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# UNIT 10 BALANCE OF PAYMENTS\*

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## 10.0 OBJECTIVES

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

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

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## 10.1 INTRODUCTION

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A closed economy is one which does not import or export goods and services. In this sense, in the present day world, all countries are open economies; only the

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degree of openness varies. Openness has three distinct dimensions, viz., 1) Openness in goods market which provides an option to consumers and firms to choose between domestic goods and foreign goods, 2) Openness in financial markets which provides an option to financial investors to choose between domestic assets and foreign assets, and 3) Openness in factor markets which provides an option to firms to choose where to locate production and to workers to choose where to work.

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

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

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## **10.2 BALANCE OF PAYMENTS ACCOUNTING PRINCIPLES**

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

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

**Table 10.1: Account of a Country's Balance of Payments****Balance of  
Payments**

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

**Table 10.1 shows a country's BoP accounts. The left side shows the ways of acquiring foreign currency and the right side shows the ways of spending foreign currency.**

The left side of Table 10.1 shows the sources of acquiring foreign currency and the right hand side shows how the foreign currency is spent. The most straight forward way in which a country can acquire foreign currency is by exporting goods (row 1). In an analogous way row (5) shows the value of imported goods. These two rows describe the country's visible trade. Row (2) lists the receipts of the country from the sale of services to foreigners during the period in question. These services include shipping, banking and insurance services, income through tourism, interest and dividends earned on investments abroad. Analogously row (6) covers payments which residents of the country make to foreigners for similar services. Items in row (1), (2), (5) and (6) together form the trade items. The items in row (3) and (7) are referred to as transfer items. The items in row (3) are the receipts which the residents of a country receive "for free" without having to make any present or future payments in return. In a purely analogous way, row (7) describes payments which the country in question makes as gifts, assistance, indemnities etc. Items in rows (1), (2), (3), (5), (6) and (7) enumerate all the payments and receipts made for the current period of time; they all have a flow dimension and refer to a certain value of exports and imports per time period.

Items (4) and (8) are different. They express changes in stock magnitudes and refer to capital receipts and payments. They play a critical role. When a government, a corporation or an individual borrows money from abroad, the country acquires foreign currency. This is recorded as capital inflow. On the other hand, foreign nationals might acquire assets in the domestic country in the form of land, houses, productive plants, shares.

All these items are recorded by row (4) along with changes in the country’s stock of gold or reserves of foreign currency. Analogously, if residents of the country were to acquire foreign assets or if the government were to lend money to a foreign government, this would give rise to an outflow of foreign currency and are accounted as capital transfers under row (8).

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### **10.3 CURRENT AND CAPITAL ACCOUNTS**

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

**Table 10.2: Disaggregation of Balance of Payments**

(1) Balance of Trade Table 10.1, row (1) and (3)
(2) Balance of Services Table 10.1, row (2) and (6)
(3) Balance of Unrequited Transfers Table 10.1, row (3) and (7)
(4) Balance of Current Account Sum of row (1), (2) and (3) of Table 10.2
(5) Balance of Capital Account Table 10.1, row (4) and (8)
(5) Balance of Payments Sum of row (4) and (5) of Table 10.2

Table 10.2 shows disaggregation of ‘Balance of Payments’ into ‘Balance of Trade’, ‘Balance of Services’, ‘Balance of Unrequited Transfers’, ‘Balance of Current Account’ and ‘Balance of Capital Account’.

Balance of current account is a broader concept than the balance of trade, as it includes i) the balance of trade, ii) the balance of services, and iii) the balance of unrequited transfers. The balance of current account can show a surplus or a deficit. The current account is in surplus if exports exceed imports plus net transfers to foreigners that is if receipts from trade in goods and services and transfer exceed payments on this account. Balance of current account is a very important concept, as it shows the flow aspect of a country’s international

transactions. We could say that all the goods and services produced within the country during the time period in question and exported, are entered on the credit side of the balance of current account. Similarly, all the goods and services imported and consumed within the country during the same period are entered on the debit side of the balance of current account.

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

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## **10.4 TYPES OF CAPITAL FLOWS: AUTONOMOUS AND ACCOMODATING**

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

Accommodating capital movements are capital flows that take place specifically to equalise the balance of payments in the book keeping sense. These flows can take various forms. Foreign firms might accept short term claims on firms in the country or perhaps a foreign government extends a loan to the country. In all these cases the accommodating capital movements are direct consequences of the balance of payments situations. Accommodating capital flows are unforeseen capital flows, which are needed to bring the balance of payments into equilibrium. These flows are *ex post* in nature. Only at the end of the period can one discover whether accommodating movements have taken place. In the sense they are unplanned and appear as a result of the economic activity which has taken place during that period.

If a deficit is settled by an accommodating capital flow, it can be viewed as warning signal for the country.

The deficit could have been settled by a short term loan or a depletion of reserves. Usually this condition cannot continue forever. Lenders are seldom willing to extend short term loans forever, and reserves have a tendency to become depleted. The government must in such a situation change its economic policy to abolish the deficit in the balance of payments that has caused the accommodating inflow.

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### **10.5 EQUILIBRIUM/ DISEQUILIBRIUM IN BALANCE OF PAYMENTS**

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

$$\text{Current Account} + \text{Capital Account} = 0$$

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

#### **Check Your Progress 1**

- 1) Explain how surplus on the current account is settled.  
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- 2) Enumerate the difference between Balance of Trade, Balance of Current Account, and Balance of Capital Account.  
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- 3) Do you agree with the statement, “Balance of Payments always balances”.  
List your reasons.

**Balance of  
Payments**

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## **10.6 NATIONAL INCOME ACCOUNTS FOR AN OPEN ECONOMY**

Consider the expenditure on an economy’s output of goods and services. In a closed economy, all output is sold domestically, and expenditure is divided into three components: consumption (C), investment (I) and government purchases (G). In an open economy some output is sold domestically and some is exported to be sold abroad. We can divide expenditure on an open economy’s output, Y, into four components: 1)  $C_d$ , consumption of domestic goods and services; 2)  $I_d$ , investment in domestic goods and services; 3)  $G_d$ , Government purchases of domestic and goods and services; 4) X, Exports of domestic goods and services. We assign subscripts ‘d’ for domestic and ‘f’ for foreign, respectively.

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

$$Y = C_d + I_d + G_d + X \quad \dots (10.1)$$

The sum of first three terms,  $(C_d+I_d+G_d)$ , is domestic spending on domestic goods and services. The fourth term, X, is foreign spending on domestic goods and services.

Note that domestic spending on all goods and services equals domestic spending on domestic goods and services plus domestic spending on foreign goods and services. Hence, total consumption equals consumption of domestic goods and service,  $C_d$ , plus Consumption of foreign goods and services,  $C_f$  ; total investment, I equals investment in domestic goods and services,  $I_d$ , plus investment in foreign goods and services,  $I_f$  ; and total government expenditure equals government purchases of domestic goods and services,  $G_d$ , plus government purchases of foreign goods and services,  $G_f$ . Thus,

$$C = C_d + C_f \quad \dots (10.2)$$

$$I = I_d + I_f \quad \dots (10.3)$$

$$G = G_d + G_f \quad \dots (10.4)$$

We substitute these three equations into the equation 10.1:

$$Y = (C - C_f) + (I - I_f) + (G - G_f) + X \quad \dots (10.5)$$

We can rearrange to obtain

$$Y = C + I + G + X - (C_f + I_f + G_f) \quad \dots (10.6)$$

The sum of domestic spending on foreign goods and services ( $C_f+I_f+G_f$ ) is expenditure on imports ( $M$ ). We can write the national income accounts identity as

$$Y = C + I + G + X - M \quad \dots (10.7)$$

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

$$Y = C + I + G + NX \quad \dots (10.8)$$

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

$$NX = Y - (C + I + G) \quad \dots (10.9)$$

**Net Exports = (Output – Domestic Spending)**

Equation (10.9) shows that in an open economy, domestic spending need not equal domestic product, or goods produced in the country. If output exceeds domestic spending, we export the difference: net exports are positive. If output falls short of domestic spending, we import the difference: net exports are negative. The key macroeconomic difference between open and closed economies is that, in an open economy a country's spending in any given year need not equal its output of goods and services, a country can spend more than it produces by borrowing from abroad, or it can spend less than it produces and lend the difference to foreigners.

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## **10.7 TRADE IN GOODS, MARKET EQUILIBRIUM, BALANCE OF TRADE**

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

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

$$Z = C + I + G + X - M/R \quad \dots (10.10)$$

The first three terms – consumption ( $C$ ), investment ( $I$ ), and government spending ( $G$ ) – constitute the **domestic demand for goods**. If the economy were closed,  $C + I + G$  would also be the demand for domestic goods. First, we must subtract imports – that part of the domestic demand that falls on foreign goods rather than on domestic goods. We must be careful here: foreign goods are different from domestic goods, so we cannot just subtract the quantity of imports,  $M$ .



If we were to do so, we would be subtracting apples (foreign goods) from oranges (domestic goods). We must first express the value of imports in terms of domestic goods. The real exchange rate,  $R$ , is defined as the price of domestic goods in terms of foreign goods.  $1/R$  is the price of foreign goods in terms of domestic goods. So,  $M/R$  is thus the value of imports in terms of domestic goods. Second, we must add exports ( $X$ ), that part of the demand for domestic goods that comes from abroad. This is captured by the term  $X$  in equation (10.10).

### 10.7.1 Determinants of $C$ , $I$ and $G$

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

$$\text{Domestic Demand: } C + I + G = C(Y-T) + I(Y, r) + G \quad \dots (10.11)$$

(+)            (+, -)

The (+) and (-) signs below a variable indicates the nature of relationship between variables in a function. In equation (10.11) the (+) sign below the variable  $(Y-T)$  indicates that there is a positive relationship between the variables  $C$  and  $(Y-T)$ . Similarly, investment,  $I$ , depends positively on production,  $Y$ , and negatively on the interest rate,  $r$ . We assume government spending,  $G$ , as given (i.e., exogenous).

### 10.7.2 Determinants of Imports

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

$$M = M(Y, R) \quad \dots (10.12)$$

(+, +)

### 10.7.3 Determinants of Exports

Exports are foreign demand for domestic goods. It depends on foreign income and exchange rate. Higher foreign income means higher foreign demand for all goods, both foreign and domestic. So, higher foreign income leads to higher exports.

Higher the price of domestic goods in terms of foreign goods the lower the exports. In other words, the higher the real exchange rate (appreciation in domestic currency), the lower are exports. We therefore write exports as

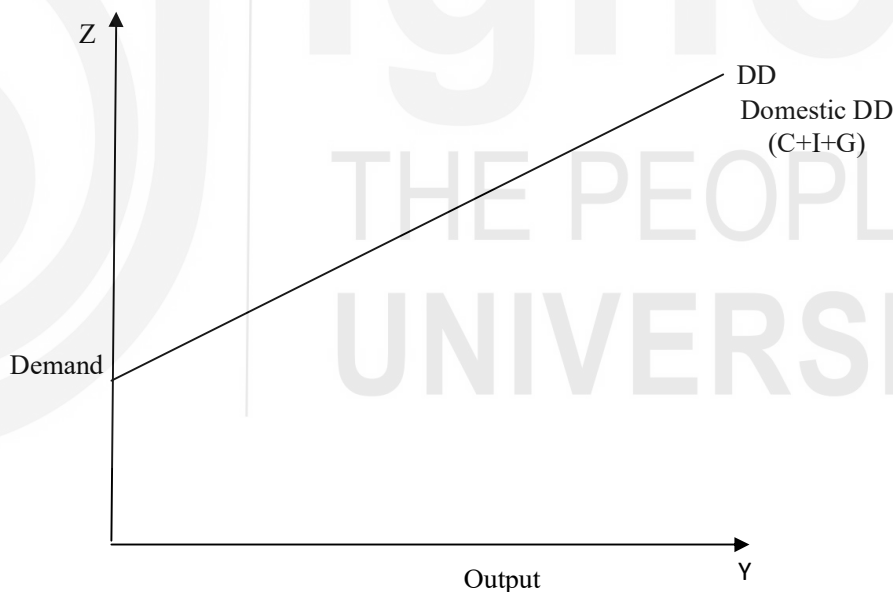
$$X = X(Y_f, R) \quad \dots (10.13)$$

(+, -)

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

**10.7.4 Putting the Components Together**

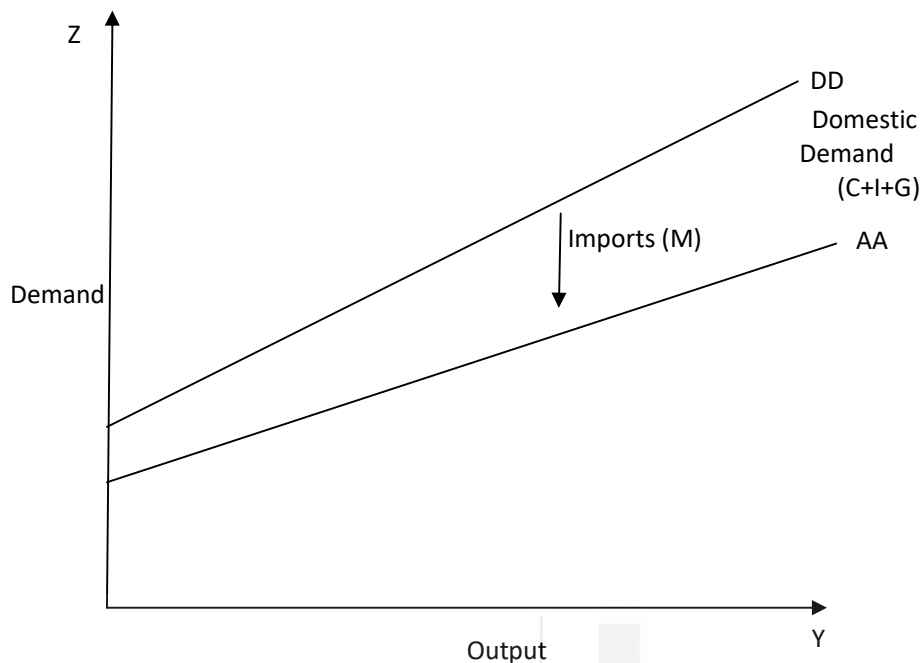
We assume that the price level is given and that output demanded will be supplied. We do not include capital account at this stage, so for the time being current account and balance of payments are the same. Fig. 10.1 plots the various components of demand against output, keeping constant all other variables (interest rate, taxes, government spending, foreign output and real exchange rate) that affect demand. In Fig. 10.1(a), the line  $DD$  plots domestic demand,  $C + I + G$ , as a function of output,  $Y$ . Under our standard assumptions, the slope of the relation between demand and output is positive but less than 1. An increase in output (equivalently, an increase in income) increases demand but less than one-for-one.



**Fig. 10.1: Panel (a): Domestic Demand**

Fig. 10.1 (a) shows the line  $DD$  which plots the domestic demand,  $C + I + G$  as a function of output,  $Y$ .

To arrive at the ‘demand for domestic goods’, we subtract imports and add exports. In Fig. 10.1(b) we subtract imports from domestic demand, and it gives us the line  $AA$ . The line  $AA$  represents the domestic demand for domestic goods. The distance between  $DD$  and  $AA$  equals the value of imports,  $(M/R)$ . Because the quantity of imports increases with income, the distance between the two lines increases with income.



**Fig. 10.1: Panel (b): Domestic Demand and Imports**

Fig. 10.1 (b) plots  $AA$  line which represents the domestic demand for domestic goods. The distance between  $DD$  and  $AA$  equals the value of imports.

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

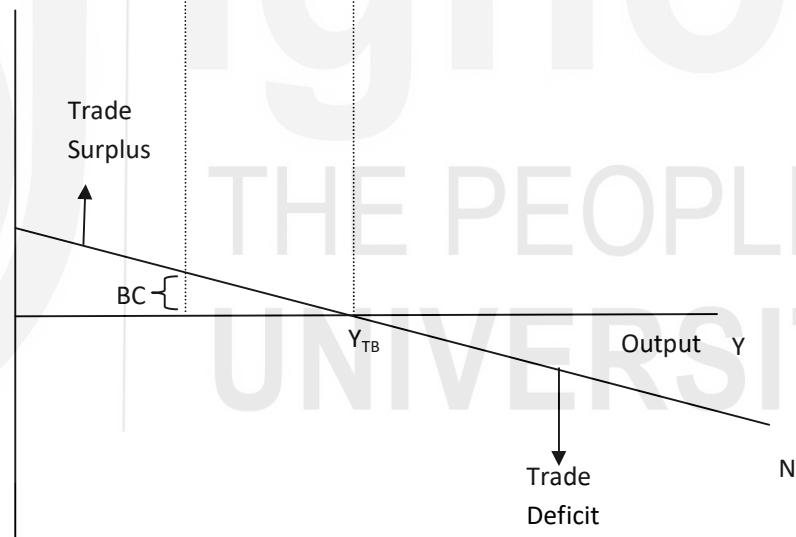
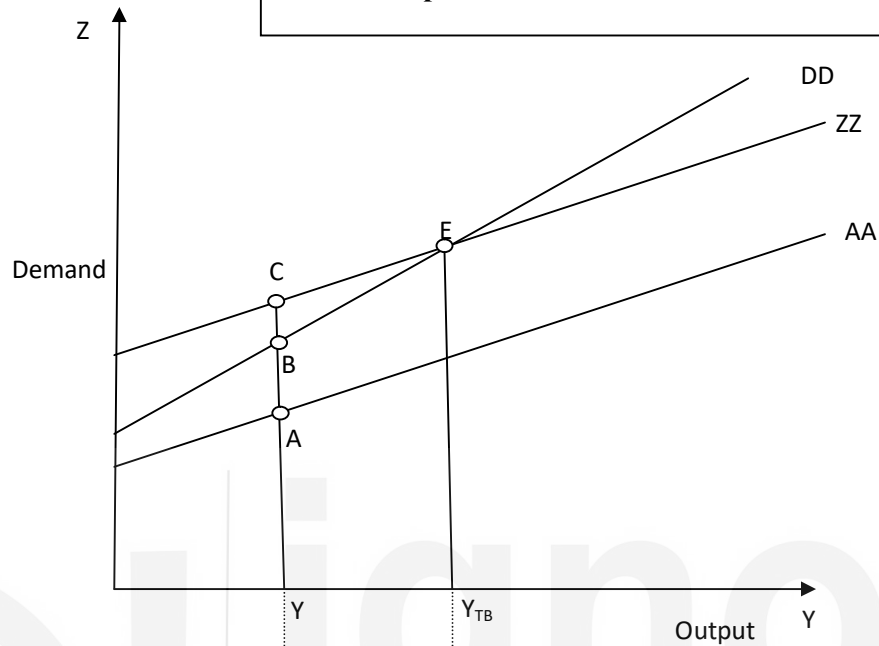
In Fig. 10.1 (c) we add exports, and it gives us the line  $ZZ$ , which is above  $AA$ . The line  $ZZ$  represents the demand for domestic goods. The distance between  $ZZ$  and  $AA$  equals exports. As exports do not depend on domestic income (they depend on foreign income), the distance between  $ZZ$  and  $AA$  is constant, i.e., both lines are parallel. Since  $AA$  is flatter than  $DD$ ,  $ZZ$  is also flatter than  $DD$ .

Fig. 10.1 (c) plots  $ZZ$  line, which represents demand for domestic goods and is arrived by adding exports to the  $ZZ$  line. At output level,  $Y$ , exports are given by the distance  $AC$  and imports by the distance  $AB$  so net exports are given by the distance  $BC$ .

Fig. 10.1 (d) shows net exports as a decreasing function of output.  $Y_{TB}$  is the level of output  $t$  which value of imports equals the value of exports.

From Fig. 10.1 (c), we can characterise *net* exports as a function of output. At output level  $Y$ , for example, exports are given by the distance  $AC$  and imports by the distance  $AB$ , so net exports are given by the distance  $BC$ .

**Fig. 10.1: Panel c: Demand for Domestic Goods and Net Exports**



**Fig. 10.1: Panel (d): Trade Balance**

This relation between net exports and output is represented as the line NX (for Net Exports) in Fig. 10.1(d). Net exports are a decreasing function of output: as output increases, imports increase, and exports are unaffected, so net exports decrease. Call  $Y_{TB}$  (TB for trade balance) the level of output at which the value of imports equals the value of exports, so that net exports are equal to 0. Levels of output above  $Y_{TB}$  lead to higher imports and to a trade deficit. Levels of output below  $Y_{TB}$  lead to lower imports and to a trade surplus.

### 10.7.5 Goods Market Equilibrium

For the goods markets to be in equilibrium, output (the left side of the equation 10.14) must be equal to the demand for domestic goods (the right side of the equation 10.14).

$$Y = C(Y-T) + I(Y, r) + G + X(Y_f, R) - M(Y, R)/R \quad \dots(10.14)$$

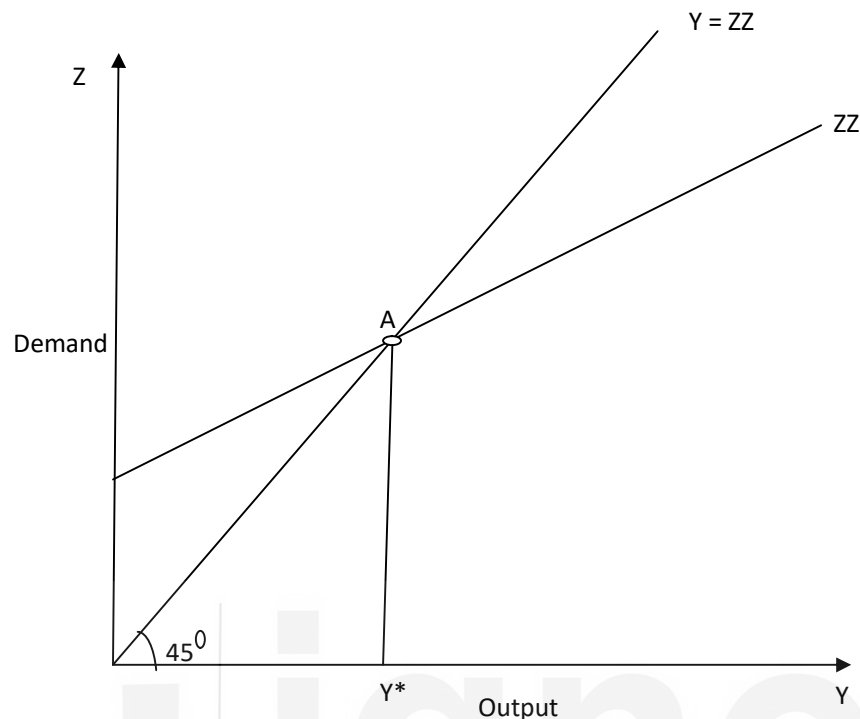
(+)      (+,-)              (+,-)              (+, +)

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

- A. Consumption, C, depends positively on disposable income, (Y-T).
- B. Investment, I, depends positively on output, Y and negatively on the real interest rate, r.
- C. Government spending, G, is taken as given.
- D. The quantity of exports, X, depend positively on foreign output,  $Y_f$  and negatively on the real exchange rate, R (a rise in real exchange rate implies and increase in the value of domestic goods in terms of foreign goods that is, a real exchange rate appreciation. This real exchange rate appreciation will make domestic goods costlier in terms of foreign goods and will make foreign goods cheaper for domestic residents. It will thus reduce the volume of exports and raise the volume of imports).
- E. The volume of imports, M, depends positively on output, Y. When domestic income goes up, the spending by domestic residence increase on all goods including imports. Imports depend positively on real exchange rate. An increase in the real exchange rate that is real exchange rate appreciation will raise the volume of imports by making them cheaper for domestic residents. The value of imports in terms of domestic goods is equal to the quantity of imports divided by the real exchange rate.

This equilibrium condition determines output as a function of all the variables we take as given, from taxes to the real exchange rate to foreign output. In Fig. 10.2, demand is measured on the vertical axis, and output (equivalently production or income) is measured on the horizontal axis. The line ZZ plots demand as a function of output; this line simply replicates the line ZZ in Fig. 10.1; ZZ is upward-sloping but with slope less than 1. Equilibrium output is at the point where demand equals output, at the intersection of the line ZZ and the 45° line,  $Y=ZZ$ , point A in the figure, with associated output level  $Y^*$ .

Fig. 10.2 shows the equilibrium in the goods market is attained at the intersection of the ZZ line (represent the demand for domestic goods) and the  $Y = ZZ$  line.  $Y^*$  is the equilibrium level of output.



**Fig. 10.2: Equilibrium in the Goods Market**

### 10.7.6 Net Exports

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

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

$$NX = X(Y_f, R) - M(Y, R)/R \quad \dots(10.15)$$

$$= NX(Y, Y_f, R) \quad \dots(10.15a)$$

(-, +, -)

Three important results follow from equation (10.15a).

1. A rise in foreign income other things being equal raises the demand for exports. It improves the home country's trade balance and therefore raises the home country's aggregate demand.
2. An increase in the real exchange rate leads to a decrease in net exports. A real appreciation of dollar against euro will make imports cheaper for the US residents and US exports costlier for Europeans by raising the price of domestic currency in terms of foreign currency.

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

Using equation (10.15a), we can rewrite the equilibrium condition in equation 10.14 as

$$Y = C(Y-T) + I(Y, r) + G + NX(Y, Y_f, R) \quad \dots(10.16)$$

(+)      (+, -)      (-, +, -)

The implications of equation (10.16) are as follows:

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

**Check Your Progress 2**

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

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

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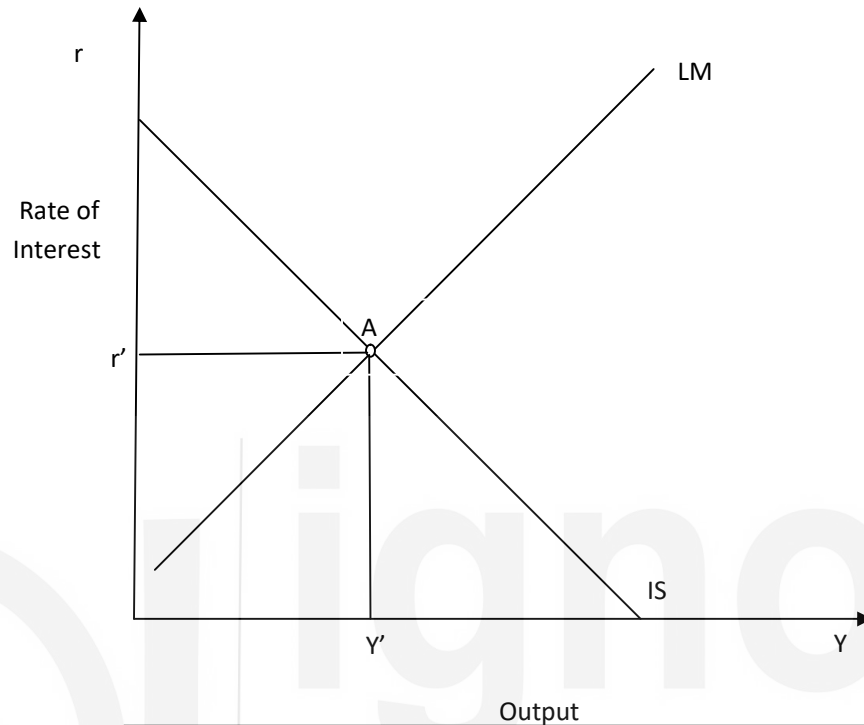
**10.8 THE IS CURVE IN OPEN ECONOMY**

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

which includes consumption, investment, government expenditure and net exports. In equation form we can say,

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



**Fig. 10.3: Equilibrium in the Goods and Financial Market (IS-LM)**

Fig. 10.3 illustrates the IS curve which shows the combinations of interest rate and output for which goods market is in equilibrium and the LM curve which shows the combinations of interest rate and output for which money market is in equilibrium. Equilibrium occurs at point A with equilibrium level of output equal to  $Y'$ .

The IS curve depicted in Fig. 10.3, is negatively sloped because higher interest rates cause investment to fall, which shifts  $ZZ$  down and lowers equilibrium GDP. In contrast, lower interest rates cause investment to rise, which shifts  $ZZ$  up and raises equilibrium GDP. The curve looks very much the same as in the closed economy, but it hides a more complex relation than before. In all cases, the IS curve shows the relationship between interest rates and level of income at which desired expenditure flows are equal to actual output or desired withdrawals are equal to desired injections. However, the flows of withdrawals and injections are different in a closed economy from an open economy. In a closed economy with no government sector, the IS curve shows the combinations of interest rate and GDP for which saving and investment are equal. In an open economy with government sector, the IS curve shows that the withdrawals from GDP are equal to the injections to the GDP. Withdrawals are in the form of savings (S), taxes



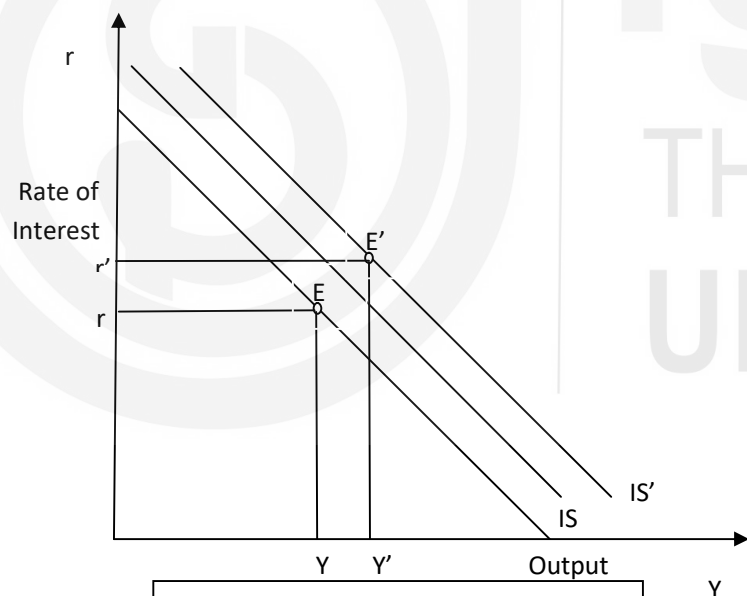
(T) and imports (M). Injections are in the form of investment (I), government purchases (G), and exports (X). Thus, for an open economy the IS curve indicates that  $(S + T + M) = (I + G + X)$ . In this case the IS curve is drawn for given values of government spending, exports, autonomous consumption as well as tax rate.

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

Equilibrium in the goods and financial market, is attained at point A in Fig. 10.3 with output level,  $Y'$  and interest rate,  $r'$ .

### Shifts in the IS Curve

An increase in the exogenous spending, shifts the ZZ curve up in Fig. 10.4, so it shifts the IS curve to the right. In an open economy, changes in real exchange rate,  $R$  and foreign income,  $Y_f$  shift the IS curve, in addition to changes in autonomous consumption, government expenditure and tax rate. A depreciation (increase in real exchange rate) increases the demand for domestic goods, shifting the IS curve out and to the right. Likewise, an increase in foreign income and with it, an increase in foreign spending on our goods will increase net exports or demand of our goods.



**Fig. 10.4: Shifts in the IS Curve**

Fig. 10.4 shows rightward shifts in the IS curve on account of a rise in foreign demand leading to an increase in interest rate and domestic output.

Fig. 10.4 shows the effect of a rise in foreign income. Higher foreign spending on domestic goods raises domestic country's exports and hence, at unchanged interest rate, requires an increase in output. This is shown by the rightward shift of the IS curve. The full effect of an increase in foreign demand, thus, is an

increase in interest rate and an increase in domestic output and employment. On other hand, a weakening of foreign economies reduces their imports and hence pulls down domestic demand. It leads to decrease in equilibrium output and interest rate.

Fig. 10.4 can also help explain the effect of depreciation in exchange rate. A depreciation raises the net exports at each level of income and hence shifts the IS curve upward to the right. Thus depreciation leads to a rise in our equilibrium output.

Table 10.3 below summarises the effect of different disturbances on the equilibrium level income and net exports.

**Table 10.3: Effects of Disturbance on Income and Net Exports**

	Increase in domestic Income, $Y$	Increase in foreign Income, $Y_f$	Increase in real exchange rate (real appreciation), $R$ ,
Income	+	+	-
Net Exports	-	+	-

**Table 10.3 summarises the effect of disturbances (changes in domestic income, foreign income and real exchange rate) on the level income and net export.**

## **10.9 CAPITAL MOBILITY**

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

### **10.9.1 International Capital Flows and the Trade Balance**

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

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

If we subtract  $(C+G)$  from both sides we obtain

$$Y - C - G = I + NX \quad \dots (10.17)$$

Since  $(Y - C - G)$  is national saving,  $S$ ,

$$S = I + NX, \text{ or } (S - I) = NX \quad \dots (10.18)$$

This form of national income accounts identity shows that an economy's net exports always equal the difference between its saving and investment. The right hand side of the identity,  $NX$ , the net export of goods and services, is also called the trade balance. It tells us how our trade in goods and services departs from the benchmark of equal imports or exports.

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

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

### 10.9.2 Balance of Payments and Capital Flows

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

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

$$BP = NX(Y, Y_f, R) + CF(r - r_f) \quad \dots(10.19)$$

Equation (10.19) shows the trade balance as a function of domestic and foreign income and the real exchange rate, and the capital account as a function of the interest rate differential. An increase in income worsens the trade balance and an increase in interest rate above the world level pulls in capital from abroad and thus improves the capital account. It follows that when income increases, even the tiniest increase in the interest rates is enough to maintain overall balance of payments equilibrium. The trade deficit would be financed by capital inflow.

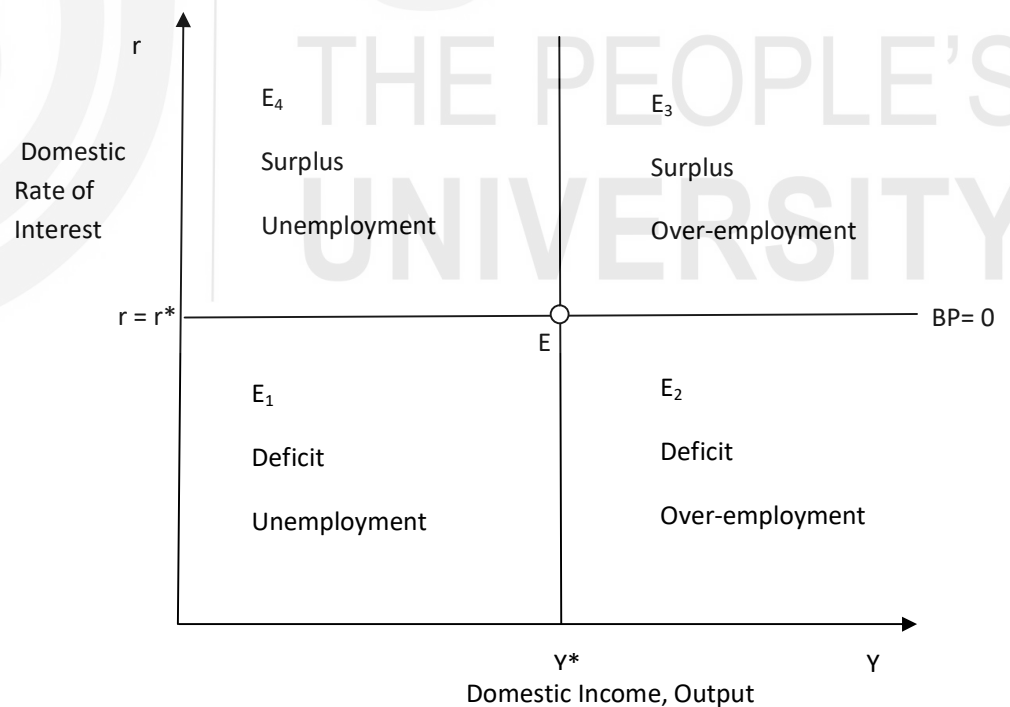
### 10.9.3 Policy Dilemmas

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

External balance exists when the balance of payments is close to zero. Otherwise, the central bank will run down its reserves in case of net outflow and accumulate reserves in case of net inflow. Internal balance exists when output is at the full employment level. In Fig. 10.5, we show the line  $BP = 0$ , derived from equation (10.19), along which we have balance of payments equilibrium. Our key assumption, i.e., perfect capital mobility, forces the  $BP = 0$  line to be horizontal. Only at a level of interest rate equal to that of the rates abroad, can we have external balance: If domestic interest rates are higher, there is a huge capital inflow resulting in surplus in capital account and overall surplus.

On the other hand, if domestic interest rate is below foreign interest rates, there is unlimited capital account deficit.

Thus  $BP=0$  must be flat at the level of world interest rates. Points above the  $BP=0$  schedule correspond to a surplus, and points below to a deficit. The full employment output level is  $Y^*$ . Point E is the only point at which both internal balance and external balance are achieved. Point  $E_1$ , for example, corresponds to a case of unemployment and a balance of payments deficit. Point  $E_2$ , by contrast, is a case of deficit and over employment.



**Fig. 10.5: External vs. Internal Balance**

We can talk about policy dilemmas in terms of points in the four quadrants of Fig. 10.5. For instance, at point  $E_1$ , there is a deficit in the balance of payments, as well as unemployment. An expansionary monetary policy would deal with the unemployment problem but worsen the balance of payments (Rightward shift of LM curve would increase the equilibrium output/employment but would lower the domestic rate of interest. The lower domestic rate of interest will make the domestic economy less lucrative for foreign investors). If the country can find a way of raising the interest rate, it would obtain financing for the trade deficit. That means that both monetary and fiscal policies would have to be used to achieve external and internal balance simultaneously.

Fig. 10.5 shows  $BP = 0$  line along which we have Balance of Payments equilibrium. Points above the  $BP = 0$  line correspond to a surplus and points below it to a deficit in BoP. The full employment output level is  $Y^*$ .

**Check Your Progress 4**

- 1) Explain how the IS curve is derived.

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

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**10.10 LET US SUM UP**

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

National Income accounting for an open economy is different from that of a closed economy in the sense that exports are to be added and imports are to be subtracted to arrive at the demand for domestic goods, the ZZ curve. Equilibrium in the goods market is attained by equating national income with the sum of

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

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

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## **10.11 ANSWERS/ HINTS TO CHECK YOUR PROGRESS EXERCISES**

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### **Check Your Progress 1**

- 1) A surplus in current account is settled by a reverse transaction in the capital account. It must be settled by either lending abroad or buying assets abroad or by accumulating reserves of foreign currency.
- 2) Balance of trade includes exports and imports of goods. Balance of current account includes balance of trade, balance of services, and balance of unrequited transfers. Balance of capital account records purchases and sales of assets such as stocks and bonds; borrowings and lending from/ to foreigners by government, corporations and individuals; any change in country's gold stock or reserves of foreign currency.
- 3) It is true only as an accounting principle. However, if deficit is financed by an accommodating capital inflow then it is a warning signal for the government to change its economic policy.

### **Check Your Progress 2**

- 1) Imports are positively affected by domestic income and real exchange rate, while, exports are positively affected by foreign income and negatively by real exchange rate. Net Exports, which is the excess of exports over imports, are positively affected by foreign income and negatively by domestic income and real exchange rate.
- 2) Go through Section 10.7 and answer.

### **Check Your Progress 3**

- 1) The IS curve is derived by equating national income to the aggregate demand. It is negatively sloped and is drawn for given values of  $C$ ,  $G$ ,  $R$ ,  $T$ ,  $r$ ,  $Y_f$ .
- 2) Go through Section 10.9 and answer.

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# UNIT 11 EXCHANGE RATE DETERMINATION\*

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## Structure

11.0 Objectives

11.1 Introduction

11.2 Exchange Rate Regimes

11.2.1 Floating Exchange Rate

11.2.2 Fixed Exchange Rate

11.2.3 Managed Floating

11.3 Nominal vs. Real Exchange Rates

11.3.1 Nominal Exchange Rates

11.3.2 Change in Exchange Rate

11.3.3 From Nominal to Real Exchange Rates

11.4 Interest Rate Parity Equation

11.5 Asset Market Approach to Exchange Rate Determination

11.5.1 Expected Rate of Return to Assets

11.5.2 Foreign Exchange Market Equilibrium: Asset Market Approach

11.6 Purchasing Power Parity (PPP)

11.7 Monetary Approach to Exchange Rate Determination

11.8 Let Us Sum Up

11.9 Answers/ Hints to Check Your Progress Exercises

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## 11.0 OBJECTIVES

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

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

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## 11.1 INTRODUCTION

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One of the key economic decisions a country takes is how it will value its currency in comparison to other currencies. An exchange rate regime is how a country manages its currency in the foreign exchange market. An exchange rate regime is closely related to the country's monetary policy.

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

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

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## **11.2 EXCHANGE RATE REGIMES**

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

### **11.2.1 Floating Exchange Rate**

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

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

### **11.2.2 Fixed Exchange Rate**

A fixed exchange rate system, or pegged exchange rate system, is a currency system in which governments try to maintain a currency value that is constant



against a specific currency or good. In a fixed exchange-rate system, a country's government decides the worth of its currency in terms of either a fixed weight of an asset, another currency, or a basket of other currencies. The central bank of a country remains committed at all times to buy and sell its currency at a fixed price.

In these countries, the central bank does not let the exchange rate adjust freely in whatever manner as implied by equilibrium in the foreign exchange market. Central banks act under implicit or explicit exchange rate targets and use monetary policy to achieve those targets. The targets are sometimes implicit, sometimes explicit; they are sometimes specific values, sometimes bands or ranges. These exchange rate arrangements (or *regimes*, as they are called) have many names. China at present has a fixed exchange rate.

### **Pegs, Crawling Pegs, Bands**

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

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

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

### **11.2.3 Managed Float**

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

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## 11.3 NOMINAL VS. REAL EXCHANGE RATES

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

### 11.3.1 Nominal Exchange Rate

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

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

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

### 11.3.2 Change in Exchange Rate

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

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

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

Although the terms appreciation and depreciation are used to describe movements of exchange rates in free markets, a different set of terms is employed to describe increases and decreases in currency values that are set by government decree. These are called *devaluation* and *revaluation*. These two terms are used when countries operate under fixed exchange rates. The label ‘fixed’ is a bit misleading: it is not the case that the exchange rate in countries with fixed exchange rates never actually changes. But changes are rare. Because these changes are rare, economists use specific words to distinguish them from the daily changes that occur under flexible exchange rates. A decrease in the exchange rate under a regime of fixed exchange rates is called devaluation rather than depreciation, and an increase in the exchange rate under a regime of fixed exchange rates is called a revaluation rather than an appreciation. In other words, when an officially set exchange rate is altered so that a unit of a country’s currency buys fewer units of foreign currency, we say that the devaluation of that currency has occurred. When the exchange rate is altered so that the currency buys more units of foreign currency, we say that an upward revaluation has taken place.

### 11.3.3 From Nominal to Real Exchange Rate

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

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

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

$$R = EP/P^* \quad \dots (11.1)$$

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

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

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

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## 11.4 INTEREST PARITY EQUATION

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

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

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

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

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

$$(1 + r_t) = E_t (1 + r_t^*) \left( \frac{1}{E_{t+1}^e} \right) \quad \dots (11.2)$$

Reorganising the above, we have

$$(1 + r_t) = (1 + r_t^*) \left( \frac{E_t}{E_{t+1}^e} \right) \quad \dots (11.3)$$

Equation (11.3) is called the ‘uncovered interest parity relation’. The assumption that financial investors will hold only the bonds with the highest expected rate of returns is obviously too strong, for two reasons:

- 1) It ignores transaction costs. Going into and out of US bonds requires three separate transactions, each with a transaction cost.
- 2) It ignores risk. The exchange rate a year from now is uncertain; holding US bonds is therefore more risky, in terms of Euros, than holding Euro bonds.

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

### Interest Rate and Exchange Rate

Let us get a better sense of what the interest parity condition implies. First, let us

rewrite  $\frac{E_t}{E_{t+1}^e}$  as  $\frac{1}{[1 + (E_{t+1}^e - E_t)/E_t]}$

Replacing  $\frac{E_t}{E_{t+1}^e}$  with above expression in equation (11.2) gives

$$(1 + r_t) = \frac{(1+r_t^*)}{[1+(E_{t+1}^e-E_t)/E_t]} \quad \dots (11.4)$$

Equation (11.4) indicates the relationship between domestic nominal interest rate,  $r_t$  and foreign nominal interest rate,  $r_t^*$ , and expected rate of appreciation of the domestic currency,

$$(E_{t+1}^e - E_t)/E_t$$

A good approximation to the above is given by

$$r_t \approx r_t^* - \left( \frac{E_{t+1}^e - E_t}{E_t} \right) \quad \dots (11.5)$$

Equation (11.5) is called the interest parity condition. The left-hand side of equation (11.5) is the rate of return on dollar assets and the right-hand side is the expected rate of return on euro assets when expressed in dollars. The interest

parity condition thus holds when the expected returns on deposits of any two currencies, measured in the same currency are equal. This is the form of the interest parity condition you must remember: *arbitrage by investors implies that the domestic interest rate must be equal to the foreign interest rate minus the expected appreciation rate of the domestic currency.* Note that the expected appreciation rate of the domestic currency is also the expected depreciation rate of the foreign currency. Thus, equation (11.5) is equivalent to the following: *the domestic interest rate must be equal to the foreign interest rate minus the expected depreciation rate of the foreign currency.*

**Check Your Progress 1**

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

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- 2) What is meant by interest parity condition?

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**11.5 ASSET MARKET APPROACH TO EXCHANGE RATE DETERMINATION**

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

**11.5.1 Expected Rate of Return to Assets**

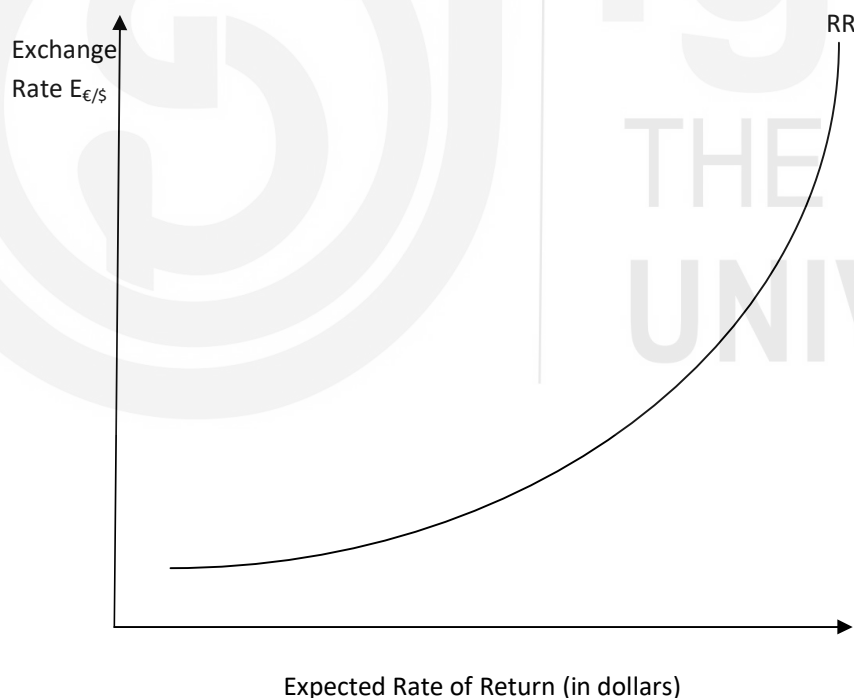
Suppose today's euro/dollar rate is €1.00 per dollar and the exchange rate you expect after one year is €1.05 per dollar. Then the expected rate of dollar appreciation against the euro is  $(1.05 - 1.00)/1.00 = 0.05$  or 5 percent per year. It means that a euro deposit must give 5% extra returns than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

to compensate for the loss in value on converting euro into dollar after a year because of dollar appreciation.

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

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

Fig. 11.1 shows that for fixed values of the expected future euro/dollar exchange rate and the euro interest rate, the relation between today's euro/dollar exchange rate and the expected dollar returns on euro deposits is an upward sloping schedule.



**Fig. 11.1: Expected Rate of Return of Euro Assets in Dollars**

Fig. 11.1 illustrates the RR schedule as a relation between today's euro/dollar exchange rate and the expected dollar return on euro deposits.

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

Foreign exchange market will be in equilibrium when interest parity condition holds. Foreign exchange market is in equilibrium when deposits of all currencies offer the same expected rate of returns. The condition that the expected returns on deposits of any two currencies are equal when measured in the same currency is called the interest parity condition. Let us see why foreign exchange market is in equilibrium when the interest parity condition holds. Suppose that the dollar interest rate is 6 percent and euro interest rate is 10 percent but dollar is expected to appreciate at 6 percent over a year. In this circumstance, the expected rate of returns on euro deposits would be 2 percent lower than that on dollar deposits. This means that no one will be willing to continue holding euro deposits and the holders of euro deposits will be trying to sell them for dollar deposits. There will therefore be an excess supply of Euro deposits and an excess demand for Dollar deposits in the foreign exchange market.

When all expected rates of returns are equal (that is, when interest parity holds), there is no excess supply of certain type of deposit and no excess demand for another. Thus, the foreign exchange market is in equilibrium when the following condition is met:

Expected rate of return on Dollar deposits = Expected rate of return on Euro deposits

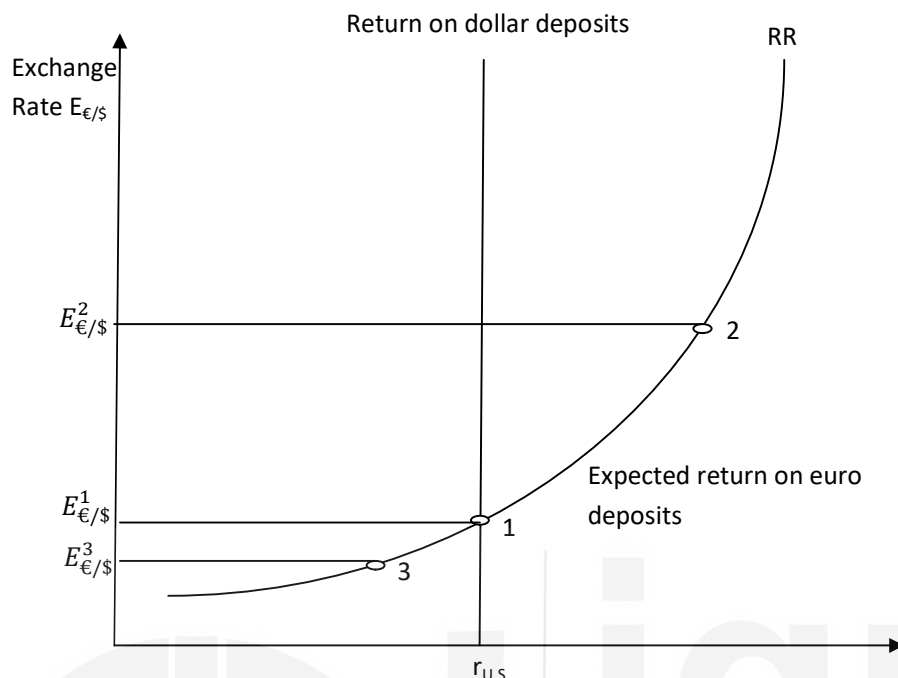
$$r_{US} = r_E - \left( \frac{E_{\$/\$}^e - E_{\$/\$}}{E_{\$/\$}} \right) \quad \dots (11.6)$$

In Fig. 11.2, the vertical schedule indicates  $r_{US}$ , the return on dollar deposits measured in terms of dollars. The upward sloping schedule, RR shows how the expected return on euro deposits, measured in terms of dollars depends on the current euro/ dollar exchange rate. The equilibrium euro/dollar rate is the one indicated by the intersection of the two schedules at point 1,  $E_{\$/\$}^1$ . At this exchange rate, the returns on dollar and euro deposits are equal, so that the interest parity condition,  $r_{US} = r_E - \left( \frac{E_{\$/\$}^e - E_{\$/\$}}{E_{\$/\$}} \right)$ , is satisfied.

In Fig. 11.2, the vertical schedule indicates the returns to dollar deposits measured in dollars and the RR schedule which represent the relation between the expected return on euro deposits measured in dollars and the current exchange rate. Equilibrium occurs at point 1, where two schedules intersect.

The upward sloping schedule measuring the expected euro return on dollar deposits tells us that at the exchange rate  $E_{\$/\$}^3$ , the rate on euro deposits is less than the rate of return on dollar deposits,  $r_{US}$ . In this situation anyone holding euro deposits wishes to sell them for the more lucrative dollar deposits. The foreign exchange market is out of equilibrium. The unhappy owners of euro deposits attempt to sell them for dollar deposits, but because the return on dollar deposits is higher than that on euro deposits at the exchange rate,  $E_{\$/\$}^3$ , no holder of a dollar deposit is willing to sell it for euro at that rate.





**Fig. 11.2: Equilibrium in the Foreign Exchange Market: Asset Approach**

As euro holders try to entice dollar holders to trade by offering them a better price for dollar, the euro/dollar exchange rate rises towards  $E_{€/\$}^1$  that is, euros become cheaper in terms of dollars. Once the exchange rate reaches  $E_{€/\$}^1$ , euro and dollar deposits offer equal returns and holders of euro deposits no longer have an incentive to try to sell them for dollars. The same process works in reverse if we were initially at point 2 with an exchange rate of  $E_{€/\$}^2$ . At point 2, the return on euro deposits exceeds that on dollar deposits, so there is now an excess supply of the latter. As unwilling holders of dollar deposits bid for the more attractive euro deposits, the price of euro in terms of dollars tends to rise that is, the Dollars tend to depreciate against the Euro. When the exchange rate has moved to  $E_{€/\$}^1$ , rates of return are equalized across currencies and the market is in equilibrium.

## 11.6 PURCHASING POWER PARITY (PPP)

The short run movements in the exchange rates are governed by asset market conditions, the long run fluctuations in the exchange rates are anchored by goods market conditions. The long run pattern is known as purchasing power parity. The notion of PPP is one of the oldest concepts in economics.

Purchasing Power Parity (PPP) theory is based on the 'Law of One Price'. Goods denominated in the same currency should have identical price between markets

after adjusting for transportation costs. If a price difference exists between two markets, then *arbitrage* is possible. Traders would buy products from the low-price market and sell it in the high-price market. Consequently, prices would converge to one price across all markets as traders shift the supply of goods from the low-price market to the high-price market. The prices in the high-price market would fall while prices in the low-price market would rise over time.

Price could differ between markets because the price differential reflects the transportation costs of the product from one market to another. Nevertheless, the PPP helps predict changes in exchange rates.

The PPP refers to the idea that the same basket of goods should cost the same when prices are measured in the same currency regardless of where it is located. So, for instance, suppose  $P_{\$}$  is the price of a bundle of goods in the United States and let  $P_{\text{€}}$  equal the price of an identical bundle in Italy (measured in Euros). If the two bundles are to have the same price, the following relationship must hold:

$$E_{\text{€}/\$} = \frac{P_{\text{€}}}{P_{\$}} \quad \dots (11.7)$$

The theory of PPP says that the long-run equilibrium value of the actual exchange rate will be  $E_{\text{€}/\$}$ . The PPP theory therefore predicts that a fall in a currency's domestic purchasing power (as indicated by an increase in the domestic price level) will be associated with a proportional currency depreciation in the foreign exchange market. Symmetrically, PPP predicts that an increase in the currency's domestic purchasing power will be associated with a proportional currency appreciation.

By re-arranging, we get

$$P_{\$} = \frac{P_{\text{€}}}{E_{\text{€}/\$}} \quad \dots (11.8)$$

The left side of equation (11.8) is the dollar price of the reference commodity basket in the US; the right side is the dollar price of the reference basket when purchased in Euro area. Thus, PPP asserts that the price levels of all the countries are equal when measured in terms of the same currency.

Let us take an example to understand this. Suppose the CPI for the US equals \$755.3 while the CPI for Euro area is €1,241.2 Euros. Thus, the absolute PPP predicts the exchange rate should be 1.64 Euros per dollar.

$$E_{\text{€}/\$} = \frac{P_{\text{€}}}{P_{\$}} = \frac{1241.2 \text{ Euros}}{755.3 \text{ Dollars}} = \frac{1.64 \text{ Euros}}{1}$$

If the spot exchange rate is 1.4 Euros per 1 dollar, subsequently, traders use arbitrage. The CPI in U.S. in Euros is 1057.42 (or \$755.3 \* 1.4 €/€) which is smaller than the CPI of the Euro area. Thus, traders could profit by purchasing a basket of goods from US and selling it in the Euro area. Thus, they potentially earn €1,241.20 – €1,057.42 = €183.78 per basket of goods.

### Absolute PPP and Relative PPP

The statement that exchange rates equal relative price levels is sometimes referred to as the absolute PPP. Absolute PPP implies a proposition known as the relative PPP, which states that the percentage change in the exchange rate between two currencies over any time period equals the difference between percentage changes in national price levels during the same time period. Relative PPP thus translates absolute PPP from a statement about price and exchange rate levels into one about price and exchange rate changes. It asserts that prices and exchange rates change in a way that preserves the ratio of each currency's domestic and foreign purchasing power.

Foreign country's (Euro area in our example) inflation between now and period

$$T = \pi_{\epsilon}$$

Domestic country's (US in our example) inflation between now and period

$$T = \pi_{\$}$$

$E_{\epsilon/\$}^0$  and  $E_{\epsilon/\$}^T$  are the domestic exchange rates (defined as euros per dollar) measured at time 0 and T. Thus, the exchange rate at time 0 is  $E_{\epsilon/\$}^0 = \frac{P_{\epsilon}}{P_{\$}}$

The exchange rate at time T is  $E_{\epsilon/\$}^T = \frac{P_{\epsilon}(1+\pi_{\epsilon})}{P_{\$(1+\pi_{\$})}}$  ... (11.9)

Exchange rate change will then be

$$\frac{E_{\epsilon/\$}^T - E_{\epsilon/\$}^0}{E_{\epsilon/\$}^0} = \frac{\frac{P_{\epsilon}(1+\pi_{\epsilon})}{P_{\$(1+\pi_{\$})}} - \frac{P_{\epsilon}}{P_{\$}}}{\frac{P_{\epsilon}}{P_{\$}}} \dots (11.10)$$

$$= \frac{1+\pi_{\epsilon}}{1+\pi_{\$}} - 1 \dots (11.10 a)$$

We use linear approximation to obtain the following

$$\frac{E_{\epsilon/\$}^T - E_{\epsilon/\$}^0}{E_{\epsilon/\$}^0} \approx \pi_{\epsilon} - \pi_{\$} \dots (11.10 b)$$

If the US price level rises by 10 percent over a year and Euro area's rises by only 5 percent, for example, relative PPP predicts a 5 percent depreciation of the dollar against the euro. The dollar's 5 per cent depreciation against the Euro just gets cancelled with the 5 per cent extra inflation in the US than the Euro area, leaving the relative domestic and foreign purchasing powers of both currencies unchanged.

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## 11.7 MONETARY APPROACH TO EXCHANGE RATE DETERMINATION

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The theory of PPP is a statement that exchange rates and domestic and foreign price levels should move together in the long run. It says nothing about what

causes any of these three variables to move. To close the circle, we need to add elements to the model. This is done with a theory of exchange rate behaviour known as monetary approach to exchange rate determination. The monetary approach to exchange rate is the workhorse theory of long-run exchange rate behaviour. It was developed in the 1970s by economists at University of Chicago and has been widely studied over the past 40 years.

The monetary approach to exchange rate has two fundamental building blocks. The first is purchasing power parity. The second is the agents in the two countries in question have well defined stable demands for real money balances as a function of national income and interest rates. Imposing money market equilibrium and PPP, it is straight forward to show that the theory predicts the

following equation for the exchange rate:

$$E_{\$/\text{€}} = \frac{P_{\text{€}}}{P_{\$}}$$

Money Market will be in equilibrium when the demand for money exactly matches the supply of money. The money is demanded for three motives namely transaction motive, precautionary motive and speculative motive by households, firms and governments. The aggregate demand for money in turn is affected by three factors: (i) The interest rate: A rise in the interest rate causes each individual in the economy to reduce their demand for money; (ii) The price level: If the price level rises, agents will have to spend more than before to purchase the same basket, they will therefore have to hold more money; and (iii) Real national income: An increase in the real national income raises the demand for money, given the price level. If  $P$  is the price level,  $r$  is the interest rate, and  $Y$  is real GNP, the aggregate demand for money,  $M^d$ , can be expressed as

$$M^d = P \times L(r, Y) \quad \dots (11.11)$$

Thus, aggregate real money demand,  $(r, Y)$ , is equal to

$$\frac{M^d}{P} = L(r, Y) \quad \dots (11.12)$$

Money Supply: An economy's supply of money is controlled by the central bank.

We will thus take the real money supply,  $\frac{M^s}{P}$ , as given.

The equilibrium in the money market is given by the equality between real money demand and real money supply.

$$\frac{M^s}{P} = \frac{M^d}{P} \quad \dots (11.13)$$

From equation (11.12) we get:

$$\frac{M^s}{P} = L(r, Y) \quad \dots (11.14)$$

By re-arranging equation (11.14), we can explain the domestic price level in terms of domestic money demand and supply.

$$P_{US} = \frac{M_{US}^s}{L(r_{\$, Y_{\$})} \quad \dots (11.15)$$

In the case of Euro area

$$P_E = \frac{M_E^S}{L(r_E, Y_E)} \quad \dots (11.16)$$

The monetary approach makes the general prediction that the exchange rate, which is the relative price of the US and the Euro area, is determined in the long run by the relative supplies of those monies and the relative real demands for them. Shifts in interest rates and output levels affect the exchange rate only through their influences on money demand.

In addition, the monetary approach makes a number of specific predictions about the long run effects on the exchange rate of changes in money supplies, interest rates and output levels.

- a) Money Supply: Other things equal, a permanent rise in US money supply  $M_{US}^S$  causes a proportional increase in the long run US price level  $P_{US}$ . Under PPP, an increase in the U.S. money supply causes a proportional long run depreciation of the dollar against the euro. Predictions in part (a) should seem straightforward. In essence, they say that if a country prints more of its own money (everything else held constant), it will decrease in value in foreign exchange markets. This is because a rise in home (foreign) money will introduce inflationary pressures in home (foreign) country.
- b) Interest Rate: A rise in the interest rate  $r_{\$}$  on dollar denominated assets lowers real U.S. money demand,  $L(r_{\$}, Y_{US})$ . By equation 11.15, the long run U.S. price level rises, and under PPP the dollar must depreciate against the euro in proportion to this U.S. price level increase.
- c) Output Level: A rise in the U.S. output raises real U.S. money demand ( $r_{\$}, Y_{US}$ ), leads to a fall in the long run U.S. price level (equation 11.15). According to PPP, there is an appreciation of the dollar against the euro.

Predictions (b) and (c) show how changes in variables that influence money demand (everything else held constant) also can influence the exchange rate. In particular, growth in the home (foreign) interest rate lowers money demand and raises home (foreign) prices. Working through PPP, this depreciates (appreciates) the exchange rate. Growth in home (foreign) income raises money demand and puts downward pressure on home (foreign) prices. Working through PPP, this appreciates (depreciates) the exchange rate.

**Check Your Progress 2**

- 1) State the difference between absolute PPP and relative PPP.  
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- 2) Explain the general prediction of the monetary approach to long run exchange rate determination.

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## **11.8 LET US SUM UP**

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In this unit, we discussed how exchange rate is determined through the interplay of interest rates, price level, and the demand for and supply of money. Exchange rate, which is the price of domestic goods relative to foreign goods, is central to the decision of export and import and hence, to international trade.

A country's decision on whether market forces will determine its exchange rate or government will maintain a constant exchange rate or monetary authority will influence exchange rate, will determine its exchange rate regime- fixed; floating or managed floating.

The asset approach to exchange rate determination is based on the premise that asset prices today are determined in large part on expectation of the future performance of an asset. Central to the determination of exchange rate is the interest parity condition which holds when the expected return on deposits of any two currencies, measured in the same currency are equal. Foreign exchange market attains equilibrium when interest parity holds. This is how equilibrium exchange rate is determined.

Economists believe that long run exchange rates are determined by the monetary approach to exchange rate determination based on (a) PPP and (b) stable demands for real money balances as a function of national income and interest rates. PPP implies that exchange rates are determined by relative price levels. Imposing money market equilibrium and PPP, the monetary approach makes the general prediction that the exchange rate is fully determined in the long run by the relative supplies of those monies and the relative real demands for them.

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## **11.11 ANSWER TO CHECK YOUR PROGRESS EXERCISES**

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### **Check Your Progress 1**

- 1) There are three basic types of exchange rate regimes: floating – wherein a currency's value is allowed to fluctuate according to the foreign exchange market; fixed – wherein government try to maintain a currency value that is

constant against a specific currency or good; managed floating- wherein monetary authority attempts to influence the exchange rate without any specific target.

- 2) Interest parity condition holds when the expected return to deposits of two currencies are equal, when measured in the same currency. This implies that domestic interest rate must equal foreign interest rate minus the expected appreciation rate of the domestic currency.

### **Check Your Progress 2**

- 1) Absolute PPP implies that the exchange rates equal relative price levels. Relative PPP states that the percentage change in the exchange rate between two currencies over any period equals the difference between percentage changes in national price levels.
- 2) It states that the exchange rate is fully determined in the long run by the relative supplies of those monies and the relative real demands for them. Shifts in interest rates and output levels affect the exchange rate only through their influences on money demand.

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## GLOSSARY

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- Absolute PPP** : It implies that exchange rate equals relative price levels.
- Accommodating Capital Flows** : Accommodating capital movements are capital flows that take place specifically to equalise the balance of payments in the book keeping sense. These flows can take various forms. Foreign firms might accept short term claims on firms in the country or perhaps a foreign government extends a loan to the country.
- Actual Output Level** : The equilibrium output level provided by the intersection of AD curve and Short run AS curve.
- Aggregate Demand Curve** : It shows the relation between overall price level in the economy and 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.
- 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.
- Automatic Stabilizers** : Revenue and expenditure items in the budget that automatically change with the state of the economy and tend to stabilize GDP.
- Autonomous Capital Flows** : Autonomous capital flows are ordinary capital flows which take place regardless of other items in the balance of payments. These flows can be caused by a foreigner paying back a loan, or a person/ company taking up loan abroad by issuing bonds.
- Autonomous Investment** : Investment spending which is not dependent on income or interest rate.
- Autonomous Spending** : A part of aggregate demand that is independent of income and output level.



- Average Propensity to Consume** : The ratio of consumption expenditure (C) to income (Y).
- 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 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.
- 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)
- Balance of Trade** : It refers to exports and imports of visible items.
- Balanced Budget Multiplier** : Equilibrium income rises by the same amount by which the government spending rises. It is assumed that the change in government spending is equal to the change in taxes. Taxes are taken as autonomous taxes.
- 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.
- Capital Account** : The capital account of the BOP includes transactions involving cross-border purchase and sale of physical and financial assets.
- 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.
- 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.
- Change in Inventories** : Inventories are stocks of finished goods/ semi-finished goods/ intermediate goods. Change in inventories is total inventories at the end of the year minus total inventories at the beginning of the year for an economy.
- Circular Flow** : It is a flow of goods or services or money from one (set of) transactor to another (set).
- Classical Economists** : Economists who subscribe to classical point of view. Eminent classical economists include Adam Smith, David Ricardo, J B Say, and A C Pigou.
- Classical Model** : A model of the economy derived from ideas of the pre-Keynesian economists. It is based on the assumption that prices and wages adjust instantaneously to clear markets and that monetary policy does not influence real variables such as output and employment.

- 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.
- Cold Turkey** : It is the policy prescription of bring down inflation rate rapidly.
- Compensation of Employees** : Remuneration given by enterprises to employees for rendering labour services.
- Consumer Price Index** : Consumer Price Index represents the rate of increase in the consumer prices of a basket of goods and 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.
- 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.
- 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.
- 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.
- 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).
- 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.

<b>Deflation</b>	: Deflation is a sustained decrease in the general price level.
<b>Demand-pull inflation</b>	: Demand-pull inflation is a sustained rise in the general price level due to an increase in aggregate demand.
<b>Demand-pull Inflation</b>	: It is the inflation initiated by an increase in aggregate demand.
<b>Depreciation</b>	: It is the loss in the value of capital asset because of normal wear and tear and expected obsolescence.
<b>Depreciation of Domestic Currency</b>	: It is a decrease in the price of domestic currency in terms of a foreign currency
<b>Derivatives</b>	: 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.
<b>Devaluation</b>	: A decrease in the exchange rate under fixed exchange rate regime implemented through government decree.
<b>Direct Personal Taxes</b>	: These are the taxes imposed on households in the form of income tax or wealth tax. Those on whom they are imposed pay them.
<b>Disposable income</b>	: Amount of income received by the households after taxes $Y_d = Y - T$
<b>Double Counting</b>	: It refers to the problem of counting the same good more than once. In order to avoid the problem, we consider the final goods and services only.
<b>Economic Agents</b>	: 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.
<b>Enterprises</b>	: These are economic agents, which employ factors of production to generate a flow of goods and services in the economy.

- 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.
- Exchange Rate Regime** : It is how a country manages its currency in the foreign exchange market.
- 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 Commercial Borrowings (ECB)** : ECB are loans which are raised by a country's corporate sector from external financial organizations on commercial terms.
- Factor Cost** : It is the total cost incurred to employ factors of production to give rise to a flow of goods and services in an economy. It is equal to value of market price minus Net Indirect Taxes.
- Factor Services** : These are the services rendered by factors of production such as land, labour, capital and enterprise.
- Final Consumption Expenditure** : This is an expenditure incurred by households, enterprises and rest of the world to purchase final consumer goods, capital goods and net exports respectively.
- 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.
- Fiscal Policy** : The policy of a government with respect to government expenditure and taxation.
- 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.

<b>Floating Exchange Rate</b>	: Exchange rate regime wherein a currency's value is allowed to fluctuate according to the foreign exchange market.
<b>Foreign Exchange Intervention</b>	: It is the buying and selling of foreign currency by the central bank in order to influence the exchange rate.
<b>Foreign Exchange Reserves</b>	: These are the foreign exchange assets (e.g., foreign currency) held by the central bank.
<b>Forward contract</b>	: 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.
<b>Forward rate</b>	: 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.
<b>Fractional Reserve Banking System</b>	: 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.
<b>Frictional Unemployment</b>	: 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.
<b>Future contract</b>	: 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.
<b>Goods Market Equilibrium</b>	: When AD and AS interact with each other. All points on the IS curve reflects equilibrium in the goods market.
<b>Government Final Consumption Expenditure</b>	: It is the expenditure incurred by government on the purchase of intermediate goods plus compensation of government employees. This expenditure is incurred to meet the collective consumption of the economy.

- 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.
- Gross Domestic Product (GDP)** : It is the sum of final goods and services produced in a country during a period of time, usually a year. We do not include intermediate goods and income acquired through illegal activities in the GDP. In most countries, including India, estimated value of GDP is available on a quarterly basis as well as on a yearly basis.
- Gross National Product (GNP)** : It is the value of goods and services produced in an economy over a year, without duplication but gross of depreciation. It is the goods and services produced by the normal residents of an economy.
- 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.
- Household Sector** : It is the sector that supplies factor services to firms or enterprises. The factor incomes received by households are used to meet their final consumption requirements and the balance is used for savings, which are passed on to the capital sector.
- Hyper-Inflation** : Inflation is a persistent increase in general price level. When the rate of inflation is very high, it is said to be hyper-inflation. Many countries have seen episodes of hyper-inflation. In 2020, for example, Venezuela has witnessed inflation rate 20,000 per cent per annum.
- 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.
- Inflation Tax** : Financing government expenditure by printing money increases prices for everyone, reducing their spending power just as a tax to finance the spending would. This is called an inflation tax.
- 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.
- Intermediate Goods** : It refers to all the goods that are used as raw material for further production of other goods.
- Inventory** : Demand varies periodically but production is fixed. Thus a firm maintains certain stock of goods to meet uncertainties in demand, supply and movement of goods. If demand exceeds current production there is decline in the stock. Similarly, if demand falls short of production there is accumulation of inventory.
- Investment** : It is the creation of capital goods in an economy over a year. It can be for replacement of worn out capital or for addition to total capital stock of an economy.
- Investment Multiplier** : It is the multiple by which income or output of an economy increase when investment increases by certain amount. It is given by the formula  $\alpha = \frac{1}{1-c}$  where  $c$  stands for marginal propensity to consume.
- Invisible Hand** : The term coined by Adam Smith, meant that government should not intervene in the running of an economy too often and too strongly.
- Involuntary Unemployment** : In indicates a situation where unemployment is not voluntary; a person is looking for a job but cannot find one.



- IS Curve** : Investment-Saving curve showing the inverse relationship between interest rate and income.
- 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.
- Labour Force** : The sum of population who are willing to work, and either employed or unemployed
- 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.
- 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.
- Marginal Product of Labour** : Change in the output due to an additional unit of labour employed.
- Marginal Propensity to consume (mpc)** : The increase in consumption due to one-rupee increase in income. It is arrived at by calculating  $\frac{\Delta Y}{\Delta C}$ .
- Marginal Propensity to Save** : Increase in saving due to one-rupee increase in the income. It is usually denoted by 's' or mps.
- Market Price** : It is the price at which a commodity or service is actually purchased by a households or a firm.
- Mixed Income of Self-employed** : It is the factor income generated by unincorporated enterprises where it is not possible to distinguish between compensation of employees and operating surplus.
- 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.
- Multiplier Effect** : The multiplier effect refers to the idea that an initial spending rise can lead to even greater increase in national

	income.
<b>Narrow Money</b>	: M1 is also known as ‘narrow money’.
<b>Natural Rate of Unemployment</b>	: 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).
<b>Net Current Transfers from Rest of the World</b>	: It is the difference between unrequited transfers from the rest of the world, over a year, and such transfers from the economy to the rest of the world.
<b>Net Domestic Product (NDP)</b>	: It is the value of goods and services produced in an economy, over a year, without duplication, net of depreciation. This concept is related to the concept of domestic territory.
<b>Net Exports</b>	: The difference between exports and imports is called net exports or the trade balance. If exports exceed imports, the country is said to run a trade surplus. If exports are less than imports, the country is said to run a trade deficit.
<b>Net Exports (NX)</b>	: It is the difference between total value of exports and imports over a year.
<b>Net Factor Income from Abroad</b>	: 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.
<b>Net Indirect Taxes</b>	: It is the difference between indirect taxes and subsidies.
<b>Nominal Exchange Rate</b>	: Price of the domestic currency in terms of the foreign currency.
<b>Non-Accelerating Inflation Rate of Unemployment (NAIRU)</b>	: It is the abbreviation for <b>non-accelerating inflation rate of unemployment</b> . 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.
<b>Normal Resident of a Country</b>	: A person who is ordinarily resides in a country and whose centre of economic interest lies in that country.

- Normal Residents** : They are the households or institutions, which have their centre of interest in the economy but some of them may temporarily be stationed abroad.
- 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.
- Operating Surplus** : It is the factor income generated by ownership and management of property. It consists of rent, interest, and profits.
- 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.
- 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.
- Phillips curve** : It is a graph named after A. W. Phillips, which shows the trade- off between unemployment and inflation.
- Potential GDP** : It is the level of output ( $Y^*$ ) corresponding to full employment of the labour force.
- Price Level** : It is the average of prices of all the goods and services produced in a country.
- 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.

<b>Production Function</b>	: It is the relationship between factors of production (inputs) and the available technology with the quantity of output produced.
<b>Quantity Theory of Money</b>	: 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.
<b>quid pro quo</b>	: 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.
<b>Rate of Net Foreign Capital Inflow</b>	: It is the difference between rate of gross domestic capital formation and rate of gross domestic savings.
<b>Real Exchange Rate</b>	: Relative price of domestic goods to foreign goods.
<b>Real Flows</b>	: These are the flows of goods or services from one set of economic agents to another..
<b>Real Money Balances</b>	: Quantity of nominal money divided by the price level.
<b>Recession</b>	: In business cycle, recession indicates the phase when there is an economic slowdown; economic growth is in a decelerating phase.
<b>Relative PPP</b>	: 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.
<b>Replacement Investment</b>	: 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.
<b>Repo Rate</b>	: Rate at which the central bank lends funds to the commercial banks against submission of collateral such as securities by the banks.
<b>Residential Investment</b>	: Investment incurred on construction of new houses and buildings is called as residential investment.
<b>Rest of the</b>	: This sector deals with economic transactions of an

<b>World Sector</b>	economy with the rest of the world.
<b>Revaluation</b>	: An increase in the exchange rate under fixed exchange rate regime implemented through government decree.
<b>Reverse Repo Rate</b>	: Rate at which the commercial banks can deposit their excess liquidity with the central bank, by purchasing securities.
<b>Sacrifice Ratio</b>	: It refers to the percentage loss of output for bringing down inflation by one per cent.
<b>Simultaneous Equilibrium</b>	: Equilibrium in the goods market as well as in the money market at the same time.
<b>Slope of Investment Function</b>	: It indicates the sensitivity of investment to changes in the interest rate.
<b>Spot rate</b>	: Exchange rates governing “on the spot” trading are called spot exchange rates and the deal is called a spot transaction.
<b>Stagflation</b>	: Stagflation refers to an economic condition where economic growth is very slow or stagnant and prices are rising.
<b>Stagflation</b>	: It occurs when output is falling and at the same time prices are rising.
<b>Statutory Liquidity Ratio (SLR)</b>	: 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.
<b>Structural theory of Inflation</b>	: The supporters of structural theories believed that inflation arises due to structural maladjustments in the country or due to certain institutional features of the business environment.
<b>Structural Unemployment</b>	: 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.
<b>Trade Surplus</b>	: A Surplus in a country’s balance of trade occurs when a country exports more goods than it imports.
<b>Transfer Payments</b>	: One-way payment of money for which no goods or services are received in exchange.

- Value Added** : It refers to the addition of value to the intermediate goods by a firm by virtue of its productive activities.
- 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.
- Value of Output** : The market value of all the goods and services produced by a firm during a financial year.
- 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.
- Wealth Effect** : A decrease in the price level reduces the real value of money and makes consumers wealthier which in turn encourages them to spend more.
- Wholesale Price Index** : Wholesale Price Index represents the rate of increase in the wholesale prices of products.

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### **SOME USEFUL BOOKS**

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- Abel Andrew B, Ben Bernanke, and Dean Croushore, 2017, *Macroeconomics*, Ninth Edition, Pearson Education
- Case Karl E., Ray C. Fair, and Sharon E. Oster, 2017, *Principles of Economics*, Twelfth Edition, Pearson Education
- Dornbusch Rudiger, Stanley Fisher, and Richard Startz, 2018, *Macroeconomics*, Thirteenth Edition, McGraw Hill
- Froyen Richard T., 2012, *Macroeconomics: Theories and Policies*, Tenth Edition, Person Education
- Sikdar Shoumyen, 2011, *Principles of Macroeconomics*, Second Edition, Oxford University Press