BECC-106

# INTERMEDIATE MACROECONOMICS - I

School of Social Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi-110068

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| Block/ Unit | Title | Unit Writer |
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| **Block 1** | **Aggregate Demand and Supply** | |
| Unit 1 | Aggregate Demand | Ms. Archana Aggarwal, Assistant Professor, Hindu College, University of Delhi<br>(Edited by Prof. Kaustuva Barik, IGNOU) |
| Unit 2 | Aggregate Supply | |
| Unit 3 | Equilibrium Output and Prices | |
| **Block 2** | **Expectations, Inflation and Unemployment** | |
| Unit 4 | Adaptive Expectations | Units 4 and 5: Dr. Tarun Manjhi, Sri Ram College of Commerce, University of Delhi (Edited by Ms. Sonica Singhi, Lakshmibai College, University of Delhi) |
| Unit 5 | Rational Expectations | |
| Unit 6 | Inflation and Unemployment | Unit 6: Dr. Kaustuva Barik, IGNOU and Dr. Tarun Manjhi, SRCC, University of Delhi |
| **Block 3** | **Balance of Payments and Exchange Rate** | |
| Unit 7 | Financial Markets | Dr. Archi Bhatia, Associate Professor, Central University of Himachal Pradesh, Dharamshala<br>(Edited by Prof. Kaustuva Barik, IGNOU) |
| Unit 8 | Balance of Payments | |
| Unit 9 | Exchange Rate Determination | |
| **Block 4** | **Open Economy Models** | |
| Unit 10 | Mundell-Fleming Model | Dr. Archi Bhatia, Associate Professor, Central University of Himachal Pradesh, Dharamshala<br>(Edited by Prof. B S Prakash, IGNOU) |
| Unit 11 | Dornbusch's Overshooting Model | |
| Unit 12 | Macroeconomic Policy in an Open Economy | |

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# CONTENTS

# COURSE INTRODUCTION

In the course 'BECC 103: Introductory Macroeconomics' you were introduced to some important issues in macroeconomics. In the present course we further build upon those ideas and delve deeper into some of the topics in macroeconomics. This course introduces you to formal modeling of a macro-economy in terms of analytical tools. It discusses various alternative theories of output and employment determination in a closed economy in the short run as well as medium run, and the role of policy in this context. The course comprises four blocks.

Block 1, entitled **Aggregate Demand and Supply**, comprises three Units. This block, in fact, is an extension of the IS-LM model discussed in BECC 103. Unit 1 on Aggregate Demand begins with the derivation of the aggregate demand curve on the basis of the IS-LM model. We bring out the factors that influence the demand curve and the type of shift they result in. Unit 2 on Aggregate Supply discusses on the derivation of the supply curve from price setting and wage setting equations. Unit 3 brings together the aggregate demand and aggregate supply curves. The impact of supply shocks and demand shocks on equilibrium put and prices are also discussed in this Unit.

The title of Block 2 is **Expectations, Inflation and Unemployment**. It deals with the theoretical aspects of expectations and its role in macroeconomics. Unit 4 brings out the concept, features, scope and limitations of adaptive expectations. The subject matter of Unit 5 is rational expectations. It shows how economic agents take into account all available information in decision-making. It further delves into issues such as policy ineffectiveness proposition, and the role of expectations in IS-LM analysis. Unit 6 brings out the relationship between inflation and unemployment. It begins with the traditional downward-sloping Phillips curve. Subsequently it introduces expectations and explains why the Phillips curve is a vertical line in the long run.

Block 3, entitled **Balance of Payments and Exchange Rate**, consists of three Units. Unit 7, titled Financial Markets, begins with the role, types and features financial markets, financial derivatives and foreign exchange markets. Unit 8 deals with balance of payments, its accounting principles, determinants of exports and imports, and capital flows. Unit 9, titled, theories of exchange rate determination, discusses various exchange rate regimes, determinants of exchange rate, and purchasing power parity.

In Block 4 we discuss issues pertaining to **Open Economy Models**. There are three Units in this Block. Unit 10 deals with the Mundell-Flemming model, which brings out the effectiveness of fiscal policy and monetary policy under various exchange rate regimes. Unit 11 discusses Dornbusch's overshooting model, which discusses the impact of monetary shocks on asset markets. Unit 12 titled Macroeconomic Policy in an Open Economy explains how policies on money supply, interest rate and exchange rate are inter-linked.

# UNIT 1 AGGREGATE DEMAND *

**Structure**



## 1.0 OBJECTIVES

After going through this Unit, you should be in a position to

- provide an overview of IS-LM analysis;
- bring out the conditions under which fiscal policy is effective;
- bring out the conditions unde4r which monetary policy is effective;
- derive the aggregate demand (AD) curve from the IS-LM model;
- identify the factors that influence the position and slope of the AD curve;
- bring out the reasons for shift in the AD curve;
- explain the impact of fiscal policy and monetary policy on the AD curve; and
- explain how the impact of a demand shock depends upon the shape of the aggregate supply (AS) curve.

## 1.1 INTRODUCTION

In Block 5 of the course 'BECC 103: Introductory Macroeconomics', we covered three issues, viz., (i) derivation of the IS curve, (ii) derivation of the LM curve, and (iii) interaction of the IS-LM curves. We learnt that goods market


* Ms. Archana Aggarwal, Assistant Professor, Hindu College, University of Delhi

equilibrium is represented through the IS curve while money market equilibrium is given by the LM curve. If we consider only one curve (either IS or LM), then we cannot determine equilibrium levels of both output (Y) and interest rate (i). In other words, goods market equilibrium cannot be determined until the rate of interest (as investment spending is a function of rate of interest) is known. Similarly, money market equilibrium cannot be determined unless the income level is known (as money demand is a function of income level). In order to overcome this limitation, we brought together the IS and the LM curves to derive the equilibrium levels of output and interest rate simultaneously. In this Unit we begin with an overview of the IS-LM model. Subsequently, we derive the aggregate demand (AD) curve and discuss how AD is impacted by fiscal policy and monetary policy. Finally, we bring together the AD curve and the aggregate supply (AS) curve to determine the equilibrium levels of output and price.

## 1.2 OVERVIEW OF THE IS-LM MODEL

The IS curve shows the combination of interest rate ($i$) and output level (Y) at which the goods market is in equilibrium. You may recall from Unit 12 of BECC 103 that on each and every point of the IS curve the goods market is in equilibrium. The IS curve is downward sloping. It is given by the following equation:

$$Y = \alpha A - \alpha b i \quad \ldots(1.1)$$

where A is autonomous spending,

$\alpha$ = autonomous spending multiplier,

$b$ = sensitivity of investment function to interest rate, and

$i$ = rate of interest.

While plotting the IS curve (see Fig. 1.1 given below) we take output ($Y$) on the x-axis and $i$ on the y-axis. Thus, the slope of the IS curve ( $\frac{di}{dY}$ ), as we can observe from (1.1), will be $-\frac{1}{\alpha b}$ (you have to re-arrange equation (1.1) and specify i in terms Y, and then differentiate the equation). From equation (1.1), however, we find that a given change in the rate of interest leads to a larger change in the income level for larger value of $\alpha b$. It means that if the autonomous spending multiplier ($\alpha$) or the sensitivity of investment spending to rate of interest ($b$) or the product of both ($\alpha b$) is larger, then the change in interest rate would be larger. We have also seen that IS curve can shift due to a change in autonomous spending $A$ or due to change in the value of multiplier $\alpha$. Thus an expansionary fiscal policy, an investment subsidy, optimism of investors leading to higher investment at each rate of interest, an increase in autonomous consumption, etc. lead to a rightward shift of IS curve in a closed economy (see Fig. 1.1).

The LM curve (see Unit 13 of BECC 103) shows the combination of $i$ and Y at which the money market is in equilibrium. You may recall that the LM curve is upward sloping. It is given by the equation

$\overline{M} / P = kY - hi$ …(1.2)

As we observe from (1.2), the slope of the LM curve is $\frac{k}{h}$ (again, you have to re-arrange the equation, specify *i* in terms of *Y*, and then differentiate it). A rightward shift of the LM curve (see Fig. 1.1 below) means that the money market equilibrium occurs at higher income level corresponding to each interest rate or a lower interest rate corresponding to each income level. A leftward or inward shift implies the converse. The LM curve shifts down (or to the right) in response to an increase in money supply (real) or a fall in money demand. However, a situation of liquidity trap makes money demand infinitely responsive to rate of interest and the corresponding LM curve becomes flat at that rate of interest. In this situation, an increase (change) in money supply fails to shift the LM curve.

### 1.2.1 Simultaneous Equilibrium in Goods and Money Markets

The intersection of the IS and LM curves gives the equilibrium levels of *i* and *Y*. Let us bring the IS and LM curves together in order to derive the equilibrium income level and equilibrium rate of interest simultaneously.

Solving equations, (1.1) and (1.2) simultaneously gives us the following equation:

$Y = \gamma A + \beta \frac{M}{P}$ ... (1.3)

Here, $\gamma = \frac{h\alpha}{h+\alpha bk}$ and $\beta = \gamma \frac{b}{h}$

The intersection of the IS and LM curves gives us equilibrium levels of output and interest rates. In Fig. 1.1, the equilibrium rate of interest is $i^*$ and equilibrium income level is $Y^*$

This equilibrium levels can change on account of shifts in (i) IS curve only, (ii) LM curve only, and (iii) both IS and LM curves. Let us look at the impact of shifts in these curves on equilibrium *i* and equilibrium *Y*.

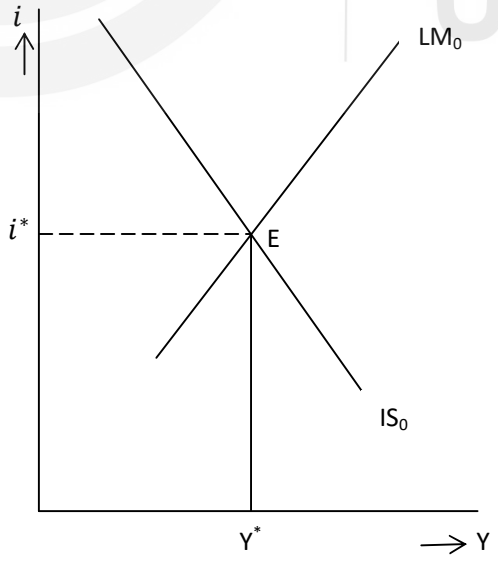


**Fig. 1.1: Equilibrium Output and Interest Rate**

### 1.2.2 Fiscal Policy and Crowding Out

We know that an expansionary fiscal policy (such as increase in government spending and reduction in tax rate) shifts the IS curve to the right. In contrast to the above, a contractionary fiscal policy shifts IS curve to the left. What happens to the equilibrium *i* and *Y*? Look at the Fig. 1.2. Suppose the initial curves are $IS_0$ and $LM_0$; with equilibrium at point E. An increase in government spending by $\Delta G$ shifts the IS curve from $IS_0$ to $IS_1$. The right-ward shift in IS curve is to the extent of $\alpha\Delta G$, i.e., by the distance EF in Fig. 1.2. *In the absence of money market*, the new equilibrium would be at point F. Output would increase from $Y_1$ to $Y_2$ and there would be no change in interest rate ($i_0$). However, this cannot happen as we have to include money market also. Point F represents excess demand for money in the financial markets. This leads to selling of bonds, a fall in bond prices and a rise in the rate of interest. The rise in interest restores equilibrium in the financial markets and the economy moves to point S where once again both the markets are in equilibrium. But this rise in interest rate leads to a fall in investment and thus a fall in output level (movement from F to S on the new IS curve, $IS_1$). Finally, equilibrium is at point S with interest rate $i_1$ and income level $Y_1$. It can be seen that the rate of interest is higher than original and output level, though higher than original, is lower than what would have happened in the absence of money market. The overall increase in output is equal to $\gamma\Delta G$ which is lower than $\alpha\Delta G$. This is on account of *crowding out* of investment.

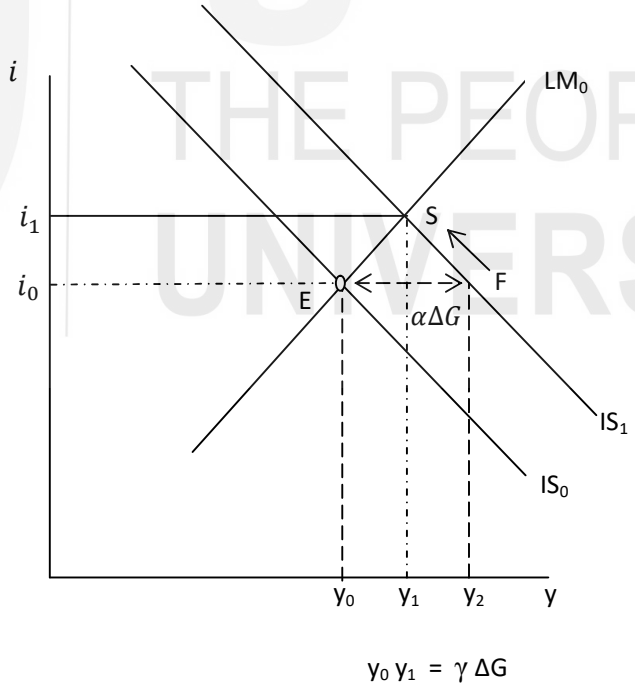


**Fig. 1.2: Crowing Out Effect**

Crowding out refers to the reduction in private spending (investment in this case) due to an increase in public spending (G). Crowding out happens because an increase in public spending leads to an increase in income and increase in money

demand, which leads to a rise in interest rate and a consequent fall in private spending such as investment. Larger the crowding out, larger the fall in private spending and lower the overall increase in income. Thus, the effectiveness of fiscal policy (in changing incomes) depends inversely on the extent of crowding out. In other words, effectiveness of fiscal policy depends on parameters *α, b, h* and *k.* Let us use the chain rule to understand the same.

$$\uparrow G \rightarrow (\alpha) \uparrow Y \rightarrow (k) \uparrow M_d \rightarrow (h) \uparrow i \rightarrow (b) \downarrow I \rightarrow (\alpha) \downarrow Y \quad \ldots (1.2)$$

The parameters in the brackets show the extent of change. For example, a higher value of $k$ makes fiscal policy less effective. Let us understand the process. A larger value of $k$ leads to a larger increase in money demand. Given the value of $h$, higher value of k leads to a greater rise in interest rate. The rise in interest rate reduces the demand for money and restores equilibrium in the money market. The higher rise in interest rate also leads to greater fall in investment (given the value of b). A greater fall in investment leads to a greater fall in income or output (given the value of α). Thus, the extent of crowding out is relatively higher and fiscal policy is less effective. You can take the value of other parameters (such as $h$, $b$ and α) and find out their effects on output level.

The results can be summed up as follows:

- *Higher* $k \rightarrow$ *Fiscal Policy is less effective*
- *Higher* $h \rightarrow$ *Fiscal Policy is more effective*
- *Higher* $b \rightarrow$ *Fiscal Policy is less effective*
- *Higher* $\alpha \rightarrow$ *Fiscal Policy is more effective.*

You can check these results algebraically by looking at the fiscal policy parameter γ. We know from (1.1) that $\gamma = \frac{h\alpha}{h+\alpha}$. Equation (1.1) shows that given the level of real money supply, an increase in A leads to an increase in Y by an amount of $\gamma\Delta A$. Higher values of $h$ and α lead to an increase in the value of γ whereas higher values of $b$ and $k$ lead to a lower value of γ.

### 1.2.3 Monetary Policy and Transmission Mechanism

Let us repeat the above exercise for monetary policy. We know that an expansionary monetary policy shifts the LM curve downwards or to the right whereas a contractionary monetary policy shifts the LM curve to the left or upwards (see Unit 13 of BECC 103). What happens to the equilibrium $i$ and $Y$? Look at the Fig. 1.3. The initial equilibrium is at E, the intersection of $IS_0$ and $LM_0$. You should note that $LM_0$ shows the equilibrium in the money market when the nominal money stock is $M_0$ and price level is $P_0$.

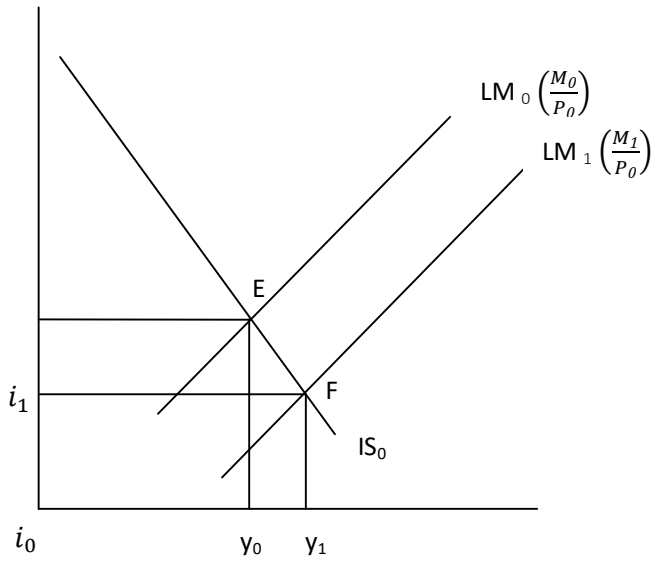


**Fig. 1.3: Transmission Mechanism**

Suppose, there is an increase in nominal money stock from $M_0$ to $M_1$. It increases the real money supply if the price level does not change (i.e., remains at $P_0$. Let $LM_1$ become the new LM curve. In Fig. 1.3 we find that the intersection between $IS_0$ and $LM_1$ takes place at point F. The rate of interest decreases from $i_0$ to $i_1$ and the output/income level rises from $Y_0$ to $Y_1$. Thus, an increase in money supply increases the equilibrium output level. It happens because an increase in money supply throws money market into disequilibrium and a decline in the rate of interest is required to restore equilibrium (by increasing demand for real balances). The decline in rate of interest, in turn, impacts the goods market so that investment spending and aggregate expenditure increase. The increase in aggregate expenditure results in an increase in equilibrium output level. This can be seen in a downward movement along the IS curve from point E to point F. This process is known as *transmission mechanism* whereby the money market 'transmits' its impact on income through the goods market.

The effectiveness of monetary policy depends on the strength of the transmission mechanism. The strength of the transmission mechanism depends on the parameters *α, b, h* and *k.* Let us look into the process through which it takes place.

$$\uparrow M_s \rightarrow \uparrow M/P \rightarrow (k \text{ and } h) \downarrow i \rightarrow (b) \uparrow I \rightarrow (\alpha) \uparrow Y \quad \text{... (1.3)}$$

The parameters in the brackets show the extent of change in output. How do these parameters impact the effectiveness of monetary policy? An increase in money supply ($M_s$) leads to a disequilibrium in the money market. People try to get rid of this excess money by buying bonds. Bond prices go up and rates of interest fall. The fall in the rate of interest increases money demand and thus the equilibrium in the money market is restored. Lower the value of *h* (or, lesser sensitivity of money demand to rate of interest), larger is the required fall in rate of interest (so that money demand rises sufficiently to restore equilibrium in the

money market, given the value of $k$). Subsequently, it leads to a larger increase in investment (given the value of $b$) and larger income (given the value of $\alpha$). Thus, a lower value of $h$ implies that monetary policy is more effective. As far as $k$ or the sensitivity of money demand to income is concerned, lower $k$ means that the restoration of money market equilibrium relies much more on interest rate and hence a larger fall in interest rate is required.[1] This then, leads to a larger increase in investment and income (given $b$ and $\alpha$).

Let us look at the impact of $b$ and $\alpha$ on the effectiveness of monetary policy. A given fall in interest rate (as a result of increase in money supply) leads to larger increase in investment (larger the value of $b$) and thus a larger increase in income. Again a given fall in interest rate (as a result of increase in money supply) leads to an increase in investment (given $b$) and this increase in investment leads to a larger increase in income, if the value of $\alpha$ is higher. Thus we can say that higher value of $b$ and $\alpha$ make monetary policy more effective.

From equation (1.1), we know that $\beta$ shows the impact of changes in money supply on income level when A= 0, $\beta = \gamma \frac{b}{h}$ is nothing but the monetary policy multiplier.

Substituting $\gamma = \frac{h\alpha}{h+\alpha bk}$, we get $\beta = \frac{h\alpha}{h+\alpha bk}\frac{b}{h}$and the effectiveness of monetary policy can be seen to be dependent on the values of $\alpha$, $b$, $h$ and $k$.

- *Lower* $k \rightarrow$ *Monetary Policy is more effective*
- *Lower* $h \rightarrow$ *Monetary Policy is more effective*
- *Higher* $b \rightarrow$ *Monetary Policy is more effective*
- *Higher* $\alpha \rightarrow$ *Monetary Policy is more effective.*

**Check Your Progress 1**

1. Assume that investment is insensitive to rate of interest, as may be the case during recession. Suggest one policy action by the government in order to increase income. Explain the logic behind your answer.

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[1] With excess money supply, equilibrium in the money market is restored with an increase in money demand which results on account of both an increase in income and fall in rate of interest. If the value of $k$ is small, money demand is not very sensitive to income and hence the rate of interest plays a larger role in increasing the required money demand.

2. Can monetary policy raise income under conditions of liquidity trap? Explain your answer.

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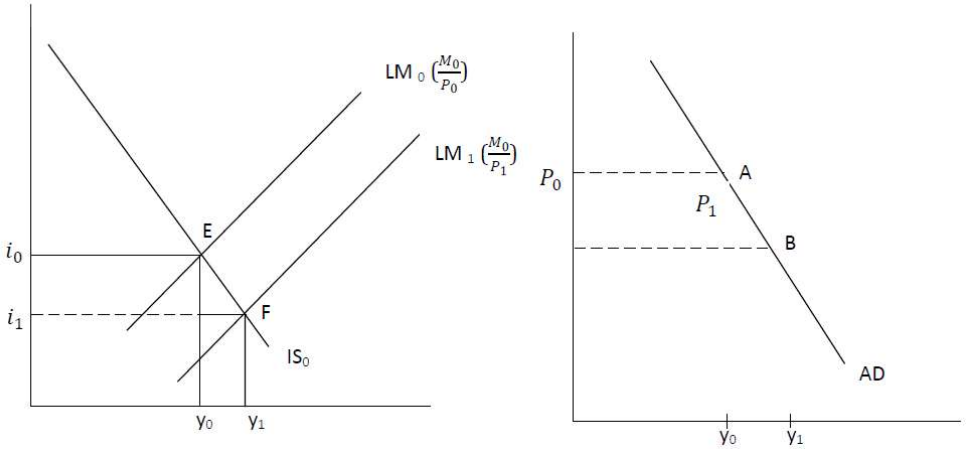
## 1.3 AGGREGATE DEMAND CURVE

The impact of fiscal and monetary changes, as discussed above, is based on the assumption of fixed price level. A change in the price level, changes the real money supply, shifts the LM curve (with a given stock of nominal money supply) and changes the equilibrium level of interest rate and output level. If we keep changing the price levels, we keep getting different levels of equilibrium output. The combination of 'Price' and 'output/income' at which goods and money markets are in simultaneous equilibrium gives the Aggregate Demand (AD) curve. The derivation of the AD curve from IS-LM curves is shown in Fig. 1.4 below.

Panel (a) of Fig. 1.4 shows $IS_0$ and $LM_0$ curves intersecting at point $E$ with an equilibrium income level of $Y_0$. The $LM_0$ curve is based on real money stock of $M_0/P_0$. Thus the combination of $P_0$ and $Y_0$ is the point $A$ on the $AD$ curve in panel (b) of Fig.1.4. With a falling Price level to $P_1$, the real money stock rises to $M_0/P_1$ (here the real money supply rises on account of fall in price level and not due to an increase in nominal money stock) and the $LM$ curve shifts to $LM_1$. Panel (a) of Fig. 1.4 shows that with the change in LM curve, the rate of interest falls to $i_1$ and income rises to $Y_1$ . Thus the combination of $P_1$ and $Y_1$ becomes point $B$ on the $AD$ curve.




**Panel (a)** **Panel (b)**

**Fig. 1.4: Derivation of AD Curve**

AD curve slopes downwards showing a negative relationship between price and output. This is because a fall in price level increases the real money supply, which throws the money market into disequilibrium. A reduction in the rate of interest restores the equilibrium in the money market. The fall in rate of interest, in turn, increases the level of investment spending and demand, thus raising the income level.

### 1.3.1 Slope of the AD Curve

The AD curve is flatter, if a given change in price leads to a larger change in income. On the other hand, the Ad curve is steeper if a given change in price leads to a smaller increase in income. The slope of the AD curve depends on parameters *α, b, h* and *k.*

$$\downarrow P \rightarrow \uparrow M/P \rightarrow (k \text{and } h) \downarrow i \rightarrow (b) \uparrow I \rightarrow (\alpha) \uparrow Y \quad \text{... (1.4)}$$

The argument is very similar to that given as above which explains the effectiveness of monetary policy (see sub-section 1.2.3). With a fall in price and hence an increase in real balances, money market is thrown out of equilibrium. Now, lower the value of *h* or less is the sensitivity of money demand to rate of interest, larger is the required fall in rate of interest in order to raise money demand sufficiently to restore equilibrium in the money market (given the value of *k*). Subsequently, it leads to a larger increase in investment (given *b*) and larger income (given *α*). Thus, lower *h* implies that same change in price leads to a larger change in income and thus AD curve is flatter. The impact of other parameters can also be argued along the lines of the previous section. The results can be summarised as follows:

- *Lower k→AD curve is flatter*
- *Lower h→ AD curve is flatter*
- *Higher b→ AD curve is flatter*
- *Higher α→ AD curve is flatter*

### 1.3.2 Shift of the AD curve

The AD curve shifts to the right or shifts upwards as a result of fiscal or monetary expansion whereas a fiscal or a monetary contraction shifts the AD curve to the left (or downwards). Any factor which shifts the IS curve or the LM curve to the right leads to a shift in the rightward shift of the AD. Thus an increase in any component of autonomous spending such as an increase in government spending leads to a rightward shift of the AD curve. Also an increase in the nominal money supply shifts AD upwards.

We elaborate on the factors that shift the AD curve and the nature of shifts they bring about.

i) **Investment:** If firms are optimistic about future they plan to increase their investment. Technological advancements in computer, for example, will lead to an increase in aggregate demand, which will shift the AD

curve to the right. Conversely, if firms become pessimistic about future business conditions, they would not undertake further investment. This will shift the AD curve towards the left.

ii) **Consumption:** Let us assume that there are certain changes in economic environment such that households save a higher amount at each level of income. This could arise because of certain incentives provided by the government, or an increase in the rate of interest on saving. An increase in saving will have the effect of reduction in consumption. Due to reduction in consumption, there will be a leftward shift of the AD curve. Let us consider another scenario. Suppose there is a stock market boom, which leads to windfall gains for households. It leads to unexpected increase in consumption. This is likely to increase consumption, thereby shifting AD curve to the right.

iii) **Government Expenditure**: Due to change in government purchases. If we drop our assumption of fixed government purchases and we let it to be flexible then it is the most direct way used by the policy makers which shift the aggregate demand curve. In case there is an increase in government purchase, then the AD curve shifts to the right, and vice versa.

iv) **Taxes**: Another factor that causes shift in the AD curve is change in the level of taxation. If there is increase in tax rates, there is decrease in the level of disposable income. A reduction in disposable income of households will lead to a reduction in aggregate consumption. On the other hand, if there is a decrease in tax rate, there is an increase in consumption of households. There are certain taxes that influence investment. If the investment tax credit increases (it is a tax rebate tied to a firm's investment spending) then it increases the investment and hence the AD curve shift rightwards.

v) **Net Exports**: Net exports are defined as exports minus imports (X – M). If there is an increase in exports (X) while imports are constant, the net exports (NX) will increase. Similarly, if there is a decrease in imports while exports remain unchanged, we witness an increase in NX. Let us discuss the impact of NX on the AD curve through an example. When Europe experiences a recession, for example, Europe buys fewer goods from the US. This reduces the US net exports at every price level. It shifts the AD curve for the US economy to the left (similar to panel (b) of Fig. 4.2). Thus we observe that a decrease in NX will shift the AD curve to the left. Similarly, an increase in the NX will shift the AD curve to the right.

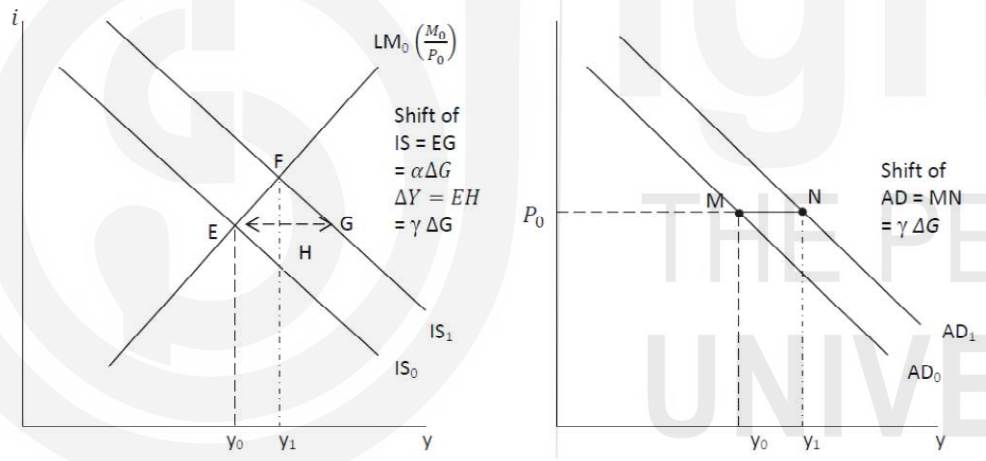
vi) **Money Supply**: An increase in money supply will lead to a reduction in the rate of interest. It is likely to increase the investment spending in the economy and finally the output level will increase. The AD curve will shift to the right. Similarly, a decrease in money supply will lead to an increase in interest rate. It will lead to a reduction in investment, which in

turn will decrease AD. Thus the AD curve will shift to the left, in the case of a decrease in money supply.

You should not forget that the price level is held constant in all the above cases. In the above discussion we have included certain important factors that influence the IS and LM curves. The price level also influences the LM curve. But it will not result in a shift in the AD curve; rather a change in P will lead to movement along the AD curve.

### 1.3.3 Fiscal Policy and AD Curve

An increase in government spending by $\Delta G$ shifts the IS curve to the right by $\alpha\Delta G$ along the output axis as shown in the previous chapter. However, on account of crowding out, the increase in equilibrium income is only by $\gamma\Delta G$ (as shown earlier). This implies that given constant prices, income rises by $\gamma\Delta G$ on account of increase in government spending. If we look at the AD curve, this means that at each price, AD curve shifts to the right, parallel to itself by $\gamma\Delta G$. This is shown in Fig. 1.5. Remember that the change in output is $\gamma\Delta G$. In both the pane (a) and panel (b) of Fig. 1.5, we represent this change by the distance $Y_0Y_1$.




**Panel (a)** **Panel (b)**

**Fig. 1.5: Fiscal Policy and Shift of the AD Curve**

### 1.3.4 Monetary Policy and AD Curve

An increase in nominal money supply shifts the LM curve to the right. It leads to a proportional shift of the AD curve to the right. The increase in nominal money supply results in an increase in income at each price level. However, the shift is proportional rather than parallel. In order to understand this, let us look at the shift of the AD curve as an upward shift rather than a rightward shift. In other words, we are looking at the increase in price at each income level on account of an increase in money supply. Quantity Theory of Money (QTM) tells us that prices rise in the same proportion as increase in money supply when income level is fixed and velocity of circulation is constant.

$$M\bar{V} = P\bar{Y} \quad \text{... (1.5)}$$

Thus a doubling of money supply leads to a doubling of prices at each income level, leading to a proportional shift of the AD curve. See Fig. 1.6

Thus expansionary policies, both fiscal and monetary, shift the AD curve to the right (or upward) and contractionary policies lead to a leftward (or downward) shift of the AD curve. The equation of the AD curve can be written as :

$$Y = \gamma A + \beta \, {}^{M}/_{P} \quad \text{... (1.6)}$$

Or $$P = \frac{\beta M}{\gamma A - Y} \quad \text{... (1.7)}$$

Here $A$ is the fiscal policy parameter; $\gamma$ is the *fiscal policy multiplier*; ${}^{M}/_{P}$ is the real money supply and $\beta$ is the *monetary policy multiplier*.

Apart from policy changes, AD curve can shift due to any change in the autonomous spending $A$. The shifts in AD curve due to a change in any component of aggregate demand is also referred to as *demand shocks*.

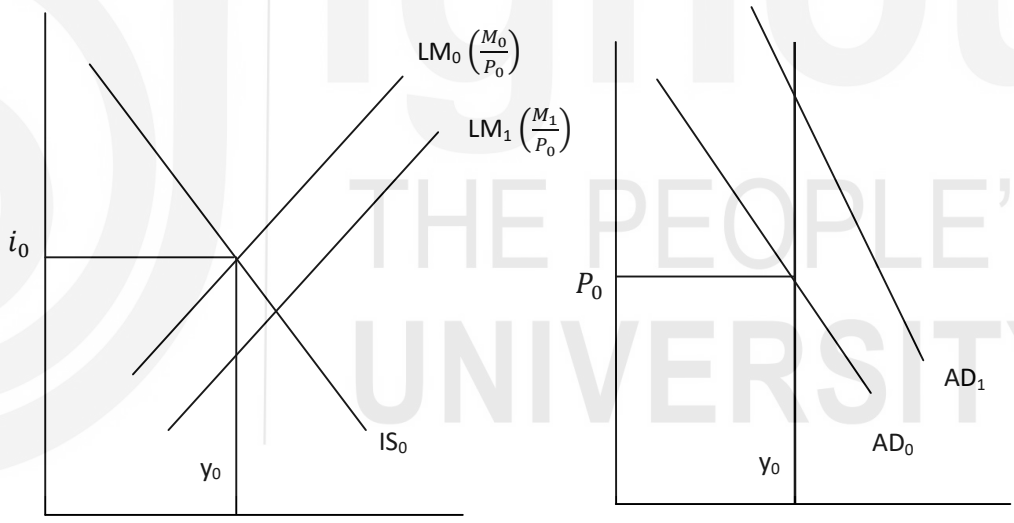



**Fig. 1.6: Monetary Policy and Shift of the AD Curve**

## 1.4 BRINGING TOGETHER AD AND AS

The equilibrium levels of income and price are determined by AD and AS. A change in aggregate demand, which shifts the AD curve, changes the equilibrium levels of output and price. The resulting quantity and price adjustment depends on the position and slope of the AS curve. Let us understand this in the context of (i) perfectly elastic AS curve, (ii) perfectly inelastic AS curve, and (iii) upward sloping AS curve. The particular shape of the AS curve depends on the conditions of the labour market.

### 1.4.1 Demand Shock and Perfectly Elastic AS Curve

Fig. 1.7 shows $AD_0$ intersecting the perfectly elastic *AS* at point *E* with output $Y_0$ and Price level $P_0$. This kind of AS curve is sometimes referred to as the *Keynesian* AS curve and is based on the assumption of completely rigid wages[2] in the labour market. An expansionary fiscal policy such as an increase in government spending by $\Delta G$ shifts the AD curve rightward by $\gamma\Delta G$ and the new *AD* curve is $AD_1$. As can be seen from the figure, the new equilibrium is given by *F* where prices remain constant whereas the income increases by $\gamma\Delta G$. In this case, fiscal expansion leads only to an increase in quantity and no change in prices.

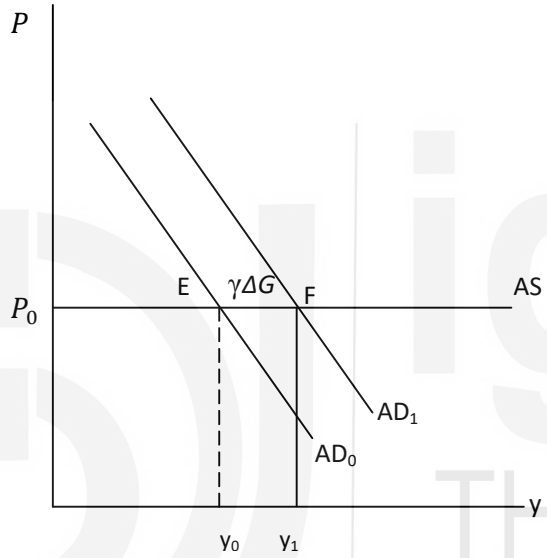



**Fig. 1.7: Effect of Demand Shock when AS Curve is Horizontal**

### 1.4.2 Demand Shock and Perfectly Inelastic AS

Fig. 1.8 shows $AD_0$ intersecting the perfectly elastic *AS* at point *E* with output $Y_0$ and Price level $P_0$.This kind of *AS* curve is also referred to as the *Classical* Supply Curve which is perfectly inelastic at full employment level of output. Let the *AD* curve shift up proportionately due to monetary expansion to $AD_1$. As is evident from the figure, there is no change in output but only a rise in the price level. This is on account of *supply side crowding out*. As demand increases, the producers want to increase production for which they need additional workers. However, since the labour market is already in full employment, the producers can only bid workers from each other, thus raising wages which in turn leads to increase in the price level. Here income and output is unable to increase due to supply conditions and hence it is called the supply side crowding out.

[2] The classical economists assumed that wage rate and price level to be flexible. Keynes put forth the view that there are rigidities in markets. See Unit 9 of BECC 103.

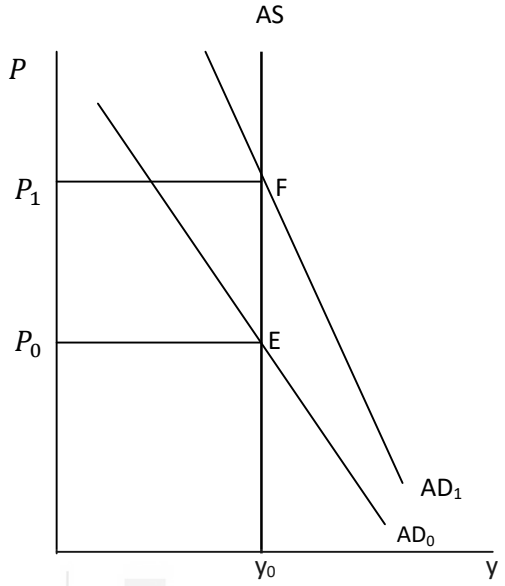



**Fig. 1.8: Effect of Demand Shock when AS Curve is Vertical**

### 1.4.3 Demand Shock and Upward Sloping AS

This kind of AS curve lies between the two extreme cases described above and is based on the assumption of less than full flexibility of wages in the labour market. A favourable demand shock leads to an increase in both output and prices whereas an adverse demand shock lowers the income and prices. This can be seen in Fig. 1.9. It is evident that the relative quantity and price adjustment depends on the slope of AS curve which in turn depends on the conditions of the labour market.

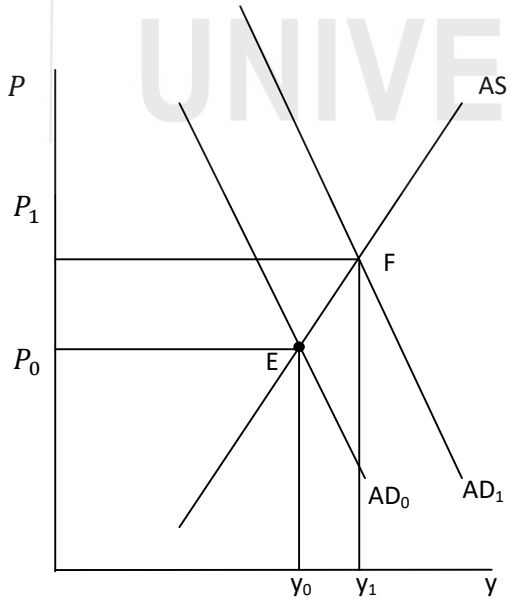



**Fig. 1.9: Effect of Demand Shock when AS Curve is Upward-sloping**

**Check Your Progress 2**

1. Draw the AD curve under the following conditions:

   a) b = 0

   b) h = ∞

   .....

   .....

   .....

   .....

   .....

   .....

   .....

   .....

2. Let there be a fall in demand for money at each level of income. Explain how this will affect the levels of output and prices under the following conditions:

   a) Keynesian AS

   b) Classical AS

   .....

   .....

   .....

   .....

   .....

   .....

   .....

   .....

## 1.5 LET US SUM UP

In this Unit we derived the AD curve from the IS and the LM curves. We explained how the simultaneous equilibrium in the goods and the money markets gives equilibrium output and interest rate for the economy. On the basis of the IS-LM curves we derived the aggregate demand curve for the economy.

We also discussed the position, slope and shifts of the AD curve. We found that AD and AS together give the equilibrium price and output in the economy. In the next Unit, we will derive the AS curve and understand the labour market conditions which underlies aggregate supply.

## 1.8 ANSWERS/ HINTS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1. An increase in G. There will be full expansionary impact on income. Income will rise by $\alpha\Delta G$. This is because there is no crowding out since b = 0.
2. Monetary policy becomes ineffective under conditions of liquidity trap. Here money demand is infinitely responsive to interest rate changes and LM curve is a flat curve. Any increase in money supply gets absorbed as money demand at the *prevailing* rate of interest. Thus rate of interest does not change and the transmission mechanism breaks down. The LM curve does not shift on account of changes in money supply.

**Check Your Progress 2**

1. In both cases the AD curve will be perfectly inelastic at a fixed level of income/output.
2. A reduction in money demand is tantamount to excess money supply in the money market. This leads to a proportional shift in the AD curve to the right.

   a) Output rises but prices remain the same

   b) Prices rise but output remains the same.

# APPENDIX TO UNIT 1: ALEGEBRAIC EXPRESION OF THE IS-LM MODEL

## A1.1 INTERACTION OF IS AND LM CURVES

As you know from Unit 14 of BECC 103, the equations for IS and LM are given as follows:

IS equation: $$Y = \alpha_G\left(\overline{A} - bi\right) \quad \ldots(A.1)$$

LM equation: $$i = \frac{1}{h}\left(kY - \frac{\overline{M}}{\overline{P}}\right) \quad \ldots(A.2)$$

As IS and LM intersect diagrammatically, there is a particular level of output and interest where IS and LM are equal. Thus we can equate (A.1) and (A.2) by substituting the interest rate given at (A.2) in the IS equation given at (A.1). This will give us the value of Y where both goods market and money market are in equilibrium.

We re-arrange terms as follows:

$$Y = \alpha_G\left[\overline{A} - \frac{b}{h}\left(kY - \frac{\overline{M}}{\overline{P}}\right)\right]$$

$$Y = \alpha_G\left[\overline{A} - \frac{bk}{h}.Y + \frac{b}{h}.\frac{\overline{M}}{\overline{P}}\right]$$

$$Y = \left[\alpha_G.\overline{A} - \alpha_G\frac{bk}{h}.Y + \alpha_G.\frac{b}{h}.\frac{\overline{M}}{\overline{P}}\right]$$

$$\left[Y + \alpha_G\frac{bk}{h}.Y\right] = \left[\alpha_G.\overline{A} + \alpha_G\frac{b}{h}.\frac{\overline{M}}{\overline{P}}\right]$$

$$Y\left[1 + \alpha_G\frac{bk}{h}\right] = \left[\alpha_G.\overline{A} + \alpha_G\frac{b}{h}.\frac{\overline{M}}{\overline{P}}\right]$$

$$Y = \left[\frac{\alpha_G}{1 + \alpha_G\frac{bk}{h}}\right]\overline{A} + \left[\frac{\alpha_G}{1 + \alpha_G\frac{bk}{h}}.\frac{b}{h}.\frac{\overline{M}}{\overline{P}}\right]$$

$$Y = \gamma.\overline{A} + \gamma\frac{b}{h}.\frac{\overline{M}}{\overline{P}} \quad \ldots(A.3)$$

where $\gamma = \left[\frac{\alpha_G}{1+\alpha_G \frac{bk}{h}}.\right]$

We can say that equilibrium level of income depends on autonomous spending $\left(\overline{A}\right)$ and real money stock $\left(\frac{\overline{M}}{\overline{P}}\right)$. Equilibrium income is higher if $\overline{A}$ and $\frac{\overline{M}}{\overline{P}}$ are higher.

If we substitute the value of Y obtained in equation (A.3) above in equation (A.2), we get the equilibrium rate of interest as

$$i = \frac{1}{h}\left(kY - \frac{\overline{M}}{\overline{P}}\right) \qquad \ldots(A.4)$$

Substituting $Y = \gamma\overline{A} + \gamma\frac{b}{h}.\frac{\overline{M}}{\overline{P}}$ (obtained in A.3) in the above equation (A.4), we get

$$i = \frac{1}{h}\left[k\left(\gamma.\overline{A} + \gamma\frac{b}{h}.\frac{\overline{M}}{\overline{P}}\right) - \frac{\overline{M}}{\overline{P}}\right] \qquad \ldots(A.5)$$

We re-arrange the terms in (A.5) as follows:

$$i = \frac{k}{h}\gamma.\overline{A} + \frac{1}{h}\left(\gamma.\frac{bk}{h}.\frac{\overline{M}}{\overline{P}} - \frac{\overline{M}}{\overline{P}}\right)$$

$$i = \frac{k}{h}\gamma.\overline{A} + \frac{1}{h}\left(\frac{\gamma bk}{h} - 1\right)\frac{\overline{M}}{\overline{P}}$$

$$i = k\gamma\overline{A} + \frac{1}{h}\left(\frac{bkh\alpha_G}{h(bkh\alpha_G)} - 1\right)\frac{\overline{M}}{\overline{P}}$$

as $\gamma = \frac{\alpha_G}{1+\frac{bk\alpha_G}{h}} = \frac{h\alpha_G}{(h+bk\alpha_G)}$

So, $i = k\gamma\overline{A} + \frac{1}{h}\left(\frac{bk\alpha_G - h - bk\alpha_G}{h+bk\alpha_G}\right)\frac{\overline{M}}{\overline{P}}$

$$i = \frac{k}{h}\gamma\overline{A} + \frac{1}{h}\left(\frac{-h}{h+bk\alpha_G}\right)\frac{\overline{M}}{\overline{P}}$$

$$i = \frac{k}{h}\gamma\overline{A} - \left(\frac{1}{h+bk\alpha_G}\right)\frac{\overline{M}}{\overline{P}} \qquad \ldots(A.6)$$

The equilibrium interest rate depends on $\alpha_G$ and the parameters of fiscal policy captured in the multiplier, $\bar{A}$ and the real money stock $\left(\frac{\bar{M}}{\bar{P}}\right)$. If the money stock rises, equilibrium interest rate will decline. If $\bar{A}$ (autonomous spending) rises, equilibrium interest rate will rise.

## A 1.2 FISCAL AND MONETARY POLICY MULTIPLIERS

Policy makers are interested in the outcome of a change in government spending in terms of change in equilibrium level of income while keeping the real money supply constant. This information is given by a fiscal policy multiplier. The equilibrium level of income obtained in the previous section is as follows:

$$Y = \gamma\bar{A} + \gamma\frac{b}{h}.\frac{\bar{M}}{\bar{P}}$$

An increase in government spending $(\Delta G)$ will change equilibrium income (Y).

$\Delta G$ is nothing but $(\bar{A})$ in this case. So,

$$\frac{\Delta Y}{\Delta \bar{G}} = \gamma$$

where $\gamma = \left[\frac{\alpha_G}{1+\alpha_G\frac{bk}{h}}.\right]$

Hence, γ is the fiscal multiplier or government spending multiplier. If we compare $\alpha_G$ (earlier multiplier) with γ (present multiplier), we realise that γ < $\alpha_G$ as γ is a fraction $\frac{1}{1+\alpha_G\frac{bk}{h}}$ . So, if we see a fiscal expansion in the IS-LM model, we would observe a dampening effect of increased interest rates.

Now, let us consider effect of *h* on γ. If *h* takes a very small value (nearly zero), then γ takes a value close to zero. On the other hand, if *h* is nearly infinity, then γ also approaches infinity.

When LM curve is near vertical, h assumes a small value and in that case fiscal policy multiplier (γ) will be nearly zero. Similarly, when LM curve is nearly horizontal, h assumes a high value and in that case the fiscal policy multiplier will approach to infinite. (Please note that the slope of LM curve is k/h). Similarly, a large value of b or k will reduce the value of fiscal policy multiplier.

Policy makers are also interested in knowing the outcome of a change in the real money supply in terms of change in the equilibrium level of income. This information will be given by monetary policy multiplier. Having the following knowledge,

$$Y = \gamma \bar{A} + \gamma \frac{b}{h} \frac{\bar{M}}{\bar{P}}$$

we can easily find out the expression of the 'monetary policy multiplier'

$$\frac{\Delta Y}{\Delta \frac{\bar{M}}{\bar{P}}} = \frac{b}{h} \gamma \qquad \ldots(A.7)$$

Larger $b$ and smaller $h$ will indicate more expansionary effect of a monetary policy on the equilibrium increase income. Larger $b$ means flatter IS curve. So, if the IS curve is steeper, then the effect of expansionary monetary policy will be somewhat low.

# UNIT 2 AGGREGATE SUPPLY*

**Structure**



## 2.0 OBJECTIVES

After going through this Unit you should be in a position to

- explain the concept of Aggregate Supply (AS) in Macroeconomics;
- identify the relationship between labour market and the AS curve;
- explain the shape of the AS curve;
- identify the factors that leads to a shift in the AS curve; and
- explain how the AS changes in the short run and in the medium run.

## 2.1 INTRODUCTION

We saw in the previous Unit that the equilibrium output and price level in the economy are determined with the help of both Aggregate Demand (AD) and Aggregate Supply (AS). In the case of a demand shock (autonomous or policy-induced), the shape of the AS curve plays a crucial role in the determination of relative change in output and prices. In this Unit, we will discuss the concept and the derivation of the AS curve. We will also see how the conditions in the labour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market determine the shape of the AS curve. Further, we will look at the concept of expectations about prices and the role played by expectations on the position of the AS curve. Finally, we will look at the relationship between the empirically observed Phillips Curve and the AS curve.

## 2.2 AGGREGATE SUPPLY CURVE AND THE LABOUR MARKET

The AS curve shows the relation between output produced and the corresponding prices at which the output is supplied by the firms. It is best to view the AS relation by asking the following question: what will be the price level corresponding to production of a certain level of output. This in turn depends on the cost of production corresponding to production of that level of output. If the cost of production is higher price of the product will be higher. Further, if the cost of production increases with an increase in output produced, prices charged should normally increase.

As you know from microeconomics, several inputs such as capital, labour and raw material are required in the production process. A major part of the cost of production is the wage cost. In fact, when we begin our production function analysis, in order to simplify issues, we assume that capital input is fixed and labour is the only variable input. Hence we need to understand how wages are determined before we can talk about prices corresponding to different levels of output. It can be shown that given the market structure in the labour market, wages depend on the level of employment (and also unemployment) in the economy. Also production of a certain level of output corresponds to a given level of employment (given the technology and the techniques of production). Thus we will first determine the relationship between unemployment (employment) and wages in the labour market and then proceed to show the relationship between the output produced and the price level (that is, the AS curve).

### 2.2.1 Perfectly Flexible Wages and the Classical AS Curve

In the perfectly competitive labour market (an assumption made by the Classical economists) the demand for and supply of labour are functions of real wages (you should refer to Unit 9 of BECC 103: Introductory Macroeconomics). Thus, we have

$$D_L = N(^W/_P) \quad \ldots (2.1)$$

$$S_L = F(^W/_P) \quad \ldots (2.2)$$

The demand curve for labour shows a negative relationship between real wages and demand for labour. As you know, in perfect completion the firms are price takers. Perfect competition in both labour market and product market leads firms to equate real wages with Marginal Product of Labour ($MP_L$) as they equate Value of Marginal Product of Labour ($VMP_L$) with a given nominal wage (W). Since the production function is assumed to be characterised by diminishing returns, ($MP_L$) declines as employment rises.

Thus the labour demand curve is downward sloping as firms take real wages as given and employ labour up to the point where marginal product equals the real wage (or value of marginal product equals the nominal wage).

The supply of labour is upward sloping. It is derived from the optimising behaviour of the labour supplying households who allocate their time between working/earning a wage and leisure. These households take the wages as given and decide the amount of labour to be supplied so as to maximise their utility.

Labour market is in equilibrium at that level of real wages and employment at which demand for labour equals the supply of labour. The assumption of *flexible wages* ensures that any temporary deviation from the equilibrium is immediately corrected by an immediate change in nominal wages. In other words, full flexibility of wages gives an employment level where everyone who chooses to work at the prevailing wages finds work or the only unemployment which exists is *voluntary unemployment* (it implies that there is no *involuntary unemployment*). The output level in the economy can be derived from the production function, given the equilibrium level of employment in the labour market or $y = f(L)$, where $L$ is the level of employment. It can be shown that the level of employment, and therefore the level of output remain the same at different price levels. An implication of the above is that there is no change in output level and we get a vertical AS curve. It means the AS curve is perfectly inelastic. Any change in price level which impacts the real wages and hence disturbs the equilibrium in the labour market is immediately corrected by a proportional change in nominal wages (see Unit 9, BECC 103). In this case the equilibrium output remains unchanged. This kind of AS curve based on the assumption of full flexibility of wages is sometimes called the *Classical Aggregate Supply Curve (*see Fig. 2.1).

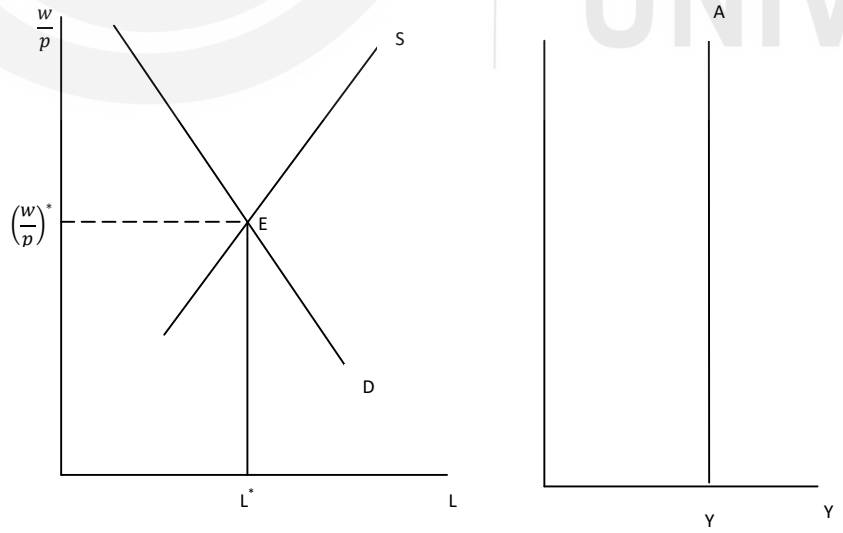


**Fig. 2.1: Labour Market Equilibrium and Classical AS Curve**

### 2.2.2 Perfectly Rigid Wages and the Keynesian AS Curve

Here we take a case which is diametrically opposite to the Classical view and wages are assumed to be perfectly rigid. Assumption of rigid nominal wages implies that we move away from the assumption of competitive markets and assume markets to be imperfect. Rigidity in wage rate could be because of two reasons: (i) Many times, as we know from our experience, wages are determined by a contract between the labour and the firms. In such cases wage rate will not change even if supply and demand conditions change. (ii) The product market is not competitive and the commodity producing firms are not price takers. The firms have some monopoly power to decide their output prices. They charge a price which is a certain 'mark-up' above the wages.

Given the imperfectly competitive labour and product markets, we need to understand how wages are determined and what are the prices charged by the firms, given the wages. One extreme example under such conditions is that of a perfectly rigid nominal wage. Here the wages remain the same irrespective of employment level. Let the firms charge a price *x%* above the wage. This would imply that prices would remain the same for all levels of employment and since each level of employment corresponds to a unique level of output, we get an AS curve which is infinitely elastic (horizontal line). In such cases, the firms charge the same price for all levels of output. This is sometimes referred to as the *Keynesian Aggregate Supply Curve* (see Fig. 2.2).

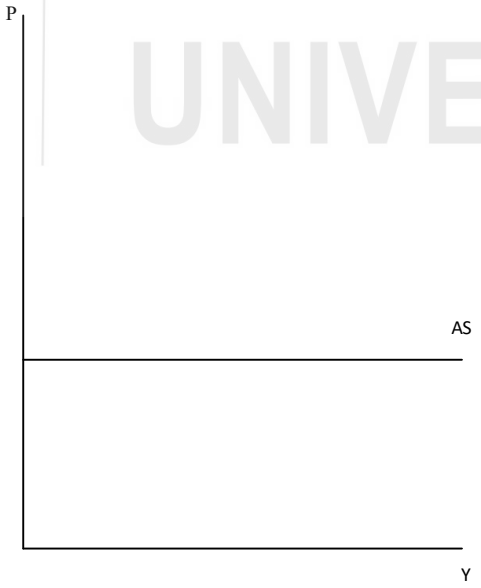


**Fig. 2.2: Wage Rigidity and AS Curve**

## 2.3 LABOUR MARKET UNDER IMPERFECT COMPETITION

Perfectly rigid wages discussed in the previous section is a special case of the less than perfectly competitive labour markets. Now we discuss the more general case where both the labour and the product markets are *not* perfectly competitive. It means that neither the labour nor the firms are price takers. In fact, wages are set either by employers or by union of workers or through the process of collective bargaining between the two. Once the wages are set, the firms set a price above the wages.

### 2.3.1 Wage Setting

The aggregate nominal wage W depends on three factors: (i) Negatively on unemployment rate, u (it implies that higher unemployment in society will negatively impact nominal wage rate); (ii) Positively on expected price level, $P^e$ (if labour expects that output price is likely to increase, they will demand higher nominal wage), and (iii) Positively on a catchall variable, z, that stands for all other variables which can affect wage setting. It can be expressed in the following way:

$$W = P^e F(u, z) \quad \ldots (2.3)$$

We look into each of these factors below.

#### *2.3.1.1 Wages and Unemployment*

The explanations of wage setting are broadly on the following two lines:

a) Bargaining by Workers

Bargaining power of the workers depends on the prevailing economic environment in the labour market. At low rates of unemployment, workers and unions enjoy a stronger bargaining position. Under these conditions, workers can obtain higher wages. However, the bargaining position is weak during high rate of unemployment and hence the workers have to accept a lower wage. In other words, according to this explanation, wages depend inversely on the rate of unemployment.

b) Efficiency Wage set by the Firms

This explanation focuses on how the firms set the wage rate they offer to labour. As unemployment falls in society, firms find it more difficult to retain old workers or recruit new workers. Firms do not want that existing workers should quit; because recruitment of new workers increase production cost. Further, new workers have to be trained which again involves cost. Therefore, the firm sets 'high wages' to attract the workers. The efficiency wage theories link the 'productivity' or 'efficiency' of the workers to the wages paid to the workers.

Both of the above explanations make the nominal wage inversely related to unemployment rate.

#### *2.3.1.2 Wages and Expected Price level* ($P^e$)

Workers are not interested in nominal wages *per se* but in the purchasing power of wages or the amount of goods which the nominal wages can buy. In other words, workers are interested in real wages, that is, $W/P$. At the time of entering into a contract for setting the wage, however, it is not possible to know the actual prices which would prevail during the period for which the contract is made. The future prices are not realised as yet; they can only be expected. If the expected prices are higher, workers would demand higher nominal wages. Thus nominal wage, W, is directly related to expected price $P^e$.

#### *2.3.1.3 Wages and Catch all Variable, z*

Apart from unemployment rate and expected price level, there are some other variables that influence wage rate. We use the letter *z* to take into account all other variables which can affect bargaining position of workers and therefore the nominal wage. As an illustration let us consider the passing of the minimum wage legislation. This improves the bargaining power of workers since workers know that they are legally entitled to the stipulated minimum wages. It makes the workers demand higher nominal wages at each unemployment rate and is indicated as an increase in z. Conversely, let us consider a situation where the trade unions become ineffective for some or the other reason. In such cases, the bargaining power of workers will decline and workers will settle for lower nominal wage at each unemployment rate. This is indicated by a decrease in *z*.

Thus nominal wage, W is directly (or, positively) related to the catch-all variable z.

### 2.3.2 Price Setting

In the previous sub-section we discussed about determination of wage rate. Now let us discuss how firms determine prices. The price of a product set by a firm depends on its cost of production. The costs, in turn, depend on the price of inputs and the production technology given by its production function. As a simplifying assumption, let us assume that one unit of labour produces one unit of output or *labour productivity* equals 1. Now the cost of producing one more unit of output or the *marginal cost* equals the cost of employing one more worker which is nothing but the wage rate. Had the product market been perfectly competitive, prices charged by the firms would have been equal to wage rate. However, the commodity market is not perfectly competitive which means that the firms (like the workers in the labour market) are not price takers but price setters. Normally, in such situations, prices charged are higher than wages or the price is some *mark-up* over the wage cost. If the mark-up is denoted by μ, then the price setting by the firm can be captured by

$$P = (1 + \mu)W \quad \ldots (2.4)$$

### 2.3.3 Equilibrium in the Labour Market

In cases where both the labour and commodity markets are not perfectly competitive, the equilibrium in the labour market is where the desires of the workers and the desires of the firms come together. For this, we will construct the Wage Setting (WS) and the Price Setting (PS) curves.

The WS curve is derived from equation (2.3) mentioned earlier. Let us assume that expected price equals the actual price (this happens in the medium run or the long run as will be explained in Unit 3). Now, the WS relation can be written as follows:

From equation (2.3) we know that $W = P^e F(u, z)$

$(-, +)$

Let $P = P^e$

Then, $W = P.F(u, z)$

Or, $\frac{W}{P} = F(u, z)$ … (2.5)

Equation (2.5) which shows the relationship between real wage rate and unemployment rate is called the wage setting equation.

The PS equation is derived from equation (2.4) given earlier. The PS equation is the same as equation (2.4) written in the form of real wages, which the firms are willing to give.

From (2.4) we know that $P = (1 + \mu)W$

Or, $\frac{P}{W} = (1 + \mu)$

Or, $\frac{W}{P} = \frac{1}{1+\mu}$ … (2.6)

We can depict the WS and PS equations through diagrams (see Fig. 2.3).

The *x* axis measures unemployment rate and the *y* axis measures real wages. The WS curve is a downward sloping curve whereas the PS curve is a horizontal line parallel to the *x* axis. The reasons are obvious. Since nominal wages, W, are an inverse function of unemployment *u*, the real wages, $\frac{W}{P}$, will vary inversely with unemployment, given the price level. For a given nominal wage (W), we get several real wage ($w = W/P$) curves, depending the value of P. If we look at equation (2.5), we observe that there could be several WS curves depending upon the value of expected price and the catch-all variable z. Let us consider a particular WS curve based on some expected price $P^e$ and catch-all variable *z*. An increase in $P^e$ and *z* will shift the WS to the right. Similarly, a decrease in $P^e$ and *z* will shift the WS to the left.

The PS curve is horizontal. Therefore, the real wage implied by the PS curve, $\frac{1}{1+\mu}$, is independent of the level of unemployment *u.*

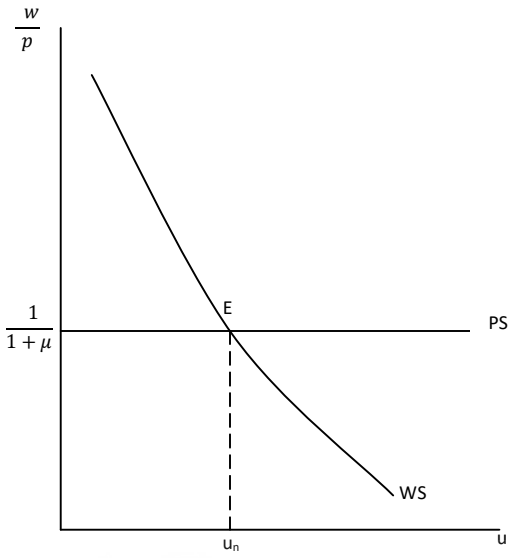


**Fig. 2.3: Labour Market Equilibrium**

Remember that the labour market is in equilibrium where the WS and the PS curves intersect. A little thought will make it clear that the WS curve is similar to the supply curve of labour in non-competitive markets. You may wonder that the WS curve in Fig. 2.3 is downward sloping while the supply curve is upward sloping. Notice that in Fig. 2.3 we measure the level of unemployment on the x-axis – as unemployment increases there is a decrease in the level of employment. With the decrease in employment, there will be a decrease in the level of output. Thus we get a downward sloping WS curve. Had we measured employment (the opposite of unemployment) on the x-axis, we would have got an upward sloping WS curve, which is similar to the supply curve of labour. Further, the PS curve is similar to demand curve of labour in non-competitive conditions. Equilibrium real wage is equal to $\frac{1}{1+\mu}$ which is the real wage implied by the PS curve. You should note that the intersection of the WS and PS curves in Fig. 2.3 gives us the equilibrium level of unemployment in the labour market. This equilibrium rate of unemployment $u_n$ is also known as the natural rate of unemployment. The natural rate of unemployment is the minimum unemployment rate which results due to various factors in an economy. These factors could be the structure of the labour force and ongoing economic environment. At any point of time there are some workers who are in a transition of job from one firm to another. There are some workers who have been replaced by technology and they are on the lookout for a new job. These workers are unemployed temporarily, which is reflected in the natural rate of unemployment.

**Check Your Progress 1**

1) Explain how the equilibrium real wage and unemployment get impacted in the following cases:

   i) Unemployment benefits being given by the state

   ii) Increasing number of people being self-employed or employed in informal jobs

   iii) Anti-monopoly legislation

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2) Bring out the factors that influence wage setting by a firm.

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3) In an imperfectly competitive market, how do firms set prices?

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4) Explain why the classical aggregate supply curve is vertical.

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## 2.4 DERIVATION OF THE AGGREGATE SUPPLY CURVE

The aggregate supply relation can be easily derived from the WS and PS relations. We learnt from equation (2.4) that $P = (1 + \mu)W$. Also, we learnt from equation (2.3) that $W = P^e F(u, z)$. Therefore, we can write the following equation:

$$P = (1 + \mu)W = (1 + \mu)P^e F(u, z) \quad \ldots (2.7)$$

In equation (2.7), you should note that the values of $P^e$, $\mu$ and $z$, are given. Thus price level *P* is inversely related to unemployment rate in the economy, *u*. This is because nominal wage W is an inverse function of *u*. If *P* is inversely related to *u*, it must be directly related to output level, *Y.* This can be seen by looking at the definition of unemployment rate and the production function.

Unemployment Rate $u = \frac{L-N}{L}$ where $L$ is the labour force and $N$ is total employment.

Also, the production function can be written as $Y = AN$, where $A$ denotes labour productivity and $N$ is employment. Recall that we assumed A = 1 (see Sub-Section 2.3.2). We continue with the same assumption. Thus the production function can be rewritten as $Y = N$.

Using the above results, $u = \frac{L-N}{L} = \left(1 - \frac{N}{L}\right)$ and $Y = N$, we can write the following relation:

$$P = P^e\,(1+\mu)F(1-\frac{Y}{L}, z) \qquad \ldots (2.8)$$

Equation (2.8) is the equation of the AS curve. Since price is inversely related to *u*, it is directly related to output level, *Y*. The parameters in the AS equation are based on the given levels of expected price $P^e$, mark-up $\mu$ and catch-all variable *z*. Price is directly related to each of these parameters and any increase in these parameters shifts the AS curve upwards. A shift in the AS curve indicates a higher price P corresponding to each level of output, Y.

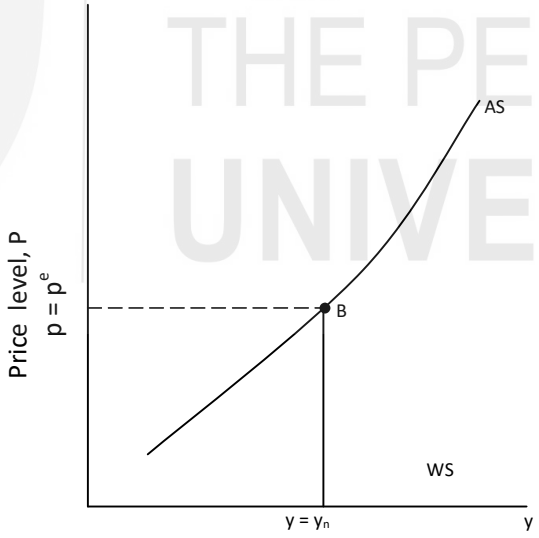



**Fig. 2.4: Aggregate Supply Curve**

Recall the definition of the supply curve – it describes the relationship between quantity supplied and the price level. The curve AS in Fig. 2.4 is the aggregate supply curve which is upward sloping. It shows that as the price level *P* rises, output level *Y* also rises. The figure also shows that the AS curve passes through point B where output level Y equals the natural level of output (also called

potential output of an economy) and the price level P equals the expected price level $P^e$. Let us explain the reasons for this.

An increase in output implies an increase in employment, N, and a fall in unemployment $u$. We know that as $u$ falls, nominal wage, W rises on account of wage setting in the less than competitive labour market. We also know that a higher wage leads the firms to set higher prices since price is a mark-up over the costs. It means that as output rises, prices also rise and we have an upward sloping AS curve.

From the equilibrium in the labour market, we know that when price equals the expected price, i.e., $P = P^e$, the equilibrium rate of unemployment is at the natural rate of unemployment, i.e., $u = u_n$. In accordance with the production function, there is a unique correspondence between employment level (and by implication unemployment) and output level. Hence the natural rate of unemployment $u_n$ corresponds to the natural level of output $Y_n$. It is that level of output which prevails if price equals expected price. Thus every AS curve passes through a point where $P = P^e$ and $Y = Y_n$. This has important implications as given below.

- When $Y = Y_n$ then $P = P^e$
- When $Y > Y_n$ then $P > P^e$
- When $Y < Y_n$ then $P < P^e$ … (2.9)

## 2.5 SHIFT OF THE AS CURVE

Let us look into equation (2.8), the aggregate supply curve.

$$P = P^e (1 + \mu) F(1 - \frac{Y}{L}, z)$$

As pointed out earlier, there is a positive relation between P and Y. Apart from P and Y, there are three factors that influence the AS curve, viz., (i) expected price $P^e$, (ii) mark-up $\mu$, and (ii) catch-all variable $z$. Any change in these factors lead to a shift of the AS curve. Let us see how a change in any of these factors affect the AS curve.

### 2.5.1 Change in Expected Price $P^e$

We have already shown that the AS curve passes through the expected price $P^e$ and the natural level of output $Y_n$. Suppose there an increase in the expected price to $P^{e\prime}$. It means that firms expect an increase in prices and they would supply a lower quantity at the existing price. This would shift the AS curve upward to the left as shown in Fig. 2.5. The new AS curve is shown as $AS'$ in the figure. Similarly, if the firms expect a fall in price (which means a decrease in expected price from $P^e$ to $P^{e"}$, they like to supply more in the present than in future. Thus there will be an outward shift in the AS curve to the right. Accordingly the AS curve will shift to $AS_2$.

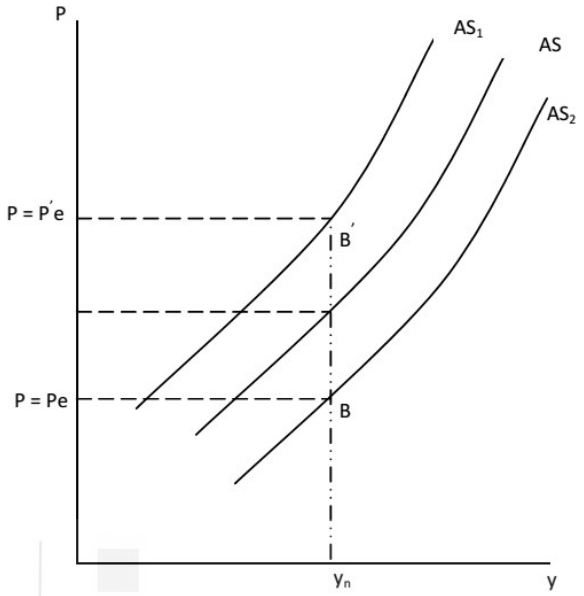



**Fig. 2.5: Shift in the AS curve**

This also helps us to see that if the aggregate demand (AD) and aggregate supply (AS) curves intersect at an output level which is lower or higher than $Y_n$ , this leads to shifts of AS curve till $Y_n$ is reached in the medium run. Let us consider an example. From the set of results given at (2.9) above, we know that if $Y > Y_n$ then $P > P^e$.

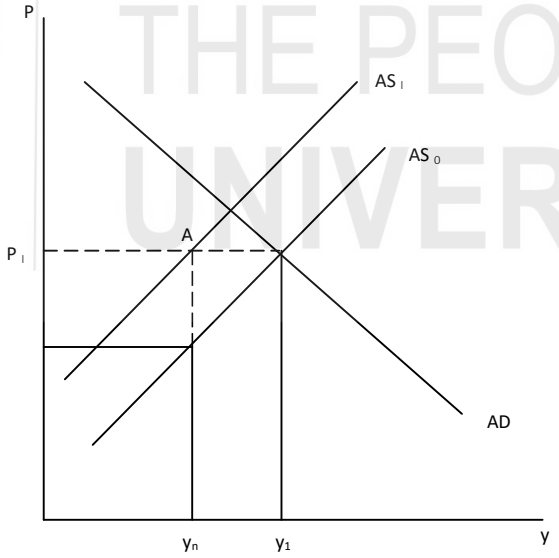



**Fig. 2.6: Expected Prices and the AS Curve**

We consider such a case in Fig. 2.6. Here $AS_0$ curve was drawn on the basis of $P^e = P_0$ and hence it passes through $P_0$ and $Y_n$. The economy starts in a short run equilibrium where $AS_0$ and AD intersect at $Y_1$ and $P_1$. It means that the actual price P is higher than the expected price $P^e$. Sooner or later, workers will realise that they are at a loss since they had considered a lower $P^e$ equal to $P_0$ while setting the wages.

With this realisation, workers will now revise their expectations about prices (The timing and the method of revision depends on the nature of wage contract and the method of forming expectations). Let us assume that workers form expectations about prices such that expected price equals the previous period's price or $P_t$=$P_{t-1}$. Coming back to Fig. 2.6, when the workers realise that the actual price $P_1$ exceeds the expected price $P_0$, they revise their expectations upward and the new expected price becomes $P_1$. With higher expected prices, they ask for higher wages and subsequently, firms charge a mark-up over revised wages. We thus have a new AS which shows higher prices at each level of output. The new AS curve $AS_1$ passes through new expected price $P_1$and the natural level of output $Y_n$, shown by point A in the figure. $AS_1$ curve lies above the $AS_0$ curve. (It should be noted that the economy is still not in medium run equilibrium but this will be discussed at length in the next Unit).

### 2.5.2 Change in Mark-Up μ and Catch-All Variable z

An increase in z leads the workers to demand higher wages for each level of unemployment/employment and thus the firms charge a mark-up over higher wages. An increase in z shows as a upward shift in the AS curve.

An increase in μ means that firms charge a higher mark-up above the costs and thus prices are higher corresponding to each level of output. Once again, the AS curve shifts upwards due to an increase in the mark-up μ.

## 2.6 SHORT-RUN AND LONG-RUN AGGREGATE SUPPLY

The short run aggregate supply curve (SRAS) is thus an upward sloping curve showing a direct relationship between output and prices. Each SRAS is drawn on the assumption of given expected prices. In the medium and the long run, however, price expectations can change resulting in the shifts of SRAS. With a change in expected prices, there is a new SRAS which passes through new expected price and natural level of output.

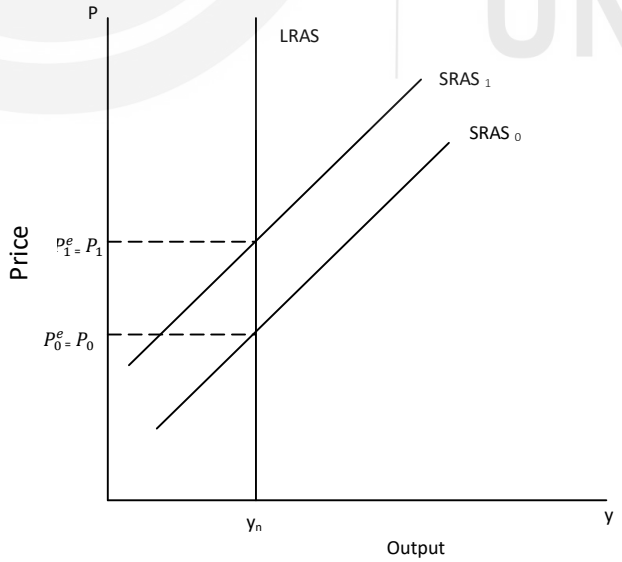



**Fig. 2.7: Long-Run AS Curve**

The points where different SRAS pass through $Y_n$ can be joined to derive the long-run aggregate supply (LRAS). In the long run, input prices change at exactly the same rate as output prices. Hence the aggregate supply curve becomes vertical. Actual output in the long is equal to the natural or potential output. It can be seen from Fig. 2.7 that the LRAS is a vertical line where output is fixed at $Y_n$ for different prices where each price equals expected price or $P = P^e$.

The level of potential output changes over time. Let us find out the reasons for such changes in potential output. You should note that potential output will change if there are changes in the quantity of labour, stock of capital, amount of natural resources, or the state of technology. Thus there are two sources of growth: (i) growth of inputs, and (ii) technological progress. The potential GDP increases over time as the economy accumulates resources. There are more machinery, more buildings, more raw materials, etc. These inputs lead to an increase in the production capacity of the economy. The other source, i.e., technological progress takes place over time in many fields. You would have noticed how more and more powerful computers and mobile phones have been invented over the years. Such improvement in technology is taking place in most fields. Technological progress leads to increase in productivity or efficiency. It implies we can produce more output from the same level of inputs.

Thus, the position of the LRAS curve moves to the right over a period of time. You should note that the changes in the level of potential output do not depend on the price level.

## 2.7 AS CURVE IN THE MEDIUM RUN

Medium run is a period of time during which the economy adjusts its fixed inputs (say, capital) to its long run level. In macroeconomics we can assume a period of about 5 to 10 years to fall under the category of medium rum. We learnt above that the AS curve is vertical in the long run (Classical) and horizontal in the short run (Keynesian).

Let us understand the medium run dynamics. In case the firms face high demand for their goods and services, they respond by producing more in short run. As the aggregate output continues to increase, firms and economy move closer to their full capacity. It is not likely that the whole economy suddenly reaches the full employment level of output. As the AD increases, the firms' response would be to increase output in the beginning. As AD keeps on increasing further, firms' will start increasing prices. The firms also begin to reach their full capacity constraints; they cannot increase their production capacity in the short run.

As you know from microeconomics, certain inputs such as capital and top management are fixed in the short run. Some firms and industries will reach their maximum production capacity before others; so there will be no kink in the AS curve. Simultaneously, there will be a decline in the unemployment rate as the economy is moving towards the full capacity level. At some level of output (Y*), it is virtually impossible for the firms to expand any further because all factors of

production are fully utilized. At that level of output, whatever be the price level, output cannot increase further.

In Fig. 2.8, we depict the upward sloping AS curve. The segment A to B shows the flatter portion (Keynesian zone), while the segment C to D shows the steeper portion (Classical zone) of the AS curve. We notice that all the three time periods (short-run, medium-run and long-run) are summarised in the above figure. The characteristic described in the AS curve are as follows: till about point B, it is the short run. Medium run is from point B to about point C (intermediate zone). Point C onwards, it is the long run (output Y*). During recession the economy is operating on the flat part of the AS curve (Keynesian view). The maximum an economy can produce is Y*, i.e., full employment output (classical view).

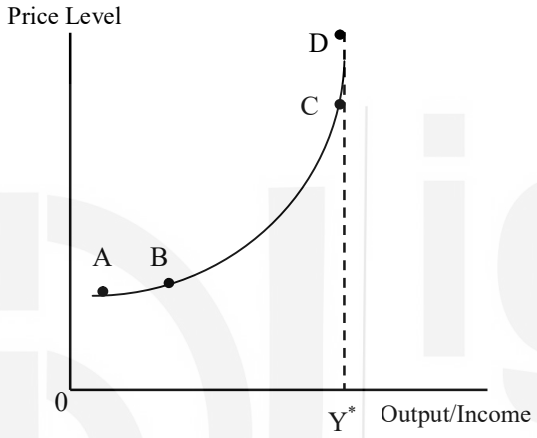



**Fig. 2.8: Medium Run Aggregate Supply Curve**

The Keynesian position of horizontal AS curve and the classical position of the vertical AS curve are exceptions. In normal circumstances, the AS curve is upward sloping. Therefore, we consider the medium-run AS curve for further analysis.

### 2.7.1 Slope of the Medium Run AS Curve

Response of input prices to changes in overall price level is the basis of difference between classical and Keynesian views. According to the Classical economists, price changes are fully anticipated. It means the expectations of producers and households are realised. For example, if producers expect that prices will increase by 10 per cent in the coming year, prices actually increase exactly by 10 per cent (neither more than 10 per cent, nor less than 10 per cent).

The Keynesian view, however, holds that an increase in price level is not fully anticipated every time. There is some time lag between the changes in input prices and the changes in output prices. In other words, the wage rate is sticky.

There are several reasons for this: (i) Nominal wages are slow to adjust to changing economic conditions. This could be attributed to 'long term contracts' between workers and firms. Usually wage rate is decided in advance, as part of the contract. (ii) Firms have to incur costs for adjusting prices.

Let us take an example of a restaurant. Vegetable prices in the market change so frequently; but restaurants maintain the same prices of food items on the menu card. If restaurants wish to change prices of food items according to vegetable prices, they have to print menu card so frequently. The printing and distribution cost of menu cards will eat away major part of their profits! A similar situation applies to other firms and they keep their prices unchanged, unless price trend in the economy is clear and significant.

Keynesian economists term this reason as 'menu cost'. (iii) Customers are accustomed to certain prices of the goods and services they purchase. They expect prices to be maintained at the same level and resist increase in prices. In order to retain their market share and customer goodwill, firms do not increase prices frequently. Thus, prices change only slowly over time. Hence, the aggregate supply curve slopes upward (See Fig. 2.9).

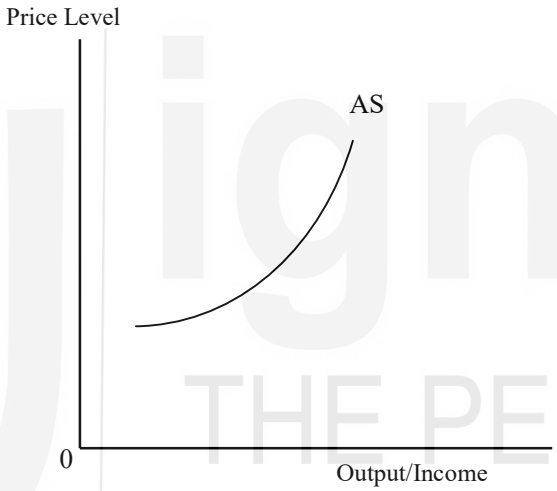



**Fig. 2.9: Medium Run Aggregate Supply Curve**

### 2.7.2 Shifts in Medium Run AS Curve

By now, you know that the AS curve describes the relation between output produced in the economy and price level. Thus any change in prices will result in a movement along the AS curve. There are several factors, apart from prices, that influence aggregate output. When we draw an AS curve, we assume these other factors to remain constant. Thus, any change in these factors results in a shift in the AS curve. Let us identify these factors.

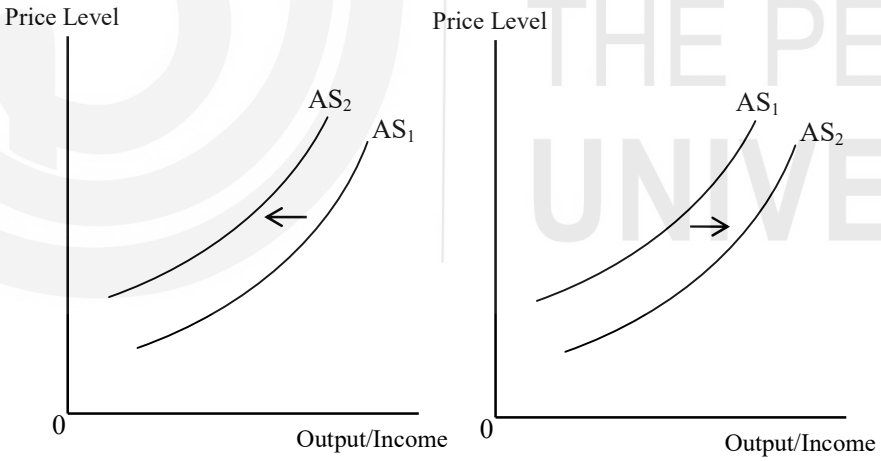
Anything that affects (apart from the price of the good) the individual firm's decision on output and prices can shift the aggregate supply curve in the short run. Thus there are several factors the shift the AS curve: supply shocks, economic growth, stagnation, public policy, and natural disasters. We discuss about these factors below.

(i) Input Prices: If the input prices fall, the cost of production also falls. It means that the firms can produce more in the given budget. Thus there is a shift in the AS curve to the right. Such a shift is depicted in panel

(b) of Fig. 2.10. Similarly, if there is an increase in input prices, production cost will increase. The AS curve will shift to the left, as shown in panel (a) of Fig. 2.10. Fluctuation in input prices is a common phenomenon. You might have observed periodical increases in crude oil prices which severely affects the Indian economy.

(ii) Technological Progress: We have discussed about the impact of technological progress on the AS curve in Section 2.6. Advancement in technology increases productivity of firms. You should note that the AS curve shifts to the right (see panel (b) of Fig. 2.10) as a result of technological progress.

(iii) Public Policy: The government provides incentives to firms so that economic growth accelerates. These incentives could be in the form of tax cuts for firms or higher government expenditure on infrastructure creation (such as roads, power supply, communication, etc.). Such incentives reduce the cost of production of firms, as a result of which the AS curve shifts to the right. Conversely, if the government policies are such that it increase the cost of production (such as stricter environmental norms, increase in tax rate, reduction in public expenditure on infrastructure), there is a left-ward shift in the AS curve. You should note that changes in tax rate on household income influences the AD curve, not the AS curve.




**Panel (a)** **Panel (b)**

**Fig. 2.10: Shifts in Medium Run Aggregate Supply Curve**

(i) Recession: Business cycles affect the AS curve. During recession there is accumulation of inventories and firms are pessimistic about the future. There is not much demand for goods and services also. In such circumstances, the AS curve shifts to the left (as shown in panel (a) of Fig. 2.10). Conversely, during the expansion phase of a business

cycle, firms are optimistic in their business operations. The AS curve will shift to the right (as shown in panel (b) of Fig. 2.10) during the expansion phase.

(ii) Natural Disasters: An economy is often struck by natural disasters such as flood, drought, earthquake, etc. Such disasters affect production adversely and the AS curve shifts to the left.

**Check Your Progress 2**

1) Explain why there is a shift in the AS curve due to change in $P^e$.

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2) State the reasons for the upward slope of the medium run aggregate supply curve.

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3) Explain the factors that will result in a rightward shift in the aggregate supply curve (use appropriate diagram).

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## 2.8 LET US SUM UP

In this Unit, we saw how the shape of AS curve depends on the conditions of the labour market. Under conditions of less than competitive labour and commodity markets, the AS curve slopes upwards showing a positive relation between the output and the price level. A change in expectation about prices shifts the AS curve which yields a vertical AS curve in the long run. We also discussed the impact of certain variables on the AS curve.

## 2.9 ANSWERS/ HINTS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1) (i) This increases z and WS shifts to the right. Real wage remains the same whereas unemployment rises. Real wage is implied by PS curve. Now workers will accept the same real wages, only at a higher rate of unemployment.

(ii) WS shifts to the left as z falls. Real wage remains the same but unemployment falls.

(iii) Mark-up falls leading to an upward shift of PS curve. Real wage rises and unemployment falls.

**Check Your Progress 2**

1. Go through Sub-Section 2.5.1 and answer.
2. The reasons for upward sloping AS curve are: (i) Nominal wages are slow to adjust to changing economic conditions; (ii) Firms have to incur cost for adjusting prices which are called menu costs; and (iii) Social norms and notions of fairness expect that firms do not change prices frequently.
3. There are several factors that affect aggregate supply and result in a shift in the AS curve. These could be supply shocks, public policy, business cycle, and natural disasters. Identify the situations that will shift the AS curve to the right. Go through Sub-Section 2.7.2 for details.

# UNIT 3 EQUILIBRIUM OUTPUT AND PRICES*

**Structure**



## 3.0 OBJECTIVES

The objective of this chapter is to use the AS-AD curves and see how output and prices get impacted due to the shifts in these curves. The chapter will also help us to understand that the government policy cannot impact output in the medium run.

## 3.1 INTRODUCTION

We derived the AD and AS curves in the last few chapters. In this chapter, we will bring them together and look at the impact of demand and supply shocks on the equilibrium output and the prices, both in the short run and in the medium run. We will also go behind the scenes and understand what happens to rate of interest and investment spending. Also, through the labour market, we will look at the impact on real wages.

## 3.2 EQUILIBRIUM OUTPUT AND PRICES: SHORT RUN AND MEDIUM RUN

Let us recall the equation of AD as $Y = \gamma A + \beta \frac{M}{P}$ or $P = \frac{\beta M}{\gamma A - Y}$ … (3.1)

where $\gamma = \frac{h\alpha}{h + \alpha b k}$ and $\beta = \gamma \frac{b}{h}$

Here $A$ is the fiscal policy parameter; $\gamma$ is the fiscal policy multiplier; $^{M}/_{P}$ is the real money supply and $\beta$ is the monetary policy multiplier. Let us recall that expansionary policies, both fiscal and monetary, shift the AD curve to the right


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(or upward) and contractionary policies lead to a leftward (or downward) shift of the AD curve. Apart from policy changes, AD curve can shift due to any change in the autonomous spending *A*. The shift in AD curve due to a change in any component of aggregate demand is also referred to as *demand shocks*.

The AS curve can be expressed as $P = P^e\,(1+\mu)F(1-\frac{Y}{L}, z)$ … (3.2)

Each AS curve is drawn based on the given levels of expected price $P^e$ (we will discuss further about expectations in Units 4 and 5), mark-up $\mu$ and catch-all variable $z$. Change in any of these parameters result in a shift of the AS curve. The shift of the AS curve due to a change in $\mu$ or $z$, are referred to as *supply shocks*. We have also seen that each AS curve passes through a point where $P = P^e$ and $Y = Y_n$. From the above, we can draw the following inferences:

- When $Y = Y_n$ then $P = P^e$
- When $Y > Y_n$ then $P > P^e$
- When $Y < Y_n$ then $P < P^e$

### 3.2.1 Equilibrium in the Short Run

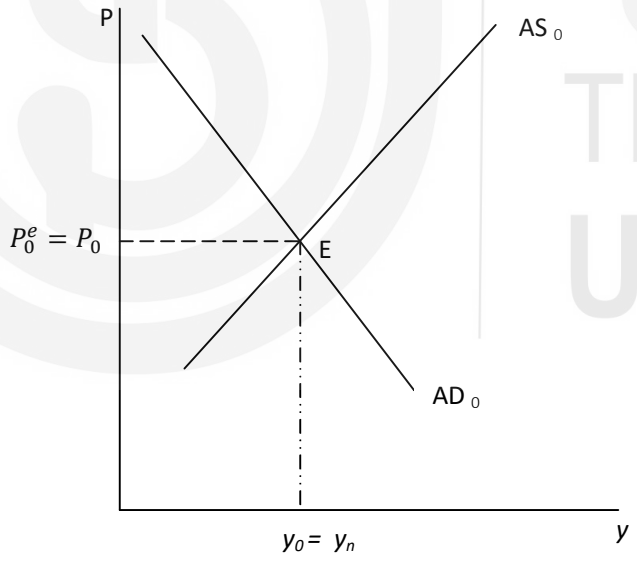



**Fig. 3.1: Equilibrium in the Short Run**

In Fig. 3.1 the aggregate demand curve is $AD_0$ and aggregate supply curve is $AS_0$. The AD and AS curves intersect at point E giving an equilibrium output $Y_0$ and equilibrium price level $P_0$. Let the output $Y_0$ be equal to the natural rate of output $Y_n$. Recall that if $Y = Y_n$, then $P = P^e$. It means that $P_0$ is also the expected price or is equal to $P_0^e$. Here the AD curve has been drawn for given values of fiscal policy parameter *A* and money supply *M*.

At point *E*, the goods market, financial market and the labour market are all in equilibrium. This is because point *E* lies on both the AD and the AS curves.

However, in the *short run*, there is no reason for the intersection of the AD and the AS curves to result in an equilibrium output which is equal to the natural rate of output. Equilibrium output could be less than or more than the natural rate of output. Equilibrium output depends on the position of AD and AS curves which in turn depends on the monetary and fiscal policies as well as mark-up $\mu$ and catch-all variable *z*.

### 3.2.2 Short Run to Medium Run

Let us now focus on the dynamics of moving from the short run to the medium run (see Fig. 3.2). We start with aggregate supply curve $AS_0$ and aggregate demand curve $AD_0$. Price level is at $P_0$, which is the expected price ($P^e$) also. Equilibrium output is $Y_1$, which is above the natural rate of output.

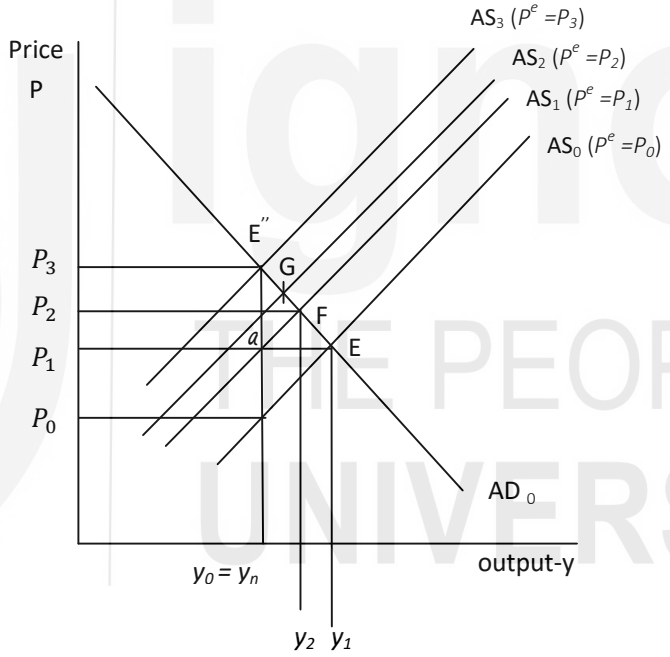



**Fig. 3.2: Equilibrium in the Medium Run**

This is the short run equilibrium we discussed in the previous sub-section. However, we know that when $Y > Y_n$ then $P > P^e$. In Fig. 3.2, $AS_0$ curve was drawn on the basis of $P^e = P_0$ and hence it passes through $P_0$ and $Y_n$ (notice that it is not the equilibrium price). The economy starts in a short run equilibrium where $AS_0$ and AD intersect at $Y_1$ and $P_1$. It means that the actual price $P_1$ is higher than the expected price $P^e = P_0$. Sooner or later, workers will realise that their actual real wage is lower than the expected real wage since they had considered a lower $P^e$ equal to $P_0$ while setting the wages. With this realisation, they will now revise their expectations about prices (The timing and the method of revision depends on the nature of wage contract and the method of forming expectations).

Let us assume that workers form expectations about prices such that expected price equals the previous period's price or $P_t$=$P_{t-1}$. Coming back to Fig. 3.2, when the workers realise that the actual price $P_1$ is higher than the expected price $P_0$, they revise their expectations upward and the new expected price becomes $P_1$. With higher expected prices, workers bargain for higher wages. Higher wage rate leads to an increase in the cost of production and firms charge a mark-up over revised wages while setting prices. We thus have a new AS curve which shows higher prices at each level of output. Thus there is a shift in the AS curve from $AS_0$ to $AS_1$. The new AS curve $AS_1$ passes through new expected price $P_1$and the natural level of output $Y_n$, (point $a$) and lies above the $AS_0$ curve. The new equilibrium is given by point *F* where the AD curve intersects the mew AS curve, with prices equal to $P_2$ and output equal to $Y_2$. (Please note that point *F* is different from the point *a* which gives the position of $AS_1$curve). The economy is still not in medium run equilibrium at point *F* as the equilibrium output $Y_2$ is greater than the natural rate of output $Y_n$. Once again, we know that when $Y > Y_n$ then $P > P^e$. Sooner or later, workers will again realise that the real wage paid to them is lower than the expected real wage since they had considered a lower $P^e$ equal to $P_1$while setting the wages. With this realisation, they will once again revise their expectations about prices and the new expected price will be equal to $P_2$ . The AS curve will shift upward to $AS_2$ which passes through expected price ($P_2$) and natural rate of output ($Y_n$) at point *b*. The equilibrium is now given by the intersection of *AD* and $AS_2$ at point *G*. Once again we do not reach natural output level ($Y_n$). The same process as described above takes place and comes to an end only when the *AS* curve has shifted sufficiently to intersect the *AD* curve at $E^{"}$ where the equilibrium output equals the natural rate of output $Y_n$ and now the equilibrium price is the expected price level. Point $E^{"}$ gives the medium run equilibrium. At this point, the wage setters have no reason to change their expectations about prices any further and therefore, there is no further shift of the *AS* curve. To sum it up:

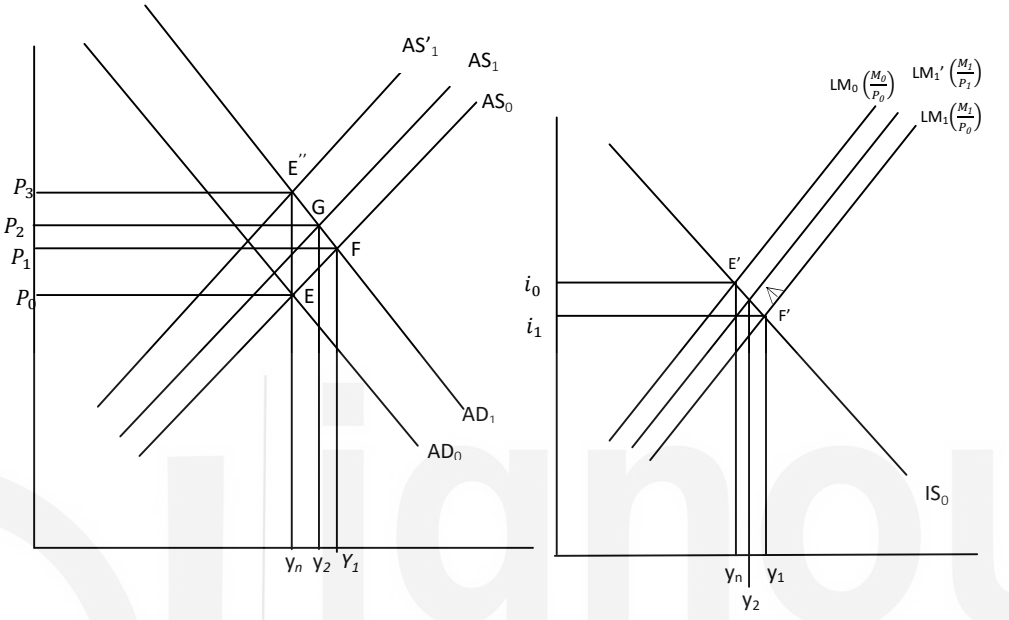
- In the short run (SR), output can be equal to, below or above the natural rate of output.
- In the medium run (MR), the output comes back to the natural rate of output. If the economy had started in a short-run equilibrium with $Y > Y_n$, the eventual rise in price level decreases the demand and the level of output. The adjustment from the SR to the MR works through the changes in price level.

In the following sections, we will look at the dynamics of adjustment on account of disturbances due to the demand shocks and supply shocks.

## 3.3 DEMAND SHOCKS

Recall that the shifts in AD curve due to a change in any component of aggregate demand is also referred to as *demand shocks*.

### 3.3.1 Expansionary Monetary Policy




**Panel (a)** **Panel (b)**

**Fig. 3.3: Effect of Monetary Expansion**

Let us consider Fig. 3.3. In panel (a) of Fig. 3.3 we present equilibrium in the economy with the help of AD and AS curves. In panel (b) we present the corresponding equilibrium with the help of IS and LM curves. Panel (a) shows that the economy operates with $AD_0$ and $AS_0$ and there is medium run equilibrium in the economy. The equilibrium is at point *E* with output equal to $Y_n$ and price level equal to $P_0$. Here, $P_0$ is also the expected price level.

Panel (b) of Fig. 3.3 shows that output level $Y_n$ corresponds to an interest rate of $i_0$ since the *IS* and *LM* curves intersect at $i_0$ and $Y_n$. Let us assume that there is a monetary expansion (i.e., money supply increases from $M_0$ to $M_1$). It will lead a decrease in interest rate, which will increase investment expenditure. Thus, the *AD* curve will shift proportionately from $AD_0$ to $AD_1$ (see Panel(a)). Point E′ in panel (b) corresponds to point E in panel (a) of Fig. 3.3.

In the short run, equilibrium shifts from point *E* to point *F* where output is equal to $Y_1$ and prices rise to $P_1$. This corresponds to point $F'$ in panel (b) of Fig.3.3. Note that a monetary expansion, initially shifts the LM curve to $LM_1$which is drawn on the basis of higher money stock $M_1$and the old price level $P_0$. However, since the price level rises to $P_1$ in the short run (see Panel (a) of Fig. 3.3), real money balances decrease to some extent and the relevant *LM* curve becomes $LM_1'$ which is based on money supply $M_1$ and higher price level $P_1$.

As we saw earlier, point F can only be the short run equilibrium because at *F*, the output is greater than natural rate of output and the actual price $P_1$ is higher than the expected price $P_0$. Sooner or later, workers will revise their expectations about prices and the new expected price becomes $P_1$. With higher expected Prices, there is a new AS curve $AS_1$ which passes through the new expected price $P_1$and the natural level of output $Y_n$. The new equilibrium is at point G with price rising to $P_2$ and the output becoming $Y_2$. The rise in prices further reduces the money balances and shifts the LM curve, further upwards in Panel (b) of Fig. 3.3. The process of upward shifting of the AS curve and also the LM curve continues till the economy reaches a new medium run equilibrium at point $E''$ where the output comes back to $Y_n$ and price becomes $P_3$. At this point, the wage setters have no reason to change their expectations about prices any further and therefore, there is no further shift of the *AS* curve. In panel (b) of Fig. 3.3, we observe that the LM curve shifts back completely till it coincides with the original *LM* curve $LM_0$ but the final LM curve is based on higher money stock $M_1$ and higher prices $P_3$. The real money balances $M_1/P_3$ is equal to the original real balances $M_0/P_0$. The interest rate comes back to the original rate of interest $i_0$. Thus a monetary expansion has no impact on any real variables in the medium run. Thus we can say that money is *neutral* in the medium run.

The results of a monetary expansion is summarised in Table 3.1.

**Table 3.1: Effects of Monetary Expansion**

| | **Output** | **Prices** | **Rate of Interest** |
|---|---|---|---|
| **Short Run** | Rises | Rises | Falls |
| **Medium Run** | Comes back to $Y_n$ | Rises | Comes back to original |

### 3.3.2 Expansionary Monetary Policy and Rational Expectations

If the expectations about prices are rational (see Unit 5), an expansionary monetary policy will have no impact on output and real balances even in the short run. This is because, workers with perfect foresight and a fully credible monetary policy, revise their expectations about prices in such a manner that in the short run itself, the expected prices become equal to the final prices. The *AS* curve shifts upwards in the short run itself so as to intersect the new *AD* curve at natural rate of output $Y_n$ and higher prices ($P_3$ in Fig. 3.3(a)). Monetary policy does not impact output in the short run also.

### 3.3.3 Expansionary Fiscal Policy

Let us look into the effect of fiscal policy on output and prices. We explain the impact of fiscal policy on output and prices in the short and the medium run with the help of Fig. 3.4.

In panel (a) of Fig. 3.4 we present the effect of an increase in government expenditure through AD and AS while in panel (b) we show it through IS and LM curves. Once again, we begin with $AD_0$ and $AS_0$. Panel (a) of Fig. 3.4 shows that the economy is in medium run equilibrium at point *E* with output equal to $Y_n$ and Price level equal to $P_0$. We also find that $P_0$ is the expected price level. Panel (b) of Fig. 3.4 shows that equilibrium is at point $E'$. Equilibrium output level $Y_n$ corresponds to an interest rate of $i_0$ since the *IS* and *LM* curves intersect at $i_0$ and $Y_n$.

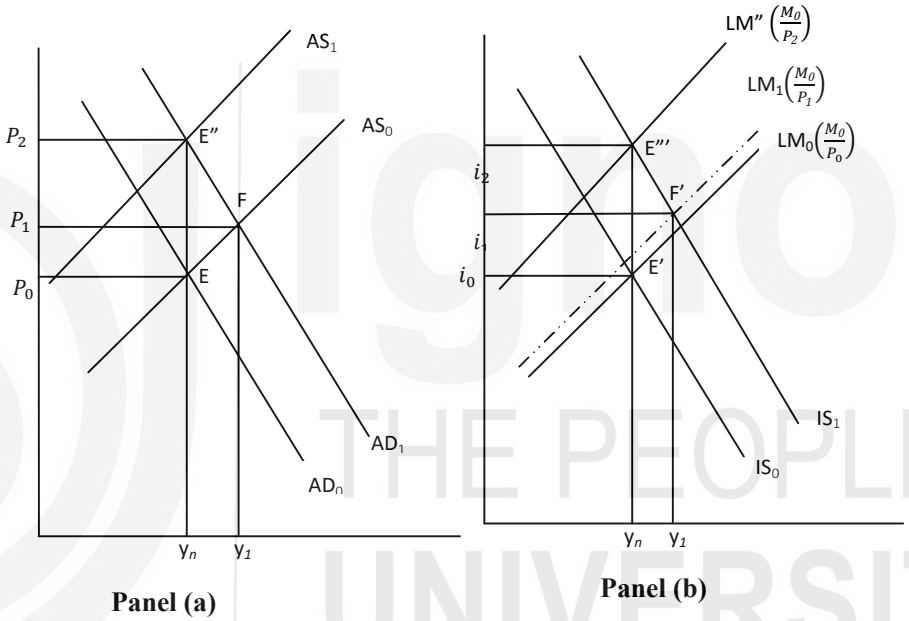



**Fig. 3.4: Effect of Fiscal Expansion**

Let us assume that there is an increase in government expenditure (G) so that the AD curve shifts to the right from $AD_0$ to $AD_1$. As a result, the short run equilibrium occurs at point *F* with output equal to $Y_1$ and prices equal to $P_1$.

In Fig. 3.4(b) we depict the impact of an increase in G through a right-ward shift in the IS curve, from $IS_0$ to $IS_1$. The *LM* curve shifts upwards to some extent (see the dotted line) due to rise in prices. The short-run equilibrium is at point $F'$ with output equal to $Y_1$ and rate of interest equal to $i_1$. In the short run, the effect on investment is ambiguous since there is an increase in both the income level and the rate of interest.

In panel (a) of Fig. 3.4, point *F* is the short run equilibrium since output is greater than the natural rate of output. Similarly, actual price $P_1$ is higher than the expected price $P_0$ . Sooner or later the workers will realise that their real wage has

declined, and they will revise their expectations about prices. This will cause an upward shift in the AS curve. Correspondingly, the LM curve will shift up. The process will continue till equilibrium reaches the point $E''$ where output is back at the natural rate of output. Notice that output level increased in the short-run but came back to its natural level in the medium run. The prices however are permanently at a higher level. The corresponding point of equilibrium in panel (b) of Fig. 3.4 is $E'''$. The equilibrium with output is equal to $Y_n$ with a higher rate of interest $i_2$.

As in the case of expansionary monetary policy, output comes back to the natural rate of output in the medium run and prices are permanently higher. However, there is an important difference compared to the impact of expansionary monetary policy. In the case of expansionary fiscal policy, the composition of output also changes. Although the output level is at the natural rate, because of the rise in government spending there is a fall in private investment spending. The fall in private investment is the result of a rise in the rate of interest. In other words, there is full crowding out.

**Table 3.2: Effect of Fiscal Expansion**

| | **Output** | **Prices** | **Rate of interest** |
|---|---|---|---|
| Short Run | Rises | Rises | Rises |
| Medium Run | Comes back to $Y_n$<br>Composition of output changes :$\uparrow G = \downarrow I$ | Rises | Rises |

**Check Your Progress 1**

1. Expansionary monetary policy as well as expansionary fiscal policy result in output coming back to its natural level in the medium run. We say that the monetary policy is neutral but the same term is not used for fiscal policy. Explain why that is so.

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2. Assume that the economy starts at medium run equilibrium. Now let the government increase taxes. Using AS and AD curves, show the impact on output and prices in the short run and the medium run.

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## 3.4 SUPPLY SHOCKS

We will now look at the impact on output and prices as a result of the shift in the AS curve. As you know from Unit 2, the AS curve can shift either due to a shift in the wage setting (WS) curve or due to a shift in the (PS) curve [the AS curve also shifts due to change in the expectations about prices but that takes place as a transition from the short-run to the medium-run]. Here, we are concerned with the shift of the AS curve in the short-run itself or a supply shock. Recall that a change in the catch-all parameter z such as fall in z will shift WS curve down and an increase in mark-up μ will shift the PS curve downwards.

### 3.4.1 Shift in PS Curve

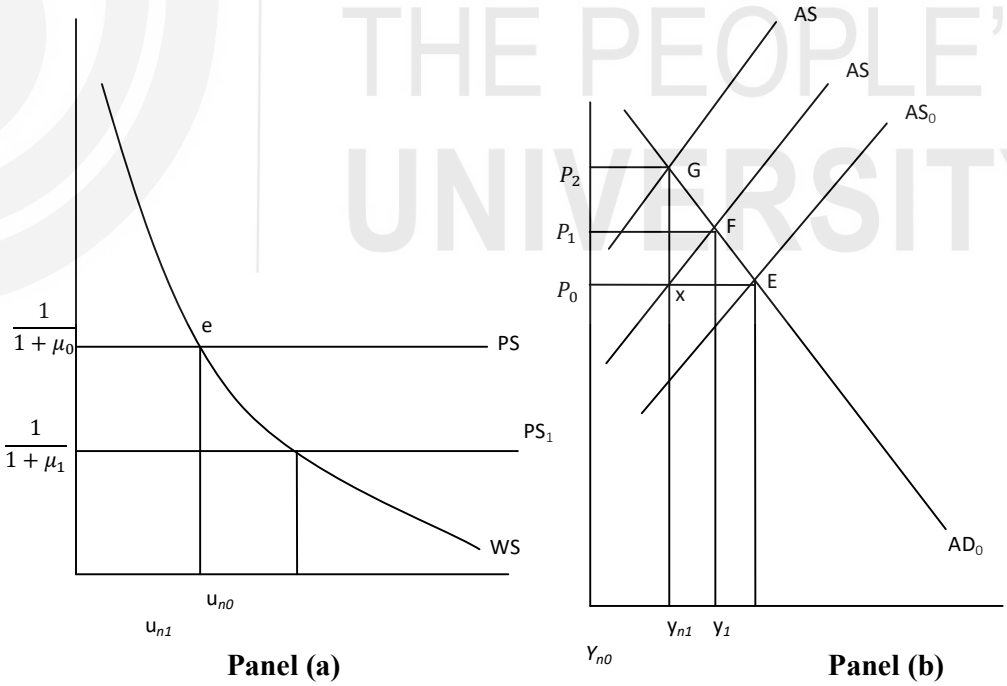


**Fig. 3.5: Effect of a Shift in WS Curve**

Look at Fig. 3.5. Panel (a) of Fig. 3.5 shows the *WS* and $PS_0$ curves intersecting at point e which gives the natural rate of unemployment as $u_{n0}$.

This corresponds to the natural rate of output equal to $Y_{n0}$ shown by the intersection of $AD_0$ curve and $AS_0$ curves (see panel (b)). The initial price which is also the expected price is equal to $P_0$. Now, let there be an increase in the global oil prices. This raises the raw material costs and the mark-up for the firms from $\mu_0$ to $\mu_1$. This leads to a downward shift of the *PS* curve from $PS_0$ to $PS_1$. Now the labour market (see panel (a) of Fig. 3.5) shows equilibrium at higher rate of unemployment $u_{n1}$ and lower real wage rate $\frac{1}{1+\mu_1}$.

A higher rate of unemployment corresponds to a lower natural rate of output $Y_{n1}$. In the short run itself, the AS curve shifts back to a new AS curve $AS_1$ which passes through the expected price $P_0$ and the new natural rate of output $Y_{n1}$ ($AS_1$ passes through point *x* in the lower part of figure 3.5). The short run equilibrium now happens at point *F* where the *AD* curve intersects the new AS curve. At *F*, the price level is higher ($P_1$) and the output level is lower ($Y_1$) than the original prices and output given by point *E*. In order to move to the *MR*, we need to compare the *SR* output $Y_1$ with the new natural rate of output $Y_{n1}$. Here, $Y_1 > Y_{n1}$ and $P_1 > P_0$. Since output $Y_1$ is greater than the natural rate of output $Y_{n1}$ and price level $P_1$ is higher than expected price $P_0$, the workers will revise their price expectations upwards and AS curve will shift up (passing through $Y_{n1}$ and new expected price $P_1$). This process continues till *AS* and *AD* curves intersect at $Y_{n1}$ and $P_2$, which is also the expected price now. The medium run equilibrium is given by intersection of $AD_0$ curve and $AS_2$ curve at point *G* (see panel (b) of Fig. 3.5. There will be no further change.

The impact of an adverse supply shock is summarised in Table 3.3.

**Table 3.3: Effect of a Shift in the WS Curve**

| | **Output** | **Prices** |
|---|---|---|
| Short Run | Falls | Rise |
| Medium Run | Falls to new natural rate | Rises |

### 3.4.2 Shift of WS Curve

The results are similar to those described above. Suppose there is an increase in contractualisation of labour resulting in a fall in the bargaining power of workers. This shows up as a fall in the catch-all parameter z and results in a leftward shift of the WS curve in the labour market.

In the labour market, the natural rate of unemployment *falls* and therefore the AS curve shifts to the right passing through *higher* natural rate of output and same expected prices. In the short run output will rise and prices would fall.

Since the actual prices are lower than expected prices, there would be a revision of price expectations downwards and the new medium run equilibrium would be at higher (natural) rate of output and lower prices which are also the expected prices.

**Check Your Progress 2**

1. Use WS-PS curves and AS-AD curves to trace out the impact of a rise in unemployment benefits on output and prices in the short and the medium run.

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2. Assume an economy starts in medium run equilibrium. The economy suffers an increase in global oil prices. However, the government increases the money supply in order to prevent recession in the short run. Show the impact on output and prices in the short run and the medium run.

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## 3.5 LET US SUM UP

The economy is continuously hit by shocks to the aggregate demand or aggregate supply or both. We have seen that in the medium run, economy always comes back to the natural rate of output. However, the natural rate of output, itself changes in case of supply shocks. However, in the short run, output can differ from natural rate of output and prices can be different from expected prices.

## 3.6 ANSWERS/ HINTS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1. Composition of output changes with fiscal policy and hence there is a real impact.
2. This is the case of contractionary fiscal policy. In the SR, output falls and prices rise. Rate of interest also falls in the SR. In the medium run, interest rate declines further and output returns to the natural rate of output. The prices are lower and are the equal to the expected prices.

**Check Your Progress 2**

1. WS curve shifts to right and there is a fall in the natural rate of output (a rise in the natural rate of unemployment). This is the case of an adverse supply shock. In the short run, prices rises and output falls. In the MR, output falls further and becomes equal to the new natural rate of output. Prices rise and equal the expected prices.
2. AD curve is shifted to the right through government policy at the time of an adverse supply shock. In the SR, output remains the same and prices rise. In the medium run, output falls to the new natural rate of output and prices rise further and equal the expected prices.

# UNIT4 ADAPTIVE EXPECTATIONS*

**Structure**



## 4.0 OBJECTIVES

After going through this unit, you will be able to

- explain the concept of adaptive expectations;
- formulate the idea of adaptive expectations with the help of algebraic equations;
- identify the pros and cons of adaptive expectations; and
- explain the implications of adaptive expectations for change in the AS curve.

## 4.1 INTRODUCTION

Expectations play an important role in our life. We take several decisions on the basis of expectations every day. For example, if we expect that it may rain later in the day, we carry an umbrella or a rain coat. If we expect traffic jam on the route, we start early for office. Economic agents also keep in mind the future value of economic variables while taking decisions. If a producer, for example, expects that profits will be higher in the coming years she will invest further to expand production capacity. If a housewife expects that prices of onion may increase in the coming weeks, she may buy some more quantity of onion and store it. If a stock holder expects that net asset value (NAV) of a particular share is likely to decrease tomorrow, she will sell it today. If a worker expects that inflation will be higher next year, he will bargain for a higher wage rate while entering into a contract with his employer. How do we incorporate such


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expectations into economic theory? There are two important hypotheses regarding expectations formation, viz., adaptive expectations hypothesis and rational expectations hypothesis. We discuss adaptive expectations hypothesis in the present Unit while rational expectations hypothesis is discussed in the next Unit.

## 4.2 ADAPTIVE EXPECTATIONS HYPOTHESIS

Adaptive expectations is a theoretical concept that deals with formulation of expectations for future on the basis of experiences and events in the recent past. For example, if inflation rate in the recent past was higher, people will expect that inflation rate will be higher in the current year. In this context, suppose we expected that rate of inflation for last year would be 12 per cent and the actual rate of inflation for last year was 12 per cent. In that case, the adaptive expectations hypothesis says that we will not change our expectations about the rate of inflation for current year. We will expect inflation rate to be 12 per cent for the current year too. On the other hand, suppose the rate of inflation for the last year was higher than 12 per cent, say 15 per cent. The adaptive expectations hypothesis says that we will change our expected rate of inflation for this year. In short, we will increase our expected rate of inflation for the current year from 12 per cent to a higher rate (say, 14 per cent). Further, suppose the rate of inflation in the past year was less than 12 per cent, say 8 per cent. The adaptive expectations hypothesis suggests that our expectations about inflation rate for current year will be lower than this somewhere between 12 per cent and 8 per cent.

The adaptive expectations hypothesis does not predict the correct amount by which there will be increase or decrease in the actual value of a variable. It only shows the change in expected value of a variable. The change will be different for different cases and can be only determined empirically. Thus, the message of the adaptive expectations hypothesis is clear. People will change their expectations of a variable if there is difference between what they were expecting for the past year and what actually happened in that year. Precisely, people will increase their expectations if the actual value of a concerned variable was higher than what they were expecting and they will reduce their expectations if the actual value of concerned variable was lower than what they were expecting. If expectations turned out to be correct then there will be no change in their expectations.

## 4.3 ALGEBRAIC TREATMENT OF ADAPTIVE EXPECTATIONS

For clear understanding, we can express adaptive hypothesis in simple algebraic equations. Suppose, we wanted to use the concept of expected income to check

that consumption is depend on expected income rather than actual income. As per correct adaptive expectations hypothesis, the following equation will be true:

$$Y_t^e - Y_{t-1}^e = \alpha(Y_{t-1} - Y_{t-1}^e) \quad \text{... (4.1)}$$

where $Y_t^e$ is the value of expected income in time period t,

$Y_{t-1}$ is the actual income in time period t-1, and $\alpha$ is a coefficient and its value is positive but less than one.

Equation (4.1) can be simplified and can be rewritten as

$$Y_t^e = Y_{t-1}^e + \alpha(Y_{t-1} - Y_{t-1}^e)$$

or,

$$Y_t^e = \alpha Y_{t-1} + (1-\alpha)Y_{t-1}^e \quad \text{... (4.2)}$$

If equation (4.2) is true, then it must be true for the last time period and the time period before that and so on. Mathematically, we can write the following equations:

$$Y_{t-1}^e = \alpha Y_{t-2} + (1-\alpha)\, Y_{t-2}^e \quad \text{... (4.3)}$$

$$Y_{t-2}^e = \alpha Y_{t-3} + (1-\alpha)\, Y_{t-3}^e \quad \text{... (4.4)}$$

$$Y_{t-3}^e = \alpha Y_{t-4} + (1-\alpha)\, Y_{t-4}^e \quad \text{... (4.5)}$$

and so on.

On the basis of the above equations, we can substitute for $Y_{t-1}^e$ in equation (4.2) and obtain the following equation:

$$Y_t^e = \alpha Y_{t-1} + \alpha(1-\alpha)Y_{t-2} + \alpha\,(1-\alpha)^2 Y_{t-3} + \alpha\,(1-\alpha)^3 Y_{t-4} \ldots \quad \ldots(4.6)$$

You should observe equation (4.6) closely. It links the unobservable variable, i.e., expected income ($Y_t^e$) to the observable actual income in the previous time periods ($Y_{t-1}, Y_{t-2}, Y_{t-3}, \ldots$). In other words, this is another way of understanding adaptive expectations hypothesis. It shows that the expectations of any variable can be written purely as a function of its past values. Since $\alpha < 1$, the coefficients attached to each lag declines as the number of lag increases. For example, if $\alpha = 0.5$, equation (4.6) can be written as

$$Y_t^e = 0.5Y_{t-1} + 0.25Y_{t-2} + 0.125Y_{t-3} + 0.0625Y_{t-4} + \cdots$$

There is one problem however. Equation (4.6) shows that to find out the value of expected income for the current period, we require data on actual income of the beginning time period ($Y_0$). If the value of $\alpha$ is less than one (which the adaptive expectations hypothesis says), then the actual income in any period will have less impact on current expected income. In simpler words, the latest data on actual income dominate the formulation of expectations about future income.

**Check Your Progress 1**

1. Explain the concept of adaptive expectations.

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2. Write down the basic equations of adaptive expectations hypothesis.

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3. In 2019 the expected rate of inflation was 7 per cent while actual rate of inflation was 5 per cent. If $\alpha = 0.5$, find out the expected inflation rate for 2020.

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## 4.4 LIMITATIONS OF ADAPTIVE EXPECTATIONS HYPOTHESIS

There are certain limitations of the adaptive expectations hypothesis. There could be situations in which the adaptive expectations hypothesis is improbable. For example, the adaptive expectations hypothesis assumes that economic agents ignore all available information. They rely on past experience and events only. Latest information can help in improving accuracy of expectations. Suppose the rate of inflation in the economy fluctuates between 0 per to 10 per cent. Then, according to the adaptive expectations hypothesis people will expect that the future rate of inflation will be between 0 per cent and 10 per cent. Suppose, there is an external disturbance (say, war, oil crisis, or global financial crisis) that will eventually affect the general price level in the country. In the recent past such an event was not there. Thus, according to adaptive expectations hypothesis, economic agents will not take it into account. However, if this information is ignored, the adaptive expectations hypothesis can give misleading signals. Let us consider some examples.

EXAMPLE 1: Assume that there is a regular increase in the value of a variable (say, inflation) in an economy. As per adaptive expectations hypothesis the expected value of the variable will be less than the actual value of the variable.

Let people form expectations according to the following equation:

$$P_t^e = 0.5\ P_{t-1} + 0.5\ P_{t-1}^e \quad \text{...(4.7)}$$

where $P_t$ is the actual rate of inflation in time period t and $P_t^e$ is the expected rate of inflation in time period t.

Now, let us assume that the rate of inflation is rising by one percentage point each year. So it will be 1 per cent in year 1; 2 per cent in year 2; 3 per cent in year 3; and so on. Suppose we are in time period '0' at the moment; and the values of expected inflation and actual inflation are 0 per cent. As per adaptive expectations hypothesis, the expected rate of inflation for the first year will be 0 per cent because last year the expected inflation was 0 per cent.

$$P_1^e = 0.5\ P_0\ + 0.5\ P_0^e = 0.5 \times 0 + 0.5\ \times 0 = 0$$

In year two, the expected inflation will increase to half the difference between actual inflation in year 1, (that is, 1 per cent) and the expected inflation in year 1 (that is, 0 per cent). Therefore, expected rate of inflation for the second year is 0.5 per cent.

$$P_2^e = 0.5\ P_1 + 0.5\ P_1^e = 0.5 \times 1 + 0.5\ \times 0 = 0.5$$

By applying the above formula, you can find out that expected inflation will be 1.25 per cent for the third year, 2.125 per cent for the fourth year, and so on. However, each year the actual rate of inflation would be higher than what was expected. So, a question arises: Is it possible for people to continue with this method of predicting wrong data every year? Will they not realise that their method of computing expectations is yielding wrong result? Will they not try to change the method of forecast of inflation?

In the above example, we considered a situation where there is an increase in the value of a variable. We found that expected value will be smaller than actual value. Let us take a variable whose value is decreasing over time. In this case, the expected value will be higher than the actual value in the subsequent time periods!

In this context, Fleming (1976) gives a suggestion that it can be resolved by 'shifting gear', i.e., people may take the rate of change of inflation rather than the level of inflation into consideration for formulation of expectations. However, if people change the method of formulating expectations by shifting gear or in some other way, the adaptive expectations hypothesis as shown above is inadequate. It does not give any guidance about when and under what circumstances such changes in the method of computations of expectations will take place.

EXAMPLE 2: Let us consider a situation in which government announces to increase the money supply over the coming year by 10 per cent. There are various possibilities. The government may increase the money supply by 5 per cent at the beginning of the year, for the first six months. So money supply at the beginning of the year will be higher by 5 percent. But if government increases money supply in the starting of the year by 10 per cent, then the increase in money supply in the beginning of the year will be 10 per cent. As per the adaptive expectations hypothesis, what do we expect about the increase in money supply for the first six months? Is it 5 per cent or 0 per cent? Therefore, there is some ambiguity on what we should expect for the next six months.

EXAMPLE 3: Talking about the implausibility of the adaptive expectations theory let us consider the example of ending the fixed exchange rate in early 1970s. The UK moved to a more flexible exchange rate system with expansionary fiscal policy in the form of higher government expenditure and increased rate of monetary growth. As is known that fixed exchange was abandoned because of pressures for exchange rate to depreciate were bound to occur as a result of the sharp increase in aggregate demand and the government did not want these pressures to interfere aggregate demand policies. Under these conditions it would surely have been naïve to base our expectations of the future course of the exchange rate on the past values of exchange rate alone. People at that time were informed that exchange rate was going to fall. Why should people not use freely available information in formulating their expectations about exchange rate? Why should we consider only the previous value of exchange rate at the time of predicting its future value?

All these examples explain the same thing – adaptive expectations hypothesis assumes that people do not pay attention to information which enables them to formulate accurate expectations. The adaptive expectations hypothesis assumes that people ignore information which would help them form better expectations. Therefore, the adaptive expectations hypothesis is known as a simple approximation which may be useful in certain situations. When expected value of any variable is being determined largely by its own lagged values, it should not be applied without consideration of whether those conditions are likely to hold.

## 4.5 ADVANTAGES OF ADAPTIVE EXPECTATIONS HYPOTHESIS

The main idea behind the adaptive expectations hypothesis is that people will adapt or change their expectations on the basis of past experience. It has certain attractive features. First, imagine that the rate of inflation increases from 8 per cent to 15 per cent and remains there. In that case expectations will increase gradually till it reaches to 15 per cent. Likewise, if actual rate of inflation decreases from 15 per cent to 8 per cent and it halts there, then expectations of people will decrease gradually till it reaches 8 per cent. Therefore, the adaptive expectations hypothesis has an attractive feature.

It shows that people can be fooled temporarily with the changes that we have assumed in the inflation rate. However, they cannot be fooled in the long run. You should be note that it will take some time for people to adapt their expectations fully. Further, another attractive feature of the hypothesis is that it allows people to relate the expected (i.e., unobservable) variables to the actual (i.e., observable) variables.

As acknowledged by the Milton Friedman, adaptive expectations were instrumental in evolving economic concepts such as Phillips curve. Phillips curve, as you will see in Unit 6, is a downward sloping curve which shows the relationship between inflation rate and unemployment rate. According to the Friedman, workers form adaptive expectations and they can be surprised by the government through unexpected change in monetary policy. .

As workers may be trapped by monetary illusion, they are unable to understand the dynamics of wages and prices. Hence, unemployment can be reduced through monetary expansions. This will result in a trade-off between inflation and unemployment. If the government chooses to fix unemployment at a low rate, there will be increase in inflation, and vice versa. However, as mentioned above, there will be also some problem because agents are arbitrarily supposed to ignore the source of information which otherwise affects their expectations. For example, with announcement by the government about a change in monetary policy, workers/ economic agents should modify their expectations, and break with the previous trends. Because of this, the hypothesis of adaptive expectations is regarded as a deviation from the rational tradition of economics.

Adaptive expectations hypothesis can be easily substituted for predicting unemployment or rate of interest or the growth rate of real income on the basis of previous data of related macroeconomic variables. For example, it suggests that investors will adjust their expectations of future behaviour based on recent past data. If the market has been trending downward, people are likely to expect that it will continue that way, because that is what it has been doing in the recent past.

In short, this hypothesis suggests that if the market has been trending downward, people will expect that this trend will continue in current and future time. However, it should be noted that this tendency could be misleading because it can cause people to lose sight of larger, long term trends. In reality, a variable could move in the opposite of the forecast by adaptive expectations hypothesis. For example, before the sub-prime crisis in the USA, home prices was increasing and trending upward for a considerable length of time. People focused on this fact and assumed that home prices would continue to increase indefinitely. Thus, they leveraged up and purchased assets with the assumption that price will not fall. However, fact is in front of us. The cycle turned and prices fell as the bubble burst.

**Check Your Progress 2**

1. Point out the limitations of adaptive expectations hypothesis in brief.

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2. Point out the advantages of adaptive expectations hypothesis.

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## 4.6 ADAPTIVE EXPECTATIONS AND SHIFT IN THE AS CURVE

Aggregate supply is total quantity of supply of goods and services in an economy in a particular time period. Aggregate supply is influenced by actual inflation and the level of output. When we incorporate adaptive expectations into the supply we get a dynamic aggregate supply curve. Let us analyse the behaviour of the AS curve in the short run and the long run.

### 4.6.1 Short-Run Aggregate Supply Curve

Short-run aggregate supply curve (AGS) shows relationship between price level and output when the expected rate of inflation is constant ( $i_0$). The economy is initially in equilibrium at point $E_0$ where the actual output Y is equal to the full employment output Y* and the actual price P is equal to the expected price $P^e$. Point $E_0$ is determined by the intersection of the upward sloping SRAS curve, the downward sloping AD curve, and the vertical long run LRAS curve. To begin with, equilibrium is at point A, which is both the short run and the long run equilibrium point.

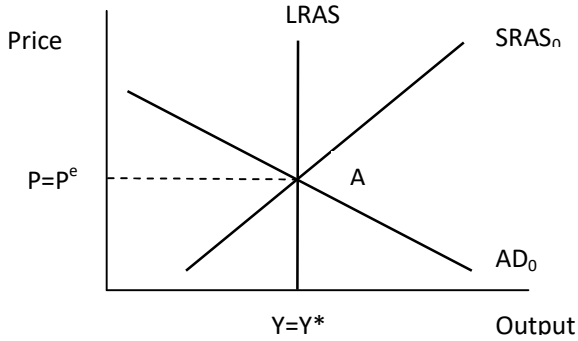


**Fig. 4.1: Equilibrium in the Short Run**

If there is change in expected inflation, there will be a shift in the SRAS curve. For example, if expected inflation increases, then there will be an upward shift in the SRAS curve. Similarly, if there is an increase in expected prices, there will be a shift in the SRAS curve.

### 4.6.2 Long-Run Aggregate Supply Curve

You should note that full employment level of output Y* is defined as that level of output at which actual price level is equal to expected price level $P_0 = P^e$.

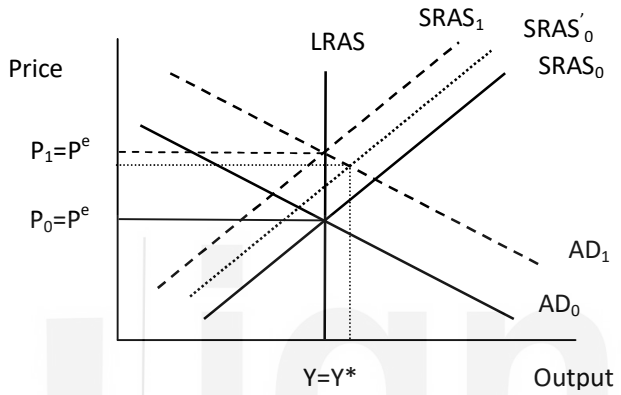


**Fig. 4.2: Long-run Dynamic AS Curve**

Let us assume that there is a favourable demand shock to the economy. The shock can happen either because of expansionary monetary policy (by increasing money supply) or expansionary fiscal policy (by increasing government spending or reducing taxes). The demand shock shifts the AD curve upward to the right (from AD to $AD_1$) as shown in Fig. 6.2.

Now if we see Fig.4.2, the shift in the AD curve to $AD_1$ has disturbed the short run equilibrium. Due to the increase in demand, the new equilibrium will be at the intersection of the $SRAS_1$ curve and the $AD_1$ curve. This would result in an increase output as well as prices. Thus actual output is more than natural output. Recall that expected prices in the economy was equal to $P_0$. The economy is in a situation of boom period. Therefore, $Y > Y^*$ and $P > P^e$.

This increase in the actual price level reduces the real wages of the workers in the current period as the actual price is now greater than what they expected the price to be. As a result, the workers in the next period will revise their expectations about the prices upward and hence demand higher nominal wages so as to keep their real wages constant. This change in the expectations of the prices upwards shifts the SRAS curve upwards.

The SRAS curve will shift upwards until the actual output Y is equal to the natural output Y* and actual prices $P_1=P^e$. It implies that equilibrium in the medium run will be at a higher level of output. In the long run, however, the economy will move back to the natural output level Y*. It also shows that in the long-run, the LRAS curve is vertical which shows the attainment of output at full employment level.

**Check Your Progress 2**

1) Discuss the shift in aggregate supply curve in the short-run.

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2) Explain why the long-run aggregate supply curve is vertical.

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## 4.7 LET US SUM UP

The adaptive expectations hypothesis deals with a method that enables people to forecast future probabilities on the basis of data of recent past. Thus the adaptive expectations hypothesis is backward looking. However, it is widely used in various fields of macroeconomics such as investment decision, consumption, saving, etc. for predicting future trends and formulating important policies. This hypothesis is easily understood with the help of algebraic equations. There are certain problems with the adaptive expectations hypothesis because at the time of formulation of predictions on the basis of previous data, people may ignore certain important information; and hence their expectations could be erroneous. Once a forecasting error is made by households or firms, they cannot forecast an accurate result. Persistence of this problem could create some kind of uneasiness among economists and policy makers. This led to development of an alternative model of how expectations are formed, i.e., the rational expectations hypothesis. The rational expectations hypothesis has largely replaced adaptive expectations hypothesis in macroeconomic theory. The adaptive expectations hypothesis also helps in explaining the shape of Phillips curve and the aggregate supply (AS) curve. If there is mismatch between expected inflation and actual inflation, there will be a shift in the AS curve in the short run. There will be no change in the shape of the AS curve in long run because expected inflation and actual inflation will always be the same. Therefore, the AS curve will be vertical in the long run.

## 4.8 ANSWERS/HINTS TO CHECK YOUR PROGRESS

**Check Your Progress 1**

1) Go through the first paragraph of Section 4.2 and answer.

2) Go through Section 4.3 and answer.

3) Apply the formula given at Section 4.3. Your answer should be 6 per cent.

**Check Your Progress 2**

1) Go through Section 4.6 and answer.

2) Go through Section 4.6 and answer.

# UNIT 5 RATIONAL EXPECTATIONS*

**Structure**



## 5.0 OBJECTIVES

After studying this unit you will be able to:

- explain the concept of rational expectations;
- interpret rational expectations algebraically;
- identify the scope and limitations of rational expectations;
- explain the policy ineffectiveness proposition (PIP) concerning the Lucas supply curve.

## 5.1 INTRODUCTION

The rational expectations hypothesis is widely used in macroeconomics. According to this hypothesis, economic agents use all available information to make predictions about economic variables. In addition, this hypothesis says that economic agents, along with available information and their experience, use their human rationality to predict the future value of an economic variable. They are well aware of it that predictions may not be correct. However, they learn from mistakes and improve their predictions for the future. This hypothesis not only applies to formulate expectations about inflation and income but also explains the formation of a wide range of economic variables.

Rational expectations hypothesis was proposed by John F. Muth in his seminal paper, "Rational Expectations and the Theory of Price Movements," published in 1961 in the journal, *Econometrica*. In this Unit we will discuss the hypothesis and its criticisms.


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## 5.2 CONCEPT OF RATIONAL EXPECTATIONS

In the middle of the twentieth century many economists were of the view that theories based on rational behaviour were inadequate to explain observed phenomena. The argument of Muth was the exact opposite of this, i.e., existing economic models did not assume enough rational behaviour. The rationality of economic thinking can be ensured by introducing the expectations of economic variables in models used to explain human behaviour.

Given the economic model, expectations are rational if actual values of variables, on average, are equal to the expected values of variables. For example, suppose there is a producer with rational expectations and (s)he performs the following thought experiments: what price should I expect, which is equal to everyone's expected price? The producer takes into account various factors for this exercise. These factors could be the anticipated supplies by others, behaviour of other producers, inflation, etc. After consideration of all these, (s)he computes the price that will prevail in future.

Milton Friedman emphasised that economic agents act as if they are maximising profit/ utility. According to Muth, people do not work with the system of equations that economists use for maximisation of profit or utility. Further, individuals do not have similar expectations; they differ in their beliefs. However, individuals' expectations should be distributed around the actual value of the variable to be forecasted. In this sense the anticipations of an average individual should be the expected value of the variable.

There are two versions of the rational expectations hypothesis: weak and strong. In the weak version, it is assumed that people have access to limited information; but they make best use of the information. Let us take a concrete example. You buy wheat flour (*atta*) every week for household consumption. You do not know the relative prices and nutrient levels of all the brands of wheat flour available in the market. With limited information available to you, however, you usually stick to the same brand (and may be the same shop, without knowing that other shops are charging a lower price!). Individuals however vary in their decision-making. They do not stick to the same brand. Thus there is no systematic error in their choice. When we take the expected value (that is, the average value) of a variable, it is usually not different from its actual value.

In the strong version of rational expectations hypothesis, it is assumed that people have access to all information. Decisions taken are based on all information. Thus, expected value of a variable is equal to its actual value. Any error in forecast is due to unexpected developments.

## 5.3 ASSUMPTIONS OF RATIONAL EXPECTATIONS

To have a logical understanding of rational expectations hypothesis, you should have clear understanding of probability theory, particularly conditional probability and the expectation operator (You should have gone through Units 9,

10 and 11 of BECC 107: Statistical Methods for Economics). The basic premises under which the rational expectations hypothesis is developed are given below.

(i) Economic agents have full and perfect information to predict the value of a future event.

(ii) Event/variable should be quantifiable to facilitate data collection and its analysis.

We know that it is difficult to quantify many variables. Changes in economic environment are difficult to quantify. We assume that probability distributions of the events are known. We are in a position to find out at least the first two moments (mean and standard deviation) of the probability distribution.

(ii) Economic agents (firms, household and government) are assumed to be rational.

They compare among available alternatives. They have the cognitive ability, time and resources to evaluate each alternative against the others. Households maximise utility while firms maximise profits. People are consistent in their choices.

## 5.4 ALGEBRAIC EXPRESSION OF RATIONAL EXPECTATIONS

The rational expectations hypothesis argues that people will use all available information related to the determination of the expected value of any variable. Let us assume that there is an economic variable Y and its expected value is determined by its own lagged values and by lagged values of other variables (X and Z) in any time period 't'.

$$Y_t = a_0 + a_1 Y_{t-1} + a_2 X_{t-1} + a_3 Z_{t-1} \quad \ldots (5.1)$$

where X, Y, and Z are variables

$\alpha_0, \alpha_1, \alpha_2$ are fixed coefficients

Equation (5.1) is an expression of general hypothesis about formulating expectations. Here we are neither defining any variable nor saying anything about the values of the coefficients in this equation. It is only an algebraic representation of a process.

Let us assume that there is a person who is formulating expectations about the value of Y in time period 't' at the end of time period t-1. He knows the process of determining the value of Y is given by equation (5.1). Let us also assume that the person knows the values of all the lagged values of X, Y, and Z by the end of time (t-1). If he is rational, his expectations about the value of Y in time period (t) will be based on his information set at the end of time period t-1. The process of determining Y will be

$$E_{t-1} Y_t = a_0 + a_1 Y_{t-1} + a_2 X_{t-1} + a_3 Z_{t-1} \quad \ldots (5.2)$$

where $E_{t-1}Y_t$ is the expected value of Y in time period 't' and it is formed on the basis of the information set available at the end of time period t-1.

Formally, $E_{t-1}Y_t$ is equal to $E(Y_t/I_{t-1})$ where E is the mathematical expectation operator and $I_{t-1}$ is the information set available at time period (t-1). The rational expectation of Y at time (t) is formulated on the basis of available information at time period (t-1). 'E' is rational expectations operator for expectations anticipated based on information of time period (t-1).

If Y is following the process mentioned in equation (5.1), then the implication of equation (5.2) is that expectations will be accurate. In other words, forecasting error will be zero. Forecasting/prediction error is the difference between the actual and the expected values of a variable.

You should note that the value of prediction error will not always zero, i.e., the expected value of a variable is not always equal to it true value. It is true when the economic process of formulating the expected value of a variable is deterministic. However, in a real sense, most of the economic processes are stochastic, not deterministic. A stochastic process includes an element of unpredictability or uncertainty. As you know, economics deals with the unpredictable/ random behaviour of human beings. This element of unpredictability in the process of formulating the rational expectations can be explained by adding a random variable in equation (5.1). That makes this process more realistic.

$$Y_t = a_0 + a_t Y_{t-1} + a_2 X_{t-1} + a_3 Z_{t-1} + v_t \quad \ldots (5.3)$$

Here, $v_t$ is a random variable and its value may be positive or negative. The variable $v_t$ represents a large number of random variables that affect human behaviour. Therefore, a smaller value of $v_t$ is better. It implies that probability distribution of the stochastic variable $v_t$ is concentrated at zero. In other words, the expected value of $v_t$ is zero.

The assumptions pertaining to $v_t$ are

(i) $v_t$ can be positive or negative.

(ii) It has a constant and finite variance ($\sigma_v^2$)

(iii) The smaller values of $v_t$ are supposed to occur more frequently than large values of $v_t$ so probability distribution of $v_t$ is centred at 0.

(iv) $v_t$ is unknown at the end of $t^{th}$ period. It is also not the part of Information Set [$I_{t-1}$].

The process of rational expectations of Y in time period (t) is based on the set of information at the end of time period (t-1). It is formed in (5.3) equation as

$$E_{t-1}Y_t = a_0 + a_1 Y_{t-1} + a_2 X_{t-1} + a_3 Z_{t-1} + E_{t-1}v_t \quad \ldots (5.4)$$

where $(E_{t-1}v_t)$ is the expectation of $(v_t)$. That is formed based on a set of information available at the end time period (t-1).

The rational expectations hypothesis must assume that the formulated expectations of this period's value of $(v)$ by a rational individual is made on the basis of the process determining $(Y_t)$, given the set of information for time period (t-1). Further, assume that the rational expectations of $v$ in time period (t) based on a set of information in time period (t-1) is zero. It can be written as:

$$E_{t-1}v_t = 0 \quad \ldots (5.5)$$

Now, based on the available information in time period (t-1), the rational expectations of Y in time period (t) can be written as follows:

$$E_{t-1}Y_t = a_0 + a_1Y_{t-1} + a_2X_{t-1} + a_3Z_{t-1} \quad \ldots (5.6)$$

If the value of Y is determined as per specifications of equation (5.3), then the value of prediction error is given by following equation:

$$Y_t - E_{t-1}Y_t = v_t \quad \ldots (5.7)$$

In stochastic models the prediction error is equal to the actual value of $v_t$. The value of $v_t$ is known only after it has occurred. If $v_t$ happens to be large, it implies that error is large because it is difficult to predict the actual $v_t$. In rational expectation hypothesis, there is no systematic pattern of $v_t$. Thus, forecasting error also does not show any pattern.

## 5.5 IMPLICATIONS OF RATIONAL EXPECTATIONS HYPOTHESIS

It is understood from the above discussion that if the process of determining the value of rational expectations of the variable Y remains unchanged, there will some components of randomness in Y which is represented by $v$. The implications of above are given below.

(a) **The mean or average of the error term is zero** - Once the random variable $v$ is included in the process of determining Y, the rational expectations of Y will not be perfectly accurate. The best thing which a rational forecaster can do is to assume that the value of $v$ is zero. It means that error made by forecaster in each period will be equal to value of $v$ in that period. Sometimes this error will be positive, at other times it will be negative. In certain rare cases the error will be zero. However, over several periods, negative errors will cancel out with positive errors. Then the average of error will be zero.

(b) **Errors of rational expectations exhibit no pattern -** the hypothesis of rational expectations rule out any pattern in forecasting errors because of the assumption that random element itself exhibits no pattern. It cannot be predicted based on the available information at the time of the forecast. However, what if the random element $(v)$ shows some pattern? For example, if the current value of $(v)$ is linked to its previous period's value as:

$$v_t = \beta v_{t-1} + \epsilon_t \quad \ldots (5.8)$$

where $\epsilon_t$ is a random error with a zero mean and which cannot be predicted based on any information available at the end of time period (t-1). The value of parameter $\beta$ varies between –1 and +1.

If $(v)$ is determined according to the process mentioned in equation (5.8), then the rational economic agents will formulate expectations about the present value of $(v)$ by following that process. Since the value of $(v)$ in period (t-1) will be a part of the information at the end of time period (t-1), the forecast value $(v)$ will deviate from the actual value of $(v)$ by an unknown, unpredictable element $(\varepsilon_t)$.

This element $(\varepsilon_t)$ shows no pattern and its mean value is zero. Therefore, even if $(v)$ shows a pattern, the rational forecast of Y will still be correct on an average and forecasting error will show no pattern.

(c) **Rational Expectations are the most accurate expectations** - the forecasted value of Y follows the process discussed above and it is based on available information in time period (t-1). Uncertainty about expected the value of Y arises because of the presence of random element $(v)$. Although the mean of the random variable is zero, it can be positive or negative in any time period. There is the variance $(\sigma_v^2)$ that tells the value of $(v)$ that will occur. If the variance $(\sigma_v^2)$ is very high then the value of $v$ will be high and vice versa. Therefore, the variance of $v$ is a measurement of the inherent unpredictability of Y. Higher the value of the variance higher will be the unpredictability of Y. If the value of variance is zero then the predictability of Y is perfect. Therefore, the range of the forecasting errors is in the same range of the unpredictable component of the process determining Y.

In other words, rational expectations are the most efficient method of forecasting because the variance of the forecasting errors (due to random element) will be lower under rational expectations than the use of any other method for forecasting or formulating expectations.

## 5.6 LIMITATIONS OF RATIONAL EXPECTATIONS HYPOTHESIS

Criticism of the rational expectations hypothesis can be understood through the following points:

(a) **The logic of rationality -** This rational expectations hypothesis assumes that an individual is a rational human being. However, in reality, is it plausible to assume that a typical individual is sensible enough to use all available information to forecast the value of any variable? Is it not that the people are more often ignorant about the economic phenomenon?

For example, how many people would be able to give a reasonably precise definition of money supply? So, if an individual is forming rational expectations about the rate of inflation, he is expected to know what the money supply is and how it is growing. In a normal situation,

rationality in economic theory implies that a person compares the cost and benefit of any activity and carries out that activity up to the point where marginal cost is equal to the marginal benefits. For example, a firm will produce up to the point where marginal revenue from producing and selling an additional unit of a good is equal to the marginal cost. If we apply to the hypothesis of rational expectations, the individual (forecaster) will compare the marginal cost of acquiring information about the process of determining a variable and the marginal benefits of making more accurate forecasts. However, the point at which marginal cost and marginal benefits are equal does not necessarily correspond to the point at which the forecasting error is equal to the purely random component of the determining process.

(b) **The availability of information -** The rational expectations hypothesis assumes that the process of determining Y is known and the values of other variables in that process are known at the end of time period (t-1). But what if the value of any of these variables used in the determination of Y is not known at the end of time period (t-1)? How will a rational forecaster determine the value of Y in time period 't'? While there may be mathematical solutions to the above questions, lack of knowledge about information will adversely affect the accuracy of rational expectations.

(c) **Unrealistic elements** - It is unrealistic to say that the expectations of every individual are precisely the same, as every individual cannot track the data of every variable necessary for predictions. Information collection and processing is a costly affair which is not possible for all individuals. If an individual is not using all relevant information for predication then there is a higher chance of formulating wrong rational expectations.

(d) **Flexible price and market clearing mechanism-** Rational expectations hypothesis assumes that price is flexible and there is continuity in market clearance. It is not true because of the prevalence of stickiness in prices and wages.

**Check Your Progress 1**

1. Briefly discuss the concept of rational expectations.

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2. Discuss the role of a random variable $v$ in rational expectations.
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3. Briefly discuss the implications of rational expectations hypothesis.
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4. Briefly discuss the limitations of rational expectations hypothesis.
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## 5.7 POLICY INEFFECTIVENESS PROPOSITION

As per the rational expectations hypothesis, there is no impact of predictable macroeconomic policy on output and employment. Unpredictable policy actions have some impact on the real GDP and employment level. The rational expectations is a cause that negates the change in the AS and AD. There is increase in price level but output remains constant.

If people forecast changes in policy correctly, then there will be an increase in the price level. With an increase in prices, there will be a demand for higher wages and it will lead to a decrease in AS.

If people forecast changes in policy incorrectly, then they cannot forecast change in prices caused by policy. Consequently, there will be an increase in output and increase in aggregate supply with the increase in prices.

### 5.7.1 Lucas Supply Curve

Robert Lucas was the first economist who highlighted the importance of public expectations in macroeconomic policymaking and forecasting. According to Lucas, the anticipations of economic agents (public, firms, and government) are more important than that of the policymakers. Hence, policymakers have to know how the economy works and to understand the expectations of economic agents (households, firms, and government).

In the early 1970s, Robert E. Lucas developed an alternative model of Phillips' Curve by assuming the rational expectations hypothesis. Lucas showed that a positive relationship between output and inflation can arise because of imperfect information about the price level in the economy. The Lucas Model says that with rational expectations, only unanticipated changes in the money supply make an impact on real output. On the other hand, all anticipated changes in money supply only affect the price level. It is known as **the Policy Ineffectiveness Proposition.**

### 5.7.2 Lucas' Imperfect Information Model

As per the rational expectations hypothesis, subjective expectations are made according to the following:

$X_t^e = \mathrm{E}[(X_t|I_{t-1})]$

$X_t^e = \mathrm{E}[(X_t|I_{t-1})]$, i.e., the expectations of a variable 'x' in this period (t) is a conditional mathematical expectation on all the information available till this period (t). In the rational expectations hypothesis, the value of mean forecast error (MFE) $\equiv 0$.

There are three characterisations of rational expectations:

(i) Mean forecast error (MFE) = 0
(ii) There is no systematic pattern in the forecast error
(iii) It is the most accurate forecast; since by definition, we are using all the information and we cannot have a better forecast.

Therefore, the critical assumptions underlying the Policy Ineffectiveness Proposition are:

(i) Prices and wages are perfectly flexible (perfect competition set up)
(ii) Expectations are rational

If prices are sticky, anticipated changes in the money supply will affect real output, even under rational expectations.

### 5.7.3 Assumptions of Lucas Model

The main idea behind the Lucas Model is as given below.

(i) When a firm observes a change in the price of the product, the firm does not know whether this change in the price of the product is caused by the change in the aggregate price level or a change in the product's relative price level. Any change in the relative price will change the optimal quantity of the good that the firm produces. This is the Signal Extraction Problem.
(ii) Since prices and wages are assumed to be flexible in this model, a firm produces according to the rule: P = MC (perfectly competitive set up).
(iii) The firm produces more only if there is a rise in the price of the good it produces relative to the prices of other goods. When the aggregate price level (say, CPI) rises, not necessarily the relative price, the firm's output

will not rise. Firms are assumed to have imperfect information on the prices. These imperfections are due to informational barriers. Firms tend to confuse overall price movements with the relative price movements, which lead to them to deviate from their optimal production, in the short run.

(iv) Lucas also assumes that people make decisions according to the rational expectations.

The Imperfect Information Model of Lucas has the following three structural/behavioural equations:

1. **AS equation**:

$$Y_t = \bar{Y} + \beta(P_t P_t^e); \beta > 0 \quad \ldots (5.9)$$

The AS equation implies that the output in this period is the sum of the full employment output.

2. **AD equation:**

$$M_t + \bar{V} = P_t + Y_t (\text{taking log of QTM equation}) \quad \ldots (5.10)$$

The AD equation is the usual Quantity Theory of Money (where the velocity of money, V, is assumed to be constant).

3. **Monetary Feedback Mechanism**:

$$M_t = \alpha(Y_{t-1}) + \varepsilon_t; \varepsilon_t \sim \mathrm{N}(0, \sigma^2); \text{ where } \alpha < 0 \quad \ldots (5.11)$$

If output is more than the full employment level of output, the use of expansionary monetary policy and hence, the policy parameter is negative. Here, money supply is some function of the actual output in the previous period (t-1) plus some stochastic error ($\varepsilon_t$) component which follows a normal distribution (with mean zero and constant variance).

In effect, $\alpha$ or the policy parameter is the anticipated part of the money supply (since it depends on the actual output of the previous period $Y_{t-1}$). While $\varepsilon_t$ is the unanticipated part of the money supply (say, due to unforeseen situations such as oil price shock, war with neighbours, drought, etc.), on average, the stochastic error term is zero.

We will prove that the policy is ineffective, i.e., anticipated changes in policy have no effect on real variables and only unanticipated changes can affect real output.

**Mathematical Derivation of the Model:**

$$P_t = (aY_t + e_t) + \bar{V} - Y_t \quad \ldots (5.12)$$

We assume rational expectations, i.e., $P_t^e = \mathrm{E}[\, P_t | \, I_{t-1}]$ The expected prices are prices conditioned upon all the information available till the point the expectations are made.

This means: $P_t^e = \mathrm{E}[(\alpha Y_{t-1} + \varepsilon_t) + \bar{V} - Y_t | \, I_{t-1}]$

$i.e., P_t^e = \mathrm{E}[\alpha Y_{t-1}|I_{t-1}] + \mathrm{E}[\varepsilon_t|I_{t-1}] + \mathrm{E}[\bar{V}|\, I_{t-1}] - \mathrm{E}[Y_t|I_{t-1}]$

(as the expectation is a linear operator).

$i.e., P_t^e = \alpha Y_{t-1} + +\bar{V} - \bar{Y}\ (this\ follows\ by\ definition)$

$i.e. P_t^e = \alpha Y_{t-1} + \bar{V} - \bar{Y}\ (under\ RE)$ …(5.13)

Summarising, we have: $P_t = (\alpha Y_{t-1} + \varepsilon_t) + \bar{V} - Y_t$

and, $P_t^e = \alpha Y_{t-1} + \bar{V} - \bar{Y}$

that is, $P_t - P_t^e = \bar{Y} - Y_t + \varepsilon_t$ … (5.14)

Substituting (5.14) in (5.9):

$Y_t = \bar{Y} + \beta(\bar{Y} - Y_t + \varepsilon_t)$

that is, $(Y_t\bar{Y})(1 + \beta) = \beta(\varepsilon_t)$

$Y_t = [\beta(\varepsilon_t)/(1 + \beta)] + \bar{Y}$ … (5.15)

In equation (5.15), we see that the policy parameter (α) does not appear in $Y_t$. It implies that the anticipated part of monetary policy is ineffective. Further, the term α does not affect output. Only unanticipated part of the money supply ($\varepsilon_t$) will have an impact on output in this model. This is the Policy Ineffectiveness Proposition.

Also, it can be proved that in this model, the Mean Forecast Error (MFE) for Output ($Y_t$) and Prices ($P_t$) = 0. Hence, this model is consistent with rational expectations hypothesis.

According to Lucas (Signal Extraction Problem), all unemployment is voluntary because the workers speculate about leisure, over time. They work more in the present if wage rate is higher, with a belief that they will enjoy leisure when wage rate low. There is uncertainty in such speculation, as there is imperfect information. Temporary changes induce certain actions and we attach a probability to the change being temporary.

**Check Your Progress 2**

1. Explain the underlying idea behind policy ineffectiveness proposition.
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2. Point out the factors that affect output as per Lucas's understanding of supply.
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## 5.8 LET US SUM UP

Rational expectations hypothesis is an improvement over the adaptive expectations hypothesis. It says that people use all available information for formulating predictions about economic variables. It also says that people use their human rationality, available information and their experience to predict the future value of any economic variable. People know that predictions may not be correct always. However, they learn from mistakes and improve upon their predictions for the future. This hypothesis is widely used in macroeconomics. It not only applies to formulate expectations about inflation and income but also explains the formation of a wide range of economic variables.

Lucas pointed out that under the rational expectations hypothesis there is no impact of anticipated macroeconomic policy on output and employment. Unanticipated policy actions, however, have some impact on output and employment.

## 5.9 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1. Go through Section 5.2. Provide the intuitive idea behind rational expectations hypothesis.
2. Go through Section 5.5. You should write the implications of the stochastic error term.
3. Go through Section 5.5 and answer.
4. Refer to Section 5.6 and answer.

**Check Your Progress 2**

1. Refer to Section 5.7 and answer.
2. Refer to equations (5.12), (5.13) and (5.14).

# UNIT 6 INFLATION AND UNEMPLOYMENT *

**Structure**



## 6.0 OBJECTIVES

After going through this unit you should be able to

- identify various types of unemployment;
- explain the concept of natural rate of unemployment;
- establish a relationship between unemployment and inflation;
- explain how the short-run Phillips curve shifts; and
- reconcile the difference in shape of the Phillips curve in short-run and long-run.

## 6.1 INTRODUCTION

In Units 7 and 8 of BECC 103 we gave some preliminary ideas of inflation – its definition, causes and effects. In this Unit we describe the relationship between inflation and unemployment. In the process, we discuss various types of unemployment and its measurement. Recall that classical economists believed in dichotomy of real and monetary variables. Thus, inflation being a monetary variable should not have any effect on a real variable such as unemployment. Keynesian economists, however, believed that change in monetary variables could affect real variables.

Inflation, as you know, is defined as a *persistent* rise or, a tendency towards persistent rise in the *general level of prices*. As and when there will be


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increase in the general price level, purchasing power of households decline. Increase in inflation is likely to reduce the value of national currency and it's vice versa. Although there are many types of inflation, it can be mainly classified into three types of inflation- demand pull (caused by increase in demand), cost push (cause by increase in cost of production) and built-in inflation (mainly caused by past events). The rate of inflation could vary from a low level to a very high level. As of 2021, Venezuela for example has an inflation rate of nearly 10,000 per cent per year.

Unemployment is a state in which healthy person fails to get employment at prevailing wage. It is caused by various factors that are concerned with demand and supply. There are broadly six types of unemployment- structural (arises due to change in structure of economy, frictional (arises due to time gap between changing jobs), cyclical (arises due to change in cycle of economy i.e. boom, recession, etc.), seasonal (arises due to change in season), disguised unemployment (it is also called hidden unemployment where marginal product of labour is very much close to zero) and under employment in which better qualified person end with low quality, low paid jobs because of excess supply of labour and lower availability of job opportunity.

## 6.2 TYPES OF UNEMPLOYMENT

'Labour force' as a concept includes all persons in the age group of 16 years to 64 years who are willing to work. Thus it includes both employed and unemployed persons. The persons not included in the labour force include those who are retired, too ill to work, keeping the house, or simply not looking for work.

'Work force' as a concept is somewhat narrower – it includes the employed persons only. Thus the difference between the labour force and the work force gives us the number of unemployed.

By employed persons we mean those who perform any paid work (thus homemakers are not included) and those who have jobs. On the other hand, the unemployed as a category includes people who are not employed but are actively looking for work. While considering unemployment we do not take into account those who are not in the labour force. We define unemployment rate as the number of unemployed divided by the total labour force. You should remember that the concept of unemployment implies 'involuntary unemployment'. This concept implies that a person is willing to work at the prevailing wage rate, but cannot find work.

There are three types of unemployment, viz., frictional, structural and cyclical. We explain the differences below.

(i) Frictional unemployment: It takes place because people switch over from one job to another. In many cases the tenure of job gets over and workers remain unemployed till they get another job. In other cases workers migrate from one region to another in search of better jobs or opt to remain out of job for short time periods. Frictional unemployment takes place because in an economy with imperfect information, job search and matching is not smooth and there are frictions in the economy.

(ii) Structural unemployment: It results from the mismatch between supply and demand for different kinds of jobs. For example, in recent years, the number of engineers and management professionals looking for jobs in India has been much higher than available jobs. This has resulted in a number of persons with technical qualification opting for low qualification jobs. Structural unemployment takes place largely due to structural shifts in an economy and adjustments to such shifts take time. A large number of educational institutions in India have discontinued their engineering education programmes.

(iii) Cyclical unemployment: It arises due to fluctuations in aggregate demand, which is a part of business cycles. When aggregate demand declines, there is simultaneous decline in the demand for labour and consequent increase in unemployment. On the other hand, a general boom in the economy increases the demand for labour and unemployment decreases. Thus cyclical unemployment is pro-cyclical in nature.

Empirical data shows that the labour force in an economy is much less than the total population. Total labour force in India, according to certain sources, is about 50 crores compared to an estimated population of 138 crores in 2020. Persons above 65 years and children below 15 years of age however should not be taken into consideration while comparing the size of the labour force to total population. A relevant ratio in this context is the 'Labour Force Participation Rate (LFPR)'. It is defined as follows:

$$\text{LFPR} = \frac{\text{Size of the labour force}}{\text{Size of population in the age group of } 16-64 \text{ years}}$$

The labour force participation rate (LFPR) varies across countries, and over time for the same country. If we take gender into account, there could be male labour force participation rate and female labour force participation rate. Usually, there is a gap between male LFPR and female LFPR. In India, for example, female LFPR is much lower compared to male LFPR. Further, there is a sharp decline in female LFPR in recent years. Such a decline could be due to cultural and structural issues.

The rate of unemployment $u$ is defined as the ratio of unemployed persons to total labour force. The rate of unemployment varies across countries and for a country over time.

## 6.3 PHILLIPS CURVE

The Phillips curve, named after A W Phillips, describes the relationship between unemployment and inflation. In 1958 Phillips, then professor at London School of Economics, took time series data on the rate of unemployment and the rate of increase in nominal wage rate for the United Kingdom for the period 1861-1957 and attempted to establish a relationship. He took a simple linear equation of the following form:

$$\dot{w} = a - bu$$

where $\dot{w}$ is the rate of wage increase, $a$ and $b$ are constants and $u$ is the rate of unemployment. Phillips found that there exists a stable and inverse relationship between $\dot{w}$ and $u$, with the implication that lower rate of unemployment is associated with higher rate of wage increase.

Subsequent to the publication of the results by Phillips, many economists followed suit and attempted similar exercises for other countries. Subsequently, it was established that there is a stable relationship between rising wage rate and rising price level. This led some economists to refine the simple equation estimated by Phillips and use of inflation (the rate of increase in prices) instead of wage rate increase. In many cases the scatter of plot of variables appeared to be a curve, convex to origin. As empirical studies reinforced the inverse relationship between the rate of inflation and the rate of unemployment the Phillips curve soon became an important tool of policy analysis.

The policy implication of such a result was astounding – an economy cannot have both low inflation and low unemployment simultaneously. In order to contain unemployment an economy has to tolerate a higher rate of wage increase and vice versa. Thus the Phillips curve justifies the discretionary stabilization policy of a government.

In Fig. 6.1 we depict a typical Phillips curve. Suppose the economy is operating at point A with inflation rate of $\pi_1$ and unemployment rate of $u_1$. If the government wants to reduce the rate of inflation to $u_2$, the economy has to tolerate a higher rate of inflation ($\pi_2$).

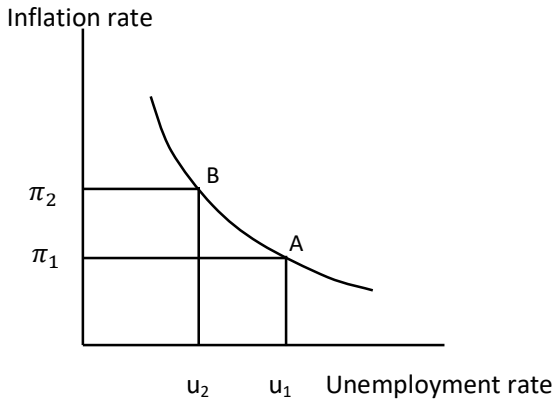


**Fig. 6.1: Phillips Curve**

During the 1960s and early 1970s the Phillips curve was considered to be an important tool of policy analysis. The prescription was simple and straight forward: During periods of high unemployment the government could follow an expansionary monetary policy which leaves more money in the hands of people. Such a policy may accelerate the rate of inflation while lowering unemployment. Conversely, during periods of high inflation the government could follow a contractionary economic policy so as to reduce inflation rate; the cost of such a policy however was supposed to be higher rate of unemployment. Thus, economists believed that there was a trade-off between inflation and unemployment. The government could choose any combination of inflation rate and unemployment rate depending upon the slope and position of the Phillips curve.

During the late 1970s and early 1980s, however, such a belief got shattered. The prescriptions of the Phillips curve did not work at all. Economies suffered from both high inflation and high unemployment. As unemployment increased, there was a lower level of output implying stagnation in economic growth. When governments tried to follow Keynesian policy prescription of higher government expenditure so as to increase aggregate demand, the rate of inflation accelerated. Thus, what most countries experienced was 'stagflation' – a combination of stagnation and inflation. The reason for stagflation was found to be supply shocks due the 'oil crisis' of 1973 and 1979 (refer to Unit 6). Stagflation prompted economists to explore further into the reasons for stagflation.

**Check Your Progress 1**

1. Write a brief note on the various types of unemployment.

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2. Explain how the Phillips curve could offer policy options before the government.

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3. Define the following concepts:
   a) Involuntary Unemployment
   b) Natural Rate of Unemployment
   c) Labour Force Participation Rate
   d) Inflation-Unemployment Trade-Off

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## 6.4 NATURAL RATE OF UNEMPLOYMENT

You might have come across the term full employment, which implies that all workers in the economy are employed. Have you ever thought of such a situation? Can it be attained? When we say that an economy is operating at 'full employment' level, we do not mean that there is zero unemployment. Because of imperfections in markets, rigidities in wages and prices, and various frictions in the economy it is not possible to obtain zero unemployment.

For example, at any point of time, some workers are in the transition process from one job to another (frictional unemployment). Similarly, a fraction of workers cannot be employed because of mismatch between the skill they possess and the skill required (structural unemployment).

In view of the above, a new concept termed 'natural rate of unemployment' was introduced in the 1960s independently by Milton Friedman and Edmund Phelps. Natural rate of unemployment takes into account the frictions and imperfections in the economy and assumes that it is natural for an economy to have certain fraction of its labour force unemployed, at any point of time. We observe that any unemployment that is not natural could be due to business cycle, or policy related.

For empirical purposes natural rate of unemployment is the total of frictional unemployment and structural unemployment in an economy.

It varies across countries, and over time for the same country. For the US economy, for example, natural rate of unemployment is estimated to be between 3.5 per cent and 4.5 per cent. Many countries do not report any estimate of natural rate of unemployment.

The concept of natural rate of unemployment reshaped macroeconomic analysis in subsequent years. As we will see later in this Unit, expectations of economic agents (such as households, firms and government) about future economic environment play a major role in the shape and position of the Phillips curve.

## 6.5 EXPECTATION-AUGMENTED PHILLIPS CURVE

The Phillips curve discussed earlier could not explain stagflation in an economy. For explaining stagflation we need to bring in expectations into our analysis. In fact, Phillips curve given in Fig. 6.1 holds true if there is no change in expectations in the minds of people. In case people perceive that there is a change in expectations, then the Phillips curve will shift. Both adaptive expectations and rational expectations have important implications for Phillips curve.

### 6.5.1 Phillips Curve under Adaptive Expectations

You know from microeconomics that workers and employers take decisions regarding employment on the basis of real wage; not nominal wage. According to Friedman and Phelps, expectations do matter. Thus the 'expected real wage' should be looked into account for determining equilibrium output and wage rate.

Workers usually enter into a contract with the employer regarding their salary for certain time period. During contract period, salary cannot be re-negotiated; it can be changed only after the contract period is over. As the workers are aware of these conditions, they incorporate expected inflation into the contract. For example, if the workers expect that inflation rate would be 3 per cent in the coming year, they will negotiate the wage rate in such a manner that the real wage rate does not decline due to price increase.

For an expected inflation rate of $\pi_1$ per cent, suppose the Phillips curve is given by $SRPC_1$ (see Fig. 6.2). Suppose the economy is at point A. At this point the expected inflation rate is $\pi_1$ (say 3 per cent) and unemployment rate is at the natural rate u* (say 6 per cent). At point A, the workers and firms expect an inflation rate of 3 per cent and they are getting it. Thus there is no pressure on the economy for a change.

There is a possibility of trade-off between inflation and unemployment along the curve $SRPC_1$. If there is higher inflation, then real wage will decline (because nominal wage cannot be increased due to existing contracts). Consequently, firms will employ more labour thereby leading to a decline in unemployment.

Suppose the government pursues an expansionist fiscal policy (government expenditure increases or tax rate decreases), which will boost aggregate demand. As a result, there is an increase in prices (means higher inflation rate). An expansionist monetary policy, such as increase in money supply or decrease in interest rate, will also have the same effect. It will lead to an increase in investment which will, to some extent, increase the demand for labour also. In either case, there is an increase in inflation rate to $\pi_2$ (say 6 per cent). The rate of unemployment reduces to $u_2$ (below the natural rate). It implies that more workers are employed, as a result of which output will be higher than potential output. In Fig. 6.2 we have shown this situation as point B.

Equilibrium at point B, however, is temporary. Workers very soon realize that there is an unexpected increase in inflation rate. In order to compensate for the price rise, workers will demand a higher wage rate. It will lead to a shift in the Phillips curve from $SRPC_1$ to $SRPC_2$. Equilibrium in the economy will be at point C in Fig. 6.2. Consequently, inflation will be at $\pi_3$ while unemployment will be at the natural rate, i.e., u*.

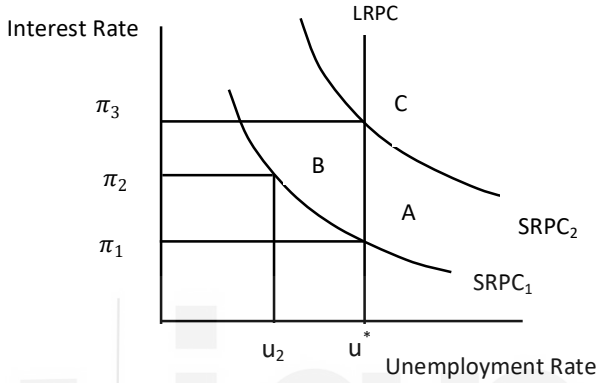


**Fig. 6.2: Shift in Phillips Curve**

Notice that unemployment in the economy is back at the natural rate (6 per cent). The inflation rate however is much higher ($\pi_3$). Thus the attempt of the government to reduce unemployment rate below the natural rate inflation rate, results in higher and higher inflation. In view of this, the natural rate of inflation is often termed as the 'non-accelerating inflation rate of unemployment' (NAIRU). It means that there is no acceleration in inflation if unemployment is maintained at this. Further, the term natural rate of unemployment indicates that it is inflexible, but social optimal. The term NAIRU, on the other hand, does not indicate any social optimality or desirability.

When unemployment is at the natural rate or NAIRU, there will be stability in the rate of inflation. When unemployment departs from the natural rate, there is acceleration or deceleration in inflation rate. Thus if actual unemployment is less than $u^*$, inflation will continue to accelerate – higher and higher in subsequent years. The concept of NAIRU and expectations formation explains the hyperinflation witnessed by many countries. Unless unemployment returns to its natural rate the inflation spiral will keep on accelerating.

The above analysis brings us to an important conclusion. Under adaptive expectations, the short run the Phillips curve is downward-sloping. In the long run however, it is vertical. In Fig. 6.2, the vertical line LRPC depicts the long run Phillips curve. Thus there is no trade-off between inflation and unemployment in the long run.

### 6.5.2 Phillips Curve under Rational Expectations

Under rational expectations economic agents such as firms and households are forward looking. They take into account all available information – past experience as well as present and future developments in the economy. There is no perfect foresight under rational expectations, but the errors cancel out on the whole.

An implication of the above is that actual inflation rate is equal to expected inflation rate. Thus workers and firms do not commit any error regarding wage rate during negotiations. Thus, there is no trade-off between inflation and unemployment under rational expectations. Unemployment rate in the economy is at the natural rate.

Suppose unemployment in the economy is at the natural rate. Firms and workers expect inflation to be at the rate of $\pi_1^e$. Suppose, the government pursues an expansionary policy as a result of which there is an increase in aggregate demand. Consequently, there is an increase in the rate inflation. If this policy was expected by the economic agents, they would have factored in the increase in inflation rate into their decision-making. If the policy is unexpected, then it would have the desired effect, that is, reduction in unemployment. This brings us to an important issue: how effective is government policy under rational expectations? If government policy is expected, it will not have any impact.

**Check Your Progress 2**

1. In 2019 the expected rate of inflation was 7 per cent while actual rate of inflation was 5 per cent. If $\lambda = 0.5$, find out the expected inflation rate for 2020.

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2. How do you reconcile the vertical long run Phillips curve with the downward sloping short run Phillips curve? Explain through a diagram.

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3. Explain the following concepts:

a) Adaptive Expectations

b) Rational Expectations

c) Non-Accelerating Inflation Rate of Unemployment (NAIRU)

d) Long-Run Phillips Curve

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## 6.6 LET US SUM UP

Unemployment results in loss of not only potential output at the macro level but also in income at the individual level. Many a time unemployment culminates into a crisis situation when there is widespread unemployment in the economy. The social sigma and psychological trauma associated with unemployment often compels policy makers to cut down on the rate of unemployment.

The classical economists assumed flexibility in real wage and prices which ensured full employment in the economy all the time. Keynesian economists, however, contest such an assumption and speak about rigidities in wage rate and prices. In case of sticky prices there is a possibility of unemployment as per the Keynesian model.

Phillips curve describes the inverse relationship between inflation and unemployment. It shows the possibility that unemployment can be reduced at the cost of higher inflation.

During the 1970s most economies in the world passed through a phase of stagflation. The trade-off between inflation and unemployment was proved to be false. In order to explain such a situation we bring in expectations into our analysis. There are two models of expectations: adaptive and rational.

According to adaptive expectations, the Phillips curve is stable in the short-run but in the long run it shifts. The long run Phillips curve is vertical. Thus there could be some trade-off between inflation and unemployment in the short-run, but in the long-run there is no trade-off. We explained the process through which the shift in the Phillips curve takes place. According to rational expectation, there is no trade-off between inflation and unemployment. Any policy of the government to reduce unemployment becomes ineffective, as people can forecast the expected changes correctly.

## 6.7 ANSWER/HINTS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1. Your answer should include frictional, structural and cyclical unemployment. Go through Section 6.2 for details.
2. Go through Section 6.3 and refer to Fig. 6.1.
3. These concepts are discussed in Sections 6.2 and 6.3.

**Check Your Progress 2**

1. Refer to the text in Section 6.5. You should explain Fig. 6.2.
2. These concepts are defined in Sections 6.5.

# UNIT 7 FINANCIAL MARKETS*

**Structure**



## 7.0 OBJECTIVES

After going through this unit you will be in a position to

- explain the role and nature of financial markets;
- distinguish between various types of financial markets;
- appreciate the recent trends in financial markets in India;
- explain how equilibrium is attained in foreign exchange market; and
- identify derivative products such as currency swaps, futures, and options.

## 7.1 INTRODUCTION

A stable financial system requires sound financial institutions, well functioning financial markets and robust financial infrastructure. Financial markets bring together buyers and sellers to trade in financial assets such as stocks, bonds, derivatives and currencies. They play an important role in allocating resources in


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an efficient manner. They also facilitate the price discovery process in financial instruments and are the conduit of transmitting policy signals to real economy. While stable markets play an important role in the pursuit of economic growth, volatile movements in financial markets have serious implications for macro-economic performance. We can classify markets according to their special features as debt or equity markets; primary and secondary markets; money and capital markets; domestic and foreign exchange markets. In this Unit, we will be discussing the foreign exchange market in detail along with an instrument of financial markets, i.e., derivatives.

The term foreign exchange refers to the process of converting home currencies into foreign currencies and vice-versa. The market where foreign exchange transactions take place is called foreign exchange market.

Over the last 30 years, financial derivatives market has seen considerable growth and dynamism. A financial derivative is defined as a financial instrument whose value depends on the values of other, more basic, underlying variables. Many different types of forward contracts, swaps, options and other derivatives are regularly traded by financial institutions. We will discuss the nature of these derivative instruments and provide an overview of how they are used.

## 7.2 FINANCIAL MARKETS: ROLE AND TYPES

Financial markets are the centres or arrangements that provide facilities for buying and selling of financial claims and services. Corporations, financial institutions, individuals and government trade in financial products on these markets either directly or through brokers and dealers on organised exchanges or off-exchanges. In financial markets funds are transferred from people who have an excess of available funds to people who have a shortage.

### 7.2.1 Role of Financial Markets

Financial markets play an important role in the economy.

**a) Channelization of Funds**

Financial markets play a crucial role in promoting greater economic efficiency by channelling funds from people who do not have a productive use for them to those who do. Financial markets channel funds from lenders/ savers who have saved surplus funds by spending less than their income to those who have a shortage of funds because they wish to spend more than their income (see Fig. 7.1). The main lenders-savers are households, but business, governments and foreigners also lend occasionally if they have surplus funds.

The most important borrowers-spenders are business and governments. Households and foreigners also borrow sometimes to finance their consumption.

**Fig. 7.1: Channelization of Funds in Financial Markets**

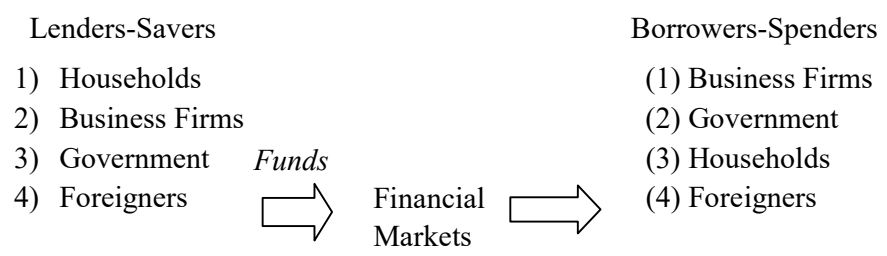


**Fig. 7.1 shows the channelization of funds from the lenders-savers to the borrowers-spenders through financial markets.**

**b) Promotion of Economic Efficiency**

Well functioning financial market is an essential determinant of high economic growth and plays an essential role in leading a country out of low income trap. A well functioning financial market facilitates the movement of funds from people who lack productive investment opportunities to people who have such opportunities. This efficient allocation of capital when employed to produce more capital, contributes to higher production and efficiency for the overall economy and thus facilitates higher economic growth.

**c) Improvement in Economic Welfare**

Activities performed in financial markets have direct bearing on personal wealth, behaviour of business and consumers, and business cycles. A well functioning market improves the well-being of consumers by allowing them to schedule their purchases. It provides funds to consumers to buy what they need without forcing them to wait until they have saved the entire purchase amount.

### 7.2.2 Types of Financial Markets

The term 'financial market' is broader term which can be sub-divided into several categories. Based on the essential features of these markets we classify financial markets as follows:

**a) Debt and Equity Markets**

A firm or an individual can obtain funds in a financial market in two ways. The most common method is to issue a debt instrument such as bond or a mortgage, which is a contractual agreement by the borrower to pay the holder of the instrument fixed amount at regular intervals (interest and principal payments) until a specified date (the maturity date), when a final payment is made. The maturity of a debt instrument is the number of years (term) till its expiry. A debt instrument is short term if its maturity is less than a year and long term if its maturity ten is years or longer.

The second method of raising funds is by issuing equities, such as common stocks, which are claims to share in the net income and asset of the firm. Owning stock means that you own a portion of the firm and thus have the right to vote on important decisions of the firm.

**b) Primary and Secondary Markets**

A primary market is a financial market in which new issue of a security (security is a generic term for financial instruments such as bond, stock or option) is sold to initial buyers by the corporation or the government agency. At different times and in different countries, different methods have been used to sell new issues of securities to investors. The issuer may sell directly to investors; it may pay a broker certain commission to distribute the new issue; or it may sell the whole issue to an underwriter who re-sells it to the public. Primary markets mobilize savings and supply fresh or additional capital to business units.

Secondary markets, on the other hand, deal in securities already issued, or existing, or outstanding and thus are known as indirect markets. Secondary market is a place where stocks that have been previously issued (in primary markets) can be resold. The Bombay Stock Exchange is an example of secondary market. Other examples are foreign exchange markets, futures markets and option markets. Secondary market serves two important functions. First, it provides liquidity to the financial instruments by making it easier and quicker to sell these instruments to raise cash. The increased liquidity of these instruments then makes them more desirable. Second, it determines the on-going price of the securities issued earlier by firms in the primary market.

**c) Money and Capital Markets**

The difference in the two markets is the period of maturity of financial assets issued in these markets. Money market is a financial market in which only short term debt instruments with original maturity of less than one year are traded. Treasury bills market, call money market and commercial bills market are the examples of the money market. Capital market is a financial market in which longer term debt generally with original maturity of one year or greater and equity instruments are traded. Stock markets and government bonds market are examples of the capital market. Equity market, debt market, and derivatives market also form part of capital market.

**d) Foreign Exchange Market**

Trade between countries involve the mutual exchange of different currencies and bank deposits denominated in different currencies. Foreign exchange market facilitates the trading of currencies and bank deposits denominated in foreign currency. Transactions conducted in the foreign exchange market determine the rate at which currencies are exchanged, which in turn determine the cost of purchasing foreign goods and financial assets.

**Check Your Progress 1**

1) What is meant by foreign exchange market?

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2) What are the different types of financial markets?

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3) Enumerate the role of financial markets.

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## 7.3 RECENT TRENDS IN FINANCIAL MARKETS IN INDIA

Financial markets in India have witnessed a fundamental transformation in the years since economic liberalization. The going has not been smooth all along but the overall effects have been largely positive. Over the decades, India's banking sector has grown steadily in size (in terms of total deposits) at an average annual growth rate of 18 percent. As of 2021, there are 135 commercial banks in operation with 12 of them state owned, 22 private sector banks, and 46 foreign banks. Although state owned banks dominate the financial sector (they account for over 80 percent of deposits and assets), the years since liberalization have seen the emergence of new private sector banks as well as the entry of several new foreign banks. Private banks are today increasingly displacing the nationalized banks from their position of pre-eminence. Though the State Bank of India remains the largest bank in the country by far, new private banks such as ICICI banks, Axis bank and HDFC bank have emerged as important players in the retail banking sector. The proportion of non-performing assets (NPAs) in the portfolios of the banks is one of the important indicators of the health of the banking sector. The foreign banks have the healthiest portfolios and the nationalized banks the worst, but the downward trend across board in NPAs is indeed a positive feature. Equity markets have also experienced difficult times as well. Since economic liberalisation of 1991, firms have relied more on equity capital to mobilise funds. Market capitalization as percentage of GDP has

increased significantly. While it was 45.13 per cent in 2003, it increased to 88 per cent in 2017. Although GDP has risen faster than before, the long term growth in equity markets has been much higher. The transition has not been smooth all along however. At least two major bubbles, in 1998 and again in 2001, rocked the Indian stock markets since economic liberalization. Several institutions have played an important role in these recurring crises including inappropriate monitoring of the bourses. Nevertheless, institutions have doubtlessly improved and have become more transparent over time. The time honoured *badla system* of rolling settlements is now gone and derivatives have firmly established themselves on the Indian scene.

The introduction and rapid growth of financial derivatives have been one of the important changes in the Indian financial sector since liberalization. The fixed income derivatives have witnessed considerable growth. The interest rate swap and forward rate agreement are being frequently used in inter-bank transactions as well as for hedging of corporate risk.

During the last decade three significant trends of (1) financial convergence, (2) financial engineering, and 3) financial inclusion have emerged. Financial convergence or universal banking is a practice whereby all financial services are made available to customers under one roof. For example, a bank, apart from its ordinary business of accepting deposits and lending money, may also offer investment banking, credit card services, and sell insurance policies.

Financial engineering is about the development and creative application of financial technology for solving financial problems, exploiting financial opportunities, and adding value. Financial inclusion has repeatedly been mentioned in policy announcement of many countries. Financial inclusion means provision of useful and affordable financial products and services to all businesses and people. Thus it implies opening of savings bank account, subscription to insurance policies, and access to credit.

## 7.4 FOREIGN EXCHANGE MARKET

Foreign exchange market is an important financial market as it has strong influences on macroeconomic variables, particularly exports and imports. In foreign exchange market currencies of different countries are traded for one another. The foreign exchange market is not a single location in which currencies are traded. It rather refers to the array of institutions through which people buy and sell currencies. It includes a hotel desk clerk who provides currency exchange as a service to hotel guests, brokers who arrange currency exchanges worth billions of dollars, and governments and central banks that exchange currencies. Major currency dealers are linked by computers so that they can track exchange rates for various currencies all over the world.

### 7.4.1 Spot Exchange Rate and Forward Exchange Rate

Central to the foreign exchange market is the rate at which currencies are traded for one another. This is called the exchange rate. There are two kinds of

exchange rate transaction. The predominant one is the spot transaction which involves immediate exchange of bank deposits. Two parties agree to an exchange of bank deposits and execute the deal immediately. Exchange rates governing such "on the spot" trading are called spot exchange rates and the deal is called a spot transaction. Forward transactions involve the exchange of bank deposit at some specified future date – one that may be 30 days, 90 days or even several years away. The exchange rates quoted in such transactions are called forward exchange rates. In a 30-day forward transaction, for example, two parties may commit themselves on April 1, 2019 to a spot exchange of €88,000 for $100,000 on May 1, 2019. The 30 day forward exchange rate is therefore € 0.88 per dollar and it is generally different from the spot rate, and from the forward rates applied to different future dates.

### 7.4.2 Equilibrium in the Foreign Exchange Market

The rates at which most currencies exchange for one another are determined by demand for and supply of the currencies concerned. We define exchange rate as the amount of domestic currency required for purchase of one unit of foreign currency. Let us discuss how a model of demand and supply operate in the foreign exchange market.

The demand curve for a currency, say dollars, relates the number of dollars buyers want to buy in any period to the exchange rate. An increase in the exchange rate means it takes more domestic currency to buy one unit of foreign currency. Thus increase in exchange rate is similar to depreciation of a currency in the foreign exchange market. A higher exchange rate, in turn, makes foreign goods and services more expensive and reduces the demand for foreign goods (that is, imports). Increase in exchange rate is thus likely to reduce the demand for foreign currency. Consequently, the demand curve for foreign exchange is downward sloping, as in Fig. 7.2.

The supply curve of foreign exchange (say dollars) emerges from a similar process. When people and firms in the United States purchase goods, services, or assets in foreign countries, they must purchase the currency of those countries first. They supply dollars in exchange for foreign currency. The supply of dollars on the foreign exchange market thus reflects the degree to which people in the United States are buying foreign money at various exchange rates. A higher exchange rate means that a dollar trades for less foreign currency (say, euro). In effect, the higher exchange rate makes foreign goods and services dearer to the U.S. buyers, so the U.S. consumers will purchase less foreign goods and services.

People will thus supply more dollars at a higher exchange rate; we expect the supply curve for dollars to be upward sloping, as suggested in Fig. 7.2. In addition to private individuals and firms that participate in the foreign exchange market, most governments participate as well. A government might seek to lower its exchange rate by selling its currency; it might seek to raise the rate by buying

its currency. Although governments often participate in foreign exchange markets, they generally represent a very small share of these markets. The most important traders are private buyers and sellers of currencies.

In Fig. 7.2, the equilibrium exchange rate is the rate at which the quantity of dollars demanded equals the quantity supplied. Here, equilibrium occurs at exchange rate E, at which Q dollars are exchanged per period.

**Fig. 7.2: Demand for and Supply of Foreign Exchange**

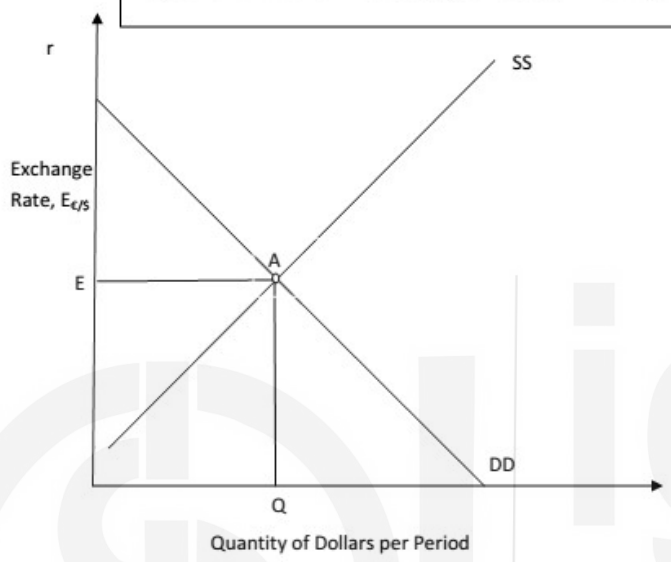



Fig. 7.2: DD is the demand curve for dollars which relate the number of dollars buyers want to buy in any period to the exchange rate. SS is the supply curve for dollars. Equilibrium occurs at exchange rate, E at which Q dollars are exchanged per period.

### Shifts in the Demand for and Supply of Foreign Currency

People purchase a country's currency for two quite different reasons: to purchase goods or services in that country or to purchase the assets of that country – its money, its capital, its stocks, its bonds, or its real estate. Both of these motives must be considered to understand why demand and supply in the foreign exchange market may change. One thing that can cause the price of the dollar to rise, for example, is a reduction in bond prices (implies increase in interest rate) in the U.S. markets. Fig. 7.3 Panel A, illustrates the effect of this change. Suppose the supply of bonds in the U.S. bond market increases from S1 to S2 in Panel (A). Bond prices will drop. Lower bond prices mean higher interest rates. Foreign financial investors, attracted by the opportunity to earn higher returns in the United States, will increase their demand for dollars on the foreign exchange market in order to purchase the U.S. bonds.

**Fig. 7.3 Panel A: Bond Market**

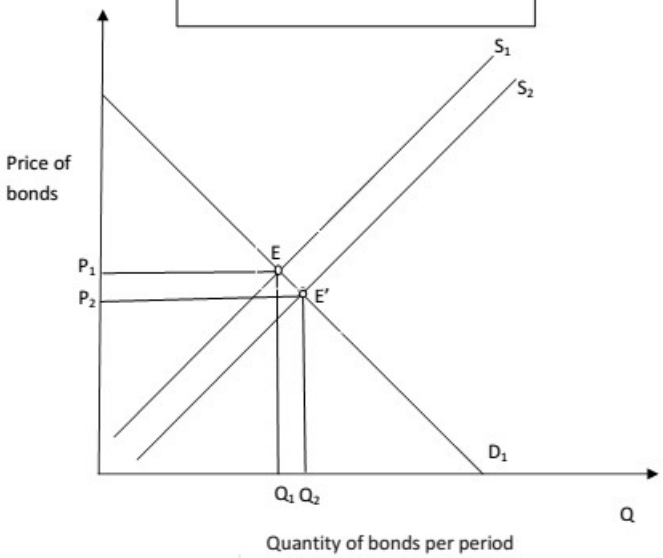
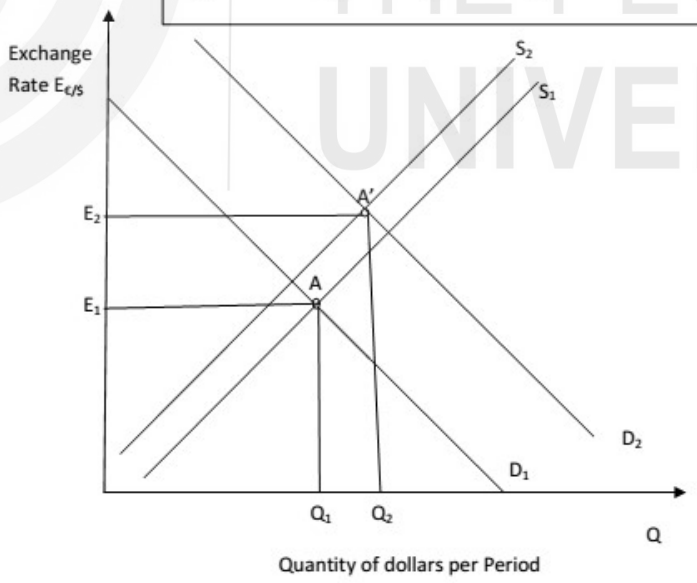



**Fig. 7.3 (A) illustrates the effect of an increase in the supply of bonds from $S_1$ to $S_2$, on bond prices, which fall from $P_1$ to $P_2$.**

Panel (B) of Fig. 7.3 shows that the demand curve for dollars shifts from $D_1$ to $D_2$. Simultaneously, the US financial investors, attracted by the higher interest rates at home, become less likely to make financial investments abroad and thus supply fewer dollars to exchange markets. The fall in the price of U.S. bonds shifts the supply curve for dollars on the foreign exchange market from S1 to S2, and the exchange rate rises from E to E′.

**Fig. 7.3 Panel (B): Foreign Exchange Market**




**In Panel (B), a fall in bond prices will cause rate of interest in home to rise. The demand for dollars will rise from $D_1$ to $D_2$ and the supply of dollars will fall from $S_1$ to $S_2$. The exchange rate rises from $E_1$ to $E_2$.**

**Check Your Progress 2**

1) Explain how equilibrium is attained in foreign exchange markets.

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2) Explain the effect of a rise in bond price on equilibrium exchange rate.

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## 7.5 FINANCIAL DERIVATIVES

Risk is a characteristic feature of all commodity and financial markets. Producers or possesses of these commodities cannot be sure of the prices that their produce or possession may fetch when they have to sell them, in the same way as the buyers are not sure what they would have to pay for their purchase. Both parties in such situations can benefit from a contract whereby forward prices may be fixed and the price risk facing them is eliminated. Forward contracts, currency swaps, future and options came into being primarily for the reason the need to eliminate price risk.

### 7.5.1 Forward Contract

A deal for the purchase or sale of a commodity, security, or any other asset can be in the spot market or in the forward market. A spot or cash market is most commonly used for trading. A majority of our day to day transactions are in the spot market, where we pay on the spot and get the delivery of the goods. In addition to spot purchase, another way to acquire or sell assets is by entering into a forward contract. In a forward contract, the buyer agrees to pay at a later date when the seller delivers the goods. Typically, the price at which the concerned commodity or asset will be traded (in future) is decided at the time of entering into the contract. Thus the price is pegged before hand to avoid the price risk and thus assures the price at which one can buy or sell goods at some future date.

Let us consider an example. Suppose a manufacturer uses certain raw material whose price is subject to variation. Thus there is a risk that the price could move adversely in future. In order to avoid the risk, the manufacturer may enter into a forward contract with the supplier of the raw material. Of course, at the maturity of a contract, if the market price of the commodity is higher than the price agreed, then the manufacturer (buyer of the raw material) stands to gain while the seller is in a losing position. The manufacturer (buyer of the raw material)

happens to lose, if the market price on the stipulated future date is lower than the agreed price.

A forward contract is evidently a reasonable means of avoiding price risk, but it entails an element of risk that a party to the contract may not honour its part of the obligation. Thus, each party faces the risk of default. There is another problem. Once a position of buy or sell is taken in a forward contract, an investor cannot retreat except through mutual consent with other party or buy entering into an identical contract and taking a position that is the reverse of the earlier position. The alternatives are by no means easy. With forward contract entered on a one to one basis and with no standardization, the forward contracts have virtually no liquidity. These problems of default and no liquidity associated with forward contracts led to the emergence of future contract. The future contracts are thus refined forward contracts.

### 7.5.2 Future Contract

A future contract is a standardized contract between two parties where one of the parties commits to sell and the other to buy, a stipulated quantity (and quality, where applicable) of a commodity, currency, security, index or some other specified item at an agreed price on a given date in the future.

Future contracts, called futures, can be traded as financial instruments on commodity exchanges or other future exchanges. People can buy or sell futures like other commodities. When an investor buys a 'futures' (so that she takes a long position) on an organised future exchanges, she is in fact assuming the right and obligation of taking the delivery of the specified item on a specified date. Similarly, when an investor sells a futures (so that she takes a short position), she assumes the right and obligation to make the delivery of the underlying asset. A clearing house or a clearing corporation provides the services for settlement of the futures traded on the exchanges. A clearing house thus plays a pivotal role in the trading of futures.

It is not necessary to hold on to a futures contract until maturity and one can easily close out a position. Either of the parties may reverse their position by initiating a reverse trade, so that the original buyer of a contract can sell an identical contract at later date, cancelling, in effect, the original contract. The fact that the buyer as well as the seller of a futures contract are free to transfer their interest in the contract to another party, makes such contract marketable instruments and thus also highly liquid. The future contracts are thus an improvement over the forward contract in terms of standardization, performance, guarantee and liquidity.

### 7.5.3 Options

The options are similar to the futures in the sense that they are also standardized but are different from them in many ways. Options, in fact, represent the right but not the obligation, to buy or sell a specified amount (and quality) of a

commodity, currency, index or financial instrument, or to buy or sell a specified number of underlying futures contracts at a specified price on or before a given date in future. Like other contracts, there are two parties to an options contract: the buyer (or the holder, owner) who takes a long position, and the seller (or writer) who takes a short position. The options contract gives the owner a right to buy/ sell a particular commodity or other asset at a pre-determined price by a specified date. The price involved is called strike price and the date involved is known as expiration. It is important to understand that such a contract gives its holder the right and not the obligation to buy/sell. The option writer, on the other hand, undertakes upon himself the obligation to sell/buy the underlying asset if that suits the option holder.

There are two types of options: call options and put options. A call option gives an owner the right to buy while a put option gives its owner the right to sell. Like future contracts, options are also tradable on exchanges. The exchange-traded options are standardized contracts and therefore, trading is regulated by the exchanges that ensure the honouring of such contracts.

When an option contract is bought, it is up to the holder, to exercise it or not, and the writer has no say. To illustrate, suppose it is March now and an investor is considering to buy May option contract on TCS involving 600 shares with an exercise price of Rs. 210. If it is a call option, the investor obtains, on purchase of the option, the right to buy 600 shares of TCS at the rate of Rs. 210 per share on the expiration day in May stipulated in the month of March. Obviously, if on that day, the price of the share in the market is quoted at higher than Rs. 210; the investor would like to exercise the call. By buying shares at Rs. 210 and selling them at the prevailing higher price, the investor can make a profit. If, on the other hand, the price of the share is quoted at Rs. 210 or lower, the investor would not exercise the call as it would amount to buying shares costlier than the market price. It may be noted that it is not necessary to hold an option until maturity. The option holder can keep the option till expiry or sell it in the market anytime before it expires. Option markets are highly liquid generally.

### 7.5.4 Currency Swaps

In addition to forwards, futures and options, financial institutions use another important financial derivative to manage risk. Swaps are financial contract that obligate each party to the contract to exchange (swap) a set of payments it owns for another set of payments owned by another party. There are two basic kinds of swap: currency swap involves the exchange of a set of payments in one currency for a set of payments in another currency. Interest rate swaps involve the exchange of one set of interest payments for another set interest payments, all denominated in the same currency.

A typical situation that necessitates currency swap is when a firm has a liability denominated in one currency and an income stream denominated in another currency. For example, an Indian firm may have borrowed Japanese Yen to

finance the acquisition of equipment from Japan. This firm may be engaged in exporting goods to the US and would therefore be receiving its income in US dollars. Thus the firm has to make payments in Japanese Yen to meet its loan commitment while it receives its income in the US dollar. If US dollar weakens against Yen, firm will incur a loss. This situation can be avoided by converting the Japanese Yen liability into a US dollar liability through a currency swap. It involves the exchange of the principal amount in one currency for the principal amount in another currency between the two parties at the beginning of the deal. The principal amount in the two currencies would be re-exchanged at the termination of loan period.

## 7.6 COVERED INTEREST ARBITRAGE

The interest parity theory maintains that in equilibrium, the premium (or discount) on a forward contract for foreign exchange is related to the interest rate differential as per equation (7.1).

$$\frac{F-S}{S} = \frac{r-r^*}{1+r^*} \quad \ldots \quad (7.1)$$

where F and S are the forward and spot exchange rates respectively, r is the domestic rate of interest on a particular class of security, and r* is the foreign rate of interest. This holds true for the pair of securities which are identical in all respects (maturity, risk class, etc.) except for the currency of denomination. When equation (7.1) is satisfied there is no profit opportunity. Empirically however, the parity condition is not always satisfied. Deviations from interest parity condition can occur because of transaction cost, political risk and capital market imperfections; thus giving rise to unexploited profit opportunity.

The most common type of interest rate arbitrage is the covered interest rate arbitrage. Interest rates vary between countries based on their current economic cycles, which creates an opportunity for international investors. By purchasing a foreign currency with a domestic currency, investors can profit from the difference in interest rate between two countries. The exchange rate risk is hedged with a forward contract. Covered interest rate arbitrage is thus, the practice of using favourable interest rate differentials to invest in a higher yielding currency and hedging the exchange risk through a forward currency contract.

Let us take an example. Suppose the dollar deposit interest rate is 1 percent while euro's deposit interest rate is 3.5 percent. Further, suppose that dollar and euro are trading at exchange rate of 1.5$/€. Investing $100,000 dollar in the domestic market at 1 percent interest rate for a year would result in a future value of $101,000. However, exchanging dollar for euro and investing in the Euro zone would result in a future value of $103,500 if exchange rate remains unchanged at the current level. However, a future appreciation of the dollar against the euro if expected, will wipe out these gains. To protect the investors from unfavourable movements of exchange rate, the investor will enter into a forward contract.

Using forward contracts, investors can hedge the exchange rate risk by locking in a future exchange rate. Suppose that the one year forward contract for $/€ would be 1.48 $/€, a slight premium in the market. The exchange back to dollars would therefore result in $1334 loss on the exchange rate, which still yields and overall $2169 gain on the position and offers downside protection.

Despite the strong logic, interest rate arbitrage is not without risk, the foreign exchange markets are fraught with risk, due to lack of cohesive regulation and tax agreements. In fact, some economists argue that covered interest rate arbitrage is not a profitable business unless transaction costs can be reduced to below markets rates. Some potential risk includes differing tax treatment, foreign exchange control, supply or demand inelasticity, transaction cost, and slippage during execution. Besides, such arbitrage opportunity is not common. Market participants will rush in to exploit any arbitrage opportunity, and market forces will prevent occurrence of arbitrage gains, if any.

**Check Your Progress 3**

1) What is the difference between a future contract and an option contract?

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2) What is the difference between a forward contract and a future contract?

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## 7.7 LET US SUM UP

Financial markets play a crucial role in channelizing funds, promoting economic efficiency, and improving welfare of society. Foreign exchange market is a place where currencies of different countries are traded for one another. The foreign currency is demanded to buy goods, services and assets in foreign currency. The equilibrium in the foreign exchange market is attained by equating the supply of foreign exchange with the demand. The rate at which this occurs is the equilibrium exchange rate. This unit also discussed special financial instruments known as derivatives and used for eliminating price risk.

## 7.8 ANSWERS/ HINTS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1) It is an arrangement which provide facilities for buying and selling of foreign exchange.

2) Debt and Equity; Primary and Secondary; Money and Capital; Foreign Exchange Market.

3) Go through Sub-Section 7.2.1 and answer.

**Check Your Progress 2**

1) Equilibrium is attained by equating demand for foreign exchange with supply of foreign exchange. The rate at which equilibrium is attained is the equilibrium exchange rate.

2) A rise in bond price means lower interest rate. Foreign investors will reduce their demand for domestic currency (dollars). Demand for dollars will fall. However, U.S. investors will be more likely to make investments abroad. Hence, they will supply more dollars to foreign exchange markets. The exchange rate will fall.

**Check Your Progress 3**

1) The options represent the right but not the obligation, to buy or sell a specified amount of a commodity, currency, index or financial instrument.

2) A forward contract is negotiated between a seller and a buyer. There is no such concept as the forward market – in this case assets or commodities are traded over the counter between two parties. Futures contracts are traded in an exchange (similar to stock exchange) meant for the purpose.

# UNIT 8 BALANCE OF PAYMENTS*

**Structure**



## 8.0 OBJECTIVES

After going through this unit you will be in a position to

- explain the Balance of Payments accounting principles in an open economy;
- identify the implications of trade deficit and surplus;
- explain how capital flows facilitate BoP equilibrium; and
- explain how equilibrium in the goods market takes place when net exports are added to domestic demand.

## 8.1 INTRODUCTION

A closed economy is one which does not import or export goods and services. In this sense, in the present day world, all countries are open economies; only the degree of openness varies. Openness has three distinct dimensions, viz., 1)


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Openness in goods market which provides an option to consumers and firms to choose between domestic goods and foreign goods, 2) Openness in financial markets which provides an option to financial investors to choose between domestic assets and foreign assets, and 3) Openness in factor markets which provides an option to firms to choose where to locate production and to workers to choose where to work.

We will concentrate on openness in the goods markets in this Unit. In an open economy, the residents have to choose between domestic goods and foreign goods. This brings in the role of the relative price of domestic goods in terms of foreign goods – the real exchange rate. In this Unit, we will include exports and imports in national income identity. In a closed economy there was no need to distinguish between the domestic demand for goods and the demand for domestic goods. However, in an open economy, exports are to be added and imports are to be subtracted to arrive at the demand for domestic goods. The factors which influence exports and imports; will also influence the demand for domestic goods and also the IS curve. The open economy IS curve includes net exports as a component of aggregate demand.

The present Unit also includes the balance of payments accounting principles. Openness in financial markets allows financial investors to hold both domestic assets and foreign assets. Openness in financial markets allows a country to have either trade surplus or trade deficit. A country running a trade deficit is buying more from the rest of the world than it is selling to the rest of the world. In order to pay for the difference between what it buys and what it sells, the country must borrow from the rest of the world. It borrows by making it attractive for foreign investors to increase their holdings of domestic assets. Let us begin with the relation between trade flows and financial flows.

## 8.2 BALANCE OF PAYMENTS ACCOUNTING PRINCIPLES

The demand for foreign exchange arises because its citizens want to buy things whose prices are quoted in foreign currencies. Whenever you (Indian citizen) purchase foreign goods, you first buy foreign currency (Dollar, Euro or Yen) and then make the purchases. The next question is where the supply of foreign exchange comes from. The domestic country, say India, earns foreign exchange when it exports goods, services or assets to another country.

Balance of payments (BoP) is the record of the transactions of the residents of the country with the rest of the world. The simple rule for BoP accounting is that any transaction that gives rise to a payment by a country's residents is a deficit item in that country's BoP.

**Table 8.1: Account of a Country's Balance of Payments (BoP)**

| Credits | Debits |
|---|---|
| (1) Exports of goods | (5) Imports of goods |
| (2) Exports of Services | (6) Imports of Services |
| (3) Unrequited receipts (gifts, indemnities etc. from foreigners) | (7) Unrequited payments (gifts, indemnities etc. to foreigners) |
| (4) capital receipts (borrowings from, capital repayments by, or sale of assets to foreigners) | (8) capital payments (lending to, capital repayments to, or purchase of assets to foreigners) |
| Total Receipts | Total Payments |

The left side of Table 8.1 shows the sources of acquiring foreign currency and the right hand side shows how the foreign currency is spent. The most straight forward way in which a country can acquire foreign currency is by exporting goods (row 1). In an analogous way row (5) shows the value of imported goods. These two rows describe the country's visible trade. Row (2) lists the receipts of the country from the sale of services to foreigners during the period in question. These services include shipping, banking and insurance services, income through tourism, interest and dividends earned on investments abroad. Analogously row (6) covers payments which residents of the country make to foreigners for similar services. Items in row (1), (2), (5) and (6) together form the trade items. The items in row (3) and (7) are referred to as transfer items. The items in row (3) are the receipts which the residents of a country receive "for free" without having to make any present or future payments in return. In a purely analogous way, row (7) describes payments which the country in question makes as gifts, assistance, indemnities etc. Items in rows (1), (2), (3), (5), (6) and (7) enumerate all the payments and receipts made for the current period of time; they all have a flow dimension and refer to a certain value of exports and imports per time period.

Items (4) and (8) are different. They express changes in stock magnitudes and refer to capital receipts and payments. They play a critical role. When a government, a corporation or an individual borrows money from abroad, the country acquires foreign currency. This is recorded as capital inflow. On the other hand, foreign nationals might acquire assets in the domestic country in the form of land, houses, productive plants, shares. All these items are recorded by row (4) along with changes in the country's stock of gold or reserves of foreign currency. Analogously, if residents of the country were to acquire foreign assets or if the government were to lend money to a foreign government, this would give rise to an outflow of foreign currency and are accounted as capital transfers under row (8).

## 8.3 CURRENT AND CAPITAL ACCOUNTS

There are several ways in which the BoP can be broken down vertically. We can first be concerned only with the export and import of goods. This gives us the 'balance of trade'. The balance of trade need not always be balanced. If the country exports more goods than it imports, it is said to have a favourable (or surplus) balance of trade. If it imports more goods than it exports, it has a unfavourable (or deficit) balance of trade.

**Table 8.2: Disaggregation of Balance of Payments**

| Credits | Debits |
|---|---|
| (1) Exports of goods | (5) Imports of goods |
| (2) Exports of Services | (6) Imports of Services |
| (3) Unrequited receipts (gifts, indemnities etc. from foreigners) | (7) Unrequited payments (gifts, indemnities etc. to foreigners) |
| (4) Capital receipts (borrowings from, capital repayments by, or sale of assets to foreigners) | (8) Capital payments (lending to, capital repayments to, or purchase of assets to foreigners) |
| Total Receipts | Total Payments |

Balance of current account is a broader concept than the balance of trade, as it includes i) the balance of trade, ii) the balance of services, and iii) the balance of unrequited transfers. The balance of current account can show a surplus or a deficit. The current account is in surplus if exports exceed imports plus net transfers to foreigners that is if receipts from trade in goods and services and transfer exceed payments on this account. Balance of current account is a very important concept, as it shows the flow aspect of a country's international transactions. We could say that all the goods and services produced within the country during the time period in question and exported, are entered on the credit side of the balance of current account. Similarly, all the goods and services imported and consumed within the country during the same period are entered on the debit side of the balance of current account.

The deficit/ surplus on the current account must be settled. If a country has a deficit on the balance of current account, the country has spent more abroad during the period than it has earned. A way to settle this is by a transaction on the capital account. The capital account records purchases and sales of assets such as stocks, bonds and land, and borrowings and lending from/ to foreigners by government, corporations and individuals, any change in country's gold stock or reserves of foreign currency. The deficit in current account can thus be financed by borrowing abroad, by selling assets or by depleting the reserves of foreign currency.

## 8.4 TYPES OF CAPITAL FLOWS: AUTONOMOUS AND ACCOMODATING

In case a country has a deficit in its balance of current account, there will always be offsetting transactions on the capital account to bring the balance of payments into equilibrium. This can be done either through autonomous or accommodating capital flow. The implications of these two flows for BoP are quite different. Hence we must distinguish between these two flows. Autonomous capital flows are ordinary capital flows which take place regardless of other items in the balance of payments. These flows can be caused by a foreigner paying back a loan, or a person/company taking up a loan abroad by issuing bonds. These transactions have an effect on the country's balance of payments but they are in no way caused by balance of payments consideration. These flows are planned capital movements. The individuals, firms or government for different reasons plan to engage in capital transactions with the rest of the world giving rise to autonomous capital flows.

Accommodating capital movements are capital flows that take place specifically to equalise the balance of payments in the book keeping sense. These flows can take various forms. Foreign firms might accept short term claims on firms in the country or perhaps a foreign government extends a loan to the country. In all these cases the accommodating capital movements are direct consequences of the balance of payments situations. Accommodating capital flows are unforeseen capital flows, which are needed to bring the balance of payments into equilibrium. These flows are ex post in nature. Only at the end of the period can one discover whether accommodating movements have taken place. In the sense they are unplanned and appear as a result of the economic activity which has taken place during that period. If a deficit is settled by an accommodating capital flow, it can be viewed as warning signal for the country. The deficit could have been settled by a short term loan or a depletion of reserves. Usually this condition cannot continue forever. Lenders are seldom willing to extend short term loans forever, and reserves have a tendency to become depleted. The government must in such a situation change its economic policy to abolish the deficit in the balance of payments that has caused the accommodating inflow.

## 8.5 EQULIBRIUM/ DISEQUILIBRIUM IN BALANCE OF PAYMENTS

In a trivial sense the balance of payments will always be in equilibrium. A deficit on the current account will have to be financed by either borrowing abroad or by depleting the reserves of foreign currency. On the contrary, if the country has a surplus on the current account, it will have to export capital by lending money abroad for instance. In this book keeping sense the balance of payments will always balance.

Current Account + Capital Account = 0

In what sense can we then have disequilibrium in balance of payments? If the government has to take recourse of accommodating capital inflow to finance a current account deficit, then it is usually a warning signal. The government must change its economic policy to reduce the deficit in the balance of payments that has caused accommodating inflow. Surpluses do not usually create great problems. The increase in official reserves of the country is referred to as an overall balance of payments surplus. Analogously depletion of reserves through accommodating capital flows is referred to as balance of payments deficit. When the central bank is losing reserves, the balance of payments is in deficit.

**Check Your Progress 1**

1) Explain how surplus on the current account is settled.

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2) Enumerate the difference between Balance of Trade, Balance of Current Account, and Balance of Capital Account.

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3) Do you agree with the statement, "Balance of Payments always balances". List your reasons.

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## 8.6 NATIONAL INCOME ACCOUNTS FOR AN OPEN ECONOMY

Consider the expenditure on an economy's output of goods and services. In a closed economy, all output is sold domestically, and expenditure is divided into three components: consumption (C), investment (I) and government purchases (G). In an open economy some output is sold domestically and some is exported to be sold abroad. We can divide expenditure on an open economy's output, Y, into four components: 1) Cd, consumption of domestic goods and services; 2) Id, investment in domestic goods and services; 3) Gd, Government purchases of

domestic and goods and services; 4) X, Exports of domestic goods and services. We assign subscripts 'd' for domestic and 'f' for foreign, respectively.

The division of expenditure into these components is expressed in the identity

$$Y = Cd + Id + Gd + X \quad \text{... (8.1)}$$

The sum of first three terms, (Cd+Id+Gd), is domestic spending on domestic goods and services. The fourth term, X, is foreign spending on domestic goods and services.

Note that domestic spending on all goods and services equals domestic spending on domestic goods and services plus domestic spending on foreign goods and services. Hence, total consumption equals consumption of domestic goods and service, Cd, plus Consumption of foreign goods and services, Cf ; total investment, I equals investment in domestic goods and services, Id, plus investment in foreign goods and services, If ; and total government expenditure equals government purchases of domestic goods and services, Gd, plus government purchases of foreign goods and services, Gf. Thus,

$$C=Cd+Cf \quad \text{... (8.2)}$$

$$I = Id+If \quad \text{... (8.3)}$$

$$G=Gd+Gf \quad \text{... (8.4)}$$

We substitute these three equations into the equation 8.1:

$$Y= (C– Cf) + (I – If) +(G – Gf)+ X \quad \text{... (8.5)}$$

We can rearrange to obtain

$$Y= C + I + G + X – (Cf + If + Gf) \quad \text{... (8.6)}$$

The sum of domestic spending on foreign goods and services (Cf+If+Gf) is expenditure on imports (M). WE can write the national income accounts identity as

$$Y = C + I + G + X – M \quad \text{... (8.7)}$$

Because spending on imports is included in domestic spending (C+I+G) and because goods and services imported from abroad are not a part of a country's output, this equation subtracts spending on imports. Defining net exports to be exports minus imports (NX = X – M), the identity becomes

$$Y = C + I + G + NX \quad \text{... (8.8)}$$

This equation states that expenditure on domestic output is the sum of consumption, investment, government purchases and net exports. The above equation can be rearranged as

$$NX = Y – (C + I + G) \quad \text{... (8.9)}$$

Net Exports = (Output – Domestic Spending)

Equation (8.9) shows that in an open economy, domestic spending need not equal domestic product, or goods produced in the country. If output exceeds domestic spending, we export the difference: net exports are positive. If output falls short of domestic spending, we import the difference: net exports are negative. The key macroeconomic difference between open and closed economies is that, in an open economy a country's spending in any given year need not equal its output of goods and services, a country can spend more than it produces by borrowing from abroad, or it can spend less than it produces and lend the difference to foreigners.

## 8.7 TRADE IN GOODS, MARKET EQUILIBRIUM, BALANCE OF TRADE

When we assumed that the economy is closed to trade, there is no need to distinguish between the domestic demand for goods and the demand for domestic goods: they meant the same thing. Now, we must distinguish between the two. Some domestic demand falls on foreign goods, and some of the demand for domestic goods comes from foreigners.

In an open economy, the demand for domestic goods is given by

$$Z = C + I + G + X - M/R \quad \text{... (8.10)}$$

The first three terms – consumption (C), investment (I), and government spending (G) – constitute the domestic demand for goods. If the economy were closed, C + I+ G would also be the demand for domestic goods. First, we must subtract imports – that part of the domestic demand that falls on foreign goods rather than on domestic goods. We must be careful here: foreign goods are different from domestic goods, so we cannot just subtract the quantity of imports, M. If we were to do so, we would be subtracting apples (foreign goods) from oranges (domestic goods). We must first express the value of imports in terms of domestic goods. The real exchange rate, R, is defined as the price of domestic goods in terms of foreign goods. 1/R is the price of foreign goods in terms of domestic goods. So, M/R is thus the value of imports in terms of domestic goods. Second, we must add exports (X), that part of the demand for domestic goods that comes from abroad. This is captured by the term X in equation (8.10).

### 8.7.1 Determinants of C, I and G

Consumption, investment and government spending decisions are not affected by the openness of the economy. Real exchange rate affects the composition of consumption spending between domestic goods and foreign goods; however it does not affect the overall level of consumption. Similarly, real exchange rate may affect the composition of investment demand – whether firms buy domestic machines or foreign machines, but it should not affect total investment. Therefore,

$$\text{Domestic Demand: } C + I + G = C(Y-T) + I(Y, r) + G \quad \text{... (8.11)}$$

$$(+) \qquad (+, -)$$

The (+) and (–) signs below a variable indicates the nature of relationship between variables in a function. In equation (8.11) the (+) sign below the variable (Y–T) indicates that there is a positive relationship between the variables C and (Y–T). Similarly, investment, I, depends positively on production, Y, and negatively on the interest rate, r. We assume government spending, G, as given (i.e., exogenous).

### 8.7.2 Determinants of Imports

Imports are domestic demand for foreign goods. It depends positively on both domestic income and exchange rate. Higher domestic income leads to a higher domestic demand for all goods, both domestic and foreign. So a higher domestic income leads to higher imports. Imports also depend on real exchange rate. Depreciation in domestic currency makes foreign goods more expensive. This leads to a decline in demand for foreign goods compared to domestic goods. Thus an increase in the real exchange rate, R, leads to an increase in imports, M. Thus, we write imports as

$$M = \underset{(+,\,+)}{M(Y, R)} \qquad \text{... (8.12)}$$

### 8.7.3 Determinants of Exports

Exports are foreign demand for domestic goods. It depends on foreign income and exchange rate. Higher foreign income means higher foreign demand for all goods, both foreign and domestic. So, higher foreign income leads to higher exports. Higher the price of domestic goods in terms of foreign goods the lower the exports. In other words, the higher the real exchange rate (appreciation in domestic currency), the lower are exports. We therefore write exports as

$$X = \underset{(+,\,-)}{X(Y_f, R)} \qquad \text{... (8.13)}$$

An increase in foreign income, $Y_f$, leads to an increase in exports. An increase (appreciation) in the real exchange rate, R, leads to a decrease in exports.

### 8.7.4 Putting the Components Together

We assume that the price level is given and that output demanded will be supplied. We do not include capital account at this stage, so for the time being current account and balance of payments are the same. Fig. 8.1 plots the various components of demand against output, keeping constant all other variables (interest rate, taxes, government spending, foreign output and real exchange rate) that affect demand. In Fig. 8.1(a), the line DD plots domestic demand, C + I + G, as a function of output, Y. Under our standard assumptions, the slope of the relation between demand and output is positive but less than 1. An increase in output (equivalently, an increase in income) increases demand but less than one-for-one. To arrive at the 'demand for domestic goods', we subtract imports and add exports.

**Fig. 8.1: Panel a: Domestic Demand**

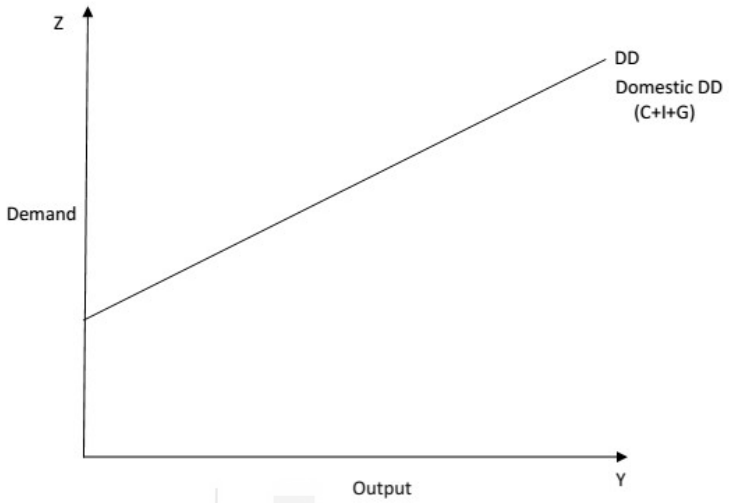


**Fig. 8.1 (a) shows the line DD which plots the domestic demand, C + I + G as a function of output, Y.**

In Fig. 8.1(b) we subtract imports from domestic demand, and it gives us the line AA. The line AA represents the domestic demand for domestic go

ods. The distance between DD and AA equals the value of imports, (M/R). Because the quantity of imports increases with income, the distance between the two lines increases with income.

**Fig. 8.1: Panel b: Domestic Demand and Imports**

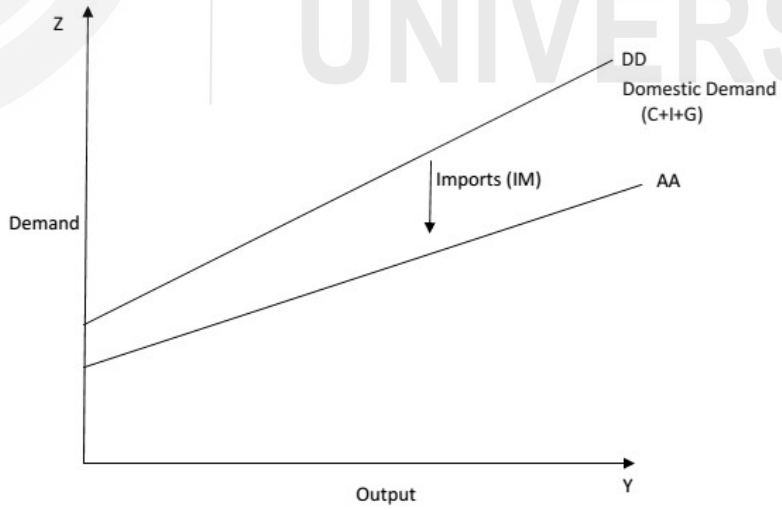


**Fig. 8.1 (b) plots AA line which represents the domestic demand for domestic goods. The distance between DD and AA equals the value of imports.**

We observe that AA is flatter than DD; as income increases, part of the additional domestic demand is for foreign goods rather than for domestic goods. In other words, as income increases, the domestic demand for domestic goods increases less than total domestic demand. Further, AA has a positive slope – an increase in income leads to some increase in the demand for domestic goods.

**Fig. 8.1: Panel c: Demand for Domestic Goods and Net Exports**

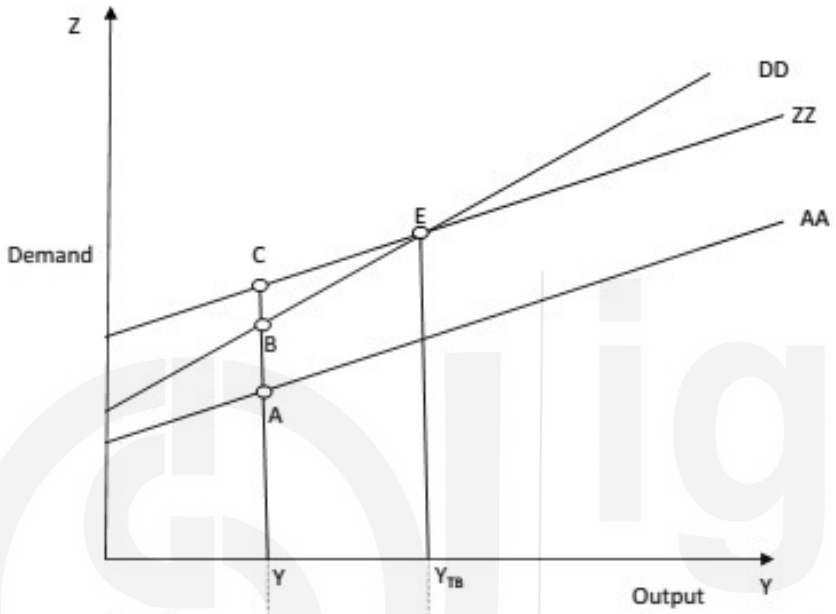


**Fig. 8.1: Panel d: Trade Balance**

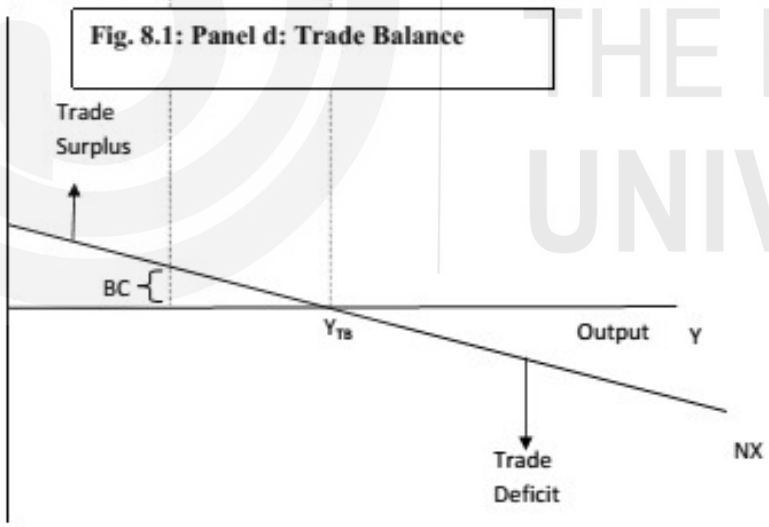


**Fig. 8.1 (c) plots ZZ line which represents demand for domestic goods and is arrived by adding exports to the ZZ line. At output level, Y, exports are given by the distance AC and imports by the distance AB so net exports are given by the distance BC.**

**Fig. 8.1 (d) shows net exports as a decreasing function of output. $Y_{TB}$ is the level of output at which the value of imports equals the value of exports.**

In Fig. 8.1 (c) we add exports, and it gives us the line ZZ, which is above AA. The line ZZ represents the demand for domestic goods. The distance between ZZ and AA equals exports. As exports do not depend on domestic income (they depend on foreign income), the distance between ZZ and AA is constant, i.e., both lines are parallel. Since AA is flatter than DD, ZZ is also flatter than DD.

From Fig. 8.1 (c), we can characterise net exports as a function of output. At output level Y, for example, exports are given by the distance AC and imports by the distance AB, so net exports are given by the distance BC.

This relation between net exports and output is represented as the line NX (for Net Exports) in Fig. 8.1(d). Net exports are a decreasing function of output: as output increases, imports increase, and exports are unaffected, so net exports decrease. Call YTB (TB for trade balance) the level of output at which the value of imports equals the value of exports, so that net exports are equal to 0. Levels of output above YTB lead to higher imports and to a trade deficit. Levels of output below YTB lead to lower imports and to a trade surplus.

### 8.7.5 Goods Market Equilibrium

For the goods markets to be in equilibrium, output (the left side of the equation 8.14) must be equal to the demand for domestic goods (the right side of the equation 8.14).

$$Y = C(Y-T) + I(Y, r) + G + X(Yf, R) - M(Y, R)/R \quad \ldots(8.14)$$
$$(+) \quad (+,-) \quad (+,-) \quad (+, +)$$

The demand for domestic goods is equal to consumption, C plus Investment, I plus Government spending, G plus the value of exports, X minus the value of imports, M.

Consumption, C, depends positively on disposable income, (Y–T).

Investment, I, depends positively on output, Y and negatively on the real interest rate, r.

Government spending, G, is taken as given.

The quantity of exports, X, depend positively on foreign output, Yf and negatively on the real exchange rate, R (a rise in real exchange rate implies and increase in the value of domestic goods in terms of foreign goods that is, a real exchange rate appreciation. This real exchange rate appreciation will make domestic goods costlier in terms of foreign goods and will make foreign goods cheaper for domestic residents. It will thus reduce the volume of exports and raise the volume of imports).

The volume of imports, M, depends positively on output, Y. When domestic income goes up, the spending by domestic residence increase on all goods

including imports. Imports depend positively on real exchange rate. An increase in the real exchange rate that is real exchange rate appreciation will raise the volume of imports by making them cheaper for domestic residents. The value of imports in terms of domestic goods is equal to the quantity of imports divided by the real exchange rate.

**Fig. 8.2: Equilibrium in the Goods Market**

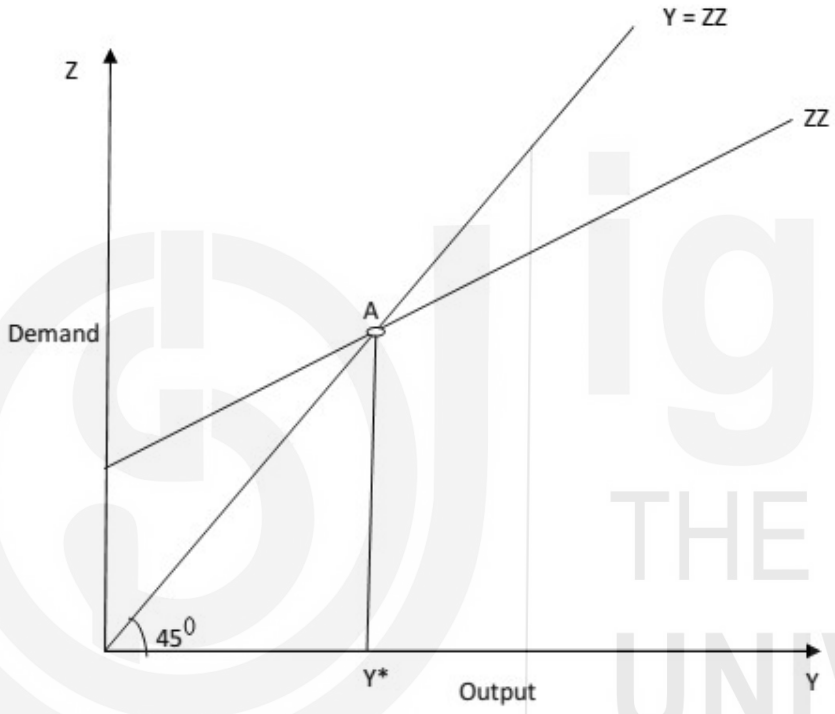


**Fig. 8.2 shows the equilibrium in the goods market is attained at the intersection of the ZZ line (represent the demand for domestic goods) and the Y = ZZ line. Y* is the equilibrium level of output.**

This equilibrium condition determines output as a function of all the variables we take as given, from taxes to the real exchange rate to foreign output. In Fig. 8.2, demand is measured on the vertical axis, and output (equivalently production or income) is measured on the horizontal axis. The line ZZ plots demand as a function of output; this line simply replicates the line ZZ in Fig. 8.1; ZZ is upward-sloping but with slope less than 1. Equilibrium output is at the point

where demand equals output, at the intersection of the line ZZ and the 45° line, Y=ZZ, point A in the figure, with associated output level Y*.

### 8.7.6 Net Exports

The difference between exports and imports (X – M) is called net exports (NX) or the trade balance. If exports exceed imports, the country is said to run a trade surplus. If exports are less than imports, the country is said to run a trade deficit.

Net exports or the excess of exports over imports; depend on our income, Y, which determines import spending; on foreign income, Yf, which affects foreign demand for domestic goods (exports) and on real exchange rate, R.

$$NX = X(Yf, R) - M(Y, R)/R \quad \ldots(8.15)$$

$$= NX(Y, Yf, R) \quad \ldots(8.15a)$$

$$(-, \ +, \ -)$$

Three important results follow from equation (8.15a).

A rise in foreign income other things being equal raises the demand for exports. It improves the home country's trade balance and therefore raises the home country's aggregate demand.

An increase in the real exchange rate leads to a decrease in net exports. A real appreciation of dollar against euro will make imports cheaper for the US residents and US exports costlier for Europeans by raising the price of domestic currency in terms of foreign currency.

A rise in domestic income raises consumption of all goods including imports. Higher import spending worsens net exports and trade balance.

Using equation (8.15a), we can rewrite the equilibrium condition in equation (8.14) as

$$Y = C(Y-T) + I(Y, r) + G + NX(Y, Y_f, R) \quad \ldots(8.16)$$

$$(+) \qquad (+, -) \qquad (-, \ +, \ -)$$

The implications of equation (8.16) are as follows:

An increase in interest rate leads to a decrease in investment spending, and as a result, to a decrease in the demand for domestic goods. It leads, through the multiplier, to a decrease in output.

An increase in the exchange rate leads to a shift in demand toward foreign goods and, as a result, to a decrease in net exports. A decrease in net exports decreases the demand for domestic goods. It leads, through the multiplier, to a decrease in output.

**Check Your Progress 2**

1) What are the factors that affect the exports, imports and net exports?

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2) Distinguish between domestic demand for goods and demand for domestic goods.

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## 8.8 THE IS CURVE IN OPEN ECONOMY

The IS curve shows the equilibrium level of GDP associated with each interest rate. The GDP is in equilibrium when desired expenditure/ aggregate demand equal actual output, Y or when injections equal withdrawals. The open economy IS curve includes net exports as a component of aggregate demand. Therefore, the equation of the IS curve is derived by equating output to aggregate demand which includes consumption, investment, government expenditure and net exports. In equation form we can say

$Y= C(Y–T) + I(Y, r) + G + NX(Y, Y_f, R)$

**Fig. 8.3: Equilibrium in the Goods and Financial Market: IS-LM**

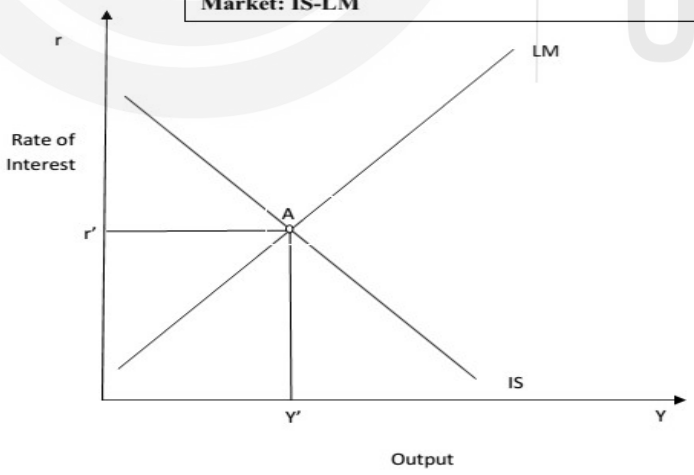


**Figure 8.3 illustrates the IS curve which shows the combinations of interest rate and output for which goods market is in equilibrium and the LM curve which shows the combinations of interest rate and output for which money market is in equilibrium. Equilibrium occurs at point A with equilibrium level of output equal to Y'.**

The IS curve depicted in Fig. 8.3, is negatively sloped because higher interest rates cause investment to fall, which shifts ZZ down and lowers equilibrium GDP. In contrast, lower interest rates cause investment to rise, which shifts ZZ up and raises equilibrium GDP. The curve looks very much the same as in the closed economy, but it hides a more complex relation than before. In all cases, the IS curve shows the relationship between interest rates and level of income at which desired expenditure flows are equal to actual output or desired withdrawals are equal to desired injections. However, the flows of withdrawals and injections are different in a closed economy from an open economy. In a closed economy with no government sector, the IS curve shows the combinations of interest rate and GDP for which saving and investment are equal. In an open economy with government sector, the IS curve shows the combinations of interest rate and GDP for which withdrawals in the form of savings, S; taxes, T; and imports, M; (S + T + M) are equal to injection in the form of investment, I; government purchases, G; and exports, X; (I + G + X). In this case the IS curve is drawn for given values of government spending, exports, autonomous consumption as well as the tax rate.

The LM relation in an open economy is exactly the same as in a closed economy. The LM curve is upward sloping. For a given value of real money stock, M/P, an increase in output leads to an increase in the demand for money, and to an increase in the equilibrium interest rate.

Equilibrium in the goods and financial market, is attained at point A in Fig. 8.3 with output level, $Y'$ and interest rate, , $r'$ .

**Shifts in the IS Curve**

An increase in the exogenous spending, shifts the ZZ curve up in Fig. 8.4, so it shifts the IS curve to the right. In an open economy, changes in real exchange rate, R and foreign income, $Y_f$ shift the IS curve, in addition to changes in autonomous consumption, government expenditure and tax rate. A depreciation (increase in real exchange rate) increases the demand for domestic goods, shifting the IS curve out and to the right. Likewise, an increase in foreign income and with it, an increase in foreign spending on our goods will increase net exports or demand of our goods.

**Fig. 8.4: Shifts in the IS Curve**

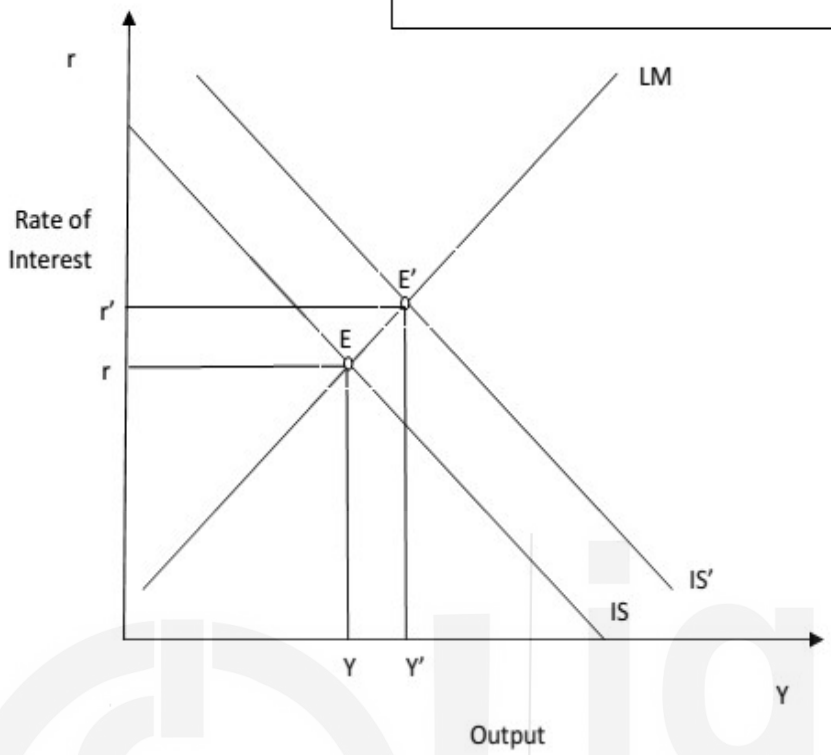


**Fig. 8.4 shows rightward shifts in IS curve on account of rise in foreign demand leading to an increase in interest rate and domestic output.**

Fig. 8.4 shows the effect of a rise in foreign income. Higher foreign spending on domestic goods raises domestic country's exports and hence, at unchanged interest rate, requires an increase in output. This is shown by the rightward shift of the IS curve. The full effect of an increase in foreign demand, thus, is an increase in interest rate and an increase in domestic output and employment. On other hand, a weakening of foreign economies reduces their imports and hence pulls down domestic demand. It leads to decrease in equilibrium output and interest rate.

Fig. 8.4 can also help explain the effect of depreciation in exchange rate. A depreciation raises the net exports at each level of income and hence shifts the IS curve upward to the right. Thus depreciation leads to a rise in our equilibrium output.

Table 8.3 below summarises the effect of different disturbances on the level income and net export.

**Table 8.3: Effects of Disturbance on Income and Net Exports**

| | Increase in Domestic Income, Y | Increase in Foreign Income, $Y_f$ | Increase in Real Exchange Rate (real appreciation), R |
|---|---|---|---|
| Income | + | + | – |
| Net Exports | – | + | – |

**Table 8.3 summarises the effect of disturbances (changes in domestic income, foreign income and real exchange rate) on the level income and net export.**

## 8.9 CAPITAL MOBILITY

In the simplest world, in which exchange rates are fixed forever, taxes are the same everywhere, and foreign asset holders never face political risks, we would expect all asset holders to pick the asset that has the highest return. That would force asset returns into strict equality everywhere in the world capital markets because no country could borrow for less. For now we will assume perfect capital mobility. Capital is perfectly mobile internationally when investors can purchase assets in any country they choose, quickly, with low transaction costs and in unlimited amounts. When capital is perfectly mobile, asset holders are able to move funds across borders in search of highest returns or lowest borrowing costs.

### 8.9.1 International Capital Flows and the Trade Balance

To see the relationship between international capital flows and the trade balance, let us look at the national income accounts identity in terms of saving and investment.

$Y = C + I + G + NX$

Subtract (C + G) from both sides to obtain

$Y - C - G = I + NX$ … (8.17)

Since (Y– C– G) is national saving, S,

$S = I + NX$ , or $(S - I) = NX$ …(8.18)

This form of national income accounts identity shows that an economy's net exports always equal the difference between its saving and investment. The right hand side of the identity, NX, the net export of goods and services, is also called

the trade balance. It tells us how our trade in goods and services departs from the benchmark of equal imports or exports.

The left hand side of the identity is the difference between domestic saving and domestic investment, (S – I), the net capital outflow. Net capital outflow equals the amount that domestic residents are lending minus the amount that foreigners are lending to us. The national income accounts identity shows that net capital outflows always equals the trade balance.

If (S – I) and NX are positive, we have a trade surplus. In this case, we are net lenders in the world financial markets and we are exporting more goods than we are importing. If (S – I) and NX are negative, we have a trade deficit. In this case we are net borrowers in the world, and we are importing more goods than we are exporting. If (S – I) and NX are exactly zero, we are said to have a balanced trade because the value of imports equal the value of exports.

### 8.9.2 Balance of Payments and Capital Flows

We now introduce the role of capital flows within a framework in which we assume that the home country faces a given price of imports and a given export demand. In addition we assume that the world rate of interest, rf, is given. With perfect capital mobility, capital flows into the country at an unlimited rate if the country's interest rate is above the foreign rate of interest, capital outflows will be unlimited.

The Balance of Payments surplus, BP, is equal to the trade surplus, NX, plus the capital account surplus, CF:

$$BP = NX(Y, Y_f, R) + CF(r - r_f) \quad \ldots(8.19)$$

Equation (8.19) shows the trade balance as a function of domestic and foreign income and the real exchange rate, and the capital account as a function of the interest rate differential. An increase in income worsens the trade balance and an increase in interest rate above the world level pulls in capital from abroad and thus improves the capital account. It follows that when income increases, even the tiniest increase in the interest rates is enough to maintain overall balance of payments equilibrium. The trade deficit would be financed by capital inflow.

### 8.9.3 Policy Dilemmas

Countries frequently face policy dilemma, in which a policy designed to deal with one problem worsens another problem. Very often there is a conflict between the goals of external and internal balance.

**Fig. 8.5: External vs. Internal Balance**

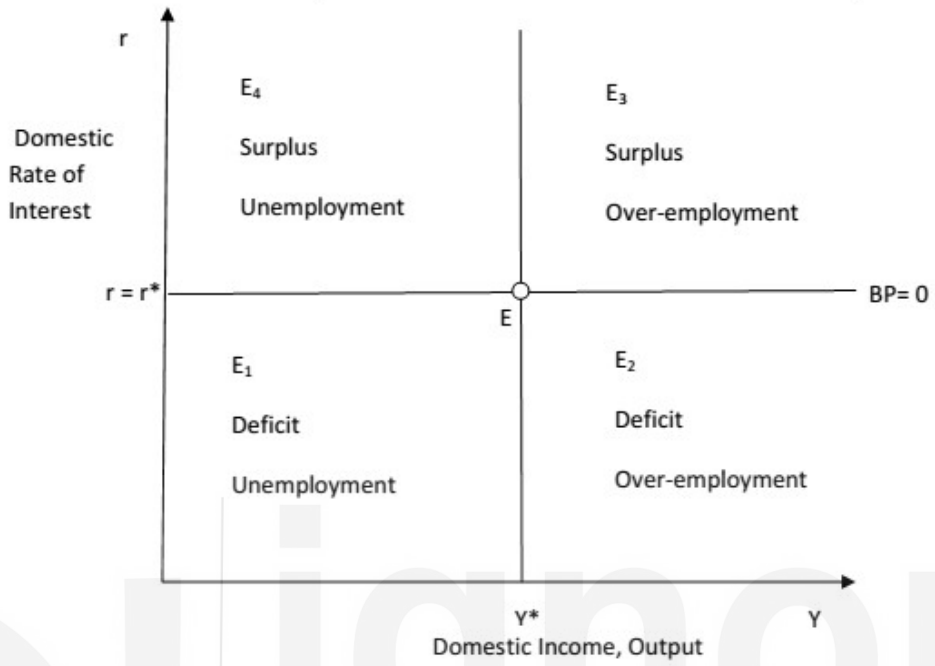


**Fig. 8.5 shows BP = 0 line along which we have Balance of Payments equilibrium. Points above the BP = 0 line correspond to a surplus and points below it to a deficit . The full employment output level is Y*.**

External balance exists when the balance of payments is close to zero. Otherwise, the central bank will run down its reserves in case of net outflow and accumulate reserves in case of net inflow. Internal balance exists when output is at the full employment level. In Fig. 8.5, we show the line BP = 0, derived from equation (8.19), along which we have balance of payments equilibrium. Our key assumption, i.e., perfect capital mobility, forces the BP = 0 line to be horizontal. Only at a level of interest rate equal to that of the rates abroad, can we have external balance: If domestic interest rates are higher, there is a huge capital inflow resulting in surplus in capital account and overall surplus. On the other hand, if domestic interest rate is below foreign interest rates, there is unlimited capital account deficit.

Thus BP=0 must be flat at the level of world interest rates. Points above the BP=0 schedule correspond to a surplus, and points below to a deficit. The full employment output level is Y*. Point E is the only point at which both internal balance and external balance are achieved. Point E1, for example, corresponds to a case of unemployment and a balance of payments deficit. Point E2, by contrast, is a case of deficit and over employment.

We can talk about policy dilemmas in terms of points in the four quadrants of Fig. 8.5 below. For instance, at point E1, there is a deficit in the balance of payments, as well as unemployment. An expansionary monetary policy would deal with the unemployment problem but worsen the balance of payments (Rightward shift of LM curve would increase the equilibrium output/employment but would lower the domestic rate of interest. The lower domestic rate of interest will make the domestic economy less lucrative for foreign investors). If the country can find a way of raising the interest rate, it would obtain financing for the trade deficit. That means that both monetary and fiscal policies would have to be used to achieve external and internal balance simultaneously.

**Check Your Progress 4**

1) Explain how the IS curve is derived.

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2) Explain why there could be a conflict between external and internal balance.

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## 8.10 LET US SUM UP

In an open economy, the residents can consume more than what they produce by borrowing from the rest of the world. All such transactions of the residents with the rest of the world are recorded in the Balance of Payments. Balance of Payments has two main components: the current account and the capital account. A deficit in the current account has to be settled by a transaction in the capital account. A deficit in the current account can be settled by three methods, viz., (i) borrowing abroad, (ii) selling assets, and (iii) depleting foreign exchange reserves.

National Income accounting for an open economy is different from that of a closed economy in the sense that exports are to be added and imports are to be subtracted to arrive at the demand for domestic goods, the ZZ curve. Equilibrium in the goods market is attained by equating national income with the sum of consumption, investment, government expenditure, and net exports. Imports are positively affected by domestic income and real exchange rate. Exports are affected positively by foreign income and negatively by exchange rate. Net

exports, which are the excess of exports over imports, are positively affected by foreign income, and negatively by domestic income and exchange rate. An increase in net exports will raise the domestic demand and equilibrium level of income. It will cause the IS curve to shift rightward.

The unit concluded by presenting a note on capital mobility. Net capital outflows are the amount that domestic residents are lending minus the amount that foreigners are lending to us. The net capital outflow always equals the trade balance. A positive (negative) capital outflow and trade balance implies that we are net lenders (net borrowers).

## 8.11 ANSWERS/ HINTS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1) A surplus in current account is settled by a reverse transaction in the capital account. It must be settled by either lending abroad or buying assets abroad or by accumulating reserves of foreign currency.

2) Balance of trade includes exports and imports of goods. Balance of current account includes balance of trade, balance of services, and balance of unrequited transfers. Balance of capital account records purchases and sales of assets such as stocks and bonds; borrowings and lending from/ to foreigners by government, corporations and individuals; any change in country's gold stock or reserves of foreign currency.

3) It is true only as an accounting principle. However, if deficit is financed by an accommodating capital inflow then it is a warning signal for the government to change its economic policy.

**Check Your Progress 2**

1) Imports are positively affected by domestic income and real exchange rate, while, exports are positively affected by foreign income and negatively by real exchange rate. Net Exports, which is the excess of exports over imports, are positively affected by foreign income and negatively by domestic income and real exchange rate.

2) Go through Section 8.7 and answer.

**Check Your Progress 3**

1) The IS curve is derived by equating national income to the aggregate demand. It is negatively sloped and is drawn for given values of C, G, R, T, r, $Y_f$ .

2) Go through Section 8.9 and answer.

# UNIT 9 EXCHANGE RATE ETERMINATION*

**Structure**



## 9.0 OBJECTIVES

After going through this unit you will be in a position to

- explain the concepts of nominal and real exchange rates;
- distinguish between various types of exchange rate regimes;
- compare returns to assets denominated in different currencies;
- apply the interest parity condition to find the equilibrium exchange rate;
- explain the Purchasing Power Parity (PPP) theory of exchange rate; and
- explain the monetary approach to exchange rate determination.

## 9.1 INTRODUCTION

One of the key economic decisions a country takes is how it will value its currency in comparison to other currencies. An exchange rate regime is how a


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country manages its currency in the foreign exchange market. An exchange rate regime is closely related to the country's monetary policy.

A country can manage its currency in a foreign exchange market under three types of exchange rate regimes, viz., (i) floating exchange rate, (ii) fixed exchange rate, and (iii) managed floating exchange rate. A floating exchange rate regime is where the central bank determines the money supply and let the exchange rate adjust freely according to market forces. In many countries, however, the central bank acts under implicit or explicit exchange rate target and uses monetary policy to achieve those targets. This type of exchange rate arrangement is called fixed exchange rate regime. There is another type, i.e., managed floating, where the central bank influences the exchange rate without having a specific exchange rate path or target. Central to the decision of whether to buy domestic goods or foreign goods is the price of domestic goods relative to foreign goods, that is, the exchange rate.

In this Unit we will discuss how the exchange rate is determined, and the role of exchange rate in international trade. First we learn how exchange rate allows us to compare the prices of goods produced by different countries. Subsequently we describe the international asset market in which currencies are traded. This is followed by a section on asset approach by showing how today's exchange rate responds to changes in the expected future values of exchange rates. The asset approach explains the exchange rate determination in the short run. To understand long term exchange rate movements, we discuss the monetary approach to exchange rate determination. In the long run, the price level plays a key role in determining both interest rate and exchange rate

## 9.2 EXCHANGE RATE REGIMES

As mentioned above, there are three basic types of exchange regimes: floating, fixed, and managed floating. We discuss each of the above types below.

### 9.2.1 Floating Exchange Rate

A floating exchange rate is a type of exchange rate regime wherein a currency's value is allowed to fluctuate according to the foreign exchange market. A currency that uses a floating exchange rate is known as a floating currency. The dollar is an example of a floating currency.

Many economists believe that floating exchange rate is the best possible exchange rate regime because it automatically adjusts to economic circumstances. It enables a country to dampen the impact of shocks and foreign business cycles. Further, it pre-empts the possibility of having a balance of payments crisis. However, they also engender unpredictability as the result of their dynamism.

### 9.2.2 Fixed Exchange Rate

A fixed exchange rate system, or pegged exchange rate system, is a currency system in which governments try to maintain a currency value that is constant against a specific currency or good. In a fixed exchange-rate system, a country's

government decides the worth of its currency in terms of either a fixed weight of an asset, another currency, or a basket of other currencies. The central bank of a country remains committed at all times to buy and sell its currency at a fixed price. In these countries, the central bank does not let the exchange rate adjust freely in whatever manner as implied by equilibrium in the foreign exchange market. Central banks act under implicit or explicit exchange rate targets and use monetary policy to achieve those targets. The targets are sometimes implicit, sometimes explicit; they are sometimes specific values, sometimes bands or ranges. These exchange rate arrangements (or *regimes*, as they are called) have many names. China at present has a fixed exchange rate.

**Pegs, Crawling Pegs, Bands**

At one end of the spectrum are countries with flexible exchange rates, such as the USA or Japan. These countries do not have explicit exchange rate targets. At the other end are countries that operate under *fixed exchange rates.* These countries maintain a fixed exchange rate in terms of some foreign currency. Some peg their currency to the dollar. Still other countries peg their currency to a basket of foreign currencies, with the weights reflecting the composition of their trade.

To ensure that a currency will maintain its 'pegged' value, the country's central bank maintains reserves of foreign currencies and gold. They can sell these reserves in order to intervene in the foreign exchange market to make up excess demand or take up excess supply of the country's currency.

Between these extremes are countries with various degrees of commitment to an exchange rate target. For example, some countries operate under a crawling peg. The name describes it well: these countries typically have inflation rates that exceed the US inflation rate. If they were to peg their nominal exchange rate against the dollar, the more rapid increase in their domestic price level above the US price level would lead to a steady real appreciation and rapidly make their goods uncompetitive. To avoid this effect, these countries choose a predetermined rate of depreciation against the dollar. They choose to 'crawl' (move slowly) vis-à-vis the dollar.

### 9.2.3 Managed Floating

Under this exchange rate regime, the central bank attempts to influence the exchange rate without having a specific exchange rate path or target. Indicators for managing the exchange rate are broadly judgmental (e.g., balance of payments position, foreign exchange reserves, parallel market developments), and adjustments may not be automatic. Intervention may be direct or indirect. The Reserve Bank of India follows a managed floating exchange rate as of now.

## 9.3 NOMINAL VS. REAL EXCHANGE RATES

Central to the decision of whether to buy domestic goods or foreign goods is the price of domestic goods relative to foreign goods. We call this relative price the real exchange rate. The real exchange rate is not directly observable, and you will not find it in newspapers. What you will find in newspapers are nominal exchange rates, the relative prices of currencies.

### 9.3.1 Nominal Exchange Rate

Nominal exchange rate between two currencies can be quoted in one of the following two ways:

- It is the price of the domestic currency in terms of the foreign currency – If, for example, we look at the US and the Euro area and think of the dollar as the domestic currency and the Euro as the foreign currency, we can express the nominal exchange rate as the price of a dollar in terms of Euros. For instance, an exchange rate of 0.86 means $1 is worth €0.86.
- As the price of the foreign currency in terms of the domestic currency – continuing with the same example, we can express the nominal exchange rate as the price of a Euro in terms of dollars. For instance, the exchange rate defined this way is 1.15 which implies €1 is worth $1.15.

Either definition is fine; we define the nominal exchange rate as the price of the domestic currency in terms of foreign currency and denote it by E. When looking, for example, at the exchange rate between the US and the Euro area (from the viewpoint of the US, so the dollar is the domestic currency), E denotes the price of a dollar in terms of Euros (so, for example, E was €0.86/$).

### 9.3.2 Change in Exchange Rate

Exchange rates between most foreign currencies change every day and every minute of the day. These changes are called nominal appreciations or nominal depreciations – appreciations or depreciations for short:

An *appreciation* of the domestic currency is an increase in the price of the domestic currency in terms of a foreign currency. In other words, a unit of domestic currency can buy more units of foreign currency. Given our definition of the exchange rate, an appreciation corresponds to an increase in the exchange rate. When the dollar becomes more valuable relative to other currencies, we say that the dollar has appreciated.

A *depreciation* of the domestic currency is a decrease in the price of the domestic currency in terms of a foreign currency. . In other words, a unit of its currency can buy fewer units of foreign currency. So, given our definition of the exchange rate, a depreciation of the domestic currency corresponds to a decrease in the exchange rate, E. In our example, we say that the dollar has depreciated when it becomes less valuable relative to other currencies.

Although the terms appreciation and depreciation are used to describe movements of exchange rates in free markets, a different set of terms is employed to describe increases and decreases in currency values that are set by government decree. These are called *devaluation* and *revaluation*. These two terms are used when countries operate under fixed exchange rates. The label 'fixed' is a bit misleading: it is not the case that the exchange rate in countries with fixed exchange rates never actually changes. But changes are rare. Because these changes are rare, economists use specific words to distinguish them from

the daily changes that occur under flexible exchange rates. A decrease in the exchange rate under a regime of fixed exchange rates is called devaluation rather than depreciation, and an increase in the exchange rate under a regime of fixed exchange rates is called a revaluation rather than an appreciation. In other words, when an officially set exchange rate is altered so that a unit of a country's currency buys fewer units of foreign currency, we say that the devaluation of that currency has occurred. When the exchange rate is altered so that the currency buys more units of foreign currency, we say that an upward revaluation has taken place.

### 9.3.3 From Nominal to Real Exchange Rate

How do we construct the real exchange rate between the Dollar and the Euro? The US and the Euro area produce many goods, and we want to construct a real exchange rate that reflects the relative price of all the goods produced in the US in terms of all the goods produced in the Euro area. We must use a price index for all goods produced in the US and a price index for all goods produced in the Euro area.

Let P be the GDP deflator for the US, P* be the GDP deflator for the Euro area (as a rule, we shall denote foreign variables with an asterisk) and E be the dollar–euro nominal exchange rate. Two steps are involved in calculating real exchange rate from nominal exchange rate.

1. The price of US goods in dollars is P. Multiplying it by the exchange rate, E – the price of dollars in terms of Euros – gives us the price of US goods in Euros, EP.
2. The price of Euro area's goods in Euro is P*. The real exchange rate (in symbols, say, R), the price of US goods in terms of Euro area's goods, is thus given by

$$R = EP/P^* \quad \text{... (9.1)}$$

The real exchange rate is constructed by multiplying the domestic price level by the nominal exchange rate and then dividing by the foreign price level. Similar to nominal exchange rates, the real exchange rates move over time. These changes are called real appreciations or real depreciations.

An increase in the real exchange rate – that is, an increase in the relative price of domestic goods in terms of foreign goods – is called a **real appreciation**. A decrease in the real exchange rate – that is, a decrease in the relative price of domestic goods in terms of foreign goods – is called a **real depreciation**.

## 9.4 INTEREST PARITY EQUATION

Openness in financial markets implies that people (or financial institutions, for example, investment trusts, that act on their behalf) face a new financial decision: whether to hold domestic assets or foreign assets. They have to make a choice between the holdings of domestic interest-paying assets versus foreign interest-paying assets. Let us think of these assets for now as domestic one-year bonds

and foreign one-year bonds. Consider, for example, the choice between US one-year bonds and Euro one-year bonds, from your point of view, as a US investor: Suppose you decide to hold US bonds.

Let $r_t$ be the one-year US nominal interest rate in year t (the subscript t refers to the year). Then, for every \$1 you put in US bonds, you will get $\$(1 \times r_t)$ next year.

Suppose you decide instead to hold Euro bonds. To buy Euro bonds, you first buy Euros at nominal exchange rate. Let $E_t$ be the nominal exchange rate between the Euro and the Dollar at the start of year t. For every \$1, you get € $E_t$. Let $r_t^*$ denote the one-year nominal interest rate on Euro bonds (in Euros) in year t. When the next year comes, you will have € $E_t$ $(1 \times r_t^*)$. You will then have to convert your Euros back into dollars. If you expect the nominal exchange rate next year to be $E_{t+1}^e$(the superscript 'e' indicates that it is an expectation; you do not yet know what the euro/dollar exchange rate will be in year $t + 1$), each euro will be worth $\$ \frac{1}{E_{t+1}^e}$. So you can expect to have $\$ E_t (1 + r_t^*) \left(1/E_{t+1}^e\right)$ next year for every \$1 you invest now.

Thus, two factors are important while deciding on the bonds you should hold, viz., (i) the relative interest rates in the US and the Euro area; and (ii) the expected nominal exchange rate between Dollar and Euro. You should note that, it is expected exchange rate – therefore, involves certain uncertainty. If investment in a currency is found to be risky (because of country specific incidents such as war, recession, political instability, etc.), there is sudden and widespread outflows of capital from that country. Such conditions lead to unexpected and substantial depreciation of that currency.

Let us now assume that financial investors care only about the expected rate of returns and therefore want to hold only the asset with the highest expected rate of returns. In that case, if both US bonds and Euro bonds are to be held, they must have the same expected rate of returns. In other words, the following relationship must hold:

$$(1 + r_t) = E_t (1 + r_t^*) \left(1/E_{t+1}^e\right) \quad \text{... (9.2)}$$

Reorganising the above, we have

$$(1 + r_t) = (1 + r_t^*) \left(E_t/E_{t+1}^e\right) \quad \text{... (9.3)}$$

Equation (9.3) is called the 'uncovered interest parity relation'. The assumption that financial investors will hold only the bonds with the highest expected rate of returns is obviously too strong, for two reasons:

1) It ignores transaction costs. Going into and out of US bonds requires three separate transactions, each with a transaction cost.

2) It ignores risk. The exchange rate a year from now is uncertain; holding US bonds is therefore more risky, in terms of Euros, than holding Euro bonds.

The adjective 'uncovered' is added to distinguish this relation from another relation called the 'covered interest parity condition'. The covered interest parity condition is derived by looking at the following choice: Buy and hold Euro bonds for one year. Or buy dollars today, buy one-year US bonds with the proceeds and agree to sell the dollars for Euros a year ahead at a predetermined price (called the forward exchange rate). The rate of returns to these two alternatives, which can both be realised at no risk today, must be the same. The covered interest parity condition is a riskless arbitrage condition.

**Interest Rate and Exchange Rate**

Let us get a better sense of what the interest parity condition implies. First, let us rewrite $E_t/E^e_{t+1}$ as $\mathbf{1}/[\mathbf{1} + (\boldsymbol{E^e_{t+1}} - \boldsymbol{E_t})/\boldsymbol{E_t}]$

Replacing $E_t/E^e_{t+1}$ with above expression in equation (9.2) gives

$$(\mathbf{1} + \boldsymbol{r_t}) = \frac{(1+r^*_t)}{[1+(E^e_{t+1}-E_t)/E_t]} \quad \text{... (9.4)}$$

Equation (9.4) indicates the relationship between domestic nominal interest rate, $r_t$ and foreign nominal interest rate, $r^*_t$, and expected rate of appreciation of the domestic currency,

$(E^e_{t+1} - E_t)/E_t$

A good approximation to the above is given by

$$\boldsymbol{r_t} \approx \boldsymbol{r^*_t} - \left(\boldsymbol{E^e_{t+1} - E_t}/\boldsymbol{E_t}\right) \quad \text{... (9.5)}$$

Equation (9.5) is called the interest parity condition. The left-hand side of equation (9.5) is the rate of return on dollar assets and the right-hand side is the expected rate of return on euro assets when expressed in dollars. The interest parity condition thus holds when the expected returns on deposits of any two currencies, measured in the same currency are equal. This is the form of the interest parity condition you must remember: *arbitrage by investors implies that the domestic interest rate must be equal to the foreign interest rate minus the expected appreciation rate of the domestic currency*. Note that the expected appreciation rate of the domestic currency is also the expected depreciation rate of the foreign currency. Thus, equation (9.5) is equivalent to the following: *the domestic interest rate must be equal to the foreign interest rate minus the expected depreciation rate of the foreign currency*.

**Check Your Progress 1**

1) What are the different kinds of exchange rate regimes? State the difference among them.

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2) What is meant by interest parity condition?

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## 9.5 ASSET MARKET APPROACH TO EXCHANGE RATE DETERMINATION

Market determined exchange rates exhibit considerable volatility. A variety of studies shows that the volatility of short-run exchange rate returns is indistinguishable from stock or bond market volatility. Because of this similarity, most economists rely on asset market models to explain short-run exchange rate behaviour. The chief characteristic of an asset market model is its emphasis on forward-looking behaviour. Asset prices today are determined in large part on expectations of the future performance of an asset. If people think an asset will rise in value in the future, they will be willing to pay more for that asset today, and its price will tend to rise. The same logic holds for foreign currencies.

### 9.5.1 Expected Rate of Return to Assets

Suppose today's euro/dollar rate is €1.00 per dollar and the exchange rate you expect after one year is €1.05 per dollar. Then the expected rate of dollar appreciation against the euro is $(1.05 - 1.00)/1.00 = 0.05$ or 5 percent per year. It means that a euro deposit must give 5% extra returns than a dollar deposit to compensate for the loss in value on converting euro into dollar after a year because of dollar appreciation.

Now suppose that today's exchange rate suddenly jumps up to €1.03 per dollar (an appreciation of dollar and a depreciation of euro) but the expected future rate is still €1.05 per euro. The expected rate of appreciation is now only $(1.05 - 1.03)/1.03 = 0.019$ or 1.9 percent instead of 5 percent. Since $r_E$ has not changed, the dollar return on euro deposits, which is the difference between $r_E$ and the expected rate of appreciation, has risen by 3.1 percentage points per year (5 percent – 1.9 percent).

An appreciation of dollar against the euro makes euro deposits more attractive relative to dollar deposits (by increasing the expected dollar returns on euro deposits). To arrive at this result, we have assumed that the expected future euro/dollar rate and interest rates do not change. A dollar appreciation today, for example, means the dollar now needs to appreciate by a smaller amount to reach any given expected future level.

Figure 9.1 shows that for fixed values of the expected future euro/dollar exchange rate and the euro interest rate, the relation between today's euro/dollar exchange rate and the expected dollar returns on euro deposits is an upward sloping schedule.

**Fig. 9.1: Expected Rate of Return of Euro Assets in Dollars**

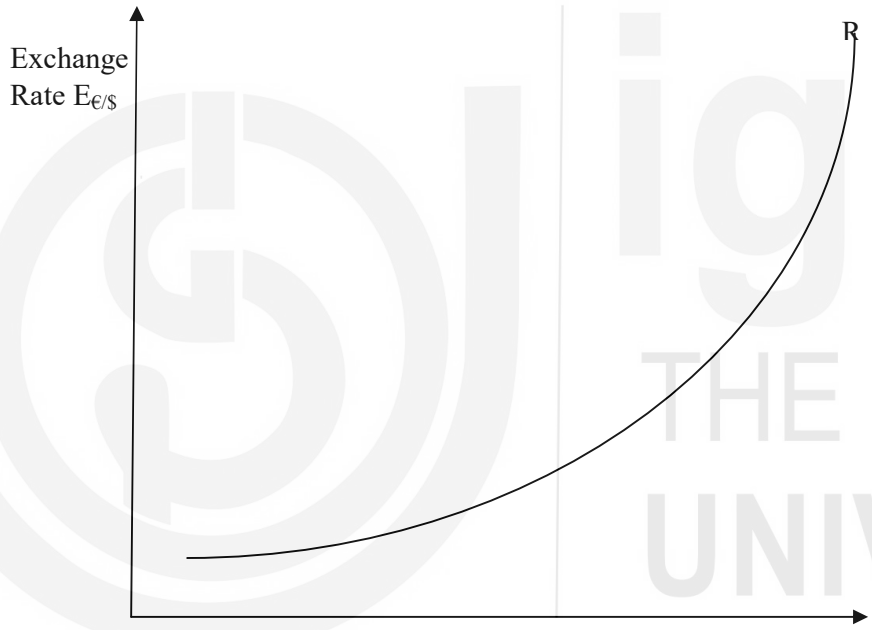



**Fig. 9.1 illustrates the RR schedule as a relation between today's euro/dollar exchange rate and the expected dollar return on euro deposits.**

### 9.5.2 Foreign Exchange Market Equilibrium: Asset Market Approach

Foreign exchange market will be in equilibrium when interest parity condition holds. Foreign exchange market is in equilibrium when deposits of all currencies offer the same expected rate of returns. The condition that the expected returns on deposits of any two currencies are equal when measured in the same currency is called the interest parity condition. Let us see why foreign exchange market is

in equilibrium when the interest parity condition holds. Suppose that the dollar interest rate is 6 percent and euro interest rate is 10 percent but dollar is expected to appreciate at 6 percent over a year. In this circumstance, the expected rate of returns on euro deposits would be 2 percent lower than that on dollar deposits. This means that no one will be willing to continue holding euro deposits and the holders of euro deposits will be trying to sell them for dollar deposits. There will therefore be an excess supply of Euro deposits and an excess demand for Dollar deposits in the foreign exchange market.

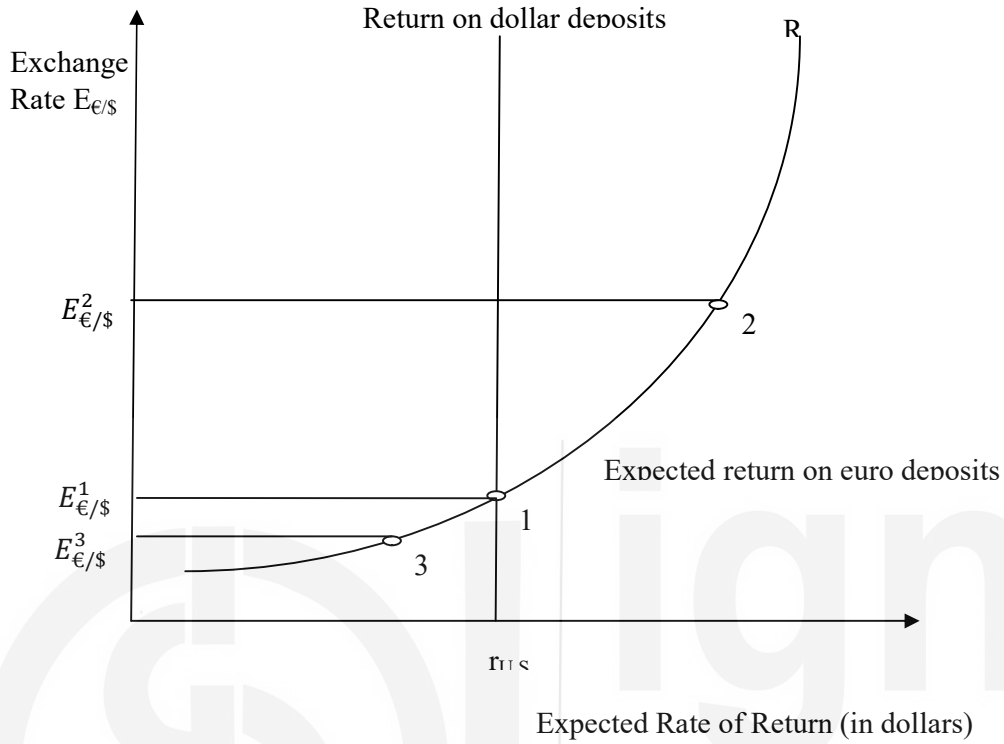
When all expected rates of returns are equal (that is, when interest parity holds), there is no excess supply of certain type of deposit and no excess demand for another. Thus, the foreign exchange market is in equilibrium when the following condition is met:

Expected rate of return on Dollar deposits = Expected rate of return on Euro deposits

$$r_{US} = r_E - \left(\frac{E^e_{€/\$} - E_{€/\$}}{E_{€/\$}}\right) \quad \text{... (9.6)}$$

In Figure 9.2, the vertical schedule indicates $r_{US}$ , the return on dollar deposits measured in terms of dollars. The upward sloping schedule, RR shows how the expected return on euro deposits, measured in terms of dollars depends on the current euro/ dollar exchange rate. The equilibrium euro/dollar rate is the one indicated by the intersection of the two schedules at point 1, $E^1_{€/\$}$ . At this exchange rate, the returns on dollar and euro deposits are equal, so that the interest parity condition, $r_{US} = r_E - \left(\frac{E^e_{€/\$} - E_{€/\$}}{E_{€/\$}}\right)$, is satisfied. The upward sloping schedule measuring the expected euro return on dollar deposits tells us that at the exchange rate $E^3_{€/\$}$ , the rate on euro deposits is less than the rate of return on dollar deposits, $r_{US}$ . In this situation anyone holding euro deposits wishes to sell them for the more lucrative dollar deposits. The foreign exchange market is out of equilibrium. The unhappy owners of euro deposits attempt to sell them for dollar deposits, but because the return on dollar deposits is higher than that on euro deposits at the exchange rate, $E^3_{€/\$}$ , no holder of a dollar deposit is willing to sell it for euro at that rate. As euro holders try to entice dollar holders to trade by offering them a better price for dollar, the euro/dollar exchange rate rises towards $E^1_{€/\$}$ that is, euors become cheaper in terms of dollars. Once the exchange rate reaches $E^1_{€/\$}$ , euro and dollar deposits offer equal returns and holders of euro deposits no longer have an incentive to try to sell them for dollars. The same process works in reverse if we were initially at point 2 with an exchange rate of $E^2_{€/\$}$ . At point 2, the return on euro deposits exceeds that on dollar deposits, so there is now an excess supply of the latter. As unwilling holders of dollar deposits bid for the more attractive euro deposits, the price of euro in terms of dollars tends to rise that is, the Dollars tend to depreciate against the Euro. When the exchange rate has moved to $E^1_{€/\$}$ , rates of return are equalized across currencies and the market is in equilibrium.

**Fig. 9.2: Equilibrium in the Foreign Exchange Market: Asset Approach**




**In Fig. 9.2, the vertical schedule indicates the returns to dollar deposits measured in dollars and the RR schedule which represent the relation between the expected return on euro deposits measured in dollars and the current exchange rate. Equilibrium occurs at point 1, where two schedules intersect.**

## 9.6 PURCHASING POWER PARITY (PPP)

The short run movements in the exchange rates are governed by asset market conditions, the long run fluctuations in the exchange rates are anchored by goods market conditions. The long run pattern is known as purchasing power parity. The notion of PPP is one of the oldest concepts in economics.

*Purchasing Power Parity (PPP)* theory is based on the 'Law of One Price'. Goods denominated in the same currency should have identical price between markets after adjusting for transportation costs. If a price difference exists between two markets, then *arbitrage* is possible. Traders would buy products from the low-price market and sell it in the high-price market. Consequently, prices would converge to one price across all markets as traders shift the supply of goods from the low-price market to the high-price market.

The prices in the high-price market would fall while prices in the low-price market would rise over time.

Price could differ between markets because the price differential reflects the transportation costs of the product from one market to another. Nevertheless, the PPP helps predict changes in exchange rates.

The PPP refers to the idea that the same basket of goods should cost the same when prices are measured in the same currency regardless of where it is located. So, for instance, suppose $P_{\$}$ is the price of a bundle of goods in the United States and let $P_{€}$ equal the price of an identical bundle in Italy (measured in Euros). If the two bundles are to have the same price, the following relationship must hold:

$$\mathbf{E_{€/\$} = \frac{P_{€}}{P_{\$}}} \quad \textbf{... (9.7)}$$

The theory of PPP says that the long-run equilibrium value of the actual exchange rate will be $E_{€/\$}$. The PPP theory therefore predicts that a fall in a currency's domestic purchasing power (as indicated by an increase in the domestic price level) will be associated with a proportional currency depreciation in the foreign exchange market. Symmetrically, PPP predicts that an increase in the currency's domestic purchasing power will be associated with a proportional currency appreciation.

By re-arranging, we get

$$\mathbf{P_{\$} = \frac{P_{€}}{E_{€/\$}}} \quad \textbf{... (9.8)}$$

The left side of equation (9.8) is the dollar price of the reference commodity basket in the US; the right side is the dollar price of the reference basket when purchased in Euro area. Thus, PPP asserts that the price levels of all the countries are equal when measured in terms of the same currency.

Let us take an example to understand this. Suppose the CPI for the US equals $755.3 while the CPI for Euro area is €1,241.2 Euros. Thus, the absolute PPP predicts the exchange rate should be 1.64 Euros per dollar.

$$\mathbf{E_{€/\$} = \frac{P_{€}}{P_{\$}} = \frac{1241.2\ Euros}{755.3\ Dollars} = \frac{1.64\ Euros}{1}}$$

If the spot exchange rate is 1.4 Euros per 1 dollar, subsequently, traders use arbitrage. The CPI in U.S. in Euros is 1057.42 (or $755.3 * 1.4 €/$) which is smaller than the CPI of the Euro area. Thus, traders could profit by purchasing a basket of goods from US and selling it in the Euro area. Thus, they potentially earn €1,241.20 – €1,057.42 = €183.78 per basket of goods.

**Absolute PPP and Relative PPP**

The statement that exchange rates equal relative price levels is sometimes referred to as the absolute PPP. Absolute PPP implies a proposition known as the relative PPP, which states that the percentage change in the exchange rate between two currencies over any time period equals the difference between percentage changes in national price levels during the same time period. Relative

PPP thus translates absolute PPP from a statement about price and exchange rate levels into one about price and exchange rate changes. It asserts that prices and exchange rates change in a way that preserves the ratio of each currency's domestic and foreign purchasing power.

Foreign country's (Euro area in our example) inflation between now and period T = $\pi_€$

Domestic country's (US in our example) inflation between now and period T = $\pi_\$$

$E^0_{€/\$}$ and $E^T_{€/\$}$ are the domestic exchange rates (defined as euros per dollar) measured at time 0 and T. Thus, the exchange rate at time 0 is $E^0_{€/\$} = \frac{P_€}{P_\$}$

The exchange rate at time T is $\boldsymbol{E^T_{€/\$} = \frac{P_€(1+\pi_€)}{P_\$(1+\pi_\$)}}$ **... (9.9)**

Exchange rate change will then be

$$\frac{E^T_{€/\$} - E^0_{€/\$}}{E^0_{€/\$}} = \frac{\frac{P_€(1+\pi_€)}{P_\$(1+\pi_\$)} - \frac{P_€}{P_\$}}{\frac{P_€}{P_\$}} \quad \text{... (9.10)}$$

$$= \frac{1+\pi_€}{1+\pi_\$} - 1 \quad \text{... (9.10 a)}$$

We use linear approximation to obtain the following

$$\frac{E^T_{€/\$} - E^0_{€/\$}}{E^0_{€/\$}} \approx \pi_€ - \pi_\$ \quad \text{... (9.10 b)}$$

If the US price level rises by 10 percent over a year and Euro area's rises by only 5 percent, for example, relative PPP predicts a 5 percent depreciation of the dollar against the euro. The dollar's 5 per cent depreciation against the Euro just gets cancelled with the 5 per cent extra inflation in the US than the Euro area, leaving the relative domestic and foreign purchasing powers of both currencies unchanged.

## 9.7 MONETARY APPROACH TO EXCHANGE RATE DETERMINATION

The theory of PPP is a statement that exchange rates and domestic and foreign price levels should move together in the long run. It says nothing about what causes any of these three variables to move. To close the circle, we need to add elements to the model. This is done with a theory of exchange rate behaviour known as monetary approach to exchange rate determination. The monetary approach to exchange rate is the workhorse theory of long-run exchange rate behaviour. It was developed in the 1970s by economists at University of Chicago and has been widely studied over the past 40 years.

The monetary approach to exchange rate has two fundamental building blocks. The first is purchasing power parity. The second is the agents in the two countries in question have well defined stable demands for real money balances as a function of national income and interest rates. Imposing money market equilibrium and PPP, it is straight forward to show that the theory predicts the following equation for the exchange rate:

$$\mathbf{E}_{€/\$} = \frac{\mathbf{P}_€}{\mathbf{P}_\$}$$

Money Market will be in equilibrium when the demand for money exactly matches the supply of money. The money is demanded for three motives namely transaction motive, precautionary motive and speculative motive by households, firms and governments. The aggregate demand for money in turn is affected by three factors: (i) The interest rate: A rise in the interest rate causes each individual in the economy to reduce their demand for money; (ii) The price level: If the price level rises, agents will have to spend more than before to purchase the same basket, they will therefore have to hold more money; and (iii) Real national income: An increase in the real national income raises the demand for money, given the price level. If P is the price level, r is the interest rate, and Y is real GNP, the aggregate demand for money, $M^d$ , can be expressed as

$$\boldsymbol{M^d = P \times L(r, Y)} \quad \textbf{... (9.11)}$$

Thus, aggregate real money demand, $(r, Y)$ , is equal to

$$\frac{\boldsymbol{M^d}}{\boldsymbol{P}} = \boldsymbol{L(r, Y)} \quad \textbf{... (9.12)}$$

Money Supply: An economy's supply of money is controlled by the central bank. We will thus take the real money supply, $\frac{M^s}{P}$ , as given.

The equilibrium in the money market is given by the equality between real money demand and real money supply.

$$\frac{\boldsymbol{M^s}}{\boldsymbol{P}} = \frac{\boldsymbol{M^d}}{\boldsymbol{P}} \quad \textbf{... (9.13)}$$

From equation (9.12) we get:

$$\frac{\boldsymbol{M^s}}{\boldsymbol{P}} = \boldsymbol{L(r, Y)} \quad \textbf{... (9.14)}$$

By re-arranging equation (9.14), we can explain the domestic price level in terms of domestic money demand and supply.

$$\boldsymbol{P_{US}} = \frac{\boldsymbol{M^s_{US}}}{\boldsymbol{L(r_\$, Y_\$)}} \quad \textbf{... (9.15)}$$

In the case of Euro area

$$\boldsymbol{P_E} = \frac{\boldsymbol{M^s_E}}{\boldsymbol{L(r_€, Y_E)}} \quad \textbf{… (9.16)}$$

The monetary approach makes the general prediction that the exchange rate, which is the relative price of the US and the Euro area, is determined in the long run by the relative supplies of those monies and the relative real demands for them. Shifts in interest rates and output levels affect the exchange rate only through their influences on money demand. In addition, the monetary approach makes a number of specific predictions about the long run effects on the exchange rate of changes in money supplies, interest rates and output levels.

a) Money supplies: Other things equal, a permanent rise in US money supply $M_{US}^{S}$ causes a proportional increase in the long run US price level $P_{US}$. Under PPP, an increase in the U.S. money supply causes a proportional long run depreciation of the dollar against the euro. Predictions in part (a) should seem straightforward. In essence, they say that if a country prints more of its own money (everything else held constant), it will decrease in value in foreign exchange markets. This is because a rise in home (foreign) money will introduce inflationary pressures in home (foreign) country.

b) Interest rates: A rise in the interest rate $r_{\$}$ on dollar denominated assets lowers real U.S. money demand, $L(r_{\$}, Y_{US})$. By equation 9.15, the long run U.S. price level rises, and under PPP the dollar must depreciate against the euro in proportion to this U.S. price level increase.

c) Output levels: A rise in U.S. output raises real U.S. money demand $(r_{\$}, Y_{US})$ , leads to a fall in the long run U.S. price level (equation 9.15). According to PPP, there is an appreciation of the dollar against the euro.

Predictions (b) and (c) show how changes in variables that influence money demand (everything else held constant) also can influence the exchange rate. In particular, growth in the home (foreign) interest rate lowers money demand and raises home (foreign) prices. Working through PPP, this depreciates (appreciates) the exchange rate. Growth in home (foreign) income raises money demand and puts downward pressure on home (foreign) prices. Working through PPP, this appreciates (depreciates) the exchange rate.

**Check Your Progress 2**

1) State the difference between absolute PPP and relative PPP.

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2) Explain the general prediction of the monetary approach to long run exchange rate determination.

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## 9.8 LET US SUM UP

In this unit, we understand how exchange rates are determined through interplay of interest rates, price level and money supply-demand. Exchange rates which are the price of domestic goods relative to foreign goods is central to the decision of export and import and hence, to international trade. A country's decision on whether market forces will determine its exchange rate or government will maintain a constant exchange rate or monetary authority will influence exchange rate, will determine its exchange rate regime- fixed; floating or managed floating. The asset approach to exchange rate determination is based on the premise that asset prices today are determined in large part on expectation of the future performance of an asset. Central to the determination of exchange rate is the interest parity condition which holds when the expected return on deposits of any two currencies, measured in the same currency are equal. Foreign exchange market attains equilibrium when interest parity holds. This is how equilibrium exchange rate is determined. Economists believe that long run exchange rates are determined by the monetary approach to exchange rate determination based on (a) PPP and (b) stable demands for real money balances as a function of national income and interest rates. PPP implies that exchange rates are determined by relative price levels. Imposing money market equilibrium and PPP, the monetary approach makes the general prediction that the exchange rate is fully determined in the long run by the relative supplies of those monies and the relative real demands for them.

## 9.9 ANSWER TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1) There are three basic types of exchange rate regimes: floating – wherein a currency's value is allowed to fluctuate according to the foreign exchange market; fixed – wherein government try to maintain a currency value that is constant against a specific currency or good; managed floating- wherein monetary authority attempts to influence the exchange rate without any specific target.

2) Interest parity condition holds when the expected return to deposits of two currencies are equal, when measured in the same currency. This implies that

domestic interest rate must equal foreign interest rate minus the expected appreciation rate of the domestic currency.

**Check Your Progress 2**

1) Absolute PPP implies that the exchange rates equal relative price levels. Relative PPP states that the percentage change in the exchange rate between two currencies over any period equals the difference between percentage changes in national price levels.

2) It states that the exchange rate is fully determined in the long run by the relative supplies of those monies and the relative real demands for them. Shifts in interest rates and output levels affect the exchange rate only through their influences on money demand.

# UNIT 10 MUNDELL-FLEMING MODEL*

**Structure**



## 10.0 OBJECTIVES

After reading this unit, you will be able to

- state the equilibrium conditions for a small open economy;
- outline the implications of the three assumptions made in the Mundell-Fleming model;
- determine the equilibrium conditions for BoP using the IS-LM framework for a small open economy;
- distinguish between 'fixed exchange rate' and 'floating exchange rate' systems with their advantages and disadvantages;
- discuss the impact of fiscal and monetary policies in an open economy under the floating exchange rate system;
- describe the effect of fiscal and monetary policies in an open economy under the fixed exchange rate system;
- indicate the feasibility of a 'policy choice' between a floating and fixed exchange rate system; and
- write a note on the significance of 'foreign exchange reserves' to an economy with an illustrative comparative profile of different economies.

## 10.1 INTRODUCTION

The most striking feature of today's economies is high degree of integration among financial and capital markets. Policymakers have to consider the


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international exchange rate and interest rate movements while formulating the domestic fiscal and monetary policies. As restrictions on free movement of capital are being dismantled, capital moves to the country which offers highest risk adjusted yield. An expansionary monetary policy reduces the yield of assets by increasing their prices. If this yield falls below the international rate of interest, the international investors will withdraw their money and invest it in other countries where they get higher returns. Capital mobility has thus linked the assets markets of the world together.

In this Unit we will introduce international trade and finance through the Mundell-Fleming model. We begin by introducing the model for a small open economy in the short run. Subsequently, we introduce the IS-LM-BP framework to study the effectiveness of policies in a small open economy. Thereafter, the effectiveness of monetary and fiscal policies for a country that operates with a floating exchange rate regime (i.e. the exchange rate adjusts freely to changes in economic conditions) is discussed. We conclude by discussing the pros and cons of fixed and floating exchange rate regimes.

## 10.2 THE MUNDELL-FLEMING MODEL

Before we start with the formal exposition of the Mundell Fleming Model, we must first understand how equilibrium in 'investment' ($I$) is determined for a small open economy. In an open economy, exports ($X$) just like investment, are an injection into the country's income stream. They are taken to be *autonomous* or independent of domestic income. On the other hand, 'imports' ($M$), just like saving ($S$), represent a leakage out of the income stream. In a small open economy, therefore, the equilibrium condition for investment in the income stream is determined by:

$$I + X = S + M \quad \text{... (10.1)}$$

$$X - M = S - I \quad \text{... (10.2)}$$

The expression ($X - M$) i.e. 'net exports' in equation (10.2) is equal to net foreign investment. If imports exceed exports, the term (X −M) is negative so that domestic investment exceeds domestic saving by the amount of net foreign disinvestment (i.e., the amount by which foreigners are investing in the country).

Developed by Robert Mundell and Marcus Fleming in the 1960s, the Mundell-Fleming model studies the implications of capital mobility under a fixed or flexible exchange rate regime in a small open economy. It is an open economy version of the IS-LM model. It makes one important and extreme assumption, i.e., the economy being studied is a small open economy with perfect capital mobility. This means, the economy can borrow or lend as much as it wants in world's financial markets and, as a result, the economy's interest rate is determined by the world interest rate. More specifically, the assumption can be delineated in terms of its three specific respects as follows:

1. Perfect capital mobility implies that investors can purchase assets in any country they choose, quickly, with low transaction costs and in unlimited amount. With such perfect capital mobility, investors can move capital to the country offering highest return without any restriction. Any change in the rate of interest of any country in the world, will cause capital flows to restore yields to the world level.
2. Small open economy implies that the interest rate in this economy *i*, is determined by the world interest rate *i** i.e. *i*= *i**. The world interest rate is assumed to be exogenously fixed since the economy, relative to the world economy, can borrow or lend as much as it wants in world financial markets without affecting the world interest rate. This means, not only the rate of interest of a small open economy is determined at the world interest rate, *i**, but its 'balance of payments' (BoP) are also in equilibrium at *i* = *i**. Thus, an increase in the domestic interest rate '*i*' above the world rate of interest '*i**', will lead to capital inflows into the domestic economy. These inflows will continue till the domestic rate of interest gets aligned with international rate of interest. Similarly, a fall in *i* below *i**, will trigger huge capital outflows. Such capital outflows from the domestic economy will continue till *i* rises and equals *i**. Hence, the *i* = *i** equation represents the assumption that the international flow of capital is rapid enough to keep the domestic interest rate equal to the world interest.

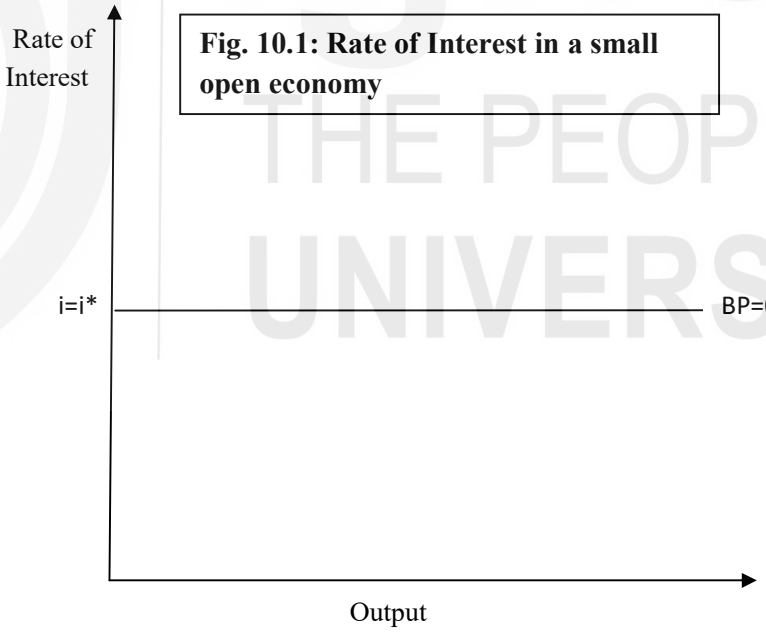



**Fig. 10.1: Rate of Interest in a small open economy**

1. It is also assumed that the price level at home (*P*) and abroad (*P**) do not vary much i.e. the model is designed for analysing short-run fluctuations. Thus, if '*e*' is the nominal exchange rate (defined as the amount of domestic currency per unit of foreign currency), a decrease in nominal exchange rate (i.e. appreciation making foreign goods cheaper relative to domestic goods) will cause a proportionate decrease in real exchange rate by '*ε*' equal to: $^{eP^*}/_{P}$.

## 10.3 EQUILIBRIUM CONDITIONS FOR BOP

The effectiveness of monetary and fiscal policy in modifying income and interest rate under the two exchange rate regimes (fixed and floating) can be explained by using the IS-LM curves framework. The IS curve shows the various combinations of interest rates ($i$) and national income ($Y$) that result in equilibrium in the goods market. The goods market equilibrium condition is expressed as:

$$\boldsymbol{Y = C(Y - T) + I(i) + G + NX(Y, e)} \quad \text{... (10.3)}$$

where, Y is Aggregate income, C is Consumption which depends on disposable income given by Y-T, T is the Taxes, I isInvestment which is inversely related to the world rate of interest i*, and NX (= X-M) is Net Exports [Imports is a positive function of national income (Y) so that 'net exports' is a negative function of Y]. NX is however positively related to changes in nominal exchange rate (e). An increase in the nominal exchange rate (i.e. depreciation) will increase exports and decrease imports thus expanding net exports.

The IS curve is negatively sloped. This is because at lower interest rates, the level of investment is higher. This keeps the level of national income also higher at lower rates of interest, which, in turn, induces a higher level of saving and imports. At each point point of the IS curve, the country's goods market is in equilibrium. Exports, government expenditure and taxes are not affected by the increase in the level of national income, as they are assumed to be exogenous. Thus equilibrium is re-established when $\Delta I = \Delta S + \Delta M$.

Recall that the LM curve shows the various combinations of interest rates ($i$) and national income ($Y$) at which the demand for money equals the supply of money such that the money market is in equilibrium. The LM curve does not change with the introduction of net exports and remains the same as under closed economy. This means

$$\boldsymbol{\frac{M}{P} = L(i, Y)} \quad \text{... (10.4)}$$

where M is the money supply exogenously given by the central bank, P is the price level (assumed to be fixed in the Mundell Fleming-model), L is the demand for real money balances (which relates negatively to the world interest rate and positively to the national income Y).

The BP curve (i.e. the 'balance of payments' curve) shows the various combinations of interest rates ($i$) and national income ($Y$) at which the country's balance of payments is in equilibrium at a given exchange rate. The balance of payments is in equilibrium when a 'trade deficit' (NX<0) is matched by an equal amount of net capital inflow or a 'trade surplus' is matched by an equal amount of net capital outflow or a zero trade balance is associated with a zero net international capital flow. The equation for the BP curve can therefore be written as:

$$\boldsymbol{X - M(Y) + F(i) = 0} \quad \text{... (10.5)}$$

Equation (10.5) states that sum of trade balance ($X–M$) plus the net capital flows F($i$), which relates positively to the interest rate, must be zero for having a balance of payments equilibrium. Note that the BP curve is positively sloped. As the level of income increases, import demand increases whereas export demand does not. Therefore to maintain the balance of payments equilibrium, capital inflow must increase. This happens only if the country's interest rate is higher than the world interest rate. Hence, the more responsive the international short-term capital flows are to changes in interest rates, the flatter would be the BP curve. Fig. 10.2 shows the shape of the BP curve under three scenarios, viz., (i) perfect capital mobility, (ii) perfect capital immobility and (iii) imperfect capital mobility. More specifically, the BP curve is horizontal at the level $i=i^*$ under perfect capital mobility, is vertical under imperfect capital immobility, and is upward sloping under imperfect capital mobility.

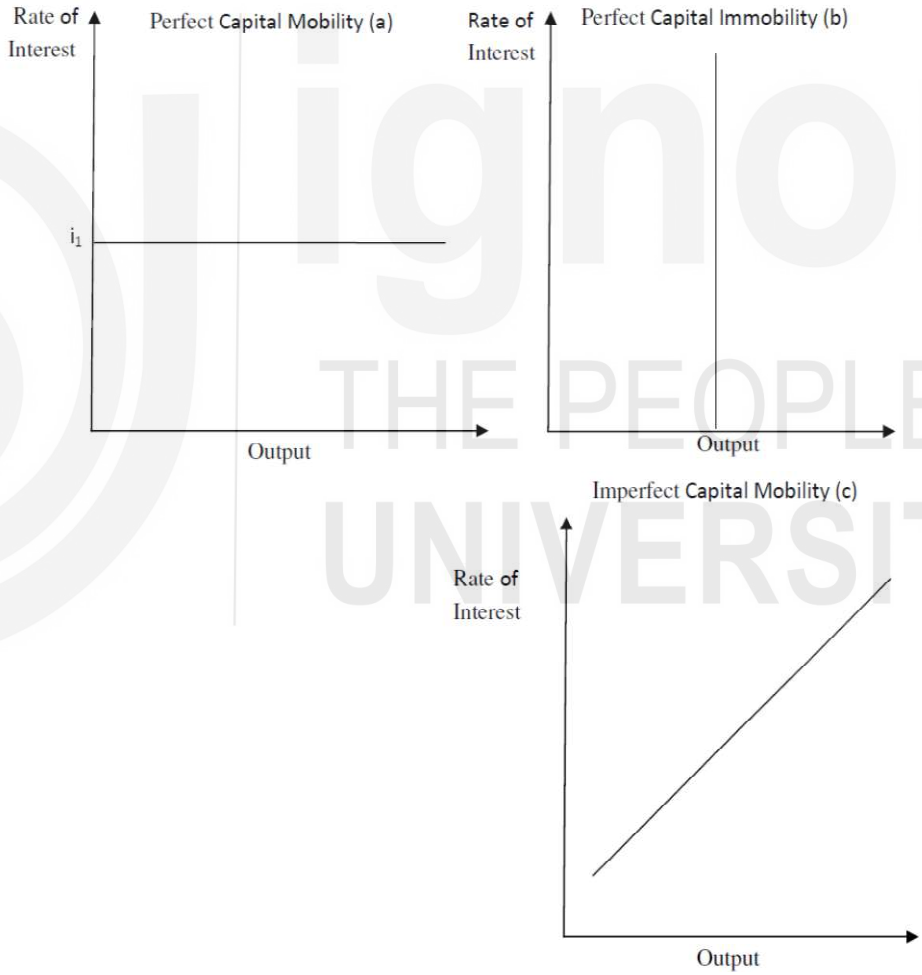
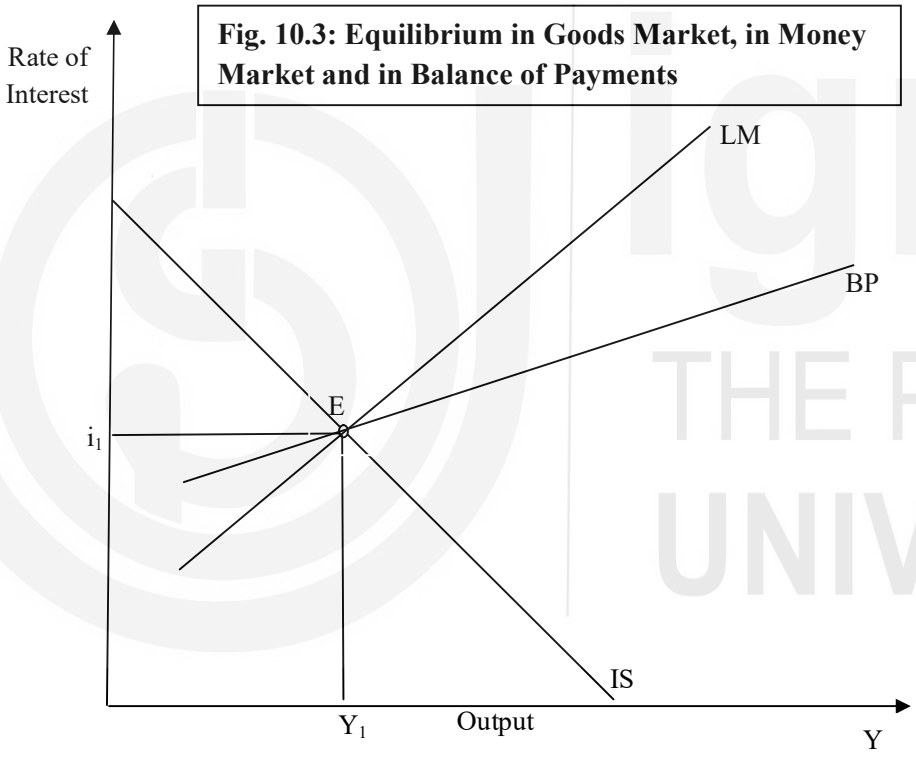



**Fig. 10.2: BP Curve under Three Different Scenarios**

In practice, however, capital is neither perfectly mobile nor perfectly immobile. Also, note that the BP curve is drawn on the assumption of a constant exchange rate. Hence, any devaluation (or depreciation) of the country's currency shifts the BP curve downwards since the country's trade balance improves.

Thus, a lower interest rate and a smaller capital inflows (or greater capital outflows) are required to keep the balance of payments in equilibrium. On the other hand, a revaluation or appreciation of the country's currency shifts the BP curve upward. Fig. 10.3 shows the the point at which the country is simultaneously in equilibrium in the goods market, in the money market, and in the balance of payments is at point E i.e. the point where the IS , the LM, and the BP curves intersect. With the elimination of all or most controls on international capital flows among the industrial countries today, the BP curve is likely to be much flatter for these countries. Alternatively, at the full employment level, it will be located to the right of the LM curve. The schedule BP= 0 is a horizontal line if the assumption of perfect capital mobility (made in the Mundell Fleming model) holds. This happens only when the interest rate equals to those prevailing at the international level i.e. $i = i^*$. At any other interest rate, capital flows are so massive that the balance of payments cannot be in equilibrium. In such situations, the central bank's intervention is needed to maintain the exchange rate.

**Fig. 10.3: Equilibrium in Goods Market, in Money Market and in Balance of Payments**




**Check Your Progress 1**

1) State the assumptions of the Mundell-Fleming model.

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2) What does the BP curve show?

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3) Under what circumstances, does the BP curve shift downwards? Why?

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## 10.4 EFFECTIVENESS OF MONETARY AND FISCAL POLICIES

Both the monetary and fiscal policies affect the capital account and thereby the balance of payments through the changes in interest rate. Fluctuations in rate of interest on account of monetary and fiscal policies pursued determine the changes in capital flows, capital account and balance of payments. Thus, the effect of these policies is not only limited to 'trade balance' but also extends to 'capital account' through the changes in the flow of capital.

### 10.4.1 Floating Exchange Rate

Floating or flexible exchange rate is a market determined exchange rate. It fluctuates in response to changing conditions of demand and supply. Through the process of currency depreciation and appreciation, it provides an adjustment mechanism for correcting the disequilibrium in the balance of payments of the country concerned.

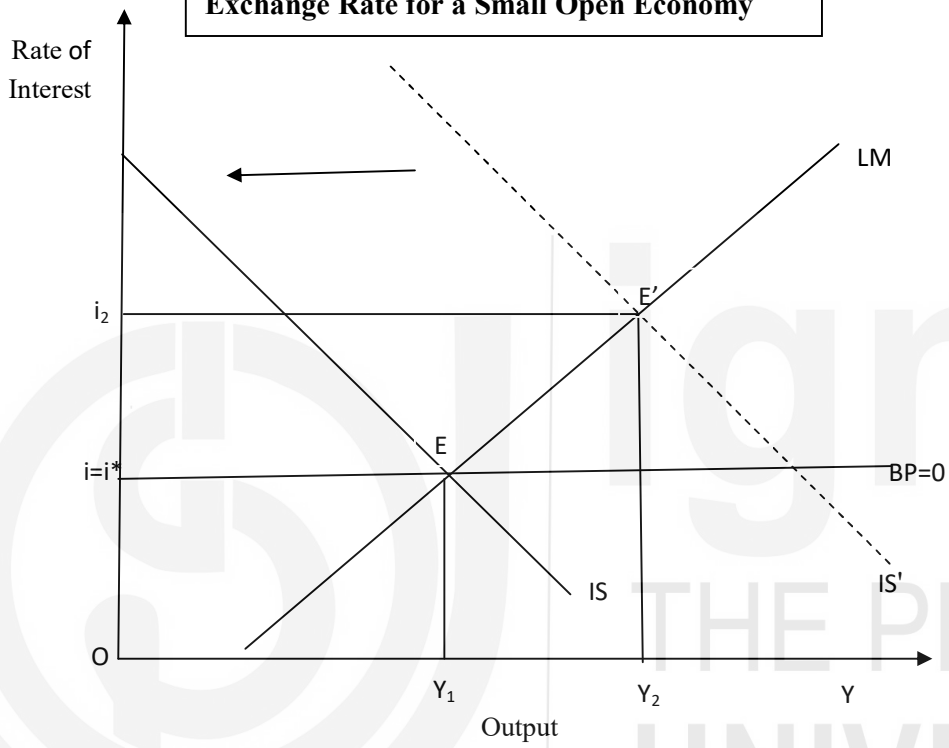
**(a) Fiscal Policy**

In such a context, suppose the government follows an expansionary fiscal policy (i.e. either by raising government purchases or by cutting taxes). This will result in an increase in planned expenditure. With the fiscal expansion, the IS curve shifts rightward to IS' (Fig. 10.4). The IS' curve intersects an unchanged LM curve at the point E'. This indicates a condition for the country's interest rate to rise, leading to massive capital inflows and appreciation of the country's currency. This discourages exports and encourages imports shifting the IS' curve to the left, back to its original IS position.

The fall in net exports offsets the effects of the expansionary fiscal policy, leaving the income level unchanged at $OY_1$ level.

Thus, in a small open economy, expansionary fiscal policy will lead to exchange rate appreciation with no effect on income. The fall in net exports will be exactly large enough to offset the expansionary effect of the fiscal policy on income. This is because, in a small open economy, $i$ is fixed at $i^*$, so that there is only one level of income that can satisfy this equation, and this level of income does not change when fiscal policy changes.

**Fig. 10.4: Fiscal Policy Effect under Flexible Exchange Rate for a Small Open Economy**



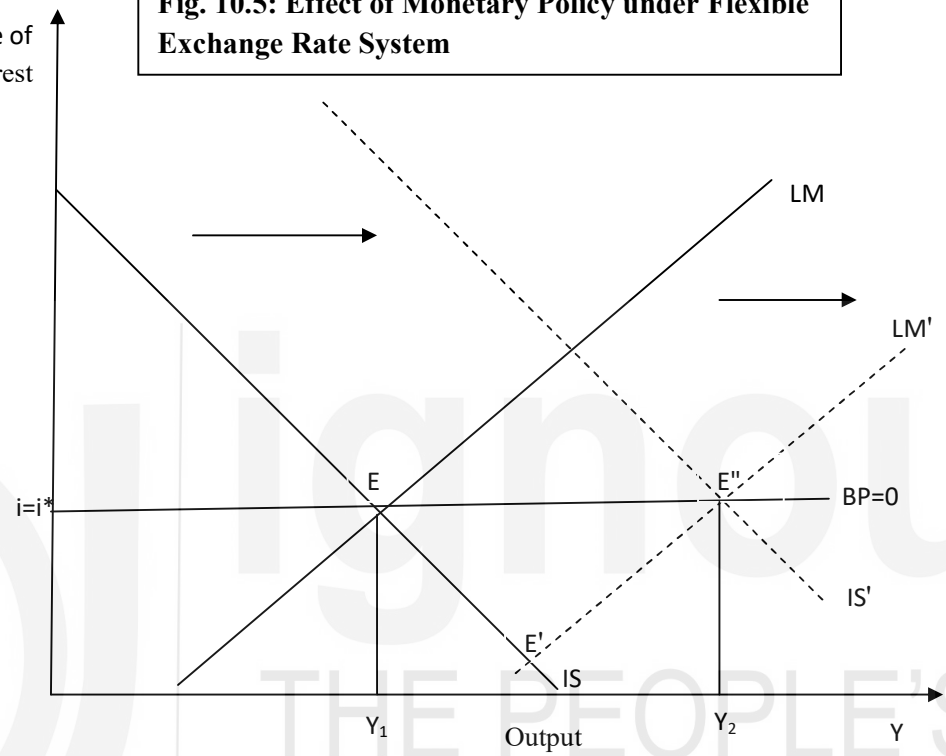

**(b) Monetary Policy**

Let us now consider the effect of 'monetary policy'. Suppose the central bank increases the supply of money. Since price is fixed, increase in money supply will shift the LM curve rightward to LM' (see Fig. 10.5). This lowers the interest rate below the world level to E'. The transmission mechanism of an expansionary policy in an open economy being different from that in a closed economy (where an increase in money supply lowers the interest rate and stimulates investment), in an open economy the interest rate is fixed at the world interest rate. Hence, increase in money supply puts downward pressure on the domestic rate of interest and capital starts flowing out of the country. This capital outflow prevents the fall in the domestic rate of interest on the one hand, while on the other, it increases the supply of domestic currency in the foreign exchange market.

This leads to depreciation of the exchange rate stimulating net exports (by making domestic goods cheaper relative to foreign goods).

The increase in net export shifts the IS curve rightward to IS' and a new equilibrium is established at E". Hence, in a small open economy, expansionary monetary policy increases income through exchange rate depreciation and increase in net exports (rather than through reduction of rate of interest and increase in investment).

**Fig. 10.5: Effect of Monetary Policy under Flexible Exchange Rate System**



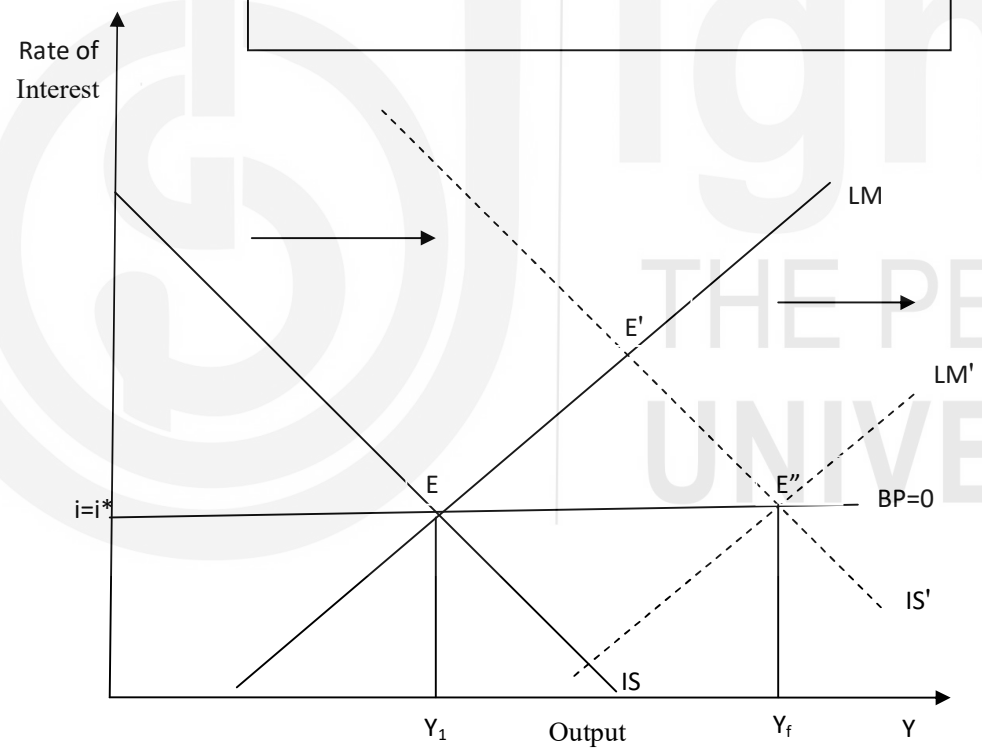

### 10.4.2 Fixed Exchange Rate

Under a fixed exchange rate regime, the central bank is committed to buy and sell domestic currency for foreign currencies at a predetermined price. Central bank maintains the fixed exchange rate by adjusting money supply to a level which ensures equality between the equilibrium exchange rate and the announced exchange rate. In a small open economy with fixed exchange rate regime, any fall in the domestic interest rate below the world level will stimulate capital outflow. This results in a downward pressure causing the exchange rate to depreciate. This creates an excess supply of domestic currency. Since the central bank is committed to maintain the fixed exchange rate, it intervenes in the foreign exchange market by selling foreign currency and buying the domestic currency. This leads to a fall in real money balances. Thus, any upward mobility in interest rates (over the world level) leads to capital inflows (and expansion of domestic real money balances) while any downward mobility of domestic interest rates (below the world level) leads to a contraction of domestic real balances through capital outflows.

**(a) Fiscal Policy**

Suppose that the government stimulates domestic spending by increasing government purchases or by cutting taxes. Such a policy shifts the IS curve rightwards to IS' (Fig. 10.6). The intersection of the IS' curve with the unchanged LM curve at point E' indicates a tendency for the country's interest rate to rise above the world level. However, because of perfect capital mobility at $i=i^*$, there is a capital inflow from abroad that increases the money supply. This shifts the LM curve to LM'. As a result, curves IS' and LM' intersect at point E" on the horizontal BP curve where $i = i^*$ and $Y = Y_f$. In this case, it will be impossible to prevent the money supply from increasing until the LM curve shifts all the way to LM'. Only then will the capital inflows come to an end and the money supply stabilises. Thus, under a fixed exchange rate, a fiscal expansion raises aggregate income.

**Fig. 10.6: Fiscal Policy under Fixed Exchange Rate**

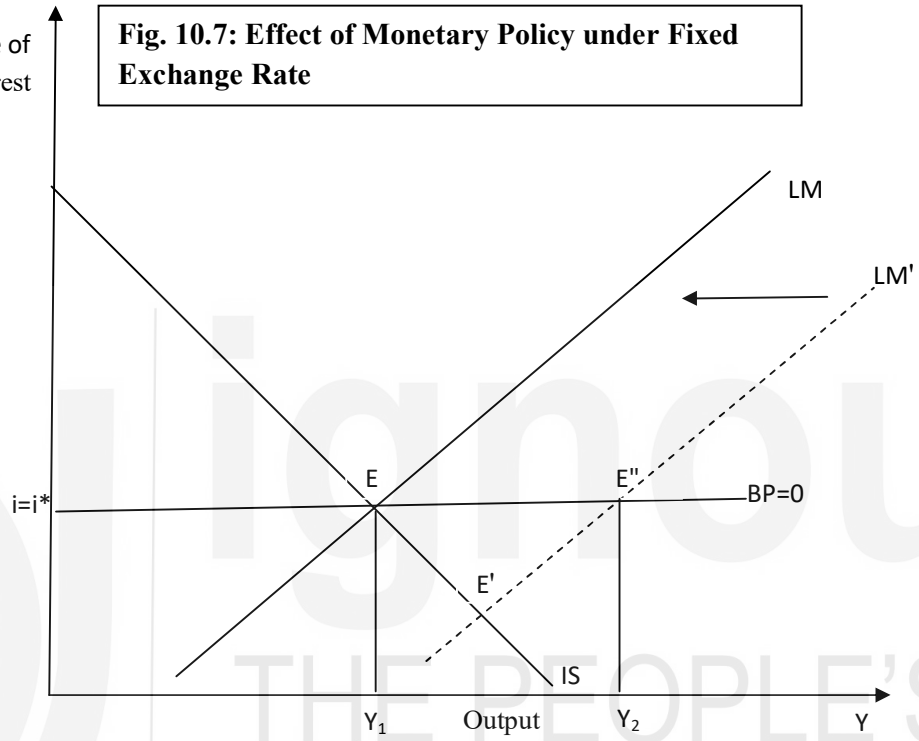



**(a) Monetary Policy**

Likewise, an expansionary monetary policy will initially shift the LM curve to LM' (Fig. 10.7). The interest rate would fall below the world rate of interest (Point E'). The resultant capital outflow reduces the money supply to the original level shifting LM' back to LM.

Any attempt to neutralise the effect of these capital outflows would soon exhaust its foreign exchange reserves and capital outflow would continue until the money supply reduces to its original position i.e. LM. Thus, with fixed exchange rate, monetary policy is ineffective if international capital flows are highly elastic. Thus, by keeping to a fixed exchange rate, the central bank loses its control over the money supply.

**Fig. 10.7: Effect of Monetary Policy under Fixed Exchange Rate**




To conclude, therefore, the Mundell–Fleming model shows that the ability of monetary and fiscal policy (to influence aggregate income) depends on the exchange-rate mechanism. Under the floating exchange rates, only monetary policy can influence income while under the fixed exchange rate, only fiscal policy can influence income. The normal potency of monetary policy is lost because the money supply is dedicated to maintaining the exchange rate at the declared level. Further, although the *IS–LM–BP* model has successfully directed the economic policy of open economies for over four decades, a serious criticism levelled against the model is that it mixes stocks and flows. In particular, the *LM* curve is based on the *stock* of money, while the *BP* curve is based on the *flow* of capital. The assumption of the model that a rise in domestic interest rate will lead to a continuous capital inflow from abroad (to finance the country's BoP deficit) is flawed since inflow could stop once the investors have readjusted their portfolios following the increase in the domestic interest rate. Table 10.1 summarises the short run effects of the model on 'income, exchange rate and trade balance'.

**Table 10.1: Short Run Effects of Policies on Income, Exchange Rate and Trade Balance**

| Policy | Floating Exchange Rate | | | Fixed Exchange Rate | | |
|---|---|---|---|---|---|---|
| | Income (Y) | Exchange Rate (e) | Net Exports (NX) | Income (Y) | Exchange Rate (e) | Net Exports (NX) |
| **Fiscal Expansion** | No effect | Rises | Falls | Rises | No effect | No effect |
| **Monetary Expansion** | Rises | Falls | Rises | No effect | No effect | No effect |

## 10.5 POLICY CHOICE

A crucial question is, which exchange rate regime (floating rate or fixed rate) is preferable? Historically, most countries had pegged their currency either to US dollars or to pound sterling or to a basket of foreign currencies. Gradually, these countries made a transition towards flexible market determined exchange rates. As discussed above, under the fixed exchange rate regime, central bank cannot follow an independent monetary policy it is rather committed to the single goal of maintaining the exchange rate at its declared level. Further, there are other important variables (like inflation, employment) which cannot be influenced under the fixed exchange rate regime by monetary policy. This is because, the central bank faces the problem of achieving the 'impossible trinity' i.e. it can choose any two but not all three attributes of fixed exchange rate, financial openness and monetary independence. If the central bank chooses fixed exchange rate (say, exchange rate is pegged to US dollar) and capital mobility, then it will have to closely match its interest rate with that of US. If the country's interest rate is lower than that of the US, there will be massive capital outflow. But interest equality implies that the country cannot conduct monetary policy independently of the US. Monetary autonomy can be regained under a fixed rate only by imposing capital controls. If capital flows are restricted, the country's interest rate will be decoupled from that in the US.

Advocates of fixed exchange rates argue that exchange-rate uncertainty makes international trade more difficult. After the world abandoned the Bretton Woods system of fixed exchange rates in the early 1970s, both real and nominal exchange rates became much more volatile. Commitment to fixed exchange rate disciplines a country's monetary authority preventing excessive exchange rate volatility. Such a policy, however, leads to greater volatility in income and employment. Despite the enhanced exchange-rate volatility under the new floating exchange rate regime, the amount of world trade has continued to rise. The primary argument for a floating exchange rate is that it allows a country to use its monetary policy for other goals such as stabilizing employment or prices. Thus, under flexible exchange rate and perfect capital mobility, an expansionary monetary policy leads to exchange rate depreciation and a consequent increase in

net exports and income. Further, depreciation shifts the demand from foreign goods towards domestic goods. While income in the domestic economy rises, it falls abroad. A depreciation induced change in net exports creates domestic employment at the expense of the rest of the world. It is for this reason that a monetary expansion and a resultant depreciation is referred to as '*beggar-thy-neighbour-policy*'. In the event of a country facing a recession, monetary expansion induced depreciation would shift world demand in its direction and help the country move towards full employment.

The choice between fixed and floating exchange rate is therefore not simple. We hence rarely observe exchange rates that are completely fixed or completely floating. Under systems of fixed exchange rates, countries can change the value of their currency if maintaining the exchange rate conflicts too severely with other goals. Under systems of floating exchange rates, countries could use formal or informal targets for the exchange rate when deciding whether to expand or contract the money supply.

**Some Illustrations**

India pegged its currency to the US dollar from 1971 to 1991 and to pound sterling from 1971 to 1975. Following the breakdown of the Breton Woods system in 1971, the value of pound collapsed and India witnessed misalignment of the rupee. To overcome the pressure of devaluation, India pegged its currency to a basket of currencies. During the period 1971-91, the exchange rate was officially determined by the RBI within a nominal band of +/- 5 percent of the weighted average of a basket of currencies of India's major trading partners. In a situation of BoP deficit under this exchange rate regime [where the RBI is selling dollars (buying rupees) to prevent a rise in the exchange rate of the rupee (depreciation)], the rupee is undervalued relative to the equilibrium. The process of supporting an undervalued currency cannot continue indefinitely, because eventually the foreign exchange reserve of the RBI would be exhausted. Before that point is reached, the RBI would have to take policy action to eliminate the deficit. This calls for domestic adjustment as indicated by equation (10.6).

$$\boldsymbol{NX = X - M = Y - AE = Y - (C + G + I)} \qquad \textbf{... (10.6)}$$

where NX is 'net exports', i.e., the trade balance and AE is Aggregate Expenditure. To improve the trade balance NX, there are three options: (i) reduce AE keeping Y the same; (ii) raise Y keeping AE the same; (iii) allow devaluation by lowering the pegged value of e closer to e*, the equilibrium value. The second option requires growth in the productivity of factors combined with harder work and longer working hours, which is neither palatable nor easily achievable in the short run. This leaves cutting back in AE and devaluation as the other alternatives. Cutback in AE is painful as unemployment is likely to rise in the economy and there will be a decline in the general standard of living (as consumption is reduced). Devaluation is likely to create inflationary pressures as imports would become costlier. Hence, governments are usually reluctant to initiate the process of adjustment in the face of falling reserves. Very often, this leads to a BoP crisis.

The economic crisis in India during the early 1990s was primarily due to the large and growing fiscal imbalances over the 1980s. Large fiscal deficits, over time, had a spill-over effect on the trade deficit culminating in an external payments crisis. By the end of the 1980s, India was in serious economic trouble. As the holding of reserve assets (with the central bank) dips low, foreign lenders lose confidence in the government. As a result, they either reduce loans or begin demanding higher interest rates. This exacerbates the BoP deficit. Worse, a speculative attack on the rupee could happen. Diminishing stock of foreign reserves therefore undermines the ability of the bank to defend a undervalued rupee. This triggers the expectation of a devaluation of the rupee in the near future. As a result, there will be a rush to sell rupees and buy dollars. By selling such dollars acquired when the price of dollar goes up after a possible rupee devaluation, one can make profit. In other words, imminent devaluation induces people to move out of the rupee making it even harder for the bank to defend the rupee. This is because it has to sell scarce dollars to those who want to shift their wealth from rupee to dollars. With this, stock of dollars would run out even faster, making devaluation of rupee ultimately inevitable. Thus, expected devaluation brings about actual devaluation.

In mid-1991, India's exchange rate was subjected to a severe adjustment. With foreign reserves nearly depleted, the Indian government permitted a sharp devaluation that took place in two steps within three days (1 July and 3 July 1991) against major currencies. RBI devaluated Indian Rupee by 9% and by a further 11% on 3rd July. In response to the BoP crisis of 1991, India made a transition to market-based exchange rate. As a result, since 1993, exchange rate fluctuations are market determined. In recent years, India's dollar reserves have reached high levels. This is a direct consequence of the RBI's exchange rate policy. Attracted by the prospect of higher return, foreign savers are buying shares in the Indian stock market on a large scale. This inflow of capital is adding to the supply of dollars.

**Table 10.2: Comparative Profile of Foreign Exchange Reserves (2018)**

(in USD billions)

| Rank | Country | US Dollars |
|---|---|---|
| 1 | China | $3210.0 |
| 2 | Japan | $1259.3 |
| 3 | Switzerland | $804.3 |
| 4 | Saudi Arabia | $501.3 |
| 5 | Russia | $460.6 |
| 6 | Taiwan | $459.9 |
| 7 | Hong Kong | $424.8 |
| 8 | India | $403.7 |
| 9 | South Korea | $402.4 |
| 10 | Brazil | $379.4 |

**Source**: IMF, 2018

China has by far the largest foreign currency reserves with over two and a half times more than the second largest reserve holder, Japan. When China and Hong Kong's reserves are considered together, the total is $3.6 trillion. Asian nations dominate foreign currency reserves, accounting for six of the top 10 with India at the eighth position. Accumulating a large stock of reserves is justified on precautionary grounds since it acts as a cushion against 'potential disruptions to foreign trade and flow of funds' which may cause serious damage to the economy. This precautionary motive is strengthened by the perception of instability in a deregulated financial environment.

**Check Your Progress 2**

1) Indicate how an expansionary fiscal policy affects the income, interest rate and exchange rate in a small open economy with flexible exchange rate.

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2) How does 'monetary policy' affect an open economy with fixed exchange rate?

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3) On what grounds is the IS-LM-BP model criticised?

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4) State the advantage and disadvantage of a fixed exchange rate system.

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5) What is the primary argument in favour of floating exchange rate system?

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6) Given the respective merits of floating and fixed exchange rate systems, could you suggest an ideal policy choice?

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## 10.6 LET US SUM UP

The unit discusses the working of a small open economy under a set of assumptions made for the Mundell-Fleming model. In particular, the working of monetary and fiscal policies in influencing the income and the exchange rate is explained. The behaviour of the economy in an atmosphere of floating and fixed exchange rate systems is also explained. The Mundell-Fleming Model shows that the power of monetary and fiscal policy to influence aggregate income depends on the exchange rate regime. Under the floating exchange rates, the monetary policy is seen to influence output level while under a fixed exchange rate system, it is the fiscal policy which can be influential in affecting the output level. Analysis of both the exchange-rate systems reveals that it is impossible for a country to simultaneously have 'free capital flows, a fixed exchange rate and an independent monetary policy (hence referred to as the impossible trinity). There are, however, some advantages to both the floating and fixed exchange rates.

While the floating exchange rates leave monetary policymakers free to pursue the other objectives such as inflation, unemployment, the fixed exchange rate system reduces the uncertainty in international business transactions. Hence, while deciding between the fixed and floating exchange rate regime, an economy has to make a judicious choice between exchange rate volatility, loss of monetary autonomy and restrictions on capital movement.

## 10.7 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1) Perfect capital mobility, small open economy, fixed price level at home and abroad.
2) It shows the various combinations of interest rate and income at which the country's BoP is in equilibrium at a given exchange rate.
3) The BP curve shifts downwards when there is a devaluation of the country's currency. Hence, lower interest rate and smaller capital inflows (or greater capital outflows) can keep the BoP in equilibrium.

**Check Your Progress 2**

1) It causes capital inflow, appreciation of domestic currency and fall in net exports. It leaves income unchanged and rate of interest fixed at $i^*$.
2) Monetary policy is ineffective as long as international capital flows are highly elastic. By maintaining a fixed exchange rate, the central bank loses control over the money supply.
3) On the ground that it mixes stock and flows i.e. while the LM curve is based on the stock of money, the BoP curve is based on the flow of capital.
4) It disciplines country's monetary system and prevents excessive exchange rate volatility. But income and employment will be more unstable.
5) It allows a country to focus its monetary policy to stabilise employment and prices.
6) No. Both have respective advantages and disadvantages. In view of this, we rarely see exchange rates that are completely fixed or completely floating.

# UNIT 11 DORNBUSCH'S OVERSHOOTING MODEL*

**Structure**



## 11.0 OBJECTIVES

After reading this unit, you will be able to

- explain the term 'overshooting';
- discuss the conditions under which the 'Dornbusch's overshooting model' works;
- illustrate the impact of 'interest rate differentials and prices' on an economy under the conditions of Dornbusch's model;
- trace the steps in the mechanism of 'adjustment process' under the conditions of Dornbusch's model in situations of flexible 'exchange rate, money and prices';
- write a note on short-run and long-run effects of 'monetary expansion' under the conditions of Dornbusch's model;
- explain the concept of 'exchange rate overshooting'; and
- illustrate how a 'new equilibrium exchange rate' is established in the market under the Dornbusch's overshooting model.

## 11.1 INTRODUCTION

Overshooting is a term used in macroeconomics and international finance. It is used to describe the behaviour of 'exchange rate' after an economy is hit with a shock, i.e., an unanticipated event of sufficient magnitude such that it affects aggregate income, the general level of prices, or the aggregate volume of employment. Overshooting describes the fact that before the exchange rate gets to its new long-run value in response to a shock, it may initially move past or 'overshoot' the new level to which it will eventually come back.


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The overshooting phenomenon is common in many modern theories in international macroeconomics that assume sticky prices in the short run. Thus, it is a necessary component of any macroeconomic forecast, as well as of the analysis of possible responses of the economy to monetary policy changes. Nevertheless, not all models predict overshooting in the behaviour of the exchange rate.

The concept of overshooting helps explain an important empirical reality, i.e., exchange rates are much more volatile than price levels or interest rates. Indeed, while prices adjust slowly and monotonically to their new long-run levels, exchange rates 'bounce around'. In a world with numerous economic shocks, this leads to a high volatility of exchange rates and a much smaller volatility of prices.

Theoretically, overshooting arises in an economic model which assumes: (i) exchange rates are flexible; (ii) uncovered interest parity holds (i.e., the difference between interest rates in the United States (US) and the Euro zone, for instance, is equal to the expected rate of the US dollar depreciation); (iii) money demand depends on interest rate and output; and (iv) prices are fixed in the short run but they adjust fully to offset the monetary shocks in the long run. Thus, in the long run, an increase in money supply would be fully reflected in an increase in price level, including the price of foreign currency (or, the exchange rate).

## 11.2 THE DORNBUSCH'S MODEL

Three factors, viz., asset markets, capital mobility and expectations play an important role in this model. The speed with which asset market adjusts to a monetary shock is much greater than the speed with which the goods market adjusts. The dynamic aspects of exchange rate in this model arise from the fact that exchange rates and the asset markets adjust faster relative to the goods market. For the purpose of this model, we assume that *the country is small in the world capital market so that it faces a given interest rate*.

Under the above conditions, capital mobility will ensure the equalisation of expected net yields. Capital inflow will occur if interest yield on one currency (say, dollar) is greater than that of the other (say, euro). Similarly, capital will flow out if the reverse happens. We make a further implicit assumption here that the assets denominated in terms of domestic and foreign currency are perfect substitutes of each other. In the beginning stages, capital flows ensure that 'uncovered interest parity' (UIP) condition holds at all times. This means, the interest differential between two countries will always be equal to the expected change in the exchange rate between the two currencies. In other words,

$$i = i^* + \frac{E^e_{\$/\epsilon} - E_{\$/\epsilon}}{E_{\$/\epsilon}} \quad \text{... (11.1)}$$

where $i$ = rate of return on dollar deposits, $i^*$ = rate of return on euro deposits, and $\frac{E^e_{\$/\epsilon} - E_{\$/\epsilon}}{E_{\$/\epsilon}}$ is the expected rate of depreciation of dollar against euro.

For instance, if $i$ = 6% and $i^*$ = 5%, then the expectation must be that the euro will appreciate by 1 percent on an annual basis in order to make the returns on investing in the European Monetary Union (EMU or simply EU) equal (i.e., equal to the return on investing in the US and thus be at *uncovered interest parity*). If $i < i^*$, so that the returns on investments are lower in the US than in the EU, then the euro is expected to depreciate (and the dollar to appreciate) by the specific percentage. We can therefore say that a positive interest rate differential leads to an expected depreciation of dollar against euro or an appreciation of euro with respect to dollar. Hence, if dollar depreciates against euro, the interest rate on dollar will exceed interest rate on euro by the expected rate of depreciation. *It means that the positive interest differential in favour of the home country (the US) over the foreign country (the EU) is equal to the expected appreciation (expressed on an annual percentage basis) of the foreign currency (€) in relation to the home-country currency ($).*

Let us turn to the operation of the 'money market' now. Since equilibrium in the domestic money market determines the rate of interest, the demand for real money balance too depends on the supply of real income. The equation for the demand for money can therefore be written as

$$\mathbf{M_d = kPY} \qquad \textbf{... (11.2)}$$

where, $M_d$ = money demanded in nominal money balances, k = desired ratio of nominal money balances to nominal national income, P = domestic price level and Y = real output. If markets are competitive, and there are no tariffs, transportation costs, or other obstructions to international trade, then as per the theory of purchasing power parity, the price of a commodity would be the same in the US as well as the EU, i.e., $P_X$ ($) = $RP_X$ (€). Thus:

$$\mathbf{P = RP^* \text{ or } \quad R = \frac{P}{P^*}} \qquad \textbf{… (11.3)}$$

where R is the exchange rate of the dollar, P is the index of dollar prices in the US, and P* is the index of euro prices in the EU. Note that the money demand function for US and EU are respectively given by $\mathbf{M_d = kPY}$ **and** $\mathbf{M_d^* = k^*P^*Y^*}$ [from (11.2)]. Further, since in equilibrium, the quantity of money demanded is equal to the quantity of money supplied, we have:

$$\mathbf{M_d = M_s} \text{ and } \mathbf{M_d^* = M_s^*} \qquad \textbf{…. (11.4)}$$

Hence, dividing the money supply function for the EU by the US function, we get

$$\mathbf{\frac{M_S^*}{M_S} = \frac{k^*P^*Y^*}{kPY}} \qquad \textbf{… (11.5)}$$

Dividing both sides of equation (11.5) by $\frac{P^*}{P}$ and $\frac{M_S^*}{M_S}$, we get

$$\mathbf{\frac{P}{P^*} = \frac{M_S k^* Y^*}{M_S^* kY}} \qquad \textbf{... (11.6)}$$

Since $R = \frac{P}{P^*}$, we can write equation (11.6) as

$$\mathbf{R = \frac{M_S k^* Y^*}{M_S^* k Y}} \quad \text{... (11.7)}$$

Since k*, Y*, k and Y are assumed to be constant, changes in exchange rate occurs due to change in $M_S$ and $M_S^*$. Further, we know that the exchange rate is determined by the 'rate of growth of the money supply and real income' [i.e., relative to the 'growth of the money supply and real income in other countries]. For instance, the growth in the country's money supply, in excess of the growth in its real income and demand for money, leads to an increase in prices and in the exchange rate (i.e., a depreciation of the currency) of the country. Conversely, an increase in the country's money supply (that falls short of the increase in its real income and demand for money) tends to reduce prices and the exchange rate (an appreciation of the currency) of the country.

### 11.2.1 Impact of Interest Differentials and Prices

An expected change in exchange rate will lead to an immediate actual change in the exchange rate by an equal percentage. This follows from the 'interest parity condition'. Let us take our previous example, i.e., $i$ = 6% and $i^*$ = 5% where euro is expected to appreciate by 1% for the yields on two assets to equalise. If, for some reason, the expected appreciation of the euro (i.e., depreciation of the dollar) increased by not by 1 percent but by 2 percent (on annual basis), this would make the return on investing in the EU 7 percent per year (5 percent in interest and 2 percent from the expected appreciation of the euro on annual basis) as compared to 6 percent return in the US market. This would lead to an immediate capital outflow from the US to the EU. This causes the appreciation of the euro to slide back by 1 percent due to 'uncovered interest parity'. Furthermore, any change in the expected depreciation of the euro (appreciation of the dollar) will have to be matched by an equal actual depreciation of the euro (appreciation of the dollar on annual basis), so as to satisfy the condition for 'uncovered interest parity'.

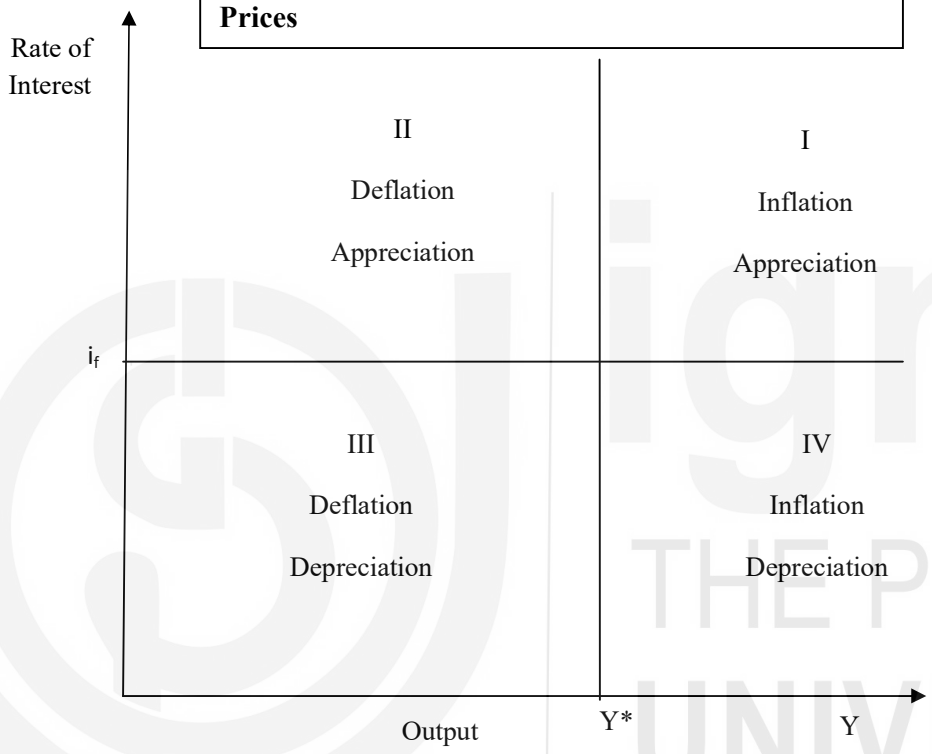
Likewise, while prices could be sticky in the short run, in the long run they are flexible. This is because while any change in money supply causes exchange rate to change immediately, prices would adjust only gradually. In other words, prices and exchange rate do not move at the same rate, i.e., due to the sticky character of prices, the goods market adjusts slowly while the financial market adjusts instantaneously. As a result, exchange rate overshoots its long run equilibrium level because of 'difference in the speed of adjustment between capital and prices across markets'.

### 11.2.2 Flexible Exchange Rate, Money and Prices

Let us assume that exchange rate is flexible, capital is highly mobile, and that prices are allowed to vary. In such a situation, let us examine how output, exchange rate and prices respond to changes in money supply and how such response evolves over time.

We shall first discuss the adjustment process of prices and the exchange rate relative to the state of the economy. Fig. 11.1 shows the impact of interest rate and output assuming that a full employment level prevails at Y*. The assumption of perfect international capital mobility is reflected in the horizontal BP schedule, i.e., only at an interest rate of $i=i_f$, the balance of payments will be in equilibrium. If the interest rate is higher, there would be a net inflow of capital. Conversely, with a lower domestic interest rate, capital would flow out and the balance of payments would become deficit.

**Fig. 11.1: Adjustment of Exchange Rates and Prices**



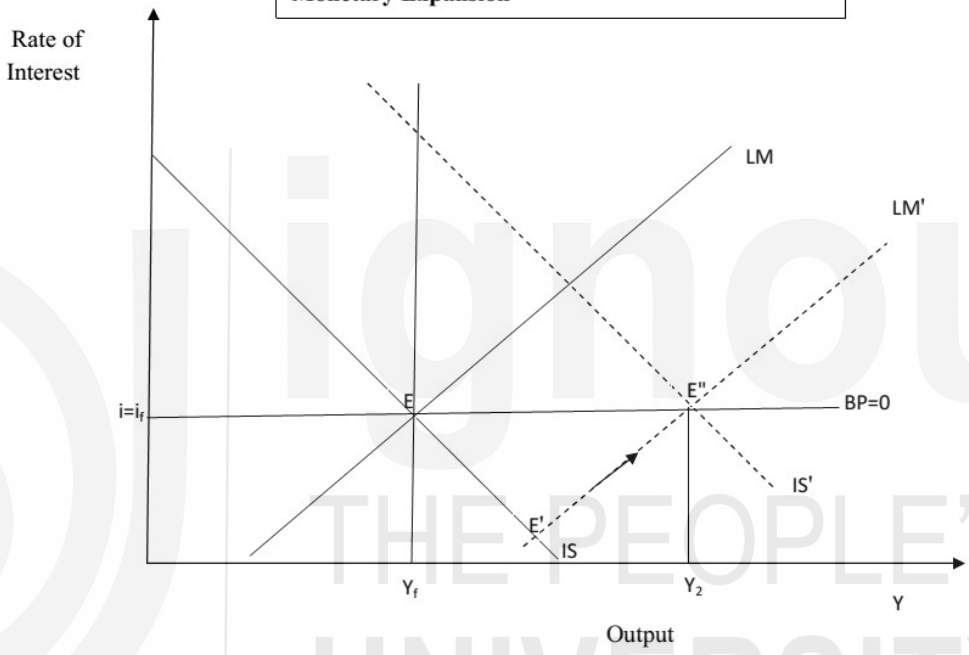

For describing the adjustment process, we now make two strategic assumptions. First, prices increase whenever output exceeds the full employment level. Second, because capital is highly mobile, the interest rate always moves towards the BP schedule (as interest rate cannot diverge far from that in the rest of the world). There is now a complicated set of adjustment process as the economy moves towards BP. For instance, a monetary expansion causes a decline in interest rate causing the capital to flow out. This means that people try to sell dollars to buy Euros, dollar depreciates, exports and income increase, money demand and interest rate rise, etc. These factors would influence the adjustment process to move the exchange rate back toward BP. This mechanism works in reverse if domestic interest rates tend to rise (say due to monetary tightening or fiscal expansion). In such an adjustment process, at any point to the right of Y*, prices would rise, and to the left of Y*, prices would fall. Points above BP lead to capital inflows and currency appreciation and points below to capital outflow and currency depreciation.

With extremely high capital mobility, the exchange rate will adjust very rapidly so that the economy is always close to or on the BP schedule.

### 11.2.3 Effects of Monetary Expansion

With given prices, a monetary expansion under flexible rates and perfect capital mobility leads to depreciation and increased income. We would be interested in knowing how this can be checked once we take adjustments in prices into account. Note that the output adjustment, in case of fixed prices, is transitory. Hence, in the long run, a monetary expansion leads to exchange depreciation and higher prices with no change in competitiveness.

**Fig. 11.2: The Short and Long Run Effects of Monetary Expansion**




In such a situation, let us consider our starting point E (in Fig. 11.2) where we have full employment, a balance of payments equilibrium, monetary equilibrium and equilibrium in the domestic goods market. Now if monetary expansion takes place and the LM schedule shifts to LM', the new goods and money market equilibrium shifts to E'. But this also results in the interest rate to fall below the world level and the exchange rate depreciates. This raises the domestic competitiveness shifting the IS schedule to IS'. Consequently, the economy moves rapidly to E", i.e., output rises, the exchange rate depreciates and the economy gains in its external competitiveness. But at E", output is above the full-employment level and hence prices rise. This causes the real balances to decline. As the real money stock, M/P, declines (because of rising prices), the LM schedule shifts to the left, interest rate tend to rise and capital tends to flow-in. The resulting appreciation leads to a decline in competitiveness shifting the IS schedule back to the initial equilibrium level. Consequently, both the IS and LM schedules move back to point E. In other words, the above process continues until point E is reached again. At point E, interest rates return to their initial level and so also the relative prices eP*/P. In moving from E to E' the exchange rate depreciates immediately, i.e., before the rise in prices. But when prices increase

and real balances fall, only part of that depreciation is reversed. Thus, over the entire process of adjustment period, prices and exchange rates rise in the same proportion, leaving the relative prices, eP*/P, unchanged. Hence, the aggregate demand also remains unchanged. In the long run, therefore, the impact of the process on money supply remains entirely neutral.

**Check Your Progress 1**

1) State the meaning of the term 'overshooting'.

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2) Mention the assumptions of Dornbush's overshooting model.

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3) What does the points above and below the BP schedule represent?

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## 11.3 EXCHANGE RATE OVERSHOOTING

Changes in interest rates and expectations disturb equilibrium leading investors to reallocate their financial assets. This leads to a new equilibrium or a change in the balanced portfolio. The adjustment involves a change in the *stock* of the various financial assets. The accumulated value of the *total stock of financial assets* in the economy would be very large compared to the yearly *flows* (i.e., additions to the stock). Besides this, there are other forces that affect the holding of various financial assets. For instance, an unanticipated increase in the country's money supply leads to an immediate decline in the country's interest rate. This decline would lead the investors to shift their domestic bonds to foreign bonds.

Such an adjustment could sometimes be very large and usually occurs over a very short time. This is in contrast to changes in the *flow* of merchandise trade which takes place gradually and over a longer period of time.

Monetary expansion leads to a fall in domestic rate of interest rendering domestic bonds unattractive. As capital flows out of the domestic economy, the exchange rate depreciates. This depreciation improves export competitiveness and increases income. However, the adjustment in the goods market and trade flows will be much slower than the adjustments in the financial markets. Thus, *stock* adjustments in financial assets are usually much larger and quicker to occur than adjustments in trade *flows*.

The differences in the size and quickness of stock adjustments in financial assets (as opposed to adjustments in trade flows) have important implications for the process by which exchange rates are determined. This is because it changes their dynamics over time. For instance, an unexpected increase in the country's money supply, and a decline in domestic interest rates, are likely to lead to a large and quick increase in the demand for foreign currency. This, in turn, leads to an immediate and large depreciation of the domestic currency. Such depreciation bypasses the smaller and more gradual changes in exchange rates resulting from changes in real markets (e.g. changes in trade flows). In the long run, their effect on exchange rates in the real markets will prevail. In the short run, however, such changes in exchange rates are likely to merely reflect in some stock adjustments in financial assets. If the real sector responds immediately, as financial sectors do, there would be no exchange rate overshooting. This analytical account helps us explain why, in the short run, exchange rates tend to overshoot (bypassing their long-run equilibrium level). We can further illustrate this as follows.

**New Equilibrium Exchange Rate**

Let us consider a situation where the central bank of the US unexpectedly increases its money supply by 10 percent, from $100 billion to $110 billion, at a point of time $t_0$ [as in Panel (a) in Fig. 11.3]. Panel (b) shows the effect of the 10 percent unanticipated increase in the US money supply by way of an immediate decline in the US interest rate (say, from 10 percent to 9 percent) [Panel (b), Fig. 11.3]. Note that the 10 percent increase in the US money supply will have no immediate effect on US prices [as in Panel C, Fig. 11.3]. We have assumed that US prices are 'sticky' and hence rise only gradually so that in the long run until they are 10 percent higher than originally (i.e., over a period in which price index rise from 100 to 110). Panel (d) of Fig. 11.3 shows how as investors shift from domestic bonds (and money balances) to foreign bonds, the exchange rate (R) increases [ i.e., the dollar depreciates by more than the 10 percent that is expected

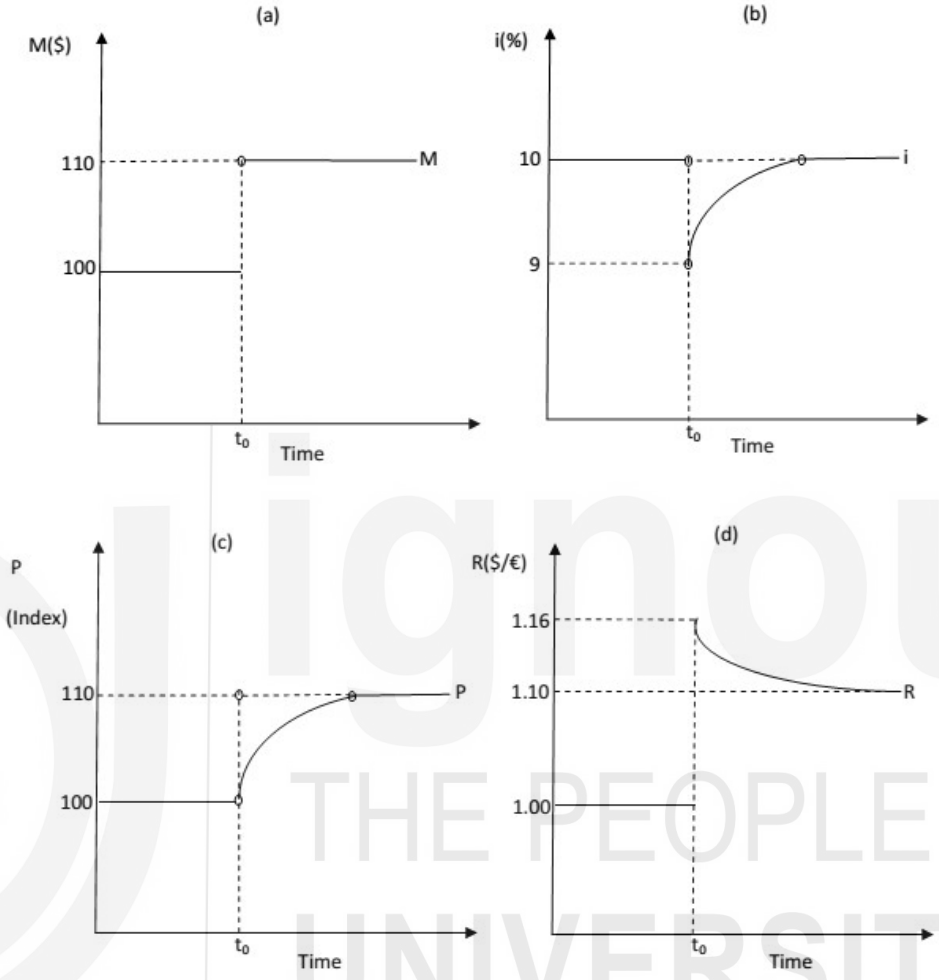
in the long run (because of the 10 percent increase in the domestic money supply)]. More specifically, R immediately rises (the dollar depreciates) by 16 percent at time $t_0$. The question therefore is why does the dollar immediately depreciate by more than 10 percent when, according to the PPP theory, we expect it to depreciate only by 10 percent (i.e., by the same percentage in which the US money supply has increased)? To explain this we must again refer to the 'uncovered interest parity' (UIP) condition given by:

$$\boldsymbol{i - i^* = EA} \qquad \textbf{... (11.8)}$$

where $i$ is the interest rate in the home country (US), $i^*$ is the interest rate in the foreign country (the EU) and $EA$ is the expected percentage appreciation per year of the foreign currency (the €) with respect to the home country's currency (the $). The condition of equation (11.8) states that the domestic interest rate $(i)$ is equal to the foreign interest rate $(i^*)$ plus the expected appreciation of the foreign currency. If we further assume for simplicity that the expected appreciation of foreign currency is zero, then the uncovered interest parity (UIP) condition simply means that $i = i^*$. However, the unanticipated increase in the US money supply does lead to a reduction in the US interest rate. Thus, the US interest rate $(i)$ is now lower than the foreign interest rate $(i^*)$ and this needs to be balanced by the expectation of a future depreciation of the foreign currency (€) [and appreciation of the dollar against euro] in order that the condition of UIP is once again satisfied.

The only way that we can expect the dollar to appreciate in the future and still end up with a net depreciation of 10 percent in the long run is for the dollar to immediately depreciate by more than 10 percent. Hence, panel (d) shows that the dollar immediately depreciates (R rises) by 16 percent at time $t_0$ [from $1/€1to $1.16/€1] and then gradually appreciates (R falls) by 6 percent to $1.10/€1 (i.e., as measured from the original base of $1.00) over time (thus removing the overshooting). This leaves a net depreciation of only 10 percent in the long run. In other words, after the initial excessive depreciation, the dollar appreciates in order to eliminate its undervaluation. Note that, over time, as US prices rise by 10 percent, the US nominal interest will also gradually rise until it reaches its original level of 10 percent. Thus, in panel (d), the dollar appreciation occurs only to remove the excessive depreciation at time $t_0$. Another way to look at this, which also brings goods market into the picture, is to realize that the immediate depreciation of the dollar will lead to a gradual increase in the country's exports and reduction in the country's imports. This will result (everything else being equal) in an appreciation of the dollar over time. Since we know from the PPP theory that the dollar must depreciate by 10 percent in the long run, the only way to expect that the dollar will appreciate in the future is for the dollar to immediately depreciate by more than 10 percent as a result of the unexpected increase in the US money supply.

**Fig. 11.3: Time Path to a New Equilibrium**




## Check Your Progress 2

1) What are the long run effects of a monetary expansion?

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2) State the reasons behind 'exchange rate overshooting'.

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## 11.4 LET US SUM UP

Analysis of monetary policy under flexible exchange rate offers an important insight on the adjustment process in the economy. This insight is that the exchange rates and prices do not move at the same rate/pace. Hence, when a monetary expansion pushes the interest rates down, the exchange rate adjusts immediately while the prices adjust only gradually. Monetary expansion, in the short run, therefore leads to an immediate and abrupt change in relative prices and competitiveness. Over time, not only the prices rise to match the increase in money but the exchange rate too will match the higher level of money and prices. In the long run, therefore, the real variables are unaffected. In the short term, however, an adjustment mechanism needs to take over the required balancing act. For this, the exchange rate overshoots its long run equilibrium level when, in response to a disturbance, it first moves beyond the normal level and then gradually returns to the long-run equilibrium position. Overshooting thus essentially means that changes in monetary policy produce larger changes in exchange rates. The resulting changes in interest rate, expectations and other factors (that affect the benefits and costs of holding the various financial assets) forces an immediate change in the stock of financial assets. Since adjustments in the real sector (trade flows) occur only gradually over time, the immediate burden of adjustment in exchange rates is borne by the financial markets (in the very short and short runs). For this, the exchange rate overshoots or bypasses its long-run equilibrium level for establishing a timely equilibrium quickly. Over time, as the cumulative contribution to adjustment coming from the real (trade) sector is felt, the exchange rate reverses its movement eliminating the overshooting. This helps re-establish the equilibrium closer to the pre-shoot-up phase.

## 11.5 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1) It is a term used to describe the behavior of 'exchange rate' after an economy is hit with a shock. The phenomenon is common to economies that assume sticky prices in the short run.

2) (a) exchange rates are flexible; (b) uncovered interest parity holds (i.e.,, the difference between interest rates in the US and euro zone is equal to the expected rate of US dollar depreciation); (c) money demand depends on interest rate and output; and (d) prices are fixed in the short run but they adjust fully to offset monetary shocks in the long run.

3) Points above BP lead to capital inflows and appreciation. Points below represent capital outflows and currency depreciation.

## Check Your Progress 2

1) Over the whole adjustment process, prices and exchange rates rise in the same proportion, leaving relative prices, eP*/P, and therefore aggregate demand unchanged. In the long run money is therefore entirely neutral.

2) Since adjustments in trade flows occur only gradually over time, most of the burden of adjustment in exchange rates must come from financial markets in the very short and short runs. Thus, the exchange rate must overshoot or bypass its long-run equilibrium level in order that equilibrium is quickly re-established in financial markets. Over time, as the cumulative contribution to adjustment coming from the real (e.g., trade) sector is felt, the exchange rate reverses its movement and the overshooting is eliminated.

# UNIT 12 MACROECONOMIC POLICY IN OPEN ECONOMY*

**Structure**



## 12.0 OBJECTIVES

After going through this unit, you will be able to

- outline the short-run response mechanisms available for the government to keep the macroeconomic factors under control;
- elucidate the short term impact of government policies on the macroeconomic factors;
- discuss the long-run impact of government policies under the floating and fixed exchange rate systems;
- explain how 'internal and external balance' can be simultaneously managed with the policies of expenditure by the government;
- state the significance of the four zones in a Swan diagram; and
- explain how 'external deficit and unemployment' can be controlled optimally by a mix of policies.

## 12.1 INTRODUCTION

At present, most economies are global economies. Hence, markets for foreign exchange, equity and commodity are aligned with each other both at the country's as well as at the global level. Due to free flow of capital, exchange rate either appreciates or depreciates. This affects the domestic and international price levels. Export promotion through a policy of exchange rate depreciation yields


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more foreign exchange. An expansionist monetary policy (through a higher money supply) leads to a rise in prices and lowers the interest rate. When domestic interest rates are low, international investors withdraw their money diverting it to countries where higher returns can be had. Hence, policies on money supply, interest rate and exchange rate are inter-linked; and they decide the volume of capital inflow and outflow.

So far (i.e., in Units 10 and 11), in our discussion of open-economy macroeconomics, we have assumed that prices remain constant (even as the economy expands and contracts). Implicitly we have assumed that prices begin to rise only when the economy reaches the full-employment level. In the real world, however, even during the course of regular business cycle, prices rise and fall as the economy expands and contracts. Therefore, in this Unit, we relax the assumption of constant prices. We examine the effectiveness of fiscal and monetary policies on output, interest rate and exchange rate in an open economy. We will also relax our assumption of small open economy and study the effect of changes in government expenditure (and thereby on money supply) on income and interest rate. We begin by studying the short-run model of a large open economy like the US.

## 12.2 SHORT-RUN EFFECT

In a large open economy, the net capital outflow is the amount that domestic investors lend abroad minus the amount that foreign investors lend within the country. As the domestic interest rate falls, domestic investors find foreign lending more attractive and foreign investors find lending here less attractive. Thus, there is a net capital outflow. Thus we can say that net capital outflow (or net foreign investment) is inversely related to the interest rate ($i$). The three equations that apply, therefore, are:

$$Y = C(Y - T) + I(i) + G + NX(e, Y) \quad \ldots (12.1)$$

$$M/P = L(i, Y) \quad \ldots (12.2)$$

$$NX(e, Y) = CF(i) \quad \ldots (12.3)$$

The first two equations are the same as those used in the Mundell–Fleming model in unit 10.The third equation states that the trade balance *NX* (representing net exports) equals the net capital outflow *CF*, which in turn depends on the domestic interest rate. Substituting (12.3) into (12.1) we get:

$$Y = C(Y - T) + I(i) + G + CF(i) \quad \ldots (12.4)$$

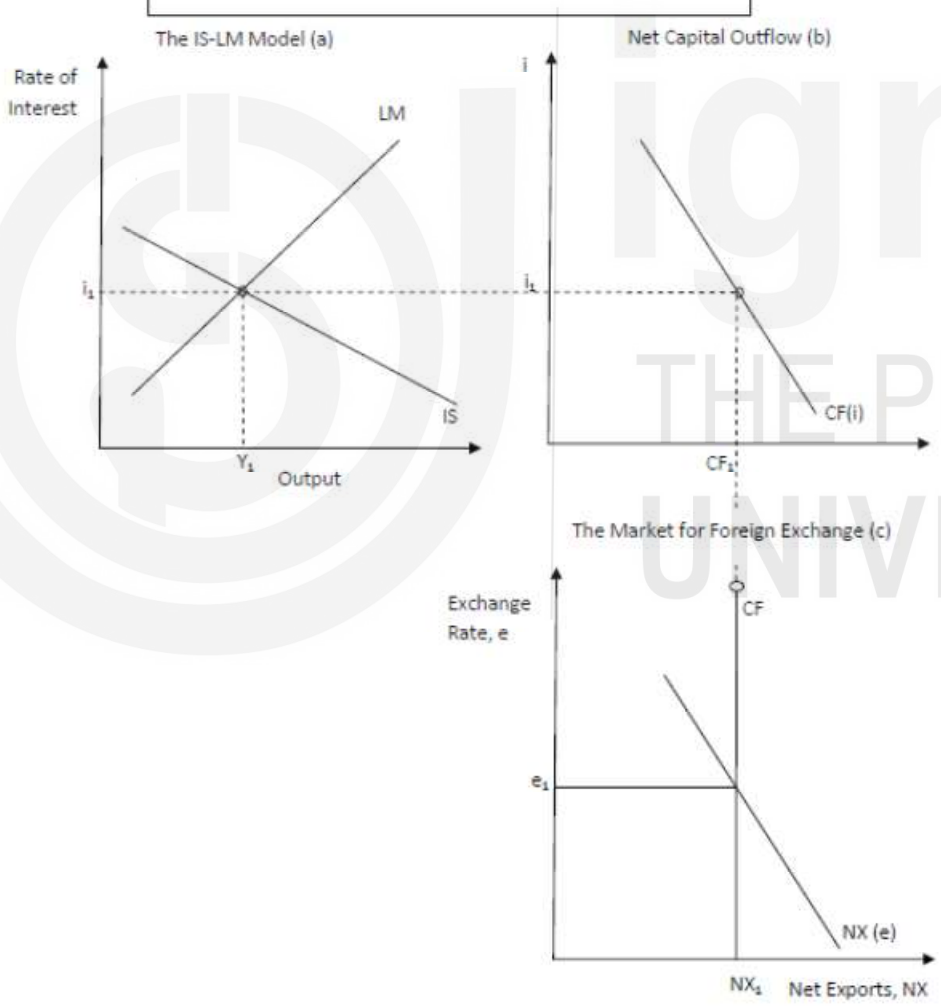
$$M/P = L(i, Y) \quad \ldots (12.5)$$

Output ($Y$) now depends on interest rate (i) for two reasons. First, a higher interest rate reduces investment. Second, a higher interest rate reduces the net capital outflow (CF). A reduction in net capital outflow implies an increase in the supply of foreign currency and appreciation in exchange rate. Thus a higher interest rate is likely to reduce net exports.

To analyse this model, consider Fig. 12.1 in which panel (a) shows the *IS–LM* diagram with the interest rate *i* on the vertical axis and income *Y* on the horizontal axis. As you know, the *IS* and *LM* curves together determine the equilibrium level of income and the equilibrium interest rate.

The new net-capital-outflow term in the *IS* equation, *CF*(*i*), makes the *IS* curve flatter than it would be in a closed economy. The more responsive international capital flows are to the interest rate, the flatter the *IS* curve would be. Further, panels (b) and (c) show how the equilibrium from the *IS–LM* model determines the net capital outflow, the trade balance and the exchange rate. In particular, panel (b) shows that the interest rate determines the net domestic investors from lending abroad and encourages foreign investors to lend here, thereby reducing the net capital outflow.

**Fig. 12.1: Short run Model for a Large Open Economy**



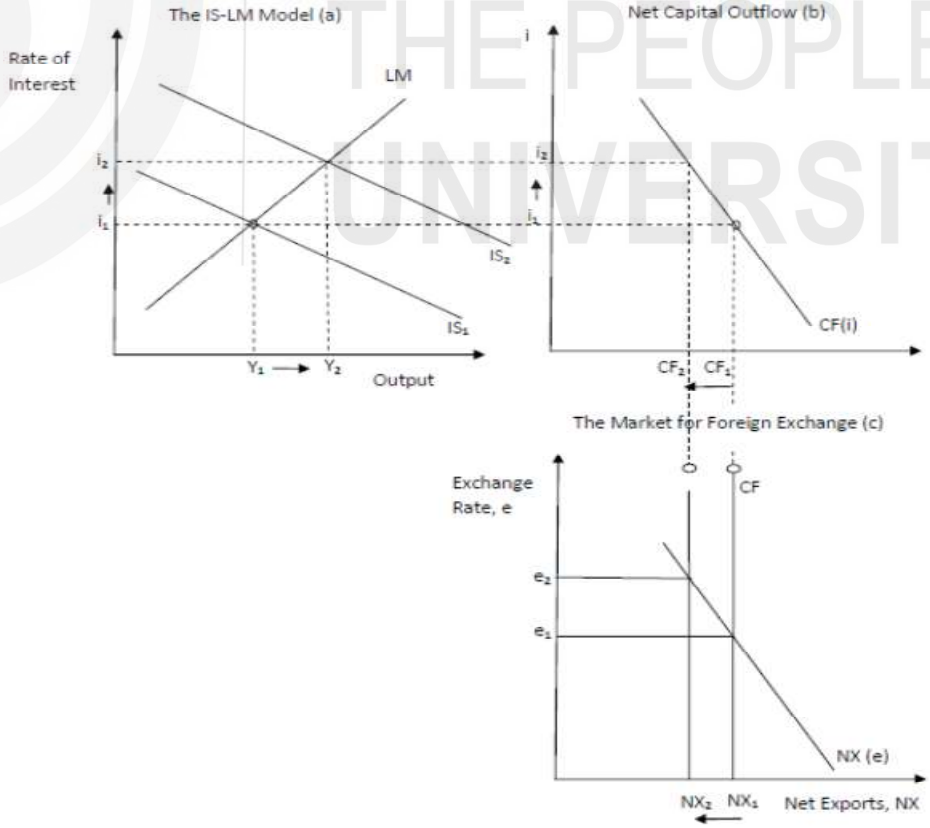

Note that the curve CF(*i*) in panel (b) slopes downward because a higher interest rate discourages domestic investors from lending abroad and encourages foreign investors to lend within the country. Panel (c) shows that the exchange rate adjusts to ensure that the net exports of goods and services (NX) are equal to the

net capital outflow (CF) (this assumption we made in equation (12.3)). Let us now examine the impact of government policies (i.e., fiscal and monetary policies) by assuming that the economy has a floating exchange rate.

### Impact of Government Policies

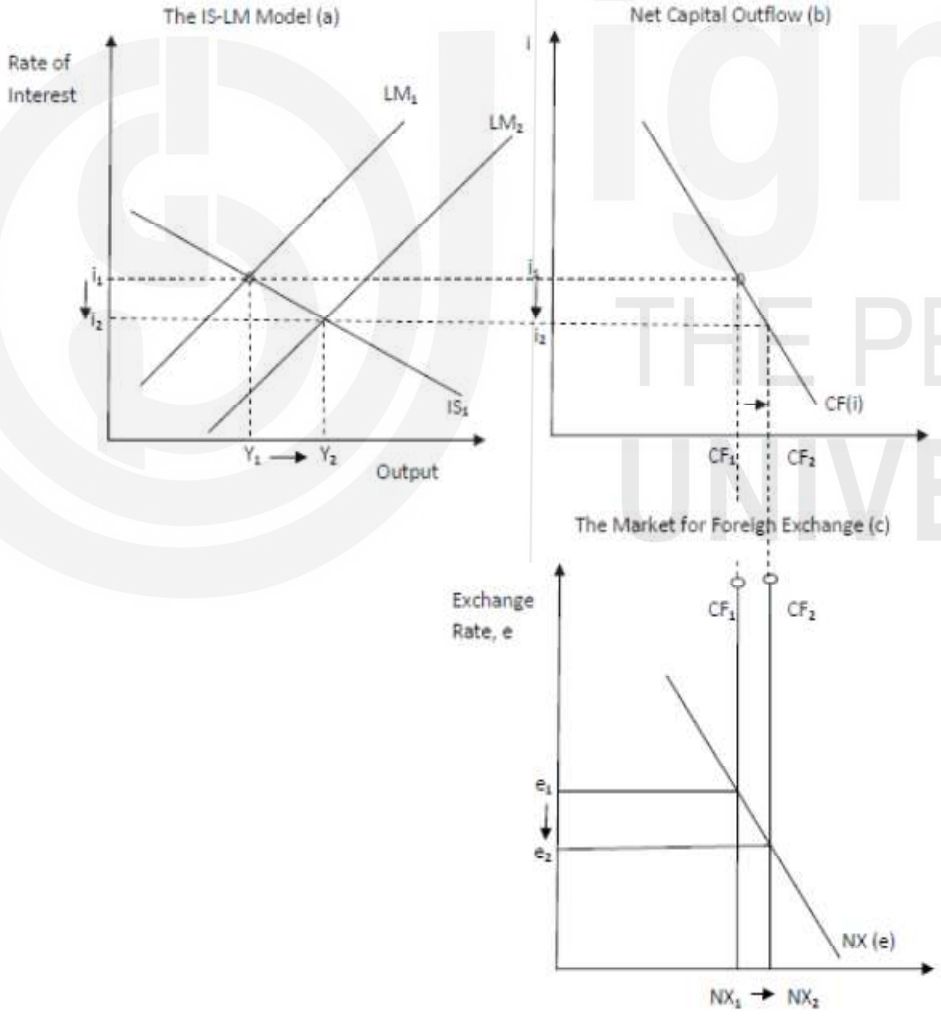
An increase in government purchases, or a cut in taxes, shifts the *IS* curve to the right. This shift leads to an increase in the level of income and an increase in the interest rate [panel (a) in Fig. 12.2]. These two effects are similar to those in a closed economy. However, in a large open economy, the higher interest rate reduces the net capital outflow [panel (b)]. The fall in the net capital outflow reduces the supply of dollars in the market. This causes the exchange rate appreciates [as in panel (c)]. Domestic goods will become more expensive relative to foreign goods and net exports fall. Hence, fiscal expansion, under a floating exchange rate, does raise income in a large open economy, unlike in a small open economy. The impact on income, however, is smaller than in a closed economy (where the expansionary impact of fiscal policy is partially offset by the crowding out of investment). Further, in a large open economy, the rise in interest rate serves as an offsetting factor with the consequent fall in the net capital outflow causing the currency to appreciate in the foreign-exchange market. This reduces the fiscal-policy multiplier even further. Together, these effects are not large enough to make fiscal policy powerless (as it is in a small open economy), but they do reduce the impact of fiscal policy.

**Fig. 12.2: Fiscal Expansion in a Large Open Economy**



Turning to the effect of a monetary expansion, an increase in money supply shifts the *LM* curve to the right [panel (a), Fig. 12.3].The level of income rises and the interest rate falls. Once again, these effects are similar to those in a closed economy. Yet, as panel (b) shows, the lower interest rate leads to a higher net capital outflow. This increases the supply of money in the domestic market for foreign exchange causing the exchange rate to falls [panel (c)]. Domestic goods become cheaper relative to foreign goods, causing the net exports to rise. The monetary transmission mechanism thus works through two channels in a large open economy (unlike in a closed economy where a monetary expansion lowers the interest rate stimulating investment).Both these effects result in a higher level of aggregate income. Hence, the *IS* curve is flatter (than it is in a closed economy) and any given shift in the *LM* curve will have a larger impact on income.

**Fig. 12.3: A Monetary expansion in a large Open Economy**



**Check Your Progress 1**

1) How is 'net capital outflow' related to changes in interest rate?

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2) State the effect of an expansionary fiscal policy in a large open economy in the short run.

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## 12.3 LONG-RUN EFFECT

In the global economy, International investors always look at the monetary policies and the interest rate behaviours of each country. The monetary and fiscal policies of a country affect that country's capital account and balance of payments. Both the monetary and fiscal policies may affect domestic as well as foreign economies through changes in balance of payments and capital inflows. In unit 10, we discussed the Mundell-Fleming model for a small open economy in the short run when the price level is fixed. In this section, we will relax the assumption of fixed prices to examine what happens when the price level changes. We will also relax the assumption of perfect capital mobility and assume elastic capital flows. In this context, the BP curve will be positively sloped. Further, as the BP curve is drawn on the assumption of fixed exchange rate, any devaluation will shift the BP curve down. With the elimination of all or most controls on international capital flows, the *BP* curve would be much more flatter (to the right of the *LM* curve) at the full-employment level of income.

### 12.3.1 Floating Exchange Rate

An expansionary fiscal policy in the form of an increase in government expenditures (and/or a reduction in taxes which increases private consumption) shifts the *IS* curve to the right. Due to this the goods market is in equilibrium at a higher level of national income for any given interest rate. On the other hand, a contractionary fiscal policy shifts the *IS* curve to the left. Likewise, an easy monetary policy (in the form of an increase in the nation's money supply) shifts the *LM* curve to the right, indicating that at each rate of interest the level of national income must be higher to absorb the increase in the money supply.

On the other hand, a tight monetary policy reduces the nation's money supply shifting the *LM* curve to the left.

The IS-LM and BP curves interest at point E (Fig. 12.4) with $i_1$ as the rate of interest and $Y_1$ as the income level. An expansionary fiscal policy will shift the IS curve rightward to IS', so as to cross LM at Z. Since Z lies to the left of BP curve, the nation will have a surplus in its external balances. With flexible exchange rates, the domestic currency appreciates relative to the foreign currency and the BP curve shifts to the left to BP'. An exchange rate appreciation reduces net exports and induces a leftward shift in the IS curve from IS' to IS''. On the other hand, appreciation of the exchange rate causes a fall in domestic prices and a subsequent rise in real money balances. This expansion in nation's real money supply shifts the LM curve rightward to LM'. This will continue until IS and LM curve intersect on BP curve and all three markets are simultaneously in equilibrium (at point E').Fiscal expansion in the long run with flexible exchange rate therefore result in a higher rate of interest ($i_2$) and higher income level ($Y_2$). Exchange rate also appreciates owing to a surplus in the balance of payments.

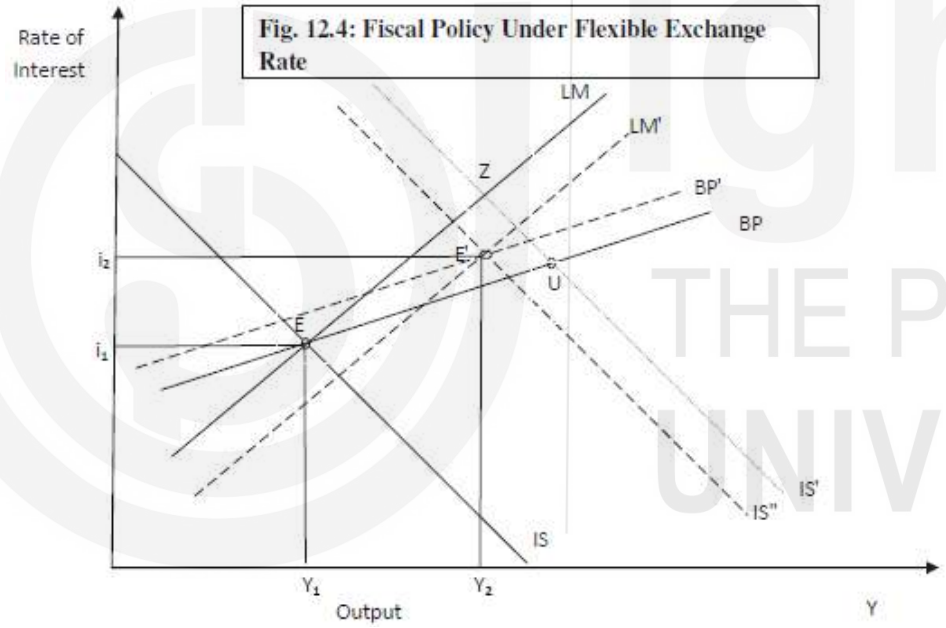


**Fig. 12.4: Fiscal Policy Under Flexible Exchange Rate**

Fig. 12.5 shows the impact of monetary policy on the country's economy with an internal and external balance at E (where income equals $Y_1$ and rate of interest equals $i_1$).An easy monetary policy shifts the LM curve rightward to LM', where it intersects the IS curve at Z. At Z, the country has an external deficit due to higher income and lower interest rate (at point E).As the exchange rate is flexible, the currency depreciates. This shifts the BP curve rightward to BP'. The exchange rate depreciation improves the nation's trade balance shifting IS rightward to IS'. This reduces real money supply by increasing domestic prices. This results in a leftward shift of LM' curve to LM''. Equilibrium will be re-established in all the three markets where IS' and LM'' intersect on the BP' curve

at E'. Thus, under the flexible exchange rate system, monetary expansion results in a fall in rate of interest to $i_2$, rise in equilibrium income to $Y_2$ and exchange rate depreciation in the long run. Note that when a nation starts with an easy monetary policy, rather than an expansionary fiscal policy, it ends up with a lower rate of interest which is a stimulus to long run growth.

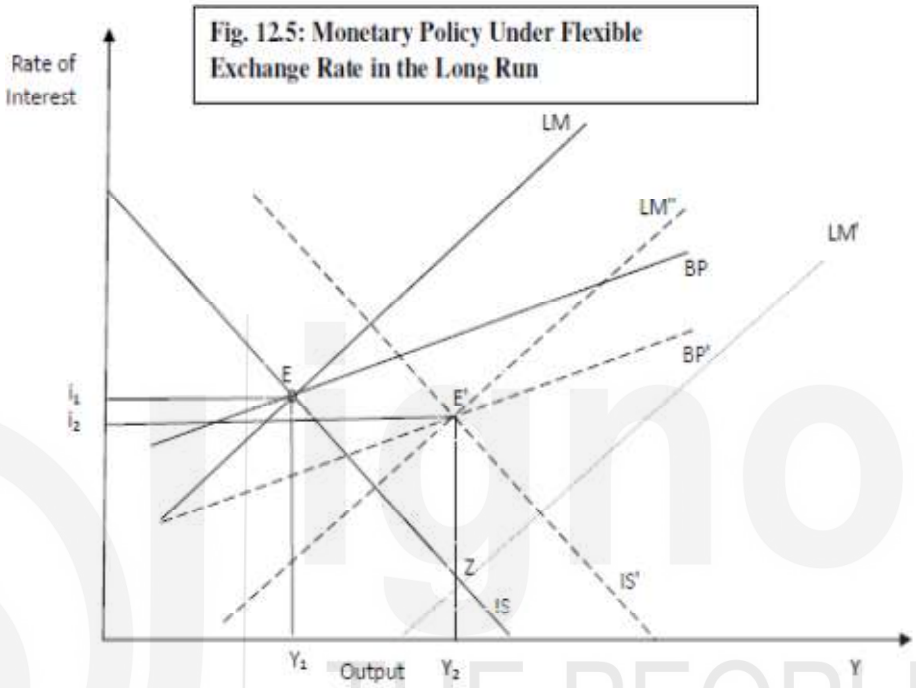


**Fig. 12.5: Monetary Policy Under Flexible Exchange Rate in the Long Run**

### 12.3.2 Fixed Exchange Rate

The IS-LM framework under fixed exchange rates will not change from that under flexible rates. Monetary and fiscal policies also will not directly affect the *BP* curve. Therefore, from an initial equilibrium at E, expansionary fiscal policy shifts the IS curve rightward to IS' making it intersect the LM curve at Z (which lies to the left of BP).Note that there is a situation of surplus in external balance. Hence, capital inflows increase the demand for domestic currency in the foreign exchange market bearing pressure on the exchange rate to appreciate. Since the central bank wants to maintain exchange rate at fixed levels, it will buy foreign currency and supply domestic currency. The increased supply of domestic currency increases the real balances shifting the LM curve rightward. This creates pressure on exchange rate to appreciate and decreases domestic prices. New equilibrium gets established at E' with higher income level $Y_2$, higher rate of interest $i_2$ and unchanged rate of exchange.

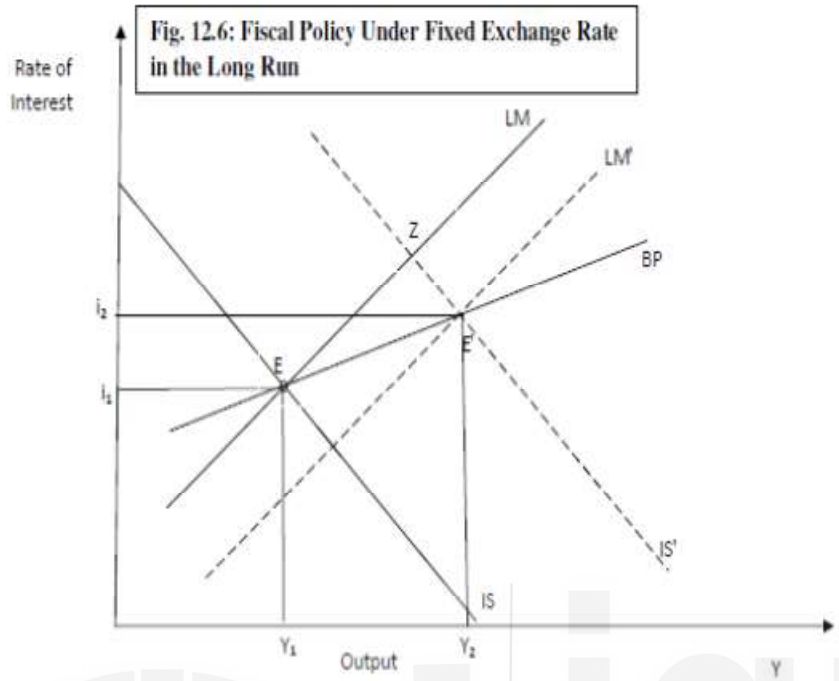


**Fig. 12.6: Fiscal Policy Under Fixed Exchange Rate in the Long Run**

If we consider the effect of monetary policy, with an expansionary monetary policy, from an initial equilibrium position at E, the LM curve shifts rightward to LM' (Fig. 12.7).The LM' curve intersects the IS curve at Z (which lies to the right of BP) yielding a deficit in 'external balances'. Capital outflow reduces the demand for domestic currency putting pressure on the exchange rate to depreciate. Central bank intervenes to buy domestic currency and sell foreign currency (so as to reduce the excess supply of domestic currency).This induces a reduction in the supply of money balances. Pressure on the exchange rate depreciates resulting in rise in domestic prices. The combined effect of rise in prices and reduction in nominal balances causes real money balances to fall. As a result the LM' curve shifts leftward to LM. Thus, monetary expansion has no effect on equilibrium income and rate of interest when capital is mobile and prices are flexible.

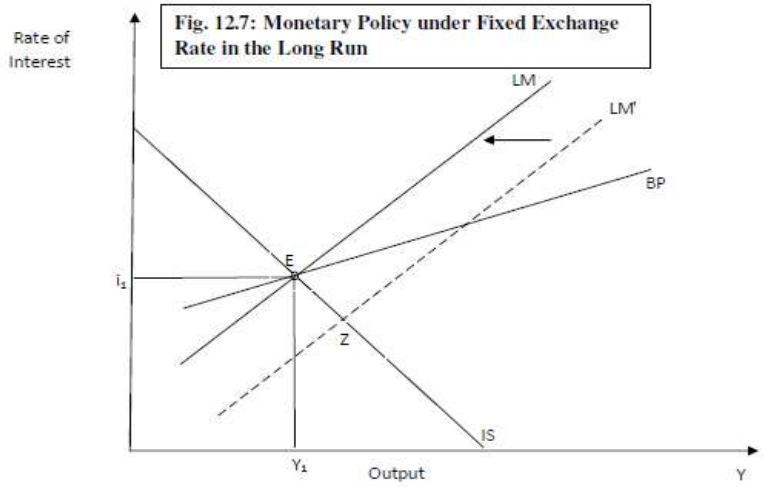


**Fig. 12.7: Monetary Policy under Fixed Exchange Rate in the Long Run**

Thus, monetary policy remains ineffective both in short run and long run under fixed exchange rate. Policy has therefore to focus on fiscal policy to achieve full employment. Under flexible exchange rates, both fiscal and monetary policies are effective in modifying output. However, expansionary fiscal policy leads to a rise in rate of interest whereas easy monetary policy leads to a fall in domestic rate of interest and hence is a better policy option for stimulating growth.

**Check Your Progress 2**

1) How does an expansionary monetary policy affect income and rate of interest in the long run under a flexible exchange rate regime?

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2) What is the log run effect of an expansionary fiscal policy under the fixed exchange rate regime?

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## 12.4 INTERNAL AND EXTERNAL BALANCE

The most important economic goals or objectives of nations are to maintain: (i) adequate internal balance and (2) a fair degree of external balance. In terms of external balance, the economy should be in equilibrium with the balance of payments. The reserves are to be kept constant in the short run while in the long run, they may increase or decrease. Internal balance exists when output is at the full employment level. If the rate of interest in a country is higher than the world interest rate, then the capital flow to that country from abroad will be unlimited. The balance of payments is then affected by both the balance of trade and capital inflow. This can be written as:

$$BoP = NX (Y, Y_f, R) + CF (i - i^*) \quad \ldots (12.6)$$

Equation explains that the trade balance is influenced by income, foreign income and the real exchange rate. If the imports and the interest rate of any country fall, the balance of payment worsens. But if the interest rate increases above the world level then the capital account improves. If the capital inflow increases, it can be used to finance the trade deficit. The interest rate can be maintained to attain the equilibrium point in the balance of payments.

### 12.4.1 Equilibrium

To achieve the objective of attaining equilibrium in both the internal and external balances, countries use two policy instruments. These are: (i) expenditure-changing policies and (ii) expenditure switching policies. Expenditure-changing policies include both fiscal and monetary policies. *Fiscal policy* refers to changes in government expenditures, taxes, or both. Repeating the equilibrium condition from unit 10 (Equation 10.1) where *G* refers to government expenditures and *T* to taxes we have:

$$I + X = S + M \quad \ldots (12.7)$$

$$I + X + G = S + M + T \quad \ldots (12.8)$$

Government expenditures *(G)*, just like investments *(I)* and exports *(X)*, are injections into the system, while taxes *(T)*, just like savings *(S)* and imports *(M)*, are a leakage from the system. Equation (12.8) can be rearranged as:

$$G-T = (S - I) + (M - X) \quad (12.8.a)$$

Equation (12.8a) postulates that a government budget deficit *(G > T)* must be financed by an excess of *S* over *I* and/or an excess of *M* over *X. Monetary policy* involves a change in the country's money supply which affects the domestic interest rates. A fall in the domestic rate of interest induces an increase in the level of domestic investment and income as also imports. On the other hand, fall in the interest rate, induces a short-term capital outflow or reduced inflow.

Expenditure-switching policies refer to changes in the exchange rate (i.e., a devaluation or revaluation). Devaluation switches expenditures from foreign to domestic commodities and can be used to correct a deficit in the nation's balance of payments. A revaluation switches expenditures from domestic to foreign products and can be used to correct a surplus in the nation's balance of payments.

### 12.4.2 Expenditure Policies

We examine here how a country can simultaneously attain internal and external balance with expenditure-changing and expenditure-switching policies. For simplicity, we assume a zero international capital flow (so that the balance of payments is equal to the nation's trade balance). We also assume that prices remain constant. We measure 'exchange rate' (R) on the vertical axis (Fig. 12.8). An increase in *R* refers to devaluation and a decrease in *R* to a revaluation. The horizontal axis measures real domestic expenditures or absorption (*D*). Besides domestic consumption and investments, *D* also includes government expenditures. The *EE* curve shows the various combinations of exchange rates and real domestic expenditures that result in external balance. The *EE* curve is positively inclined since a higher *R* (due to devaluation) improves the country's exports relative to imports. To maintain external balance, domestic absorption must increase to induce imports to match higher exports. On the other hand, the *YY* curve shows the various combinations of exchange rates *(R)* and domestic absorption *(D)* that results in internal balance (i.e., full employment with price

stability).The *YY* curve is negatively inclined. A lower R (revaluation) from $R_2$ to $R_1$ reduces income below full employment. Domestic absorption must rise to induce income to increase from $D_2$ to $D_3$ to maintain internal balance (Point J on YY).Only at point *F* (i.e., at $R_2$ and $D_2$) the economy can be simultaneously in external and internal balance , i.e., where the *EE* and *YY* curves intersect. Points above the *EE* curve refer to 'external surpluses' and points below refer to 'deficits'. Points below the *YY* curve refer to unemployment and points above it refer to inflation. We can therefore define four zones of external and internal imbalance as follows:

Zone I: External surplus and internal unemployment

Zone II: External surplus and internal inflation

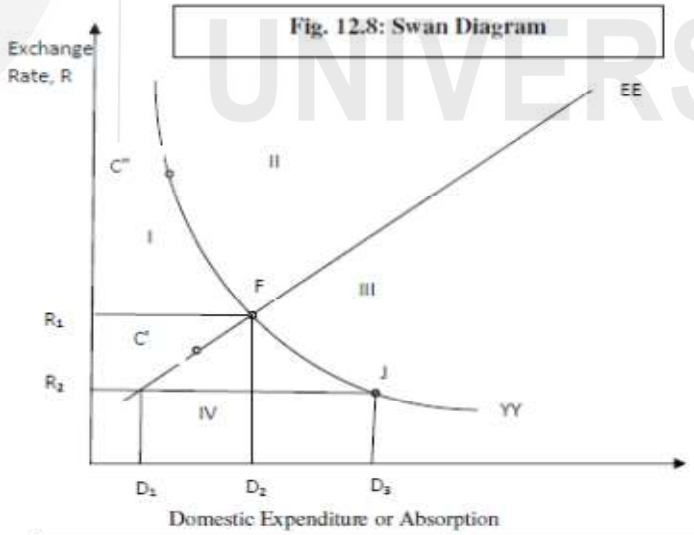
Zone III: External deficit and internal inflation

Zone IV: External deficit and internal unemployment

We can determine the combination of expenditure-changing and expenditure-switching policies required to reach point *F* from the Fig. 12.8.For instance, starting from point *C* (deficit and unemployment), both the exchange rate *(R)* and domestic absorption *(D)* must be increased to reach point *F*. By increasing only *R*, the economy can attain either external balance (point C' on the *EE* curve) or with a larger increase in *R*, internal balance (point C" on the *YY* curve).

It cannot attain both simultaneously. Similarly, by increasing only domestic absorption, the economy can attain only internal balance (point *J* on the *YY* curve) which leaves an external deficit (since the economy will be below the *EE* curve).Thus, a calibrated adoption of twin policies is required to achieve the two goals simultaneously.

**Fig. 12.8: Swan Diagram**

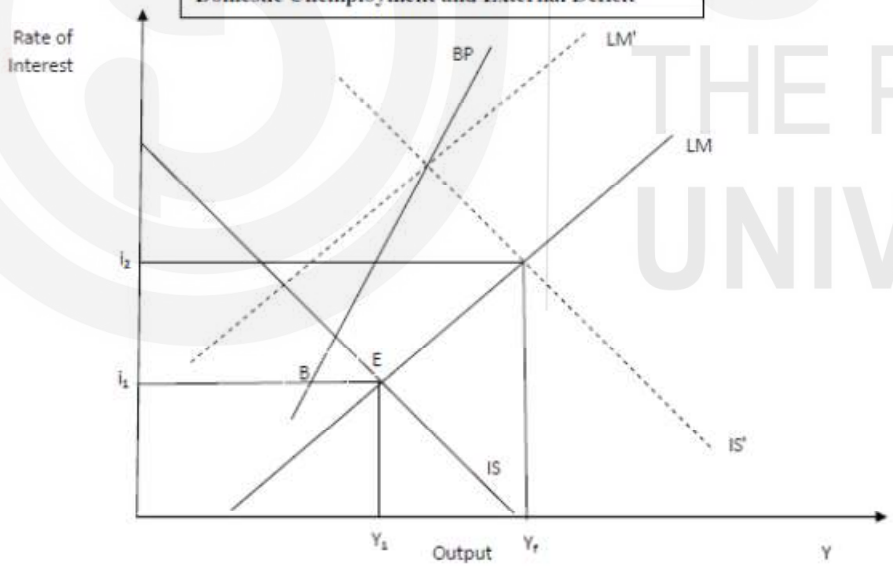



**Swan Diagram** was originally published by Australian economist Trevor Swan in 1956. It is way of analyzing an economy in terms of both its internal and external balance. On the y axis, we have the real exchange rate, while on the x axis we have domestic demand. A policy mix of expenditure switching and changing policies is usually necessary to achieve both internal and external balances.

## 12.5 EXTERNAL DEFICIT AND UNEMPLOYMENT

Let us now turn to examining how fiscal and monetary policies can be used to attain internal and external balance. For this, we start from a position of external deficit and unemployment assuming imperfect capital mobility. Imperfect capital mobility implies that international capital flows are not very responsive to changes in international interest differentials. The *BP* curve is steeper than the *LM* curve and is located to the left of the *LM* curve at the full-employment level of national income ($Y_f$). Let us consider an initial situation where the *IS* and *LM* curves intersect at point *E* but the *BP* curve does not (Fig. 12.9).This means, the domestic economy is in equilibrium (with unemployment) at $i_1$ and $Y_1$but the economy faces a deficit in its balance of payments (since point *E* is to the right of point *B* on the *BP* curve).The economy can reach full-employment level (of output of $Y_f$) with external balance by using the expansionary fiscal policy (which shifts the *IS* curve to the right to IS')and a tighter monetary policy (which shifts the *LM* curve to the left to LM').This makes the IS' and LM' curves cross the *BP* curve at $i_2$and $Y_f$. To reach the full-employment level $Y_f$, and also have equilibrium in its balance of payments, the country should pursue a stronger expansionary policy and tighter monetary policy. Thus, two *conflicting* policies (an expansionary fiscal policy and a tight monetary policy) are required to attain internal and external balance simultaneously.

**Fig. 12.9: Fiscal and Monetary Policy from Domestic Unemployment and External Deficit**



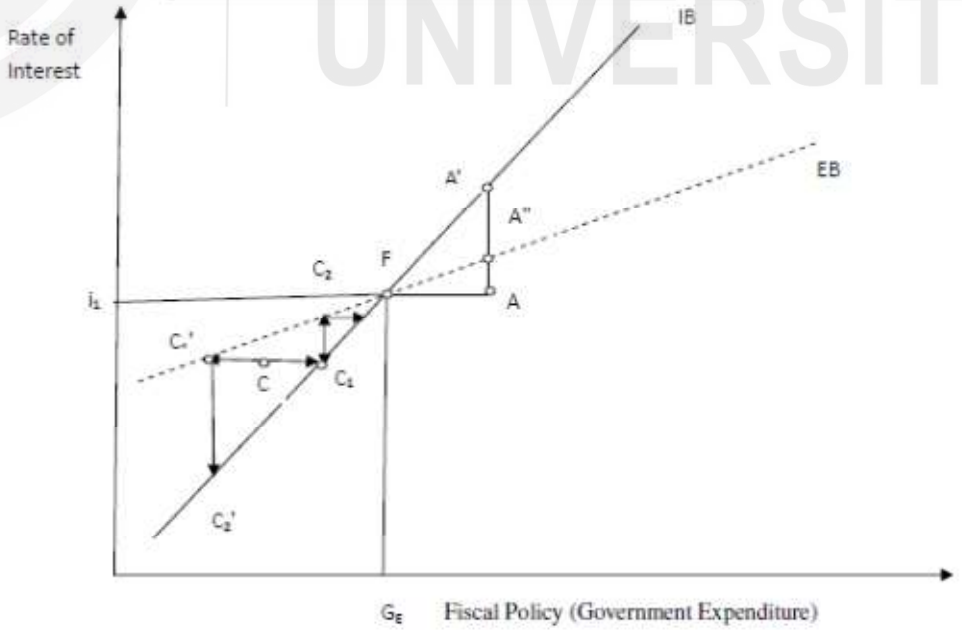

**Policy Mix for Optimal Balance**

It is thus clear that we need to adopt a policy-mix to simultaneously achieve internal and external balance. For this, consider Fig. 12.10 where movements along the horizontal axis away from the origin refer to *expansionary* fiscal policy (i.e., higher government expenditures and/or lower taxes), while movements along the vertical axis away from the origin refer to *tight* monetary policy (i.e., reductions in the country's money supply and increases in its interest rate).

The *IB* line shows the various combinations of fiscal and monetary policies that result in internal balance (i.e., full employment with price stability). The *IB* line is positively inclined because an *expansionary* fiscal policy must be balanced by a tighter monetary policy of a sufficient intensity to maintain internal balance. For instance, starting at point *F*, an increase in government expenditure moves the economy to point *A* that leads to excess aggregate demand and a demand-pull inflation. This can be corrected by a tighter monetary policy and higher interest rate that moves the country to point *A*'on the *IB* line.

The *EB* line, on the other hand, shows the various combinations of fiscal and monetary policies that result in external balance (i.e., equilibrium in the country's balance of payments).Starting from a point of external balance on the *EB* line, an expansionary fiscal policy stimulates national income causing the country's trade balance to worsen. This needs to be balanced with a tighter monetary policy that increases the country's interest rate to sufficiently increase the capital inflows (or reduce capital outflows) so as to attain external balance. For instance, starting from point *F* on the *EB* line, an expansionary fiscal policy that moves the country to point *A* leads to an external deficit. This can be corrected by a tighter monetary policy and higher interest rate (which moves the country to point *A*'on the *EB* line).Only at point *F*, where the *IB* and *EB* lines cross, will the country be simultaneously in internal and external balance. The crossing of the *IB* and *EB* curves (in Fig. 12.10) defines the four zones of internal and external imbalance. Note that the *EB* line is flatter than the *IB* line. This is always the case whenever short-term international capital flows occur due to international interest differentials. This can be further explained as follows:

**Fig. 12.10: Effective Market Classification and the Policy Mix**



Expansionary fiscal policy raises national income and increases the transaction demand for money in a country. If monetary authorities increase the money supply sufficiently to satisfy this increased demand, the interest rate will remain unchanged. Under these circumstances, fiscal policy affects the level of national income but not the interest rate. On the other hand, monetary policy operates by changing the money supply and the country's interest rate. The change in the interest rate affects not only the level of investment and national income (through the multiplier process) but also international capital flows. As a result, monetary policy is more effective than fiscal policy in achieving external balance. Hence, the *EB* line is flatter than the *IB* line. Following the *principle of effective market classification*, monetary policy should be assigned to achieve external balance and fiscal policy to achieve internal balance. If the country does the opposite, it would move farther away from internal and external balance. For instance, if from point *C* (in Fig. 12.10) which indicates unemployment and a deficit (zone IV)], the country adopts a contractionary fiscal policy to eliminate the external deficit and moves to point $C_1$' on the *EB* line, and then adopts an easy monetary policy to eliminate unemployment by moving to point $C_2$' on the *IB* line, the economy would move farther and farther away from point *F*. On the other hand, if the country appropriately uses an expansionary fiscal policy to reach point $C_1$ on the *IB* line, and then adopts a tighter monetary policy to reach point $C_2$ on the *EB* line, the country would move closer and closer to point *F*. In fact, a country could move from point *C* to point *F* in a single step by an appropriate mix of expansionary fiscal and contractionary monetary policies (as in the *IS –LM –BP* model in Fig. 12.9).

**Check Your Progress 3**

1) State the significance of the four zones in the Swan diagram.

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2) Why is there a need to use the two policies harmoniously to achieve the two goals of internal and external balance?

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3) Indicate how an economy can achieve both the internal and external balance under a fixed exchange rate starting from a situation of external deficit and unemployment.

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## 12.6 LET US SUM UP

Relaxing the assumption of small economy, the unit has dealt with a large open economy to consider how a monetary contraction affects the economy in the short run. In a closed economy, a monetary contraction raises the interest rate, lowers investment and thus lowers aggregate income. The interest rate is unaffected because it is determined by world financial markets. The effect in the large economy is an average of the two cases , i.e., a monetary contraction raises the interest rate and reduces the investment but only to an extent. The assumption of sticky prices also needs relaxed. If we do this, under flexible exchange rates, both fiscal and monetary policy is effective in modifying output. But monetary policy is rendered ineffective under fixed exchange rate regime since the Central bank looses it autonomy because of its commitment to hold exchange rates constant. Maintenance of internal and external balances is often therefore two conflicting objectives. Internal balance exists when economy is at full employment level with price stability while external balance requires equilibrium in balance of payment. A country should therefore use fiscal policy to achieve internal balance and monetary policy to achieve external balance.

## 12.7 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress 1**

1) The net capital outflow/net foreign investment is negatively related to the interest rate. This is because, as the domestic interest rate falls, domestic investors find foreign lending more attractive and foreign investors find lending less attractive.

2) It shifts the IS curve rightward. Higher interest rate reduces the net capital outflow and exchange rate appreciates. Domestic goods become more expensive relative to foreign goods and net exports fall. Fiscal expansion therefore does raise income. In other words, the impact is much smaller than in the closed economy.

**Check Your Progress 2**

1) It affects by resulting in a fall in rate of interest, rise in equilibrium income and depreciation in exchange rate.

2) It results in a surplus of external balance causing capital inflows thereby exerting pressure on the exchange rate to appreciate.

**Check Your Progress 3**

1) We can determine the combination of expenditure-changing and expenditure-switching policies for maintaining 'internal and external balance' in a large open economy.

2) In a situation of external deficit and unemployment, both the exchange rate *(R)* and domestic absorption *(D)* must be increased. By increasing only *R*, the country can attain either external balance or with a larger increase in *R*, only the internal balance. It cannot attain both simultaneously. Similarly, by increasing domestic absorption only, the country can attain internal balance but continues to have an external deficit. Thus, the two policies are usually required to be adopted harmoniously to achieve the two goals simultaneously.

3) A country can attain the full-employment level of output with external balance by using the expansionary fiscal policy that shifts the IS curve to the right to IS' and a tighter monetary policy that shifts the LM curve to the left to LM', so that the IS' and LM' curves cross the unchanged BP curve at $i_2$and $Y_f$.

# GLOSSARY

**Aggregate Supply Curve** : According to classical economists, the aggregate supply curve is vertical, implying that total output is always at the full employment level. In the short run, according to Keynes, the aggregate supply curve will be horizontal if the economy has under-utilised resources.

**Appreciation of Domestic Currency** : It is an increase in the price of domestic currency in terms of a foreign currency.

**Absolute PPP** : It implies that exchange rate equals relative price levels.

**Aggregate Demand Curve** : It shows the relation between overall price level in the economy with the total output produced in the economy.

**Aggregate Supply** : Aggregate supply is the total quantity of goods and services that firms produce and sell at a given price level.

**Actual Output Level** : The equilibrium output level provided by the intersection of AD curve and Short run AS curve.

**Balance of Payments** : It is the record of all economic transactions between the residents of a country and the rest of the world in a particular period. These transactions are made by individuals, firms and government bodies. Thus the balance of payments includes all external visible and non-visible transactions of a country.

**Badla System** : Badla was an indigenous carry-forward system invented on the Bombay Stock Exchange as a solution to the perpetual lack of liquidity in the secondary market. Badla were banned by the Securities and Exchange Board of India (SEBI) in 1993, effective March 1994, amid complaints from foreign investors, with the expectation that it would be replaced by a futures-and-options exchange.

**Balance of Trade** : It refers to exports and imports of visible items.

**Bank Rate** : Rate at which the central bank lends funds to the commercial banks.

**Bond** : In economics, it is an instrument of indebtedness. It is a promise to pay its holder certain agreed upon amount of money at specified dates in the future.

**Broad Money** : M3 is known as 'broad money' since it includes time deposits as well.

**Budget Deficit** : When government receipts fall short of government expenditure, we encounter the problem of budget deficit.

**Budget Surplus** : Excess of government revenue over government spending.

**Business Cycle** : Periodical ups and downs in economic activity in an economy. There are four phases of a business cycle, viz., expansion, recession, depression, and recovery. During expansion phase the economy grows while during recession there is a deceleration in growth rate. Depression is much severe and the economy may witness negative economic growth. During recovery, as the name suggests, the economy recovers from depression.

**Balance of Payments** : It is a systematic record of all its transactions (involving goods, services, physical and financial assets, as well as transfer payments) of a country with the rest of the countries in the world during a given period (typically one year)

**BP Schedule** : It shows the various combinations of interest rates ($i$) and national income ($Y$) at which the country's balance of payments is in equilibrium at a given exchange rate.

**Capital Goods** : These are goods which help in further production of goods. Example could be machineries.

**Cash Reserve Ratio (CRR)** : It is the percentage of bank deposits that the banks are required keep with the central bank. In India, in 2019 the CRR is 4 percent. Thus, if Rs. 100 is deposited in a bank, the bank needs to keep Rs. 4 with the RBI. The RBI can vary the CRR between 3 per cent and 15 per cent.

**Consumer Price Index** : Consumer Price Index represents the rate of increase in the consumer prices of a basket of goods and services.

**Core Inflation** : Core inflation is a measure of inflation that excludes items that face volatile price movement, notably food and energy.

**Cost-push inflation** : Cost-push inflation is a sustained rise in the general price level due to a rise in the cost of production in the economy.

**Cost-push inflation** : Cost-push inflation is a sustained rise in the general price level due to a rise in the cost of production in the economy.

**Crowding Out** : It reflects a situation when increase in public investment is possible at the cost of private investment.

**Capital Account** : The capital account of the BOP includes transactions involving cross-border purchase and sale of physical and financial assets.

**Current Account** : The current account of BOP records receipts from and payments to foreigners due to international trade in goods and services (including factor services).

**Consumption of Fixed Capital** : The capital goods wear out or fall in value as a result of its consumption or use in the production process.

**Capital Account** : The capital account records purchases and sales of assets such as stocks, bonds and land, and borrowings and lending from/ to foreigners by government , corporations and individuals, any change in country's gold stock or reserves of foreign currency.

**Currency Swap** : Swaps are financial contract that obligate each party to the contract to exchange (swap) a set of payments it owns for another set of payments owned by another party.

**Cyclical Unemployment** : It arises due to fluctuations in aggregate demand, which is a part of business cycles. When aggregate demand declines, there is simultaneous decline in the demand for labour and consequent increase in unemployment. On the other hand, a general boom in the economy increases the demand for labour and unemployment decreases. Thus cyclical unemployment is pro-cyclical in nature.

**Classical View** : The Classical view holds that the resources are fully employed in all the firms and hence the manufacturing units are working at their capacity.

**Contractionary Policy** : A contractionary policy aims at slowing down the economy through a decrease in G or Ms or an increase in T. It shifts the AD curve to the left.

**Capital Mobility** : Refers to investors being able to purchase assets in any country they choose, with low transaction costs and in unlimited amount.

**Deflation** : Deflation is a sustained decrease in the general price level.

**Demand-pull inflation** : Demand-pull inflation is a sustained rise in the general price level due to an increase in aggregate demand.

**Depreciation** : It is the loss in the value of capital asset because of normal wear and tear and expected obsolescence.

**Depreciation of Domestic Currency** : It is a decrease in the price of domestic currency in terms of a foreign currency

**Devaluation** : A decrease in the exchange rate under fixed exchange rate regime implemented through government decree.

**Derivatives** : A derivative is a security with a price that is dependent upon or derived from one or more underlying assets. The derivative itself is a contract between two or more parties based upon the asset or assets. Its value is determined by fluctuations in the underlying asset. The most common underlying assets include stocks, bonds, commodities, market indexes, currencies.

**Demand-pull Inflation** : It is the inflation initiated by an increase in aggregate demand.

**Economic Agents** : These are groups of transactors, which indulge in economic activities like production/ income generation/ addition to capital stock. Economic agents can be classified into producers, households, capital sector, rest of the world, and government.

**External Commercial Borrowings (ECB)** : ECB are loans which are raised by a country's corporate sector from external financial organizations on commercial terms.

**Exchange Rate Regime** : It is how a country manages its currency in the foreign exchange market.

**Exchange Rate** : Exchange rate between two currencies is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in relation to another currency.

**Exchange Rate Effect** : When a fall in the India's price level causes India's interest rate to fall, the real value of the rupee declines in foreign exchange market and this depreciation stimulates Indian net exports and thereby increases the quantity of Indian goods and services demanded by the rest of the world.

**EB Curve** : Shows the various combinations of fiscal and monetary policies that result in external balance (i.e., equilibrium in the country's balance of payments).

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| **Expansionary Policy** | : | An expansionary policy aims at stimulating the economy through an increase in G or $M_s$ or a decrease in T. It shifts the AD curve to the right. |
| **External Balance** | : | External balance is attained when a country is running neither excessive current account deficit nor surplus (i.e., net surplus is equal to or close to zero). |
| **Expenditure Changing Policies** | : | Expenditure changing policy aims to affect income and employment with the goal of equating domestic expenditure or absorption and production and takes the form of fiscal or monetary policy. |
| **Expenditure Switching Policies** | : | Is a macroeconomic policy that affects the composition of a country's expenditure on foreign and domestic goods. More specifically, it is a policy to balance a country's current account by altering the composition of expenditures on foreign and domestic goods. |
| **Exchange Rate Depreciation** | : | Refers to currency depreciation which is the loss of value of a country's currency expressed with respect to one or more foreign currencies. It typically happens in a floating exchange rate system in which no official currency value is maintained. |
| **Financial Sector** | : | This sector of the economy mops up savings of various sectors and uses it for lending to other sectors of the economy. |
| **Fiscal Policy** | : | It pertains to Government's policy towards taxes and government spending. |
| **Fractional Reserve Banking System** | : | Under this system, banks are required to hold a certain fraction of their demand and time liabilities in the form of cash balances with the central bank. |
| **Foreign Exchange Intervention** | : | It is the buying and selling of foreign currency by the central bank in order to influence the exchange rate |
| **Foreign Exchange Reserves** | : | These are the foreign exchange assets (e.g., foreign currency) held by the central bank. |
| **Floating Exchange Rate** | : | Exchange rate regime wherein a currency's value is allowed to fluctuate according to the foreign exchange market. |
| **Fixed Exchange Rate** | : | It is a regime in which government try to maintain a currency value that is constant against a specific currency or good. |

**Forward Rate** : Forward transactions involve the exchange bank deposit at some specified future date- one that may be 30 days, 90 days or even several years away. The exchange rates quoted in such transactions are called forward exchange rates.

**Forward Contract** : In a forward contract, the buyer agrees to pay cash at a later date when the seller delivers the goods. Typically, the price at which the underline the commodity or asset will be traded is decided at the time of entering into the contract. Thus the price is pegged before hand to avoid the price risk and thus assures the price at which one can buy or sell goods at some future date.

**Future Contract** : A future contract is a standardized contract between two parties where one of the parties commits to sell and the other to buy, a stipulated quantity (and quality, where applicable) of a commodity, currency, security, index or some other specified item at an agreed price on a given date in the future.

**Fiscal Policy** : The policy of a government with respect to government expenditure and taxation.

**Frictional Unemployment** : It takes place because people switch over from one job to another. In many cases the tenure of job gets over and workers remain unemployed till they get another job.

**Government Sector** : It is the sector, which produces goods and services that are not sold at a price. Such goods are meant to meet collective consumption requirements of an economy. The expenses of these goods are met by tax and non-tax revenue of the government.

**Great Depression** : The time duration when the over production and unemployment made it impossible for the world economies to operate at equilibrium. It started in 1929 and went on for a good 7-8 years.

**High-powered Money** : M0 is known as monetary base or central bank money or high-powered money.

**Hot Money** : Money which quickly moves from one nation to another in search of speculative gains.

**Income-Leisure Trade-Off** : Change in income leading to a change in leisure/ labour due to change in the wage rate.

**Inflation** : Inflation is a persistent increase in the general level of prices.

**Inflation Targeting** : The objective of the monetary policy in many countries is inflation targeting, where the central bank targets to achieve certain inflation rate. For example, in India, the Reserve Bank of India targets an inflation rate of 4 per cent with a tolerance band of 2 per cent.

**IB Curve** : The *IB* line shows the various combinations of fiscal and monetary policies that result in internal balance (i.e., full employment with price stability) in the country.

**Inventory** : Demand varies periodically but production is fixed. Thus a firm maintains certain stock of goods to meet uncertainties in demand, supply and movement of goods. If demand exceeds current production there is decline in the stock. Similarly, if demand falls short of production there is accumulation of inventory.

**Investment** : It is the creation of capital goods in an economy over a year. It can be for replacement of worn out capital or for addition to total capital stock of an economy.

**Investment Multiplier** : It is the multiple by which income or output of an economy increase when investment increases by certain amount. It is given by the formula $\alpha = \frac{1}{1-c}$ where $c$ stands for marginal propensity to consume.

**Invisible Hand** : The term coined by Adam Smith, meant that government should not intervene in the running of an economy too often and too strongly.

**Involuntary Unemployment** : In indicates a situation where unemployment is not voluntary; a person is looking for a job but cannot find one.

**IS Curve** : Investment-Saving curve showing the inverse relationship between interest rate and income.

**Intermediate Goods** : It refers to all the goods that are used as raw material for further production of other goods.

**Interest Parity Condition** : It is a condition where expected returns on deposits of any two currencies are equal when measured in the same currency.

**Interest Rate Effect** : A lower price level reduces the interest rate, encourages greater spending on investment good and thereby increases the quantity of goods and services demanded.

**Internal Balance** : Internal balance is a state in which the economy is at its potential level of output, i.e., it maintains the full employment of a country's resources and domestic price levels are stable.

**Keynesian View** : The Keynesian view hold that the resources are under-utilised at least in short run. The prices are sticky and hence output can be increased without much effect on the prices.

**Liquidity Trap** : At a very low rate of interest (nearly zero), people wish to hold any amount of money and not interested in the interest-bearing assets.

**LM Curve** : Locus of the points which show the money market equilibrium at various combinations of income and rate of interest.

**Labour Force** : The sum of population who are willing to work, and either employed or unemployed

**Money Multiplier** : The money multiplier is the ratio of the stock of money to the stock of high powered money.

**Multiplier** : The amount by which the equilibrium output changes when autonomous spending increases by one unit.

**Managed Floating** : Exchange rate regime in which the monetary authority attempts to influence the exchange rate without having a specific exchange rate path or target.

**Multiplier Effect** : The multiplier effect refers to the idea that an initial spending rise can lead to even greater increase in national income.

**Narrow Money** : M1 is also known as 'narrow money'.

**Net Exports (NX)** : It is the difference between total value of exports and imports over a year.

**Net Factor Income from Abroad** : It is the difference between factor incomes earned by the normal residents of an economy stationed abroad temporarily and the factor incomes earned by normal residents of the rest of the world stationed in the economy temporarily.

**Net Indirect Taxes** : It is the difference between indirect taxes and subsidies.

**Nominal Exchange Rate** : Price of the domestic currency in terms of the foreign currency.

**NAIRU** : It is the abbreviation for **n**on-**a**ccelerating **i**nflation **r**ate of **u**nemployment. It is an unemployment rate that is consistent with a constant inflation rate. NAIRU is the unemployment rate at which the long-run Phillips curve is vertical. It is often termed as natural rate of unemployment.

**Natural Rate of Unemployment** : It takes into account the frictions and imperfections in the economy and assumes that it is natural for an economy to have certain fraction of its labour force unemployed, at any point of time. It is often termed as 'non-accelerating inflation rate of unemployment (NAIRU).

**Net Capital Outflow** : The net capital outflow is the amount that domestic investors lend abroad minus the amount that foreign investors lend to the country.

**Open Economy** : It is an economy, which has economic transactions with the rest of the world.

**Open Market Operations** : Sale/ purchase of government securities by the central bank to/ from the public and the banks.

**Options** : The options are similar to the future contract in the sense that they are also standardized but are different from them in many ways. Options, in fact, represent the right but not the obligation, to buy or sell a specified amount (and quality) of a commodity, currency, index or financial instrument, or to buy or sell a specified number of underlying futures contracts at a specified price on or before a given date in future.

**Output Gap** : The difference between actual output level (Actual GDP) and the full employment level (potential output level or potential GDP) is known as the output gap.

**Overshooting** : The term describes the fact that before the exchange rate gets to its new long-run value in response to a shock, it initially moves past (overshoot) the new level to which it will eventually settle.

**Per Capita GDP** : The ratio of Gross domestic Product (GDP) to total population of a country.

**Phillips Curve** : It shows the relationship between inflation and unemployment. Phillips curve is downward sloping in the short-run, implying a trade-off between the two. In the long-run the Phillips Curve is vertical, implying that unemployment rate cannot be brought down below natural rate of unemployment.

**Price Level** : It is the average of prices of all the goods and services produced in a country.

**Phillips Curve** : It is a graph named after A. W. Phillips, which shows the trade- off between unemployment and inflation.

**Price-Output Response Curve** : It traces out the price decisions and output decisions of all firms in the economy under a given set of circumstances.

**Potential GDP** : It is the level of output (Y*) corresponding to full employment of the labour force.

**Purchasing Power Parity** : The term is used to convey that the exchange rates between currencies are in equilibrium so that their purchasing power in the countries is the same.

**Quantity Theory of Money** : The quantity theory of money states that there is a direct relationship between the quantity of money in an economy and the level of prices of goods and services sold.

**quid pro quo** : It is a Latin phrase which means an exchange relationship between persons/ economic agents. When you get something from a transactor in return for (in exchange of) something, it is called quid-pro-quo.

**Real Money Balances** : Quantity of nominal money divided by the price level.

**Recession** : In business cycle, recession indicates the phase when there is an economic slowdown; economic growth is in a decelerating phase.

**Replacement Investment** : It is that part of currently produced capital goods, which are meant to replace the capital stock arising out of normal wear and tear, and expected obsolescence.

**Repo Rate** : Rate at which the central bank lends funds to the commercial banks against submission of collateral such as securities by the banks.

**Residential Investment** : Investment incurred on construction of new houses and buildings is called as residential investment.

**Rest of the World Sector** : This sector deals with economic transactions of an economy with the rest of the world.

**Reverse Repo Rate** : Rate at which the commercial banks can deposit their excess liquidity with the central bank, by purchasing securities.

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| **Real Exchange Rate** | : | Relative price of domestic goods to foreign goods. |
| **Revaluation** | : | An increase in the exchange rate under fixed exchange rate regime implemented through government decree. |
| **Relative PPP** | : | It states that the percentage change in the exchange rate between two currencies over any period equals the difference between percentage changes in national price levels. |
| **Sacrifice Ratio** | : | It refers to the percentage loss of output for bringing down inflation by one per cent. |
| **Stagflation** | : | Stagflation refers to an economic condition where economic growth is very slow or stagnant and prices are rising. |
| **Statutory Liquidity Ratio (SLR)** | : | Banks are required to hold a certain percentage of their demand and time deposits in the form of government securities. Currently (in 2019) the SLR is 19.5 per cent in India. |
| **Spot Rate** | : | Exchange rates governing "on the spot" trading are called spot exchange rates and the deal is called a spot transaction. |
| **Structural Unemployment** | : | It is the type of unemployment that arises because of certain structural issues in an economy. It could be due to the mismatch between the supply of and demand for labour in certain sectors of the economy. Educational quality in certain sectors may not be as per industry requirements. |
| **Transfer Payments** | : | One-way payment of money for which no goods or services are received in exchange. |
| **Trade Surplus** | : | A Surplus in a country's balance of trade occurs when a country exports more goods than it imports. |
| **Uncovered Interest Parity (UIP)** | : | Refers to the interest rate differential between two countries which will always equal the expected change in the exchange rate between the two currencies. |
| **Value of Money** | : | The value of money is its purchasing power, the amount of goods and services it can buy. Value of money is inversely related to price level. When price level increases, value of money declines. |
| **Velocity of Money** | : | The number of times the money stock of turns over per year in order to finance the annual flow of transactions or income. |

## SOME USEFUL BOOKS


Abel Andrew B, Ben Bernanke, and Dean Croushore, 2017, *Macroeconomics*, Ninth Edition, Pearson Education

Blanchard, Olivier, 2020, *Macroeconomics*, Sventh Edition, Pearson Education

Dornbusch Rudiger, Stanley Fisher, and Richard Startz, 2018, *Macroeconomics*, Thirteenth Edition, McGraw Hill

D'Souza, Errol, 2009, Macroeconomics, Pearson Education

Froyen, Richard T., 2012, *Macroeconomics: Theories and Policies*, Tenth Edition, Person Education

Krugman, Paul R., Maurice Obstfeld, and Marc Melitz, 2017, International Economics, Pearson Education

Mankiw, Gregory N., and Mark P. Taylor, 2017, *Macroeconomics*, Cengage Learning India Pvt. Ltd.