$$NX(\varepsilon) = CF \quad (4)$$

where

$NX(\varepsilon)$ = Net export is a function of real exchange rate, ε.

CF = Net capital outflow which is the difference between S and I.

Figure 12.3 graphically shows the foreign exchange market.

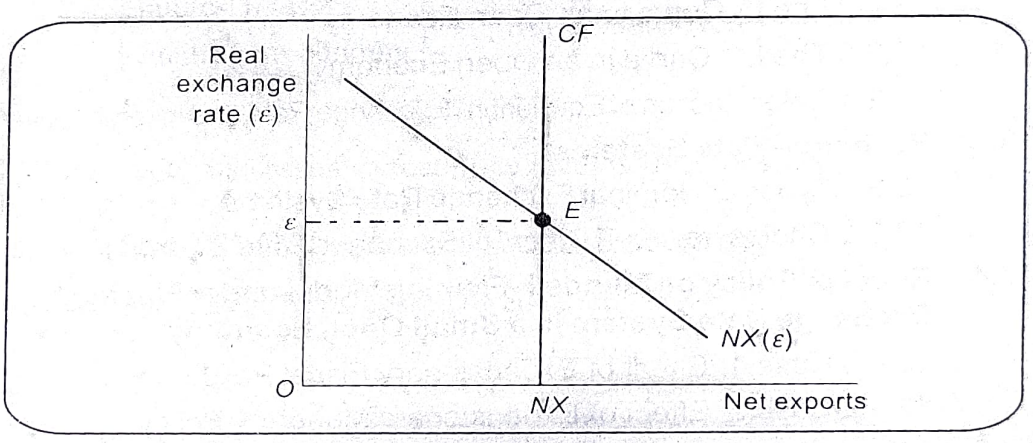


Fig. 12.3 Determination of Equilibrium Real Exchange Rate

where

CF = It is net capital outflow curve which is a vertical line since neither saving nor investment depends on real exchange rate. It shows supply of rupees to be exchanged into foreign currency.

$NX(\varepsilon)$ = It is net exports curve which is downward sloping since net exports is inversely related to real exchange rate. It shows demand for rupees from our net exports.

Point E = It is the point of equilibrium where:

$$NX(\varepsilon) = CF$$

It gives Oe as the equilibrium real exchange rate.

Summary

Features of a Large Open Economy

Features of a large open economy are:

- It affects the world interest rate.
- Capital is not perfectly mobile in such an economy.
- Net capital outflow in such an economy *(CF)* is negatively related to domestic real interest rate *r*.

$$CF = CF(r)$$

CF can be positive or negative. It is a downward sloping line in a large open economy. In a small open economy *CF* is a horizontal line at the fixed world interest rate. In a closed economy, *CF* curve is a vertical line.

Key Markets in a Large Open Economy

Two key markets are:

1. The Market for Loanable Funds

   In a large open economy,

$$\bar{S} = I(r) + CF(r)$$

   Equilibrium rate of interest (r) occurs where vertical national saving S curve intersects downward sloping $I(r) + CF(r)$ curve.

2. The Market for Foreign Exchange

   In a large open economy,

$$NX(\varepsilon) = CF$$

   Equilibrium real exchange rate (ε) occurs where downward sloping $NX(\varepsilon)$ curve intersects vertical *CF* curve.

Questions

(With Hints on Answers)

1. Explain the concept of net capital outflow in a large open economy. How does it differ from a closed economy and a small open economy?

Ans. Refer to Section 12.1.

2. Distinguish between a closed economy, small open economy and a large open economy. Comment on the behaviour of net foreign investment in each case. *[Delhi, B.Com., (H.), 2007]*

Ans. Refer to Section 12.1.

3. *(a)* Discuss the features of a large open economy.

Chapter 13

The Mundell-Fleming Model and Interest Rate Differentials

Chapter Outline

13.1 INTRODUCTION

In this chapter, the IS-LM model of a closed economy is extended to an open economy (both 'small' and 'large' open economy). The extended model is called Mundell–Fleming Model. The model explains the reasons for short-run fluctuations in income and the exchange rate.

13.2 THE MUNDELL–FLEMING MODEL: A SHORT-RUN MODEL OF THE SMALL OPEN ECONOMY

The model was developed by **Robert A. Mundell** and **J. Marcus Fleming** in the early 1960s to analyse short-run fluctuations.

13.2.1 The Assumptions of the Model

The Model assumes small open economy with **perfect capital mobility**. It means this economy can borrow or lend as much as it wants in world financial markets. It implies that:

$$\begin{bmatrix}\text{Interest rate in} \\ \text{small open economy}\end{bmatrix} = [\text{World interest rate}]$$

or
$$\boxed{r = r^*} \qquad (1)$$

The model also assumes that price level is fixed or sticky.

13.2.2 The IS* Curve in an Open Economy

The goods market can be expressed by equation:

$$Y = C + I + G + NX \qquad (2)$$

or
$$\boxed{Y = C(Y - T) + I(r^*) + G + NX(e)} \qquad (3)$$

where

Y = Aggregate income

$C(Y - T)$ = Consumption, which depends on disposable income. Disposable income is given by $Y - T$.

$I(r^*)$ = Investment, which is inversely related to world interest rate r^*.

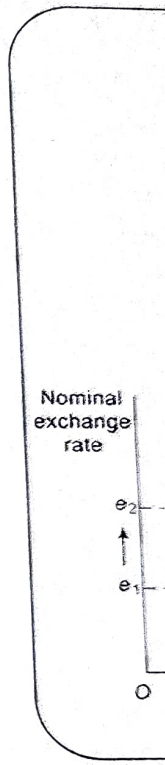
G = Government purchases

$NX(e)$ = Net exports which is negatively related to nominal exchange rate, e.

[**Note:** In the previous two chapters we took $NX = NX(e)$. That is, net export as a function of real exchange rate. We also said that $e = \frac{e \cdot P}{P^*}$. **Since Mundell–**

Fleming Model a
proportional to

Graphically,
It gives the IS^* c



Fi

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Fleming Model assumes that P and P^* are fixed, real exchange rate (ε) is proportional to the nominal exchange rate (e)|

Graphically, the goods market equilibrium Eq. (2) is shown in Fig. 13.1. It gives the IS^* curve in an open economy.

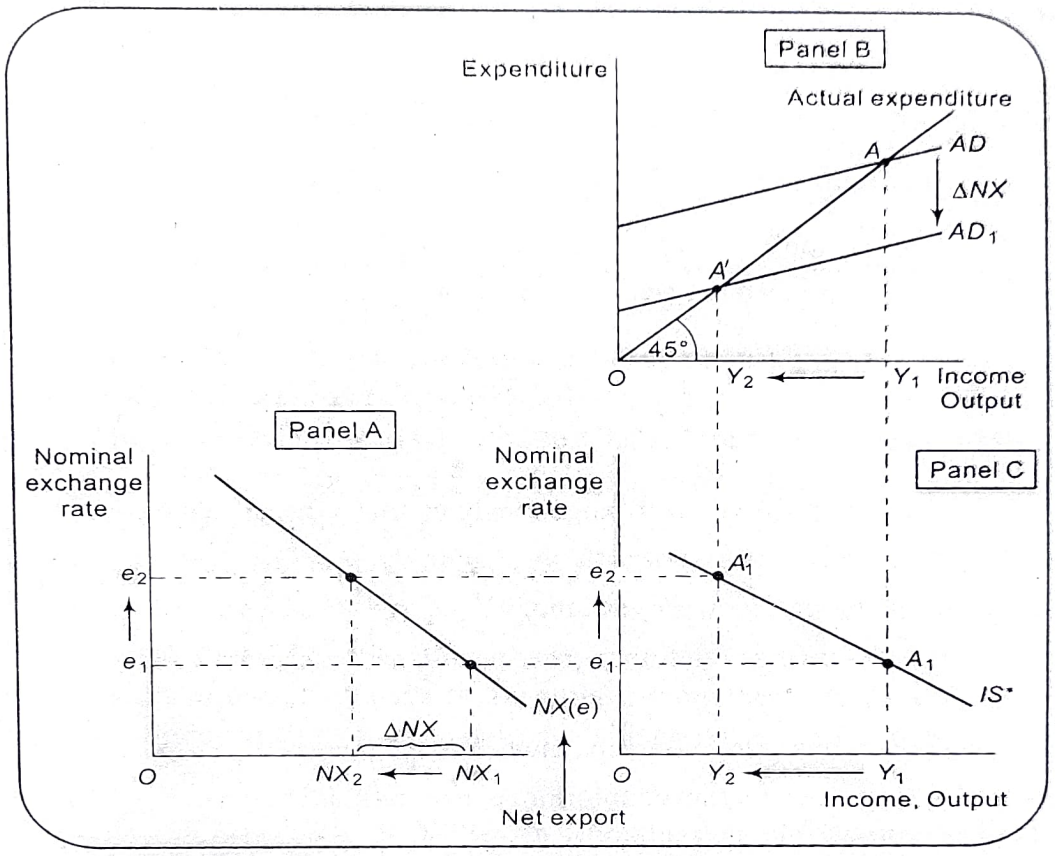

Fig. 13.1 Derivation of IS^* Curve in a Small Open Economy

In Panel (A), net export schedule is shown. At nominal exchange rate e_1, the net exports are NX_1 as given by $NX(e)$ curve. When nominal exchange rate rises to e_2, net export falls to NX_2. The fall in net export is equal to ΔNX.

In Panel (B), the Keynesian cross is drawn. Original equilibrium occurs at point A where Actual Expenditure = Aggregate Demand (or $AD = C + I + G + NX$). It gives OY_1 as the level of income. Fall in NX by ΔNX shift AD curve downward to AD_1. New equilibrium point is A' where actual expenditure is equal to aggregate demand AD_1. It reduces the level of income to OY_2.

In panel (C), the IS^* curve is derived from net export curve and Keynesian cross. At e_1 exchange rate (in Panel A), income is OY_1 (given in Panel B). Extend e_1 line rightwards and Y_1 line downwards, we obtain point A_1. When exchange rate rises to e_2, income level falls to Y_2. Extending e_2 line rightwards and Y_2 line

downwards, point A_1, is obtained. Joining points A_1 and A'_1, IS^* curve to obtained in an open economy. IS^* curve is downward sloping.

Thus, IS* curve gives the inverse relationship between exchange rate and level of income.

13.2.3 The LM* Curve in an Open Economy

The money market equilibrium can be expressed by equation:

$$\begin{bmatrix}\text{Supply of real}\\ \text{money balances}\end{bmatrix} = \begin{bmatrix}\text{Demand for}\\ \text{real money balances}\end{bmatrix}$$

or

$$\boxed{\frac{M}{P} = L(r^*, Y)} \qquad (4)$$

where

M = Money supply which is exogenously given by the central bank.

P = Price level. It is assumed to be fixed in the model.

L = Demand for real money balances.

r^* = There is inverse relationship between L and interest rate (or world interest rate) r^*.

Y = There is direct relationship between L and income Y.

Graphically, the money market equilibrium equation (4) is shown in Fig. 13.2. It gives the LM^* curve in an open economy.

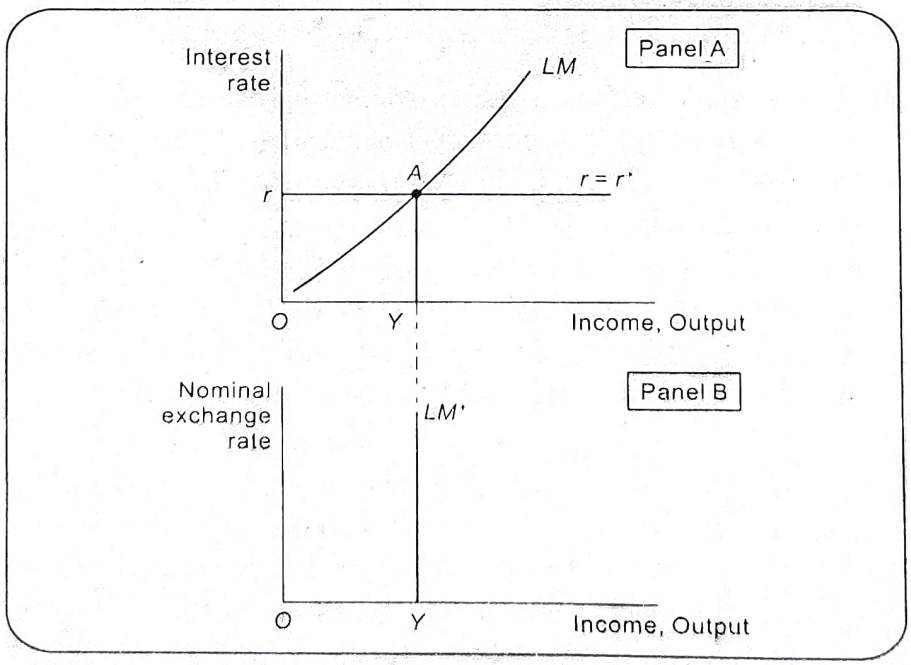

Fig. 13.2 Derivation of LM^* Curve in an Open Economy

In Panel (A), the *LM* curve (of a closed economy) is drawn. It shows direct relationship between interest rate and income. The world interest rate r^* is given and is equal to r. At point A, world interest rate equals the money market equilibrium condition. It gives OY as the level of income.

In Panel (B), the *LM* curves in an open economy (LM^*) is derived. LM^* curves is a vertical line at OY level of income. It is vertical because exchange rate (e) does not affect the LM^* curve.

Thus, LM^* curve is derived from world interest rate but is unaffected by exchange rate.

13.2.4 Determination of Equilibrium Exchange Rate and Income Level

Mundell–Fleming model determines equilibrium exchange rate and level of income in a small open economy by bringing together Eqs. (3) and (4) and Figs. 13.1 and 13.2.

Rewriting Eqs. (3) and (4), we have:

$$Y = C(Y - T) + I(r^*) + G + NX(e) \qquad \text{...(5) } IS^* \text{ equation}$$

$$\frac{M}{P} = L(r^*, Y) \qquad \text{...(6) } LM^* \text{ equation}$$

Exogenous variables are:

- G and T
- M
- P
- r^*

Endogenous variables are:

- Y
- e

Figure 13.3 determines the level of income and exchange rate in Mundell–Fleming model.

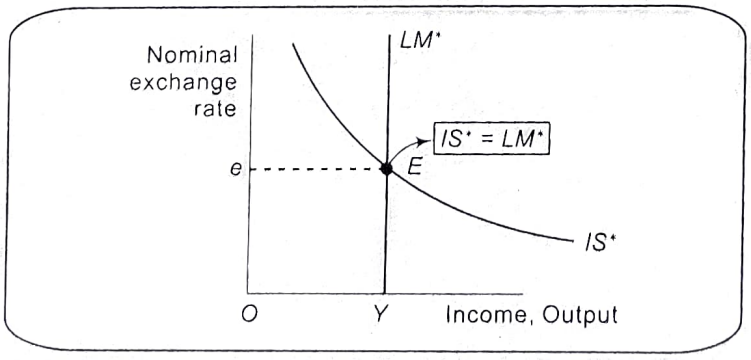

Fig. 13.3 Mundell–Fleming Model: *IS-LM* Model in a Small Open Economy

where,

IS^* = IS^* curve shows goods market equilibrium in a small open economy.

LM^* = LM^* curve shows money market equilibrium in a small open economy.

Point E = It is the point of equilibrium of goods market and money market. At this point, IS^* and LM^* curves interest each other. It gives Oe as the exchange rate and OY as the level of income.

13.3 EXCHANGE RATE SYSTEMS

13.3.1 Types of Nominal Exchange Rate Systems

There are two types of nominal exchange rate systems. These are:

1. *Floating or Flexible exchange rate:* In this, exchange rate fluctuates in response to changing economic conditions.
2. *Fixed exchange rate:* In this, exchange rate does not change with changing economic conditions.

13.3.2 Choice between Different Exchange Rate Systems

1. **Brief History:** At the end of World War II, it was believed that a system of fixed exchange rates would promote the growth of world trade. In 1944, delegates from 44 nations met in Bretton Woods to discuss the creation of fixed exchange rate system. From the Bretton Woods conference emerged an exchange rate arrangement called *gold exchange standard.* In this system, each nation fixes the values of its currency in term of gold, but buys and sells the U.S. dollar rather than gold to maintain fixed exchange rates. The U.S. dollar was the reserve *currency* of the system.

Two new organisations—the International Monetary Fund (IMF) and the World Bank emerged from the Bretton Woods conference in 1944. Fixed exchange rates are maintained by government intervention in the foreign exchange market and buying and selling of currencies by a central bank.

The Bretton Woods system officially dissolved in 1971 at a meeting of the finance ministers of the leading world powers at the Smithsonian Institution in Washington, D.C. The U.S. dollar was devalued.

The governments of the major industrial countries adopted floating exchange rates in March, 1973.

The world today consists of some countries with fixed exchange rates; other countries with floating exchange rates; and still others whose exchange rate systems lie somewhere in between.

2. **Advantages of Fixed Exchange Rate System:** Advantages of fixed exchange rate system are:
   1. It removes uncertainty that accompanies international business transactions and creates confidence in foreign currency.
   2. It disciplines a nation's monetary authority and prevent excessive growth in the money supply. (The monetary authority has to pursue single goal of maintaining exchange rate at its fixed level).
   3. It is simpler to implement than floating exchange rate system since money supply adjusts automatically to the necessary level.
   4. It serves as an anchor to constrain inflationary government policies. Fixed exchange rate can be maintained only between countries with similar macroeconomic policies and similar underlying economic conditions.
3. **Advantages of Floating Exchange Rate System:** Floating exchange rate is also *called market determined* exchange rate or *flexible* exchange rate. The rate is determined by the unregulated forces of demand and supply. Government intervenes periodically to make sure that exchange rate movements are in order.

The advantages of floating exchange rate system are:

1. It allows monetary policy to attain goals such as stabilising prices, employment, etc.
2. It allows countries to formulate their macroeconomic policies independent of other nations. The country can focus more on its domestic policies.
3. Empirically, the amount of world trade has increased under floating exchange rate.
4. It provides a smooth adjustment mechanism for correcting the disequilibrium in the balance of payments of the country concerned. It is done through currency depreciation or currency appreciation.

4. **Concept of Speculative Attacks, Currency Boards, and Dollarization**
   1. **Speculative Attacks:** It is a situation which changes investors' perception.
   2. **Currency Board:** It is an arrangement by which the central bank holds enough foreign currency to back, in some fixed ratio, each unit of the domestic currency.
   3. **Dollarization:** It is a plan in which domestic currency is abandoned in favour of a foreign currency. The domestic currency is converted into U.S. dollar.

13.4 EFFECT OF POLICY ON MUNDELL–FLEMING MODEL UNDER FLOATING EXCHANGE RATE SYSTEM IN A SMALL OPEN ECONOMY

13.4.1 Case 1: Effect of Expansionary Fiscal Policy

If the government follows expansionary fiscal policy (that is, raising G or reducing T), it will raise planned expenditure. The IS^* curve will shift rightward. It is graphically shown in Fig. 13.4.

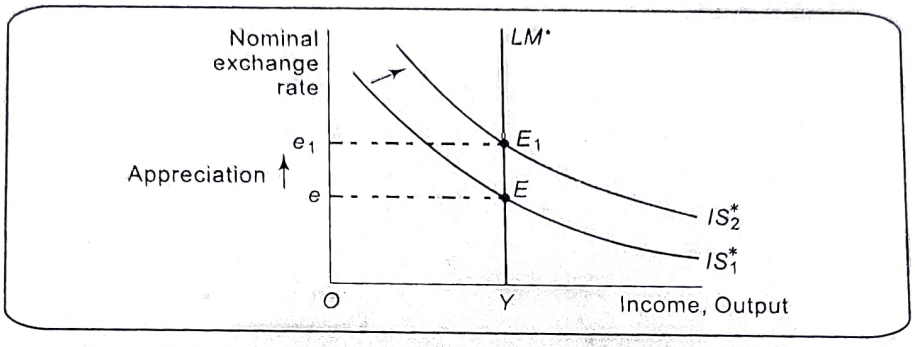

Fig. 13.4 Effect of Expansionary Fiscal Policy in a Small Open Economy

where,

IS_1^* = It is the original IS^* curve. It intersects LM^* curve at point E. It gives Oe on the exchange rate and OY as the level of income.

IS_2^* = With fiscal expansion, IS_1^* curve shifts rightwards to IS_2^*. It intersects an unchanged LM^* curve at point E_1. It raises or **appreciates** exchange rate to Oe_1. The level of income remain the same OY. (**Note:** In a closed economy, the level of income would have risen). Appreciation in exchange rate makes domestic goods expensive and reduces net exports. Fall in net exports offsets the rise in income which could have taken place due to expansionary fiscal policy. That is why, income level remains unchanged at OY level.

Thus, the *effects of expansionary fiscal* policy are:

1. Exchange rate rises.
2. Income level remains unchanged.
3. Net exports fall.

13.4.2 Case 2: Effect of Expansionary Monetary Policy

If the government follows an expansionary monetary policy (that is, raising money supply), it will raise real balances $\left(\frac{M}{P}\right)$ since price is fixed. It will shift LM^* curve to the right. It is graphically shown in Fig. 13.5.

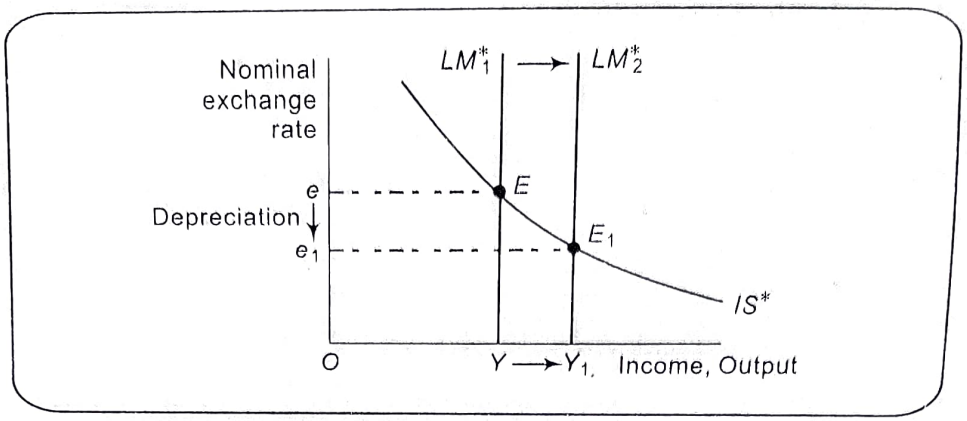

Fig. 13.5 Effect of Expansionary Monetary Policy in a Small Open Economy

where,

LM_1^* = It is the original LM^* curve. It intersects the IS^* curve at point E. It gives Oe as the exchange rate and OY as the level of income.

LM_2^* = With monetary expansion, M rises, P remaining constant $\frac{M}{P}$. It shifts LM_1^* curve rightwards to LM_2^*. LM_2^* intersects IS^* curve at point E_1. It lowers or **depreciates** the exchange rate to Oe_1 and raises the income to OY_1. Depreciation in exchange rate makes domestic goods cheaper relative to foreign goods. Net exports rises.

Thus, the *effects of expansionary monetary* policy are:

1. Exchange rate falls.
2. Net exports rises.
3. Income level rises.

[**Note:** Devaluation means reduction in the value of the currency. It raises net exports and income level. It's graphical representation will be like Fig. 13.5.

Revaluation means increase in the value of the currency. It will shift LM^* curve leftward. It reduces net exports, and income level]

13.5 EFFECT OF POLICY ON MUNDELL–FLEMING MODEL UNDER FIXED EXCHANGE RATES IN A SMALL OPEN ECONOMY

13.5.1 How does Fixed Exchange Rate System Operate?

As mentioned earlier, the Central Bank is committed to buy or sell the domestic currency for foreign currency at a predecided price in fixed exchange rate system. That is, in order to have equality between equilibrium exchange rate and

announced exchange rate, the Central Bank adjusts money supply to the required level.

Example: Let India fix the exchange rate as 100 rupees per dollar. It means India is ready to take \$1 per ₹ 100 or give ₹ 100 per \$1.

The following two situations explain how a fixed exchange rate system decides the money supply.

Situation 1: When equilibrium exchange rate is more than fixed exchange rate. In our example, let equilibrium exchange rate be 150 rupees per dollar. Figure 13.6 shows the situation.

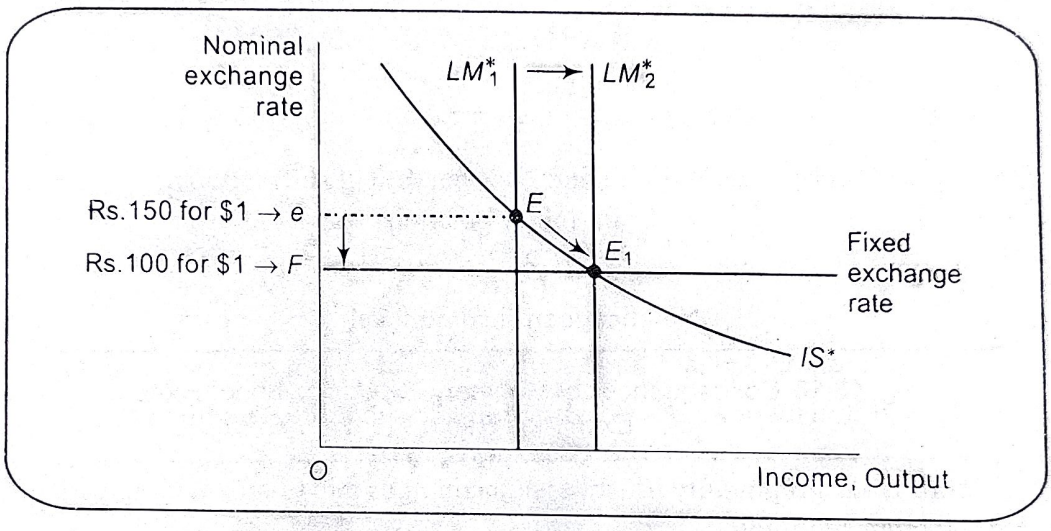

Fig. 13.6 When $e > F$, Money Supply Rises

In the figure:

e = It is the equilibrium exchange rate determined from the point where $IS^* = LM_1^*$

OF = If the fixed exchange rate is OF, then equilibrium exchange rate Oe is more than fixed exchange rate. In this situation, arbitrageur a person engaged in the simultaneous buying and selling of same or similar securities in two different markets for taking advantage of the difference in prices) will earn profit by buying rupees in foreign exchange market. Arbitrageur buys ₹ 300 for \$2, and then sell rupees to India for \$3 and earns profit of \$1. When India buys ₹ 300, it pays \$3. This raises the money supply. It is shown by rightward shift of LM_1^* curve to LM_2^* curve. The rightward shift is to the extent (till point E_1) such that exchange rate reduces to OF level.

Situation 2: When equilibrium exchange rate is less than fixed exchange rate. In our example let equilibrium rate be 50 rupees per dollar. Figure 13.7 shows this situation.

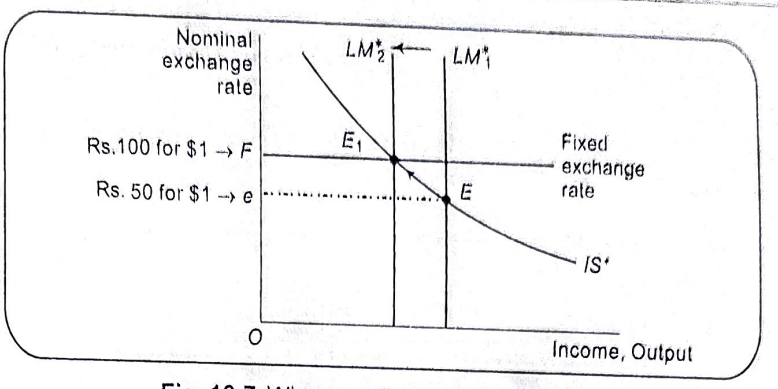

Fig. 13.7 When $e < F$, Money Supply Falls

where

e = It is the equilibrium exchange rate where $IS^* = LM_1^*$.

OF = If the fixed exchange rate is OF, then equilibrium exchange rate (Oe) is less than fixed exchange rate. In this situation, arbitrageur will earn profit by buying dollars in foreign exchange market. Arbitrageur buys ₹ 100 from India for $1 and then sell ₹ 100 in the foreign exchange market place for $2. When India sells these rupees, it gets $1. This reduces the money supply. It is shown by leftward shift of LM_1^* curve to LM_2^* curve. The extent of shift in LM^* curve is such that exchange rate rises to OF level.

13.5.2 Effect of Policy

Case 1: Effect of Expansionary Fiscal Policy

The sequence of effects of expansionary fiscal policy under fixed exchange rate is shown in Fig. 13.8.

Expansionary fiscal policy
↓
IS^* curve shifts rightward
↓
Equilibrium exchange rate rises
↓
Arbitrageurs will start selling domestic currency to the Central Bank
↓
Monetary expansion takes place
↓
LM^* curve shifts rightward
Income level rises (and no change in nominal exchange rate)

Fig. 13.8 Consequences of Fiscal Expansion under Fixed Exchange Rate System

Figure 13.9 graphically illustrates the effects of fiscal expansion in a small open economy.

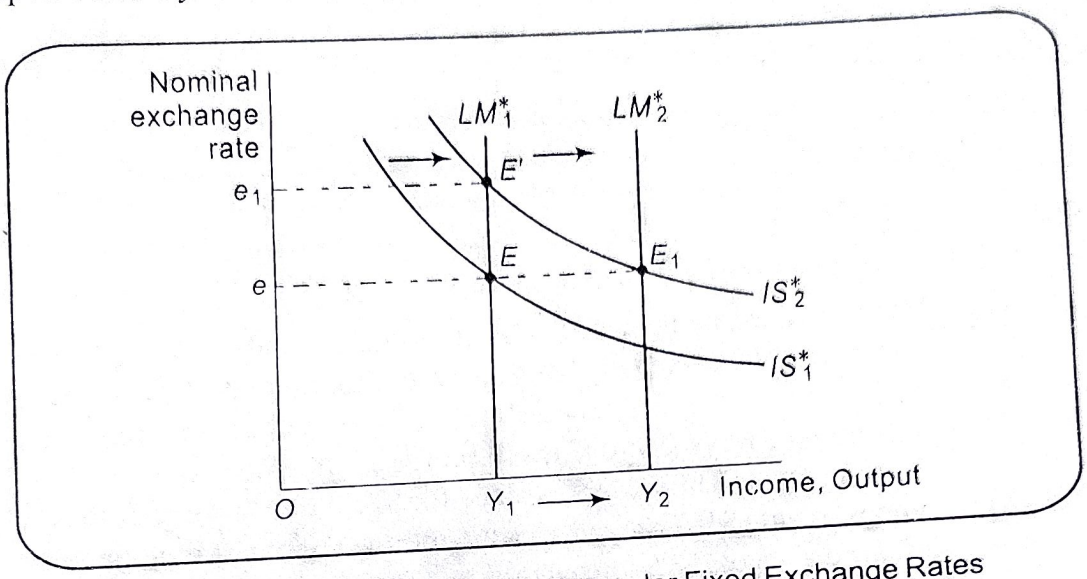

Fig. 13.9 Effect of Fiscal Expansion under Fixed Exchange Rates in a Small Open Economy

where

Oe = It is the initial situation where Oe is the equilibrium exchange rate and the fixed exchange rate.

IS_2^* = Fiscal expansion leads to rightward shift of IS_1^* curve to IS_2^* curve. New equilibrium takes place at E'. Equilibrium exchange rates rises from Oe to Oe_1.

LM_2^* = To maintain the fixed exchange rate at Oe level, arbitrageurs will start **selling** domestic currency to the Central Bank. Money supply rises. It is shown by rightward shift of LM_1^* to LM_2^* curve.

Point E_1 = It is the final equilibrium point where $LM_2^* = IS_2^*$. The level of income rises from OY_1 to OY_2 and there is no change in the nominal exchange rate which remains Oe.

Thus, the *effects of fiscal expansion* are:

(1) No change in exchange rate.

(2) No change in net exports.

(3) Income level rises.

Case 2: Effect of Expansionary Monetary Policy

The sequence of effects of expansionary monetary policy (that is, increase in money supply) under fixed exchange rates is shown in Fig. 13.10.

Expansionary monetary policy

↓

LM^* curve shifts rightward

↓

Equilibrium exchange rate falls

↓

Arbitrageurs will start selling domestic currency in the foreign exchange market

↓

Money supply will fall and LM^* curve will shift leftwards to its initial position

↓

No change in income level

Fig. 13.10 Consequences of Monetary Expansion under Fixed Exchange Rates

Figure 13.11 graphically illustrates the changes due to monetary expansion in a small open economy.

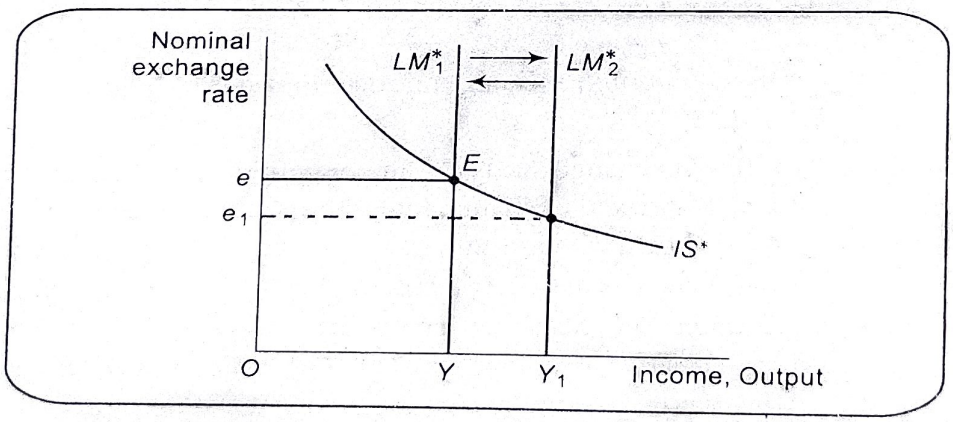

Fig. 13.11 Effect of Monetary Expansion under Fixed Exchange Rates in a Small Open Economy

where

Oe = It is the initial situation where Oe is the equilibrium exchange rate given by $IS^* = LM_1^*$. It is also the fixed exchange rate.

LM_2^* = With monetary expansion LM_1^* curve shifts rightwards to LM_2^* Equilibrium exchange rate, where $LM_2^* = IS^*$, falls to e_1.

To maintain the fixed exchange rates at Oe level, arbitrageurs will starts selling

domestic currency in the foreign exchange market. Money supply falls. LM_2^* curve falls back to LM_1^* level and Oe level of nominal exchange rate is restored.

Thus, the *effects of monetary expansion* are:

1. No change in exchange rate.
2. No change in net exports.
3. No change in income level.

13.6 EFFECT OF CHANGING PRICE LEVEL IN THE MUNDELL–FLEMING MODEL: DERIVATION OF THE AGGREGATE DEMAND CURVE

Incorporating real exchange rate formula $\varepsilon = \frac{e.P}{P^*}$ in equation (5), we get:

$$Y = C(Y - T) + I(r^*) + G + NX(\varepsilon) \quad (7)$$

$$\frac{M}{P} = L(r^*, Y) \quad (6)$$

where

$NX(\varepsilon)$ = Net exports is taken as a function of real exchange rate, ε

The sequence of effect due to fall in price level is shown in Fig. 13.12.

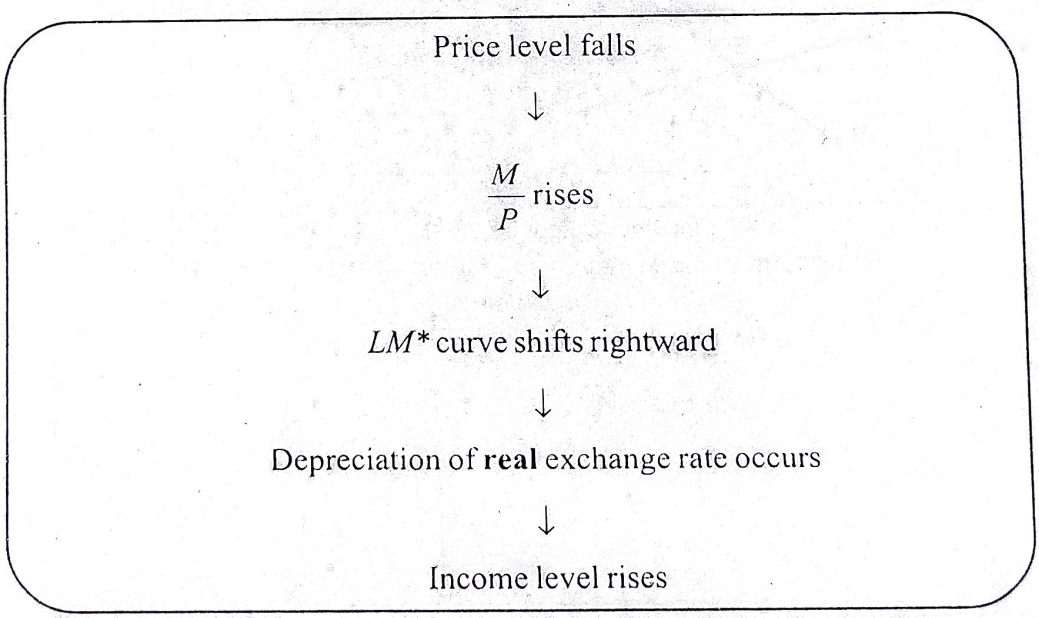

Fig. 13.12 Consequence of Fall in Price on Mundell–Fleming Model in a Small Open Economy

Figure 13.13 graphically illustrates two panels. Panel (A) shows the effect of fall in price level on exchange rate and income level. Panel (B) derives the aggregate demand curve in a small open economy.

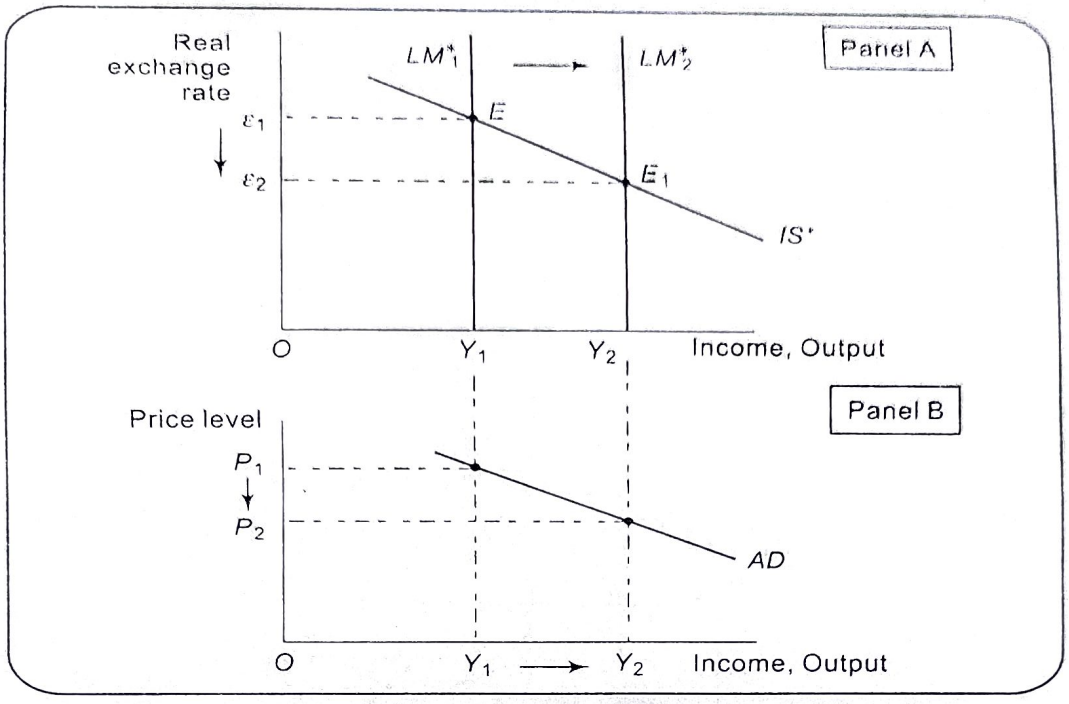

Fig. 13.13 Mundell–Fleming Model and *AD* curve in a Small Open Economy

In Panel (A), Mundell–Fleming model is shown. A fall in price raises $\frac{M}{P}$ and brings about a rightward shift in LM_1^* curve to LM_2^* curve. New equilibrium occurs at point E_1 (where $IS^* = LM_2^*$). Real exchange rate falls from $O\varepsilon_1$ to $O\varepsilon_2$ and income level rises from OY_1 to OY_2.

In Panel (B), the aggregate demand curve is derived in a small open economy. *AD* curve shows that as price level falls, income level rises.

In other words, ***AD curve shows the inverse relationship between price level and income level in a small open economy.***

13.7 SHORT-RUN AND LONG-RUN EQUILIBRIA IN A SMALL OPEN ECONOMY

Figure 13.14 shows short-run and long-run equilibria in a small open economy. In Panel (A) the Mundell–Fleming model is shown and in Panel (B) *AD–AS* model is shown. In both panels:

Point S = In Panel B, it is short-run equilibrium under the Keynesian assumption that price is fixed at OP level where short-run AS equals AD. The economy's income level is OY_1, which is less than the natural rate $O\bar{Y}$. In Panel A, point S shows equality between IS^* and LM_1^* curve.

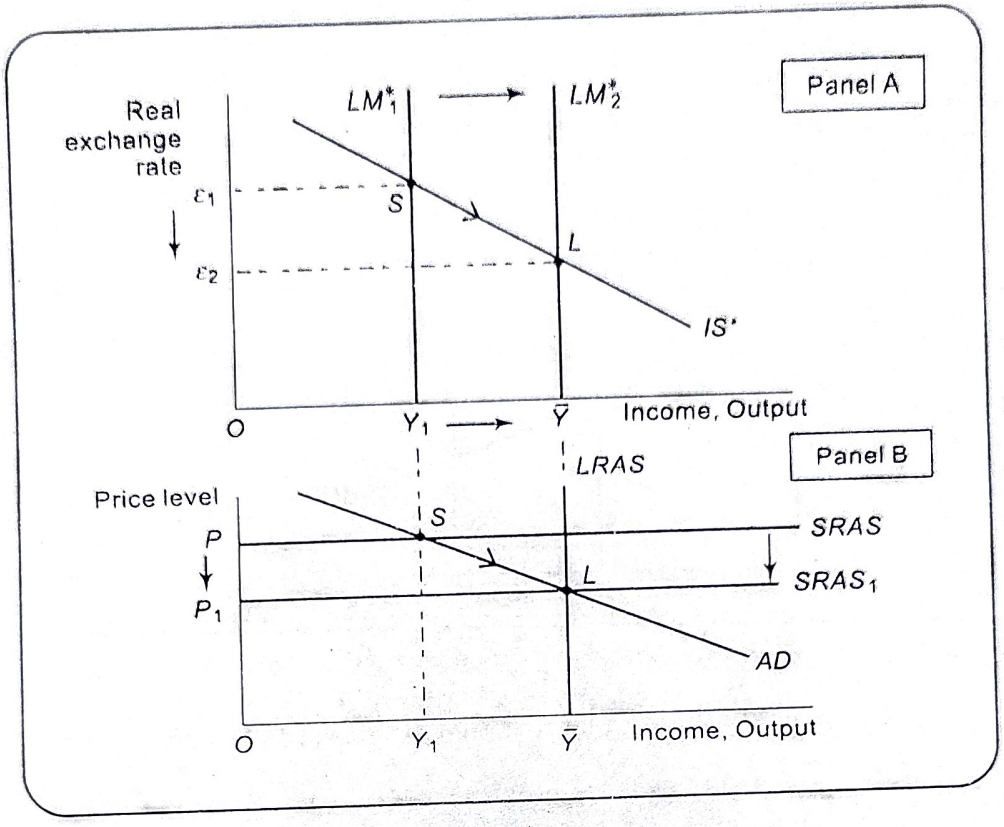

Fig. 13.14 Short-Run and Long-Run Equilibria

Point L = **Long-run** equilibrium occurs at point L in both panels. In Panel A, a fall in price, raises $\frac{M}{P}$. LM_1^* curve shifts rightward to LM_2^* curve. Long-run equilibrium occurs at point L where $IS^* = LM_2^*$.

Real exchange rate falls to ε_2. As a result, net exports rises and income level rises to $\bar{Y}$ level. In Panel B, point L shows long-run equilibrium under the classical assumption that price level changes so that economy can have income at its natural rate, $O\bar{Y}$. At point L $SRAS_1 = AD$ at $\bar{Y}$ level of income.

13.8 SHORT-RUN IS–LM MODEL OF A LARGE OPEN ECONOMY

As stated in the previous chapter, in a large open economy net capital outflow is negatively related to domestic real interest rate (r).

That is: $$CF = CF(r) \quad (8)$$

Since net exports (NX) equals net capital outflow (CF), Eq. (11) can be written as:

$$NX(e) = CF(r) \tag{9}$$

The IS equation of the model is:

$$Y = C(Y-T) + I(r) + G + NX(e) \tag{10}$$

Substitute Eq. (12) in Eq. (13), we get:

$$Y = C(Y-T) + I(r) + G + CF(r) \tag{11}$$

and the LM equation is

$$\frac{M}{P} = L(r; y) \tag{12}$$

Figure 13.15 graphically shows short-run model of a large open economy.

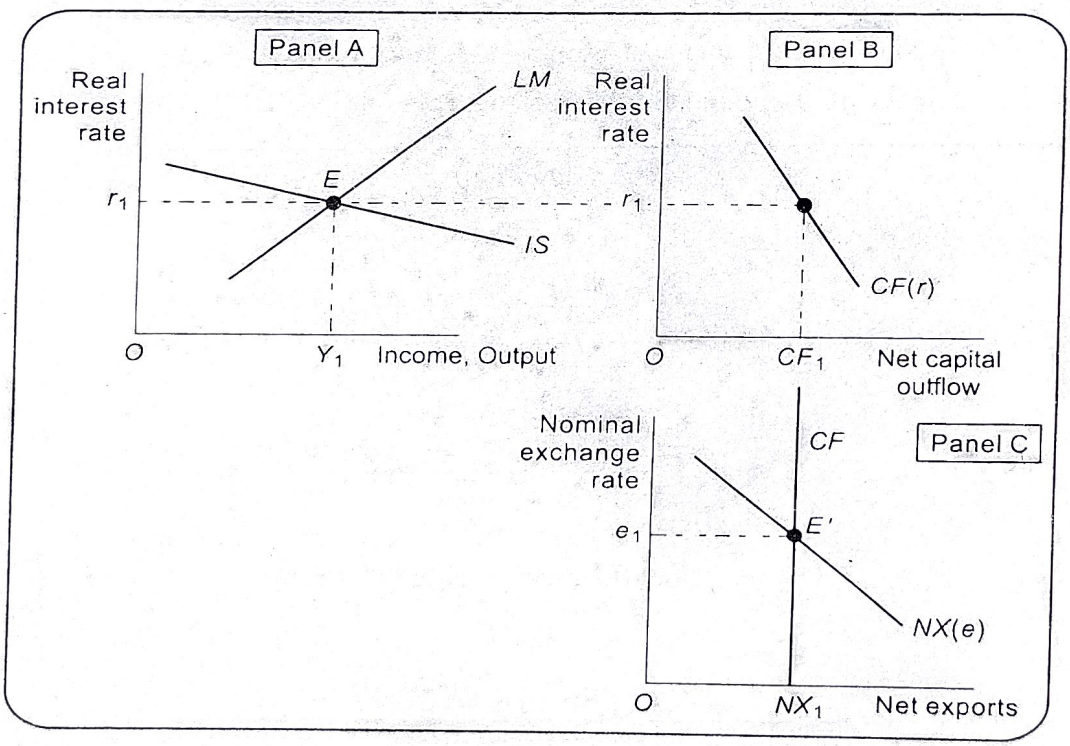

Fig. 13.15 Short-Run Model of a Large Open Economy

In Panel A, $IS-LM$ model is shown. It shows:

IS = IS curve which is flatter because international capital flows are responsive to interest rate.

Point E = Equilibrium occurs at point E where $IS = LM$. It gives Or_1 as the real interest rate and OY_1 as the income level.

In Panel B, net capital outflow curve is shown.

$CF(r)$ = At real interest rate of r_1 net capital outflow is CF_1 as given by $CF(r)$ curve, which is downward sloping. In Panel C, the market for foreign exchange is shown where:

CF = Net capital outflow (CF) is given by a vertical line. It is given at the level of CF_1 as determined by Panel B.

NX = Net exports curve is downward sloping.

Point E' = Equilibrium in foreign exchange market occurs at point E' where $NX(e) = CF$. It gives Oe_1 as the exchange rate.

13.9 EFFECT OF POLICY IN A LARGE OPEN ECONOMY

13.9.1 Case 1: Effect of Expansionary Fiscal Policy

The sequence of effects of expansionary fiscal policy in a large open economy (under floating exchange rate) is shown in Fig. 13.16.

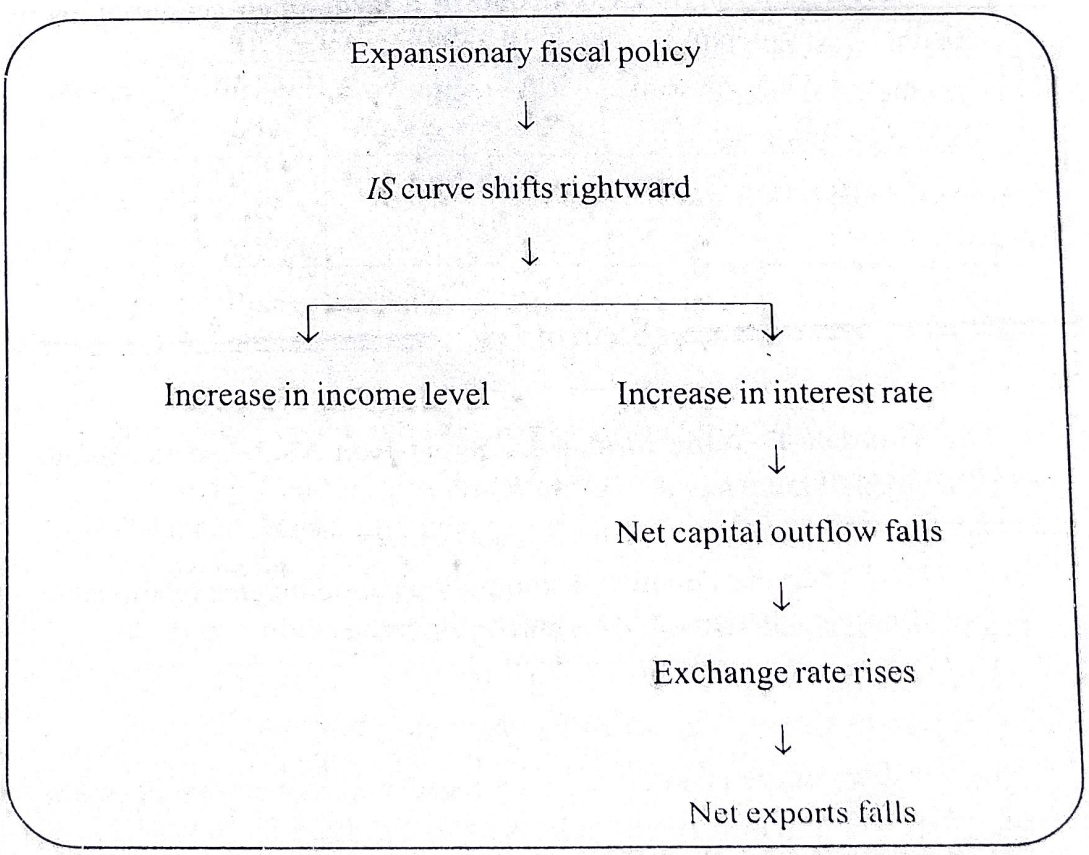

Fig. 13.16 Sequence of Effects of Expansionary Fiscal Policy in a Large Open Economy

Figure 13.17 graphically shows the fiscal expansion in a large open economy.

In Panel A, $IS-LM$ model is shown. The explanation is same as that of Fig. 13.17.

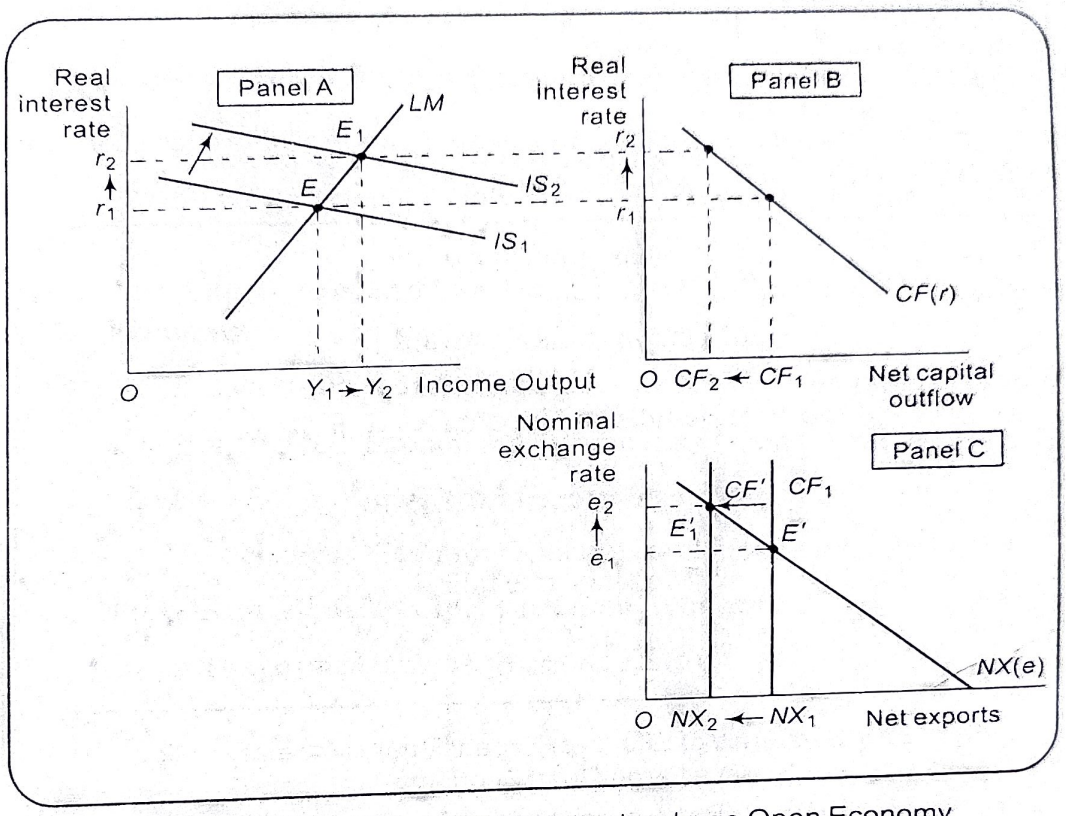

Fig. 13.17 Effect of Fiscal Expansion in a large Open Economy

IS_2 = With fiscal expansion IS_1 curve shifts rightwards to IS_2. As a result, new equilibrium occurs at point E_1. Equilibrium real interest rate rises to Or_2 and income level rises from OY_1 to OY_2.

In Panel B, net capital outflow is shown.

Or_2 = With rise in real interest rate to Or_2 level, net capital outflow falls from CF_1 to CF_2 level.

In Panel C the market for foreign exchange is shown.

CF' = The fall in CF in Panel B leads to leftward shift in CF curve to CF' curve. New foreign exchange market equilibrium takes place at E'_1 point. Equilibrium exchange rate rises from Oe_1 to Oe_2 level and net exports fall from NX_1 to NX_2 level.

Thus, *effects of fiscal expansion in a large open economy* are:

1. Real interest rate rises.
2. Income level rises.

3. Exchange rate rises.
4. Net exports fall.

13.9.2 Case 2: Effect of Expansionary Monetary Policy

The sequence of effects of expansionary monetary policy in a large open economy (under floating exchange rate) is shown in Fig. 13.18.

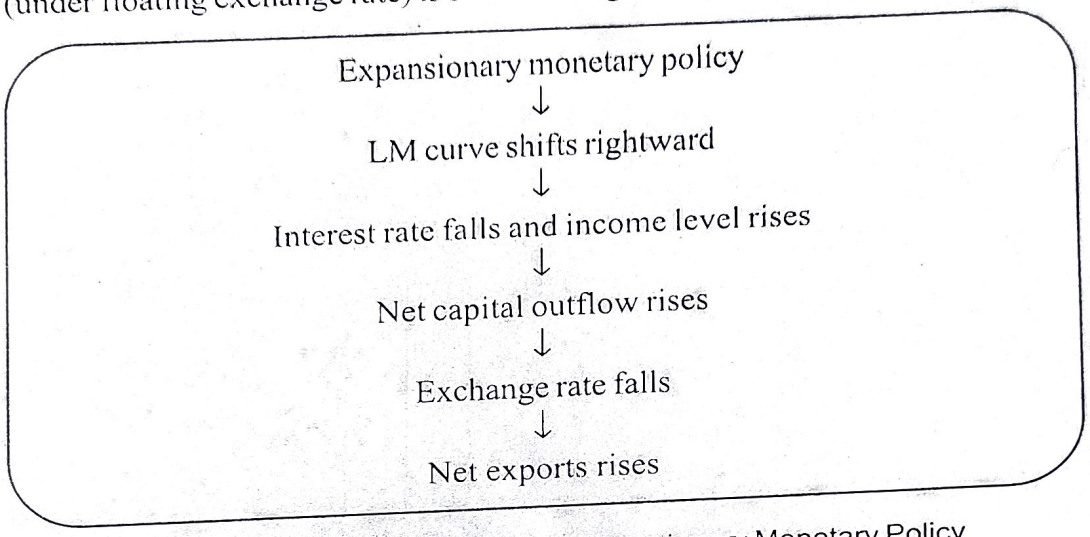

Fig. 13.18 Sequence of Effects of Expansionary Monetary Policy in a Large Open Economy

Figure 13.19 graphically shows the monetary expansion in a large open economy.

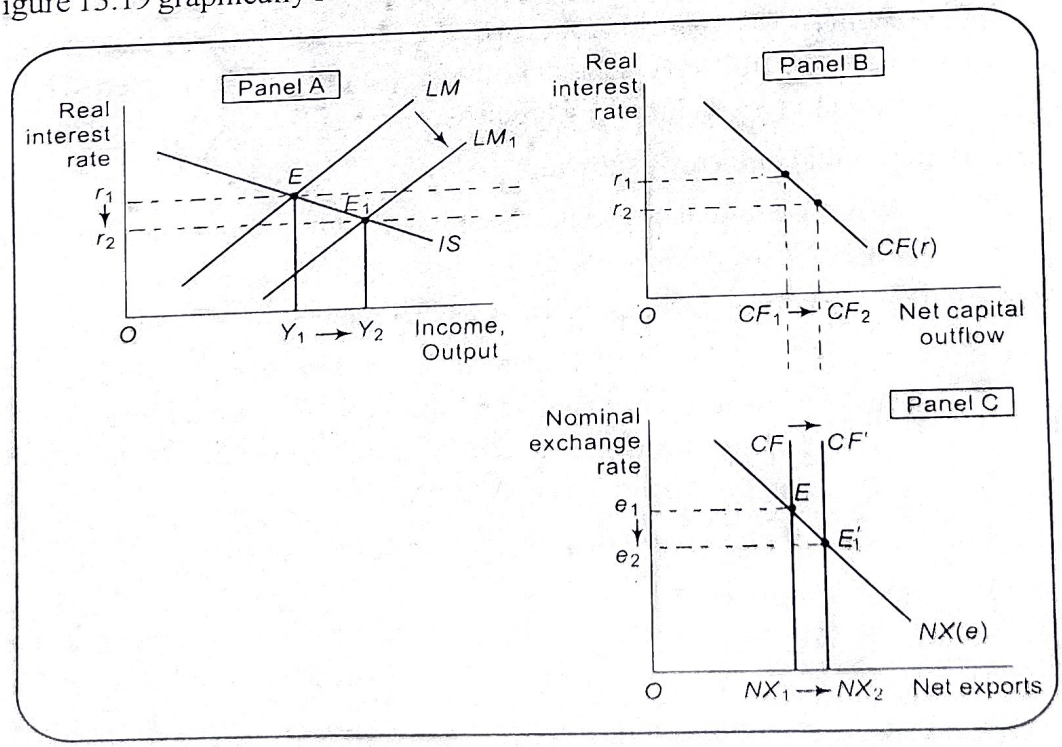

Fig. 13.19 Effect of Monetary Expansion in a Large Open Economy

In Panel A, the *IS–LM* model is shown.

LM_1 = With monetary expansion, *LM* curve shifts rightwards to LM_1. It gives new equilibrium point as E_1. Equilibrium real interest rate falls from Or_1 to Or_2 and income level rises from OY_1 to OY_2 level.

In Panel B, net capital outflow curve is shown.

Or_2 = At lower interest rate of Or_2, net capital outflow rises from CF_1 to CF_2 as given by *CF(r)* curve.

In Panel C, the market for foreign exchange is shown.

CF' = It is the new net capital outflow curve. The extent of rise in *CF* curve from *CF* to *CF'* is decided by Panel B. New foreign exchange market equilibrium occurs at point E_1' where *NX(e)* = *CF'*. Equilibrium exchange rate fall from Oe_1 to Oe_2 and net exports rises from NX_1 to NX_2 level.

Thus, the effects of monetary expansion in a large open economy are:

1. Real interest rate falls.
2. Income level rises.
3. Exchange rate falls.
4. Net exports rises.

Summary

The Mundell–Fleming Model—A Short-Run Model of the Small Open Economy

1. The model assumes that at given price level, $r = r^*$.
2. The *IS** curve is downward sloping indicating inverse relationship between exchange rate and level of income.
3. *IS** equation is given as:

$$Y = C(Y - T) + I(r^*) + G + NX(e).$$

4. The *LM** curve is a vertical line because exchange rate does not affect the *LM** curve.
5. *LM** equation is given as:

$$\frac{M}{P} = L(r^*, Y)$$

6. Where *IS** and *LM** curves intersect each other, equilibrium in goods