UNIT 11 EXCHANGE RATE DETERMINATION*

Structure

11.0 OBJECTIVES

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

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

11.1 INTRODUCTION

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

11.2 EXCHANGE RATE REGIMES

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

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.

11.3 NOMINAL VS. REAL EXCHANGE RATES

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

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

$$\mathbf{R = EP/P^*} \qquad \textbf{... (11.1)}$$

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**.

11.4 INTEREST PARITY EQUATION

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

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

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

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

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

$$(1 + r_t) = E_t\,(1 + r_t^*)\left(1/E_{t+1}^e\right) \quad \text{... (11.2)}$$

Reorganising the above, we have

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

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

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

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

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

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

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

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.

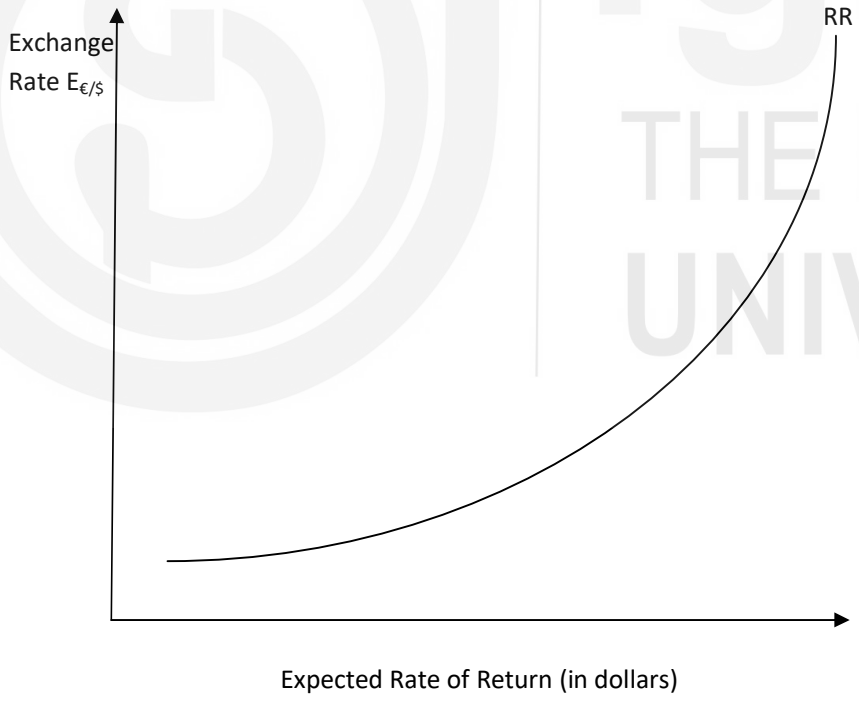

Fig. 11.1: Expected Rate of Return of Euro Assets in Dollars

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

$$r_{US} = r_E - \left(\frac{E^e_{€/\$} - E_{€/\$}}{E_{€/\$}}\right) \quad \text{... (11.6)}$$

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.

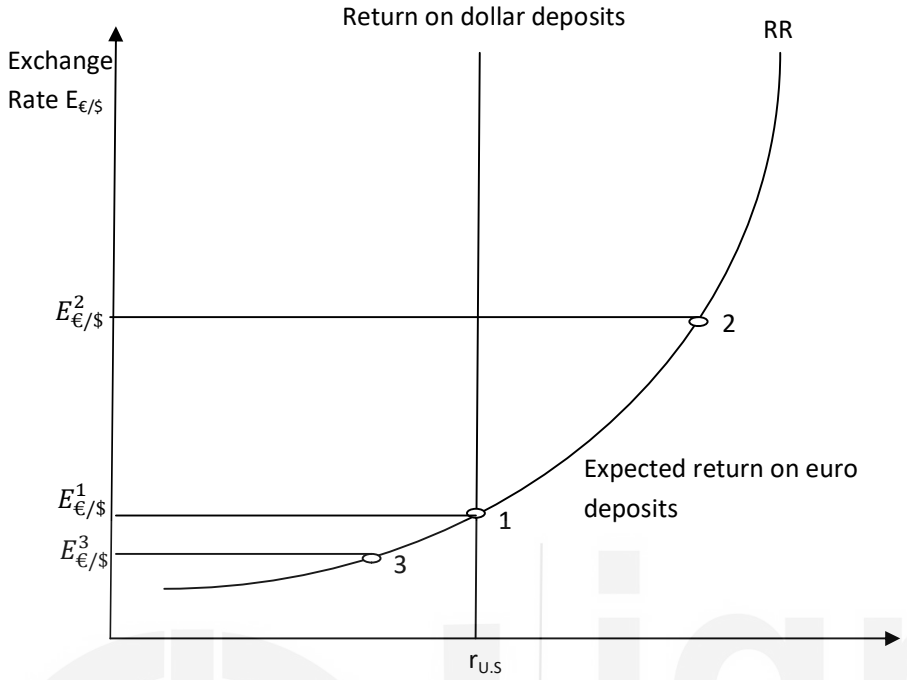

Fig. 11.2: Equilibrium in the Foreign Exchange Market: Asset Approach

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

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 $P_{€}$ equal the price of an identical bundle in Italy (measured in Euros). If the two bundles are to have the same price, the following relationship must hold:

$$\mathbf{E_{€/\$} = \frac{P_{€}}{P_{\$}}} \qquad \textbf{... (11.7)}$$

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

By re-arranging, we get

$$\mathbf{P_{\$} = \frac{P_{€}}{E_{€/\$}}} \qquad \textbf{... (11.8)}$$

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.

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

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

Absolute PPP and Relative PPP

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

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

T = $\pi_{€}$

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

T = $\pi_{\$}$

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

The exchange rate at time T is $\boldsymbol{E^T_{€/\$} = \frac{P_€(1+\pi_€)}{P_\$(1+\pi_{\$})}}$ **... (11.9)**

Exchange rate change will then be

$$\frac{E^T_{€/\$} - E^0_{€/\$}}{E^0_{€/\$}} = \frac{\frac{P_€(1+\pi_€)}{P_\$(1+\pi_\$)} - \frac{P_€}{P_\$}}{\frac{P_€}{P_\$}} \quad \textbf{... (11.10)}$$

$$= \frac{1+\pi_€}{1+\pi_\$} - 1 \quad \textbf{... (11.10 a)}$$

We use linear approximation to obtain the following

$$\frac{E^T_{€/\$} - E^0_{€/\$}}{E^0_{€/\$}} \approx \pi_€ - \pi_\$ \quad \textbf{... (11.10 b)}$$

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.

11.7 MONETARY APPROACH TO EXCHANGE RATE DETERMINATION

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

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

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

following equation for the exchange rate:

$$\mathbf{E}_{€/\$} = \frac{\mathbf{P}_{€}}{\mathbf{P}_{\$}}$$

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

$$\boldsymbol{M^d = P \times L(r, Y)} \quad \textbf{... (11.11)}$$

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

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

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.

$$\boldsymbol{\frac{M^s}{P} = \frac{M^d}{P}} \quad \textbf{... (11.13)}$$

From equation (11.12) we get:

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

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

$$\boldsymbol{P_{US} = \frac{M^s_{US}}{L(r_{\$,} Y_{\$})}} \quad \textbf{... (11.15)}$$

In the case of Euro area

$$P_E = \frac{M_E^S}{L(r_€, Y_E)} \quad \text{… (11.16)}$$

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

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.

11.11 ANSWER TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

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

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

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

Check Your Progress 2

1) Absolute PPP implies that the exchange rates equal relative price levels. Relative PPP states that the percentage change in the exchange rate between two currencies over any period equals the difference between percentage changes in national price levels.

2) It states that the exchange rate is fully determined in the long run by the relative supplies of those monies and the relative real demands for them. Shifts in interest rates and output levels affect the exchange rate only through their influences on money demand.

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GLOSSARY

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.

Deflation : Deflation is a sustained decrease in the general price level.

Demand-pull inflation : Demand-pull inflation is a sustained rise in the general price level due to an increase in aggregate demand.

Demand-pull Inflation : It is the inflation initiated by an increase in aggregate demand.

Depreciation : It is the loss in the value of capital asset because of normal wear and tear and expected obsolescence.

Depreciation of Domestic Currency : It is a decrease in the price of domestic currency in terms of a foreign currency

Derivatives : A derivative is a security with a price that is dependent upon or derived from one or more underlying assets. The derivative itself is a contract between two or more parties based upon the asset or assets. Its value is determined by fluctuations in the underlying asset. The most common underlying assets include stocks, bonds, commodities, market indexes, currencies.

Devaluation : A decrease in the exchange rate under fixed exchange rate regime implemented through government decree.

Direct Personal Taxes : These are the taxes imposed on households in the form of income tax or wealth tax. Those on whom they are imposed pay them.

Disposable income : Amount of income received by the households after taxes $Y_d = Y - T$

Double Counting : 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.

Economic Agents : These are groups of transactors, which indulge in economic activities like production/ income generation/ addition to capital stock. Economic agents can be classified into producers, households, capital sector, rest of the world, and government.

Enterprises : 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.

Floating Exchange Rate : Exchange rate regime wherein a currency's value is allowed to fluctuate according to the foreign exchange market.

Foreign Exchange Intervention : It is the buying and selling of foreign currency by the central bank in order to influence the exchange rate.

Foreign Exchange Reserves : These are the foreign exchange assets (e.g., foreign currency) held by the central bank.

Forward contract : In a forward contract, the buyer agrees to pay cash at a later date when the seller delivers the goods. Typically, the price at which the underline the commodity or asset will be traded is decided at the time of entering into the contract. Thus the price is pegged before hand to avoid the price risk and thus assures the price at which one can buy or sell goods at some future date.

Forward rate : Forward transactions involve the exchange bank deposit at some specified future date- one that may be 30 days, 90 days or even several years away. The exchange rates quoted in such transactions are called forward exchange rates.

Fractional Reserve Banking System : Under this system, banks are required to hold a certain fraction of their demand and time liabilities in the form of cash balances with the central bank.

Frictional Unemployment : It takes place because people switch over from one job to another. In many cases the tenure of job gets over and workers remain unemployed till they get another job.

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

Goods Market Equilibrium : When AD and AS interact with each other. All points on the IS curve reflects equilibrium in the goods market.

Government Final Consumption Expenditure : 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.

Narrow Money : M1 is also known as 'narrow money'.

Natural Rate of Unemployment : It takes into account the frictions and imperfections in the economy and assumes that it is natural for an economy to have certain fraction of its labour force unemployed, at any point of time. It is often termed as 'non-accelerating inflation rate of unemployment (NAIRU).

Net Current Transfers from Rest of the World : 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.

Net Domestic Product (NDP) : 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.

Net Exports : 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.

Net Exports (NX) : It is the difference between total value of exports and imports over a year.

Net Factor Income from Abroad : It is the difference between factor incomes earned by the normal residents of an economy stationed abroad temporarily and the factor incomes earned by normal residents of the rest of the world stationed in the economy temporarily.

Net Indirect Taxes : It is the difference between indirect taxes and subsidies.

Nominal Exchange Rate : Price of the domestic currency in terms of the foreign currency.

Non-Accelerating Inflation Rate of Unemployment (NAIRU) : It is the abbreviation for **n**on-**a**ccelerating **i**nflation **r**ate of **u**nemployment. It is an unemployment rate that is consistent with a constant inflation rate. NAIRU is the unemployment rate at which the long-run Phillips curve is vertical. It is often termed as natural rate of unemployment.

Normal Resident of a Country : 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 aboard.

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.

Production Function	:	It is the relationship between factors of production (inputs) and the available technology with the quantity of output produced.
Quantity Theory of Money	:	The quantity theory of money states that there is a direct relationship between the quantity of money in an economy and the level of prices of goods and services sold.
quid pro quo	:	It is a Latin phrase which means an exchange relationship between persons/ economic agents. When you get something from a transactor in return for (in exchange of) something, it is called quid-pro-quo.
Rate of Net Foreign Capital Inflow	:	It is the difference between rate of gross domestic capital formation and rate of gross domestic savings.
Real Exchange Rate	:	Relative price of domestic goods to foreign goods.
Real Flows	:	These are the flows of goods or services from one set of economic agents to another..
Real Money Balances	:	Quantity of nominal money divided by the price level.
Recession	:	In business cycle, recession indicates the phase when there is an economic slowdown; economic growth is in a decelerating phase.
Relative PPP	:	It states that the percentage change in the exchange rate between two currencies over any period equals the difference between percentage changes in national price levels.
Replacement Investment	:	It is that part of currently produced capital goods, which are meant to replace the capital stock arising out of normal wear and tear, and expectedobsolescence.
Repo Rate	:	Rate at which the central bank lends funds to the commercial banks against submission of collateral such as securities by the banks.
Residential Investment	:	Investment incurred on construction of new houses and buildings is called as residential investment.
Rest of the	:	This sector deals with economic transactions of an

World Sector		economy with the rest of the world.
Revaluation	:	An increase in the exchange rate under fixed exchange rate regime implemented through government decree.
Reverse Repo Rate	:	Rate at which the commercial banks can deposit their excess liquidity with the central bank, by purchasing securities.
Sacrifice Ratio	:	It refers to the percentage loss of output for bringing down inflation by one per cent.
Simultaneous Equilibrium	:	Equilibrium in the goods market as well as in the money market at the same time.
Slope of Investment Function	:	It indicates the sensitivity of investment to changes in the interest rate.
Spot rate	:	Exchange rates governing "on the spot" trading are called spot exchange rates and the deal is called a spot transaction.
Stagflation	:	Stagflation refers to an economic condition where economic growth is very slow or stagnant and prices are rising.
Stagflation	:	It occurs when output is falling and at the same time prices are rising.
Statutory Liquidity Ratio (SLR)	:	Banks are required to hold a certain percentage of their demand and time deposits in the form of government securities. Currently (in 2019) the SLR is 19.5 per cent in India.
Structural theory of Inflation	:	The supporters of structural theories believed that inflation arises due to structural maladjustments in the county or due to certain institutional features of the business environment.
Structural Unemployment	:	It is the type of unemployment that arises because of certain structural issues in an economy. It could be due to the mismatch between the supply of and demand for labour in certain sectors of the economy. Educational quality in certain sectors may not be as per industry requirements.
Trade Surplus	:	A Surplus in a country's balance of trade occurs when a country exports more goods than it imports.
Transfer Payments	:	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.

SOME USEFUL BOOKS

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