
UNIT 10 MUNDELL-FLEMING MODEL^{*}

Structure

- 10.0 Objectives
- 10.1 Introduction
- 10.2 The Mundell- Fleming Model
- 10.3 Equilibrium Conditions for BoP
- 10.4 Effectiveness of Monetary and Fiscal Policy
 - 10.4.1 Floating Exchange Rate
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- 10.5 Policy Choice
- 10.6 Let Us Sum Up
- 10.7 Answers/Hints to CYP Exercises

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:

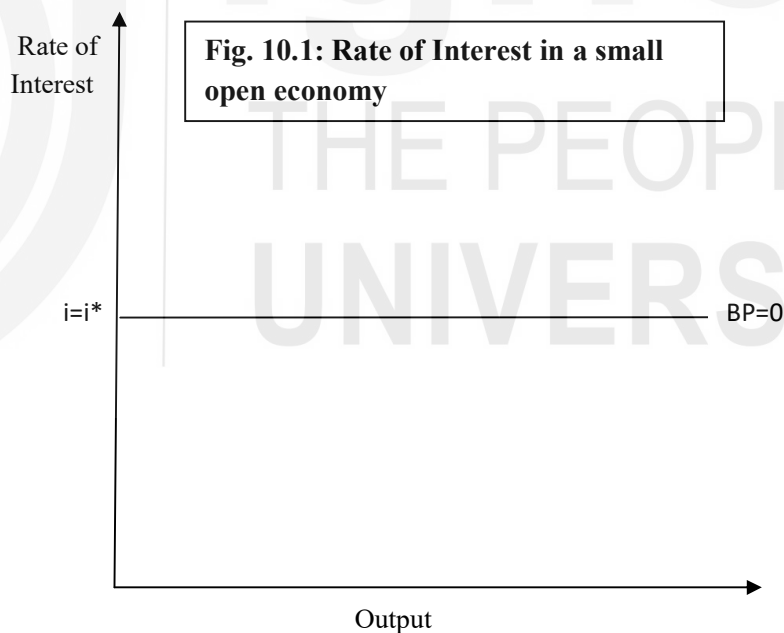
$$I + X = S + M \quad \dots (10.1)$$

$$X - M = S - I \quad \dots (10.2)$$

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.



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:

$$Y = C(Y - T) + I(i) + G + NX(Y, e) \quad \dots (10.3)$$

where, Y is Aggregate income, C is Consumption which depends on disposable income given by $Y - T$, T is the Taxes, I is Investment 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

$$\frac{M}{P} = L(i, Y) \quad \dots (10.4)$$

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:

$$X - M(Y) + F(i) = 0 \quad \dots (10.5)$$

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 perfect capital immobility, and is upward sloping under imperfect capital mobility.

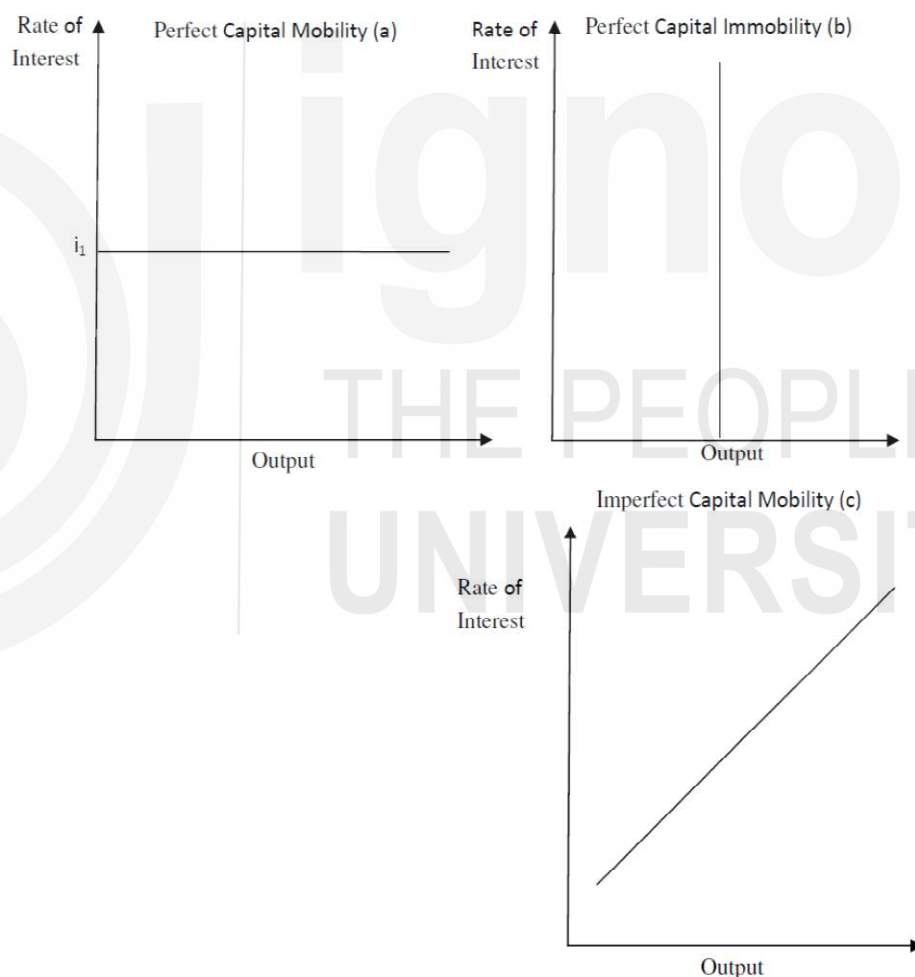
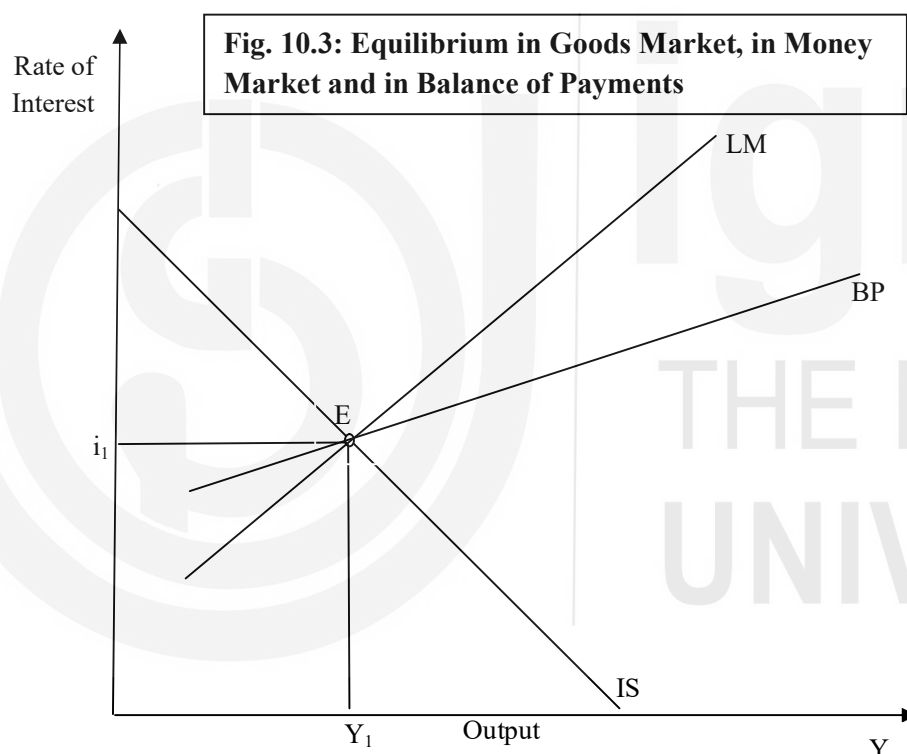


Fig. 10.2: BP Curve under Three Different Scenarios

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.



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

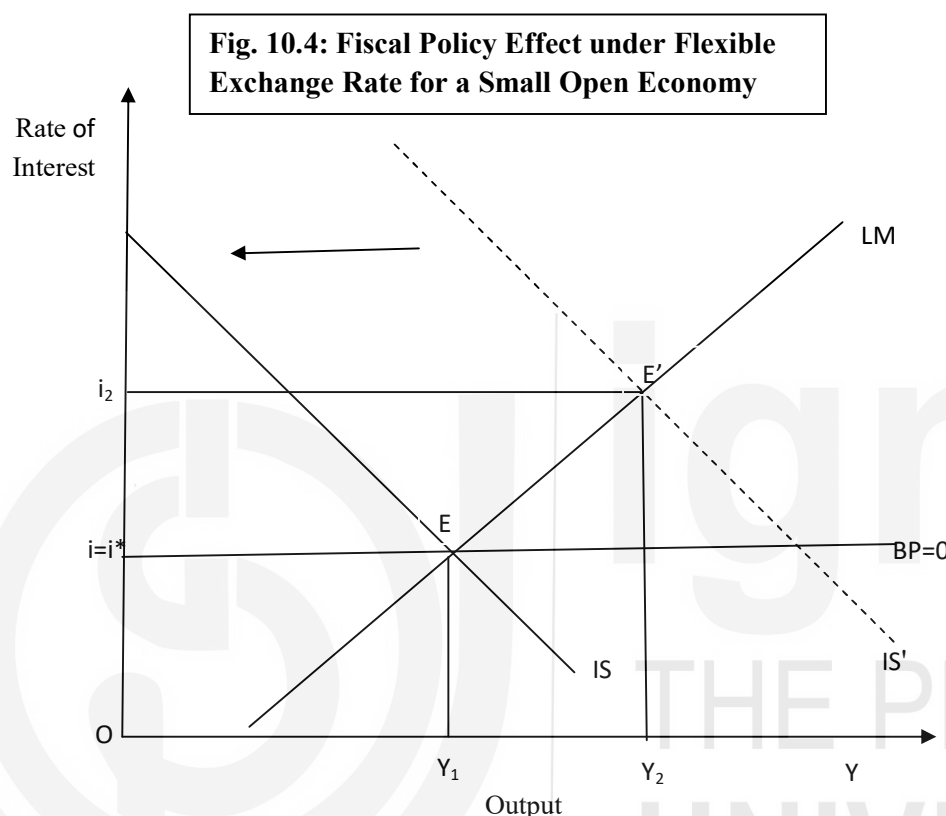
Floating or flexible exchange rate is a market determined exchange rate. It fluctuates in response to changing conditions of demand and supply. Through the process of currency depreciation and appreciation, it provides an adjustment mechanism for correcting the disequilibrium in the balance of payments 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.

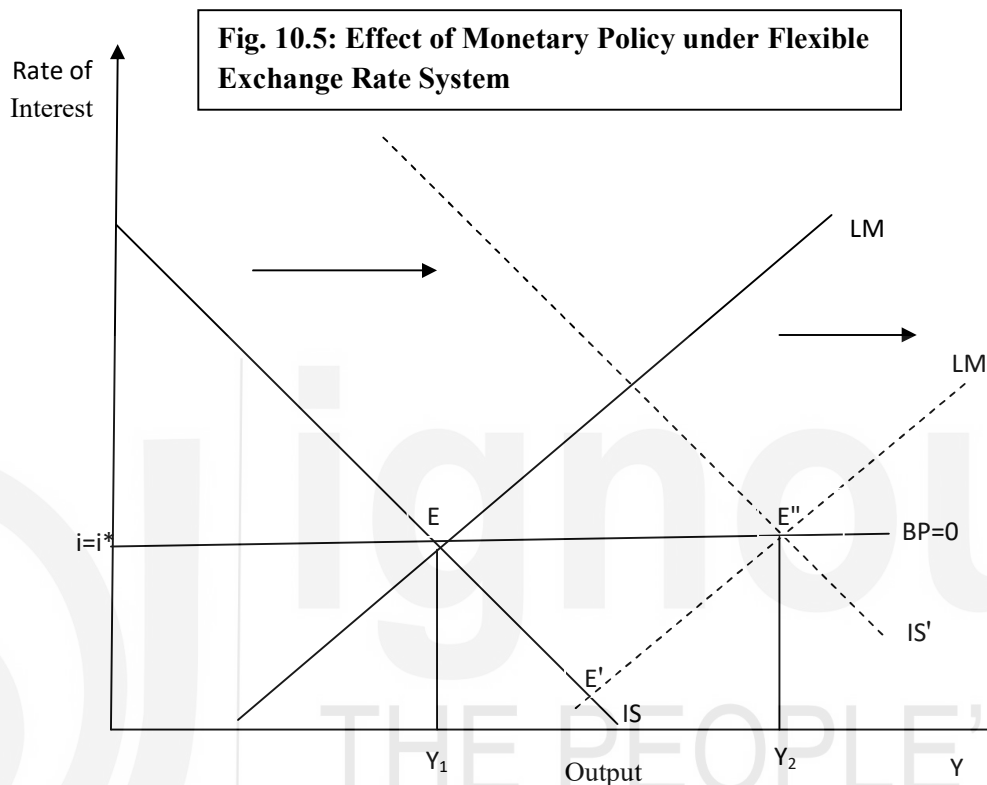


(b) Monetary Policy

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).



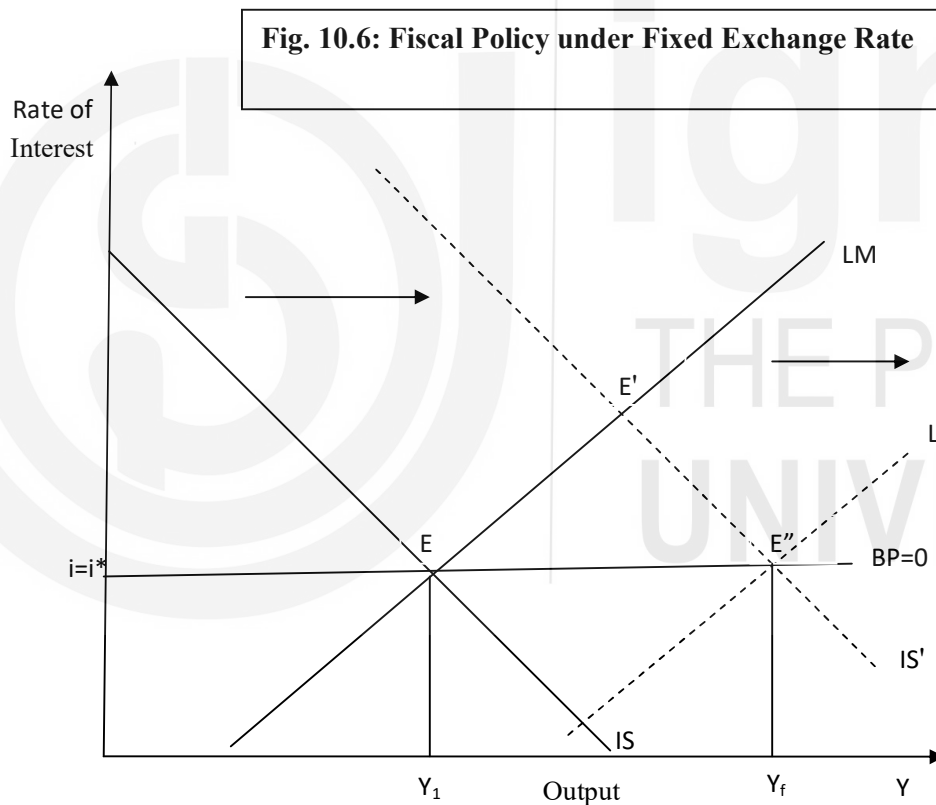
10.4.2 Fixed Exchange Rate

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

Mundell-Fleming Model

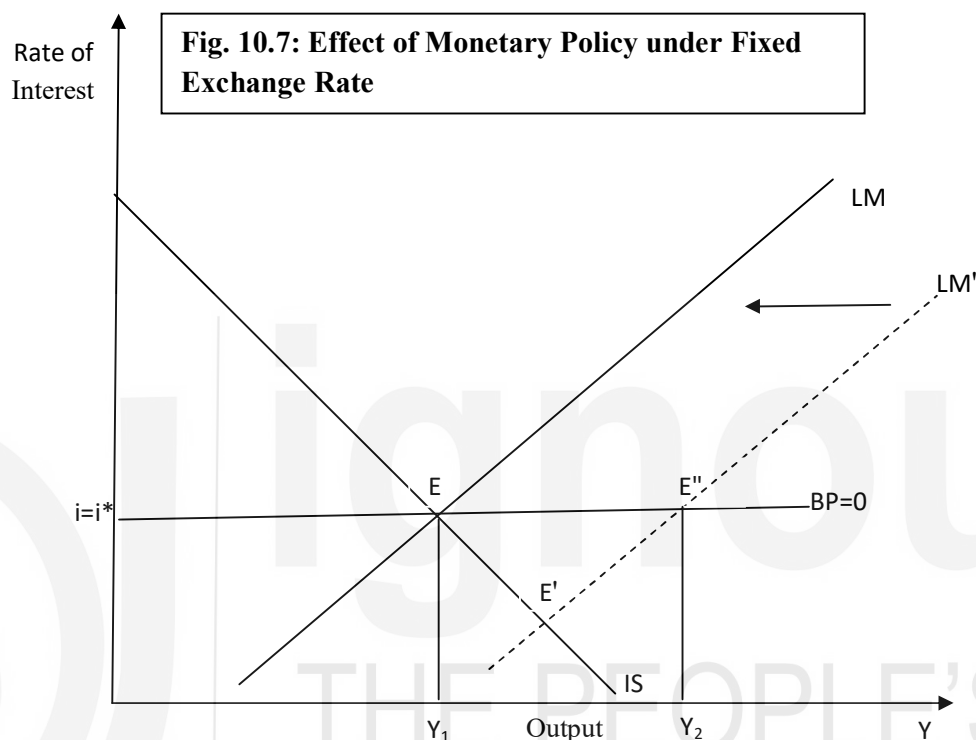
Suppose that the government stimulates domestic spending by increasing government purchases or by cutting taxes. Such a policy shifts the IS curve rightwards to IS' (Fig. 10.6). The intersection of the IS' curve with the unchanged LM curve at point E' indicates a tendency for the country's interest rate 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.



(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.



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).

$$NX = X - M = Y - AE = Y - (C + G + I) \quad \dots (10.6)$$

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
- 11.1 Introduction
- 11.2 The Dornbusch's Model
 - 11.2.1 Impact of Interest Differentials and Prices
 - 11.2.2 Flexible Exchange Rate, Money and Prices
 - 11.2.3 Effects of Monetary Expansion
- 11.3 Exchange Rate Overshooting
- 11.4 Let Us Sum Up
- 11.5 Answers/Hints to Check Your Progress Exercises

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,

$$i = i^* + \frac{E_{\$/\epsilon}^e - E_{\$/\epsilon}}{E_{\$/\epsilon}} \quad \dots (11.1)$$

where i = rate of return on dollar deposits, i^* = rate of return on euro deposits, and $\frac{E_{\$/\epsilon}^e - E_{\$/\epsilon}}{E_{\$/\epsilon}}$ 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

$$M_d = kPY \quad \dots (11.2)$$

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:

$$P = RP^* \text{ or } R = \frac{P}{P^*} \quad \dots (11.3)$$

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 $M_d = kPY$ and $M_d^* = k^*P^*Y^*$ [from (11.2)]. Further, since in equilibrium, the quantity of money demanded is equal to the quantity of money supplied, we have:

$$M_d = M_s \text{ and } M_d^* = M_s^* \quad \dots (11.4)$$

Hence, dividing the money supply function for the EU by the US function, we get

$$\frac{M_s^*}{M_s} = \frac{k^*P^*Y^*}{kPY} \quad \dots (11.5)$$

Dividing both sides of equation (11.5) by $\frac{P^*}{P}$ and $\frac{M_s^*}{M_s}$, we get

$$\frac{P}{P^*} = \frac{M_s k^* Y^*}{M_s^* k Y} \quad \dots (11.6)$$

Since $R = \frac{P}{P^*}$, we can write equation (11.6) as

$$R = \frac{M_S k^* Y^*}{M_S^* k Y} \quad \dots (11.7)$$

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

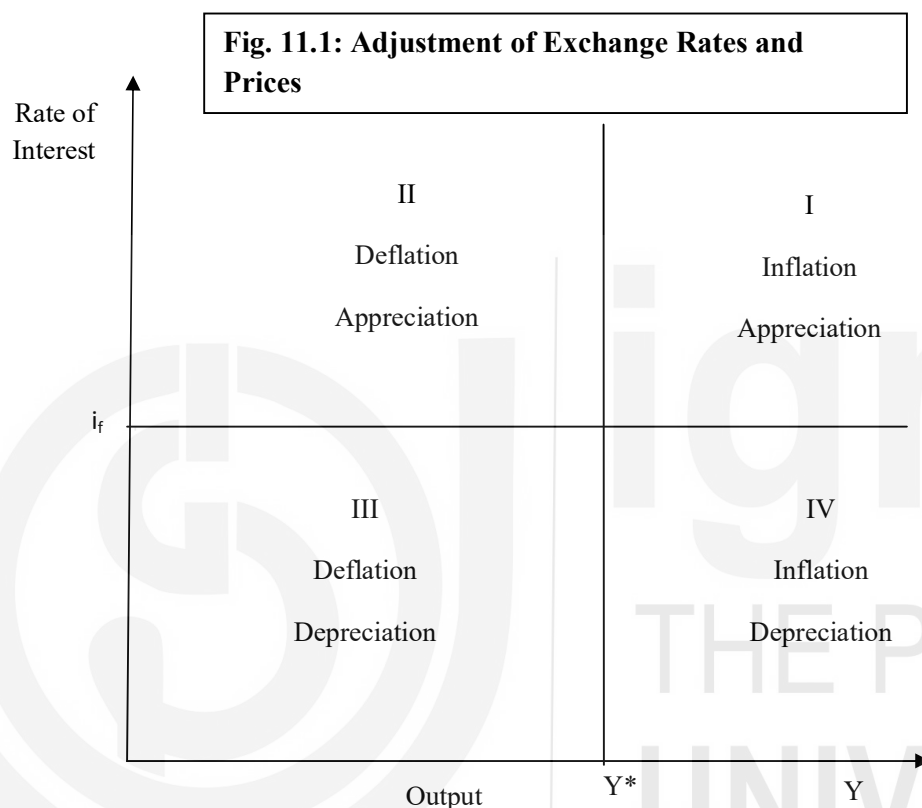
An expected change in exchange rate will lead to an immediate actual change in the exchange rate by an equal percentage. This follows from the 'interest parity condition'. Let us take our previous example, i.e., $i = 6\%$ and $i^* = 5\%$ where euro is expected to appreciate by 1% for the yields on two 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.



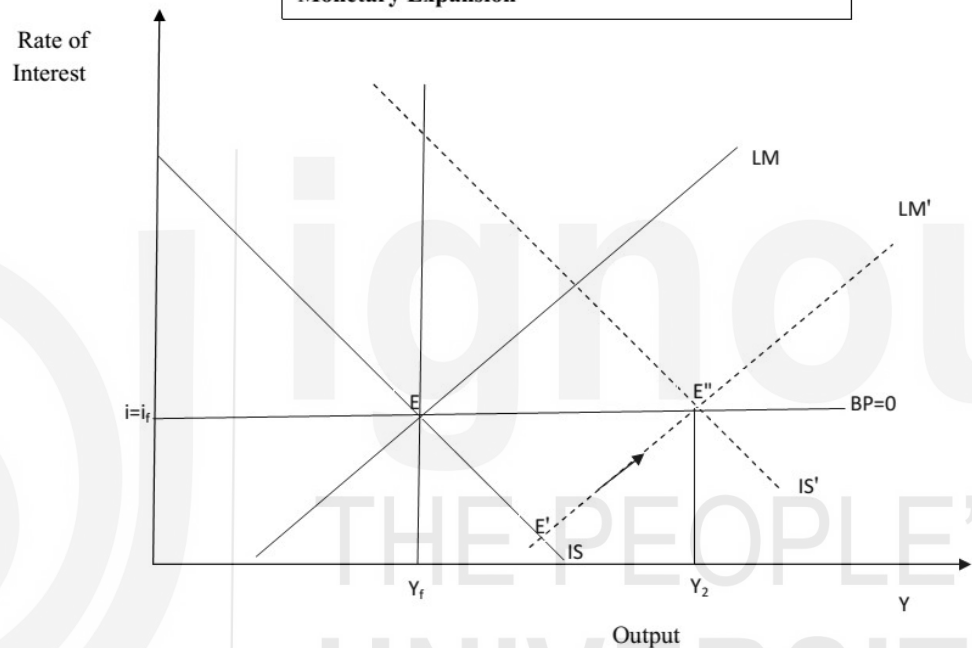
For describing the adjustment process, we now make two strategic assumptions. First, prices increase whenever output exceeds the full employment level. Second, because capital is highly mobile, the interest rate always moves towards the BP schedule (as interest rate cannot diverge far from that in the 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 Dornbusch'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

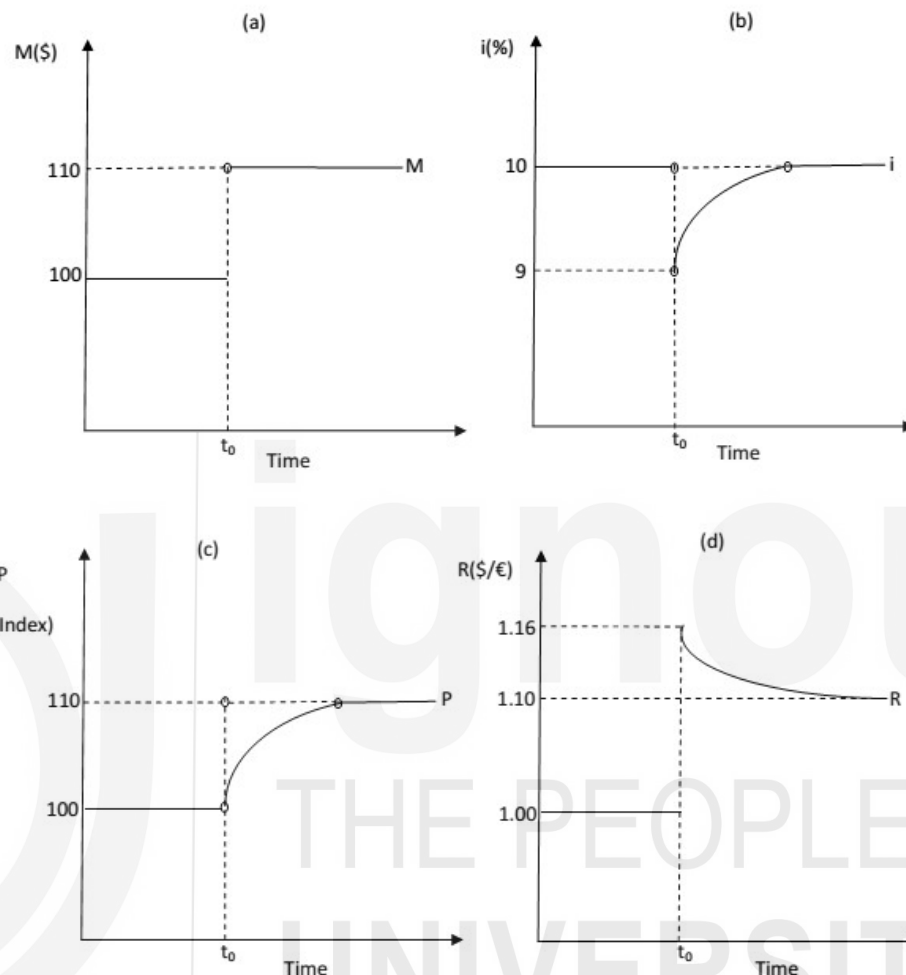
in the long run (because of the 10 percent increase in the domestic money supply)]. More specifically, R immediately rises (the dollar depreciates) by 16 percent at time t_0 . The question therefore is why does the dollar immediately depreciate by more than 10 percent when, according to the PPP theory, 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:

$$i - i^* = EA \quad \dots (11.8)$$

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/€1 to \$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
- 12.1 Introduction
- 12.2 Short-Run Effect
- 12.3 Long-Run Effect
 - 12.3.1 Floating Exchange Rate
 - 12.3.2 Fixed Exchange Rate
- 12.4 Internal and External Balance
 - 12.4.1 Equilibrium
 - 12.4.2 Expenditure Policies
- 12.5 External Deficit and Unemployment
- 12.6 Let Us Sum Up
- 12.7 Answers/Hints to Check Your Progress Exercises

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:

$$Y = C(Y - T) + I(i) + G + NX(e, Y) \quad \dots (12.1)$$

$$M/P = L(i, Y) \quad \dots (12.2)$$

$$NX(e, Y) = CF(i) \quad \dots (12.3)$$

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:

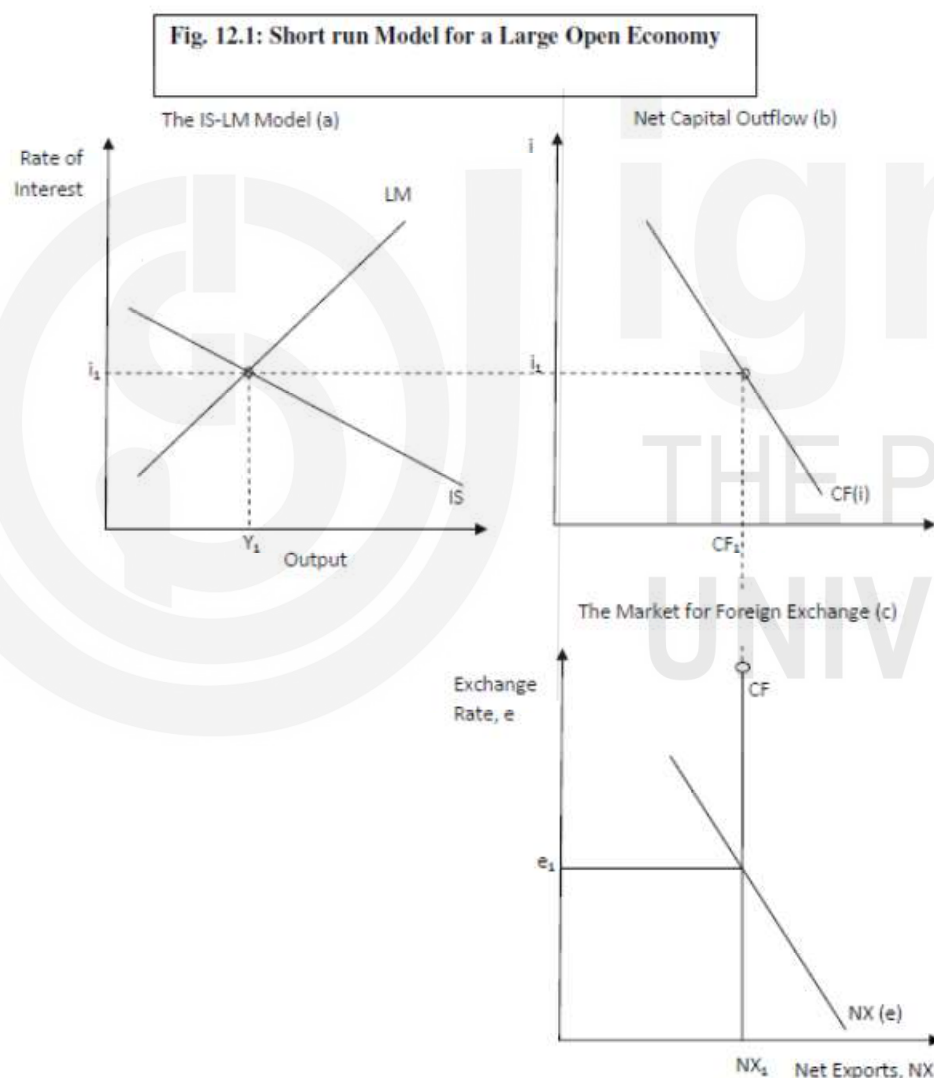
$$Y = C(Y - T) + I(i) + G + CF(i) \quad \dots (12.4)$$

$$M/P = L(i, Y) \quad \dots (12.5)$$

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.



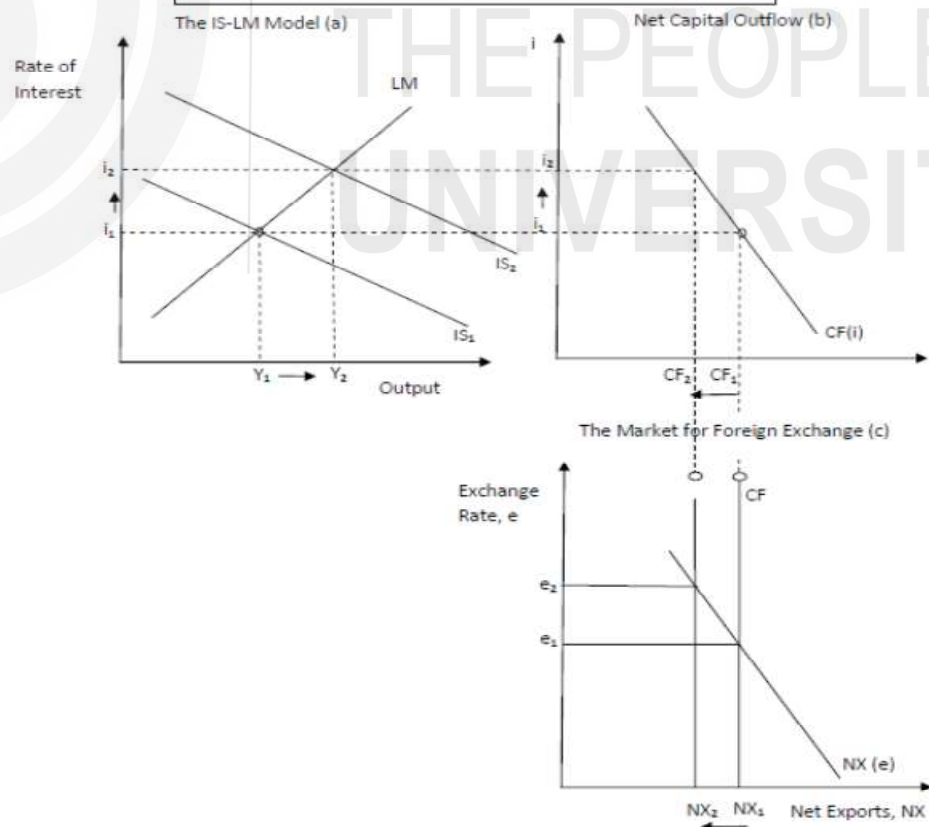
Note that the curve $CF(i)$ in panel (b) slopes downward because a higher interest rate discourages domestic investors from lending abroad and encourages foreign investors to lend within the country. Panel (c) shows that the exchange rate adjusts to ensure that the net exports of goods and services (NX) 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.

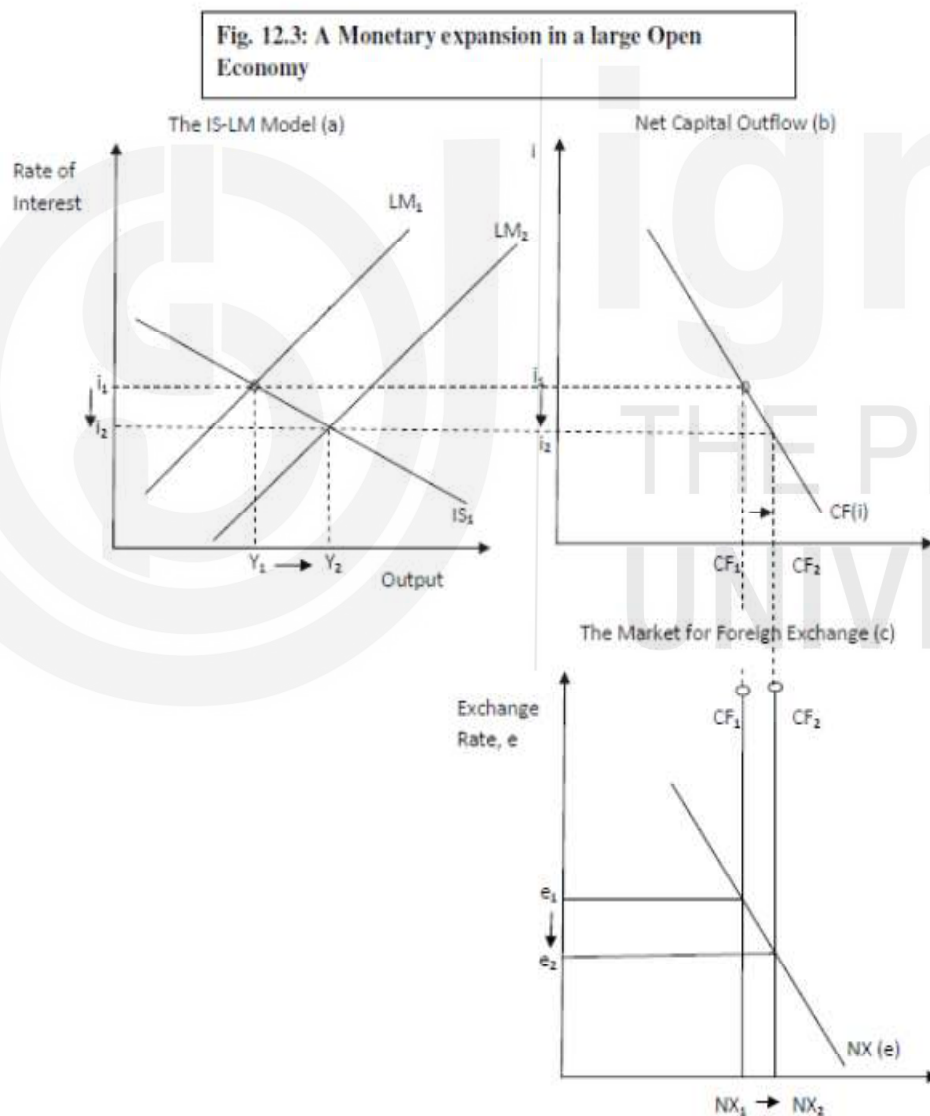
Impact of Government Policies

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 to appreciate [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 fall [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.



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 intersect 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.

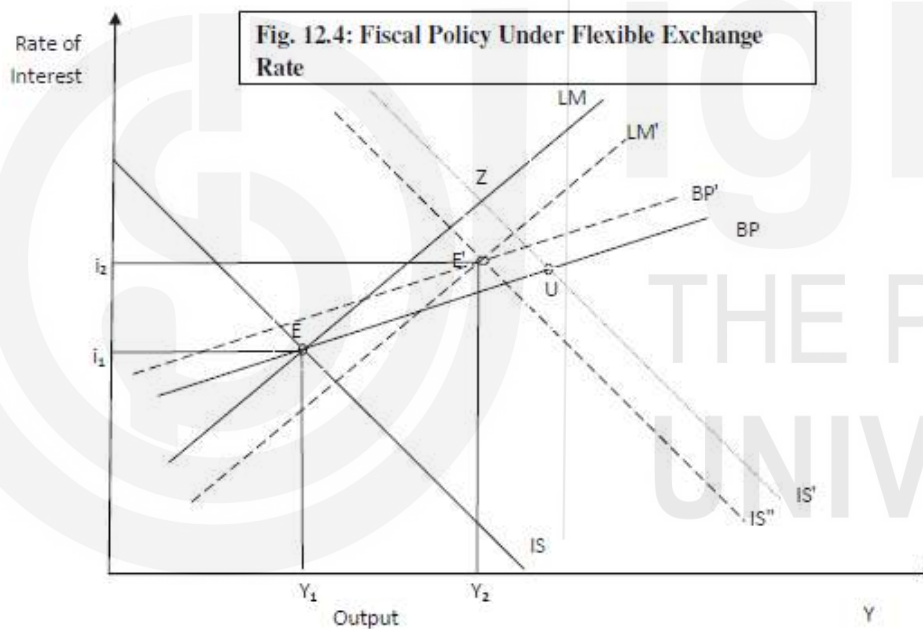
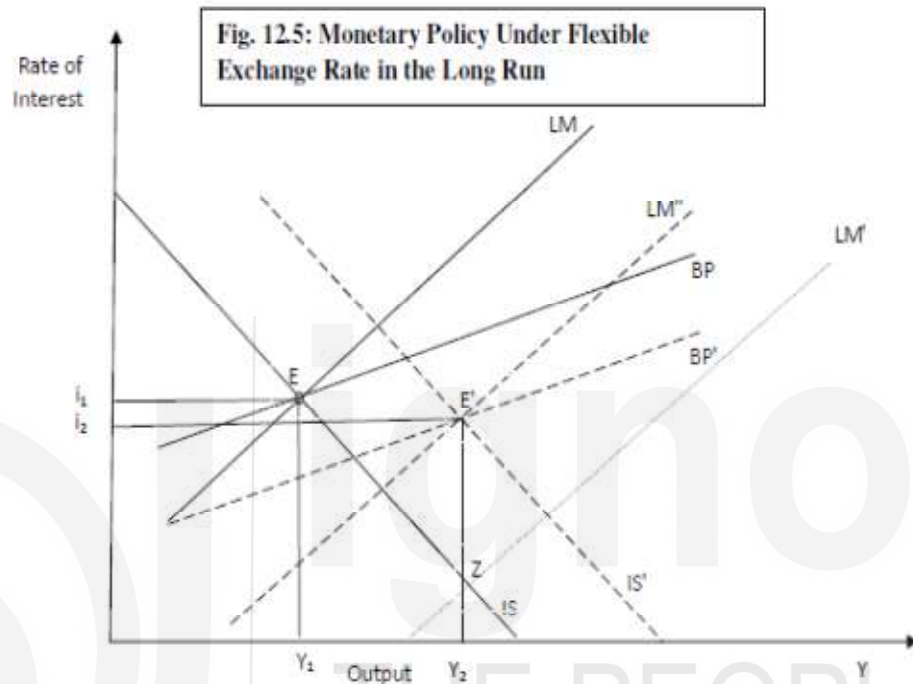


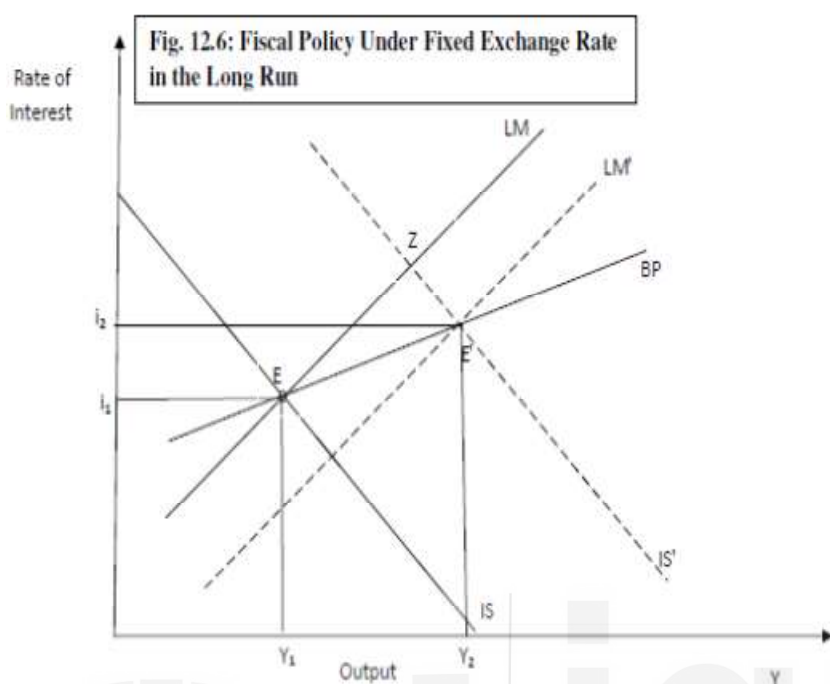
Fig. 12.5 shows the impact of monetary policy on the country's economy with an internal and external balance at E (where income equals Y_1 and rate of interest equals i_1). An easy monetary policy shifts the LM curve rightward to LM' , where it intersects the IS curve at Z. At Z, the country has an external 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.

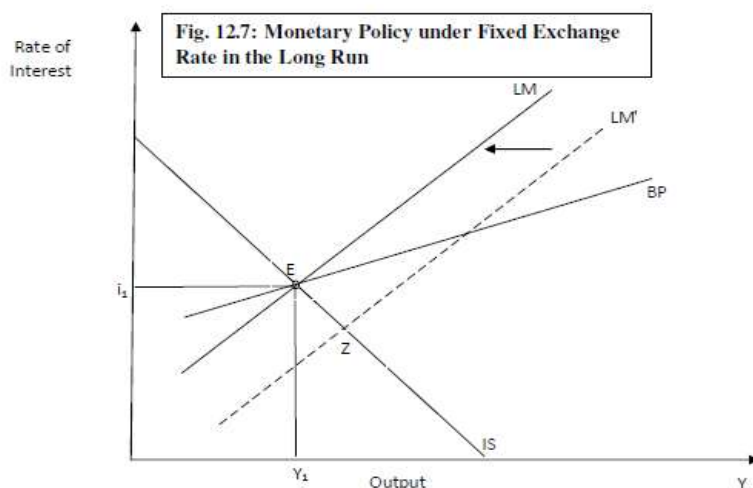


12.3.2 Fixed Exchange Rate

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.



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.



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:

$$\text{BoP} = \text{NX} (Y, Y_f, R) + \text{CF} (i - i^*) \quad \dots (12.6)$$

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:

$$I + X = S + M \quad \dots (12.7)$$

$$I + X + G = S + M + T \quad \dots (12.8)$$

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

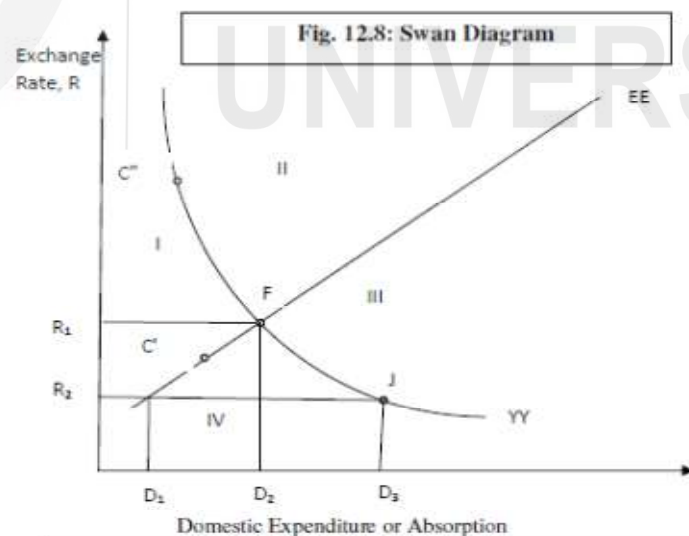
Zone II: External surplus and internal inflation

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).

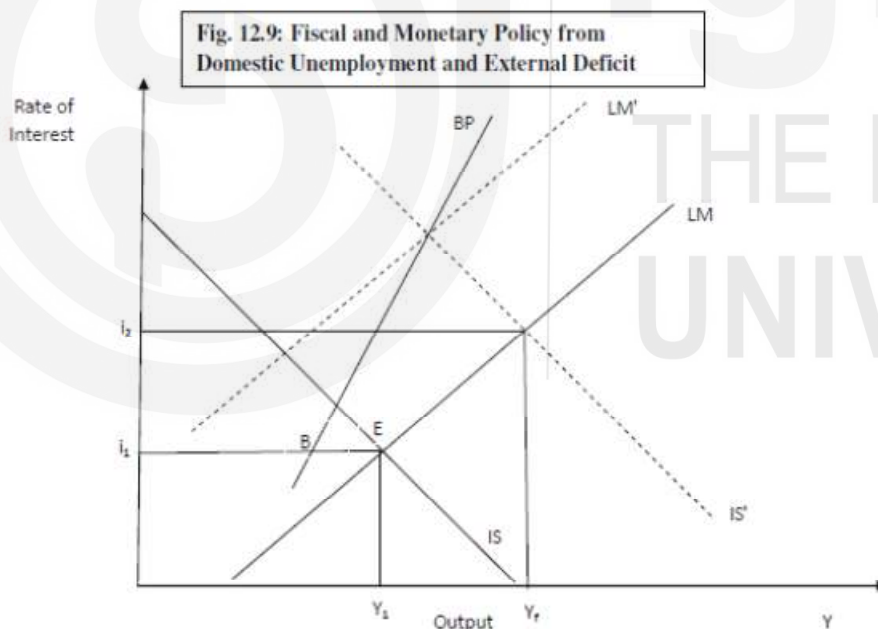
It cannot attain both simultaneously. Similarly, by increasing only domestic absorption, the economy can attain only internal balance (point J on the YY curve) which leaves an external deficit (since the economy will be below the EE curve). Thus, a calibrated adoption of twin policies is required to achieve the two goals simultaneously.



Swan Diagram was originally published by Australian economist Trevor Swan in 1956. It is a 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.

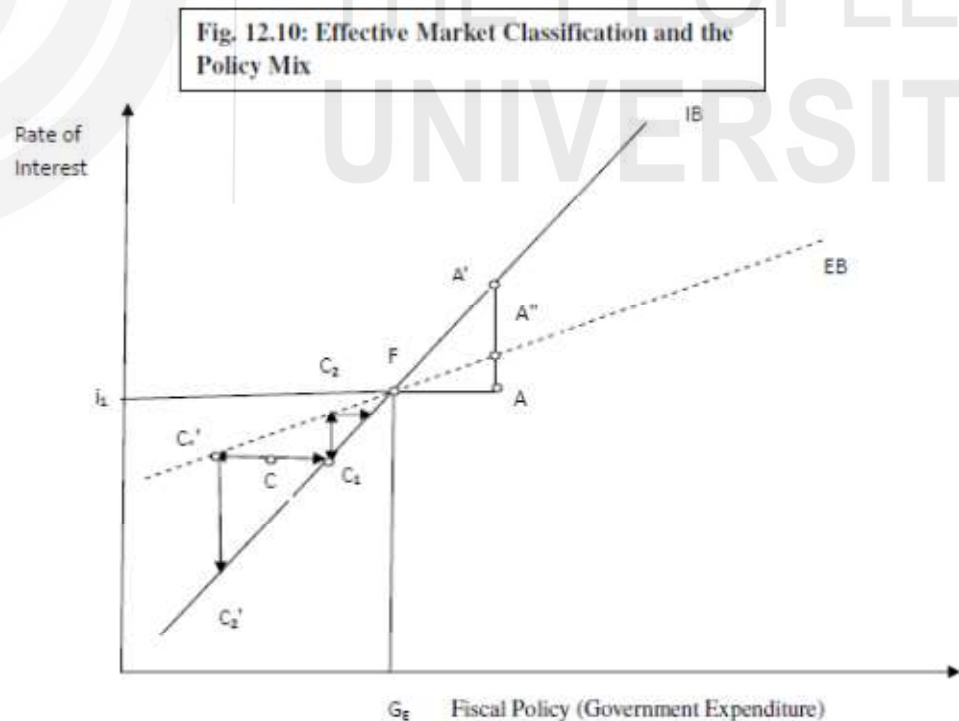


Policy Mix for Optimal Balance

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:



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 loses its 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).

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 <i>IB</i> 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 <i>c</i> 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	: It 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 non-accelerating inflation rate of unemployment . 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.

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

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