
UNIT 18 FIXED EXCHANGE RATE SYSTEM

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18.0 OBJECTIVES

After going through this unit, you should be able to

- explain the meaning and determination of fixed exchange rate;
- analyse the relationship between fixed exchange rate and BoP;
- analyse how changes in fixed exchange rate are brought about; and
- construct and interpret exchange rate indices.

18.1 INTRODUCTION

National currencies are generally acceptable within the geographical boundaries of a country. As such, trade between countries typically involves exchange of one country's currency for that of another. For example, if India were to import from the US, payments are to be made in US\$. For making this international payment, India needs to earn the US\$ (through exports) or buy the same from the foreign exchange market. How many Indian rupees need to be paid to purchase US\$ depends on the value of dollar or *exchange rate*.

As you know, a rise (fall) in the external value of Rupee is called an appreciation (depreciation). For example, if the exchange rate between Rupee-US dollar is Rs.35/\$ which changes to Rs 32/\$, then the value of Rupee in terms of dollar has increased. Hence, Rupee has appreciated against the dollar. Conversely, had the exchange rate changed to Rs 38/\$ then the value of Rupee in terms of dollar would have decreased. In this case, Rupee has depreciated against the dollar.

Assuming a simple situation where only two countries trade with one another, international transactions take place between two currencies. Exchange rate, in this situation, is determined by the demand for and supply of the two currencies. Because the exchange rate is expressed as the value of one currency in terms of another, when one currency appreciates, the other depreciates.

However, when a country has multiple trading partners, exchange rate between two currencies will also be influenced by the changes in the value of other currencies. For example, consider India's major trading partners to be the US, EU, Japan and China. The exchange rate between US\$ and Indian rupee will not only be influenced by the

export and import flows between these two countries but also by the value of Euro, Yen and Yuan. If the exchange rate between US\$ and Yen changes, this also will influence the exchange rate between US\$ and Rupee. These dynamics of exchange rate changes are analyzed with appropriate exchange rate indices, namely, nominal effective exchange rate (NEER) index and real effective exchange rate (REER) index.

Exchange rate changes are also a function of the exchange rate regime followed by a country, which is of two types, viz., flexible and fixed exchange rates. When the exchange rate is determined by the equality between demand and supply for foreign currency, then we have flexible or floating exchange rate regime. When official intervention (by monetary authorities or government) is used to maintain the exchange rate at a particular value, then we have *fixed* or *pegged* exchange rate regime. Between these two regimes, there are many possible intermediate cases, such as, *adjustable peg* and *managed float*. Under the *adjustable peg*, governments maintain the par values for the exchange rates but explicitly identify the conditions under which the par value can change. In a *managed float*, the government seeks to have some stabilizing influence on the exchange rate but does not fix the exchange rate at a pre determined par value.

18.2 DETERMINATION OF FIXED EXCHANGE RATE

In the flexible exchange rate regime, exchange rates are highly volatile which leads to uncertainties in the international payments/transactions. For most developing countries, such uncertainties are unacceptable especially considering their development agenda. Therefore, stability in exchange rate is maintained through government intervention.

Let us consider a simplified analysis of how a fixed exchange rate system operates. As given in Fig. 18.1, S is the supply curve and D^1 and D^2 are the demand curves for foreign exchange (say, dollar). The equilibrium exchange rate with respect to S and D^2 is Rs.30/\$. Assume that the government intervenes to ensure that the exchange rate is maintained at Rs. 25/\$. When exchange rate is Rs.25/\$ demand for dollar is higher than supply of dollar. In order to ensure that the exchange rate does not rise to Rs. 30 per dollar (which is required by supply-demand equilibrium), the government needs to sell Q_1Q_2 dollars. On the other hand, suppose prevailing demand conditions are depicted by the demand curve D^1 , where equilibrium exchange rate dictated by supply-demand condition is Rs.20/\$. In this case, the government needs to buy Q_1Q_3 dollars from the foreign exchange market to ensure that the exchange rate is maintained at Rs. 25/\$.

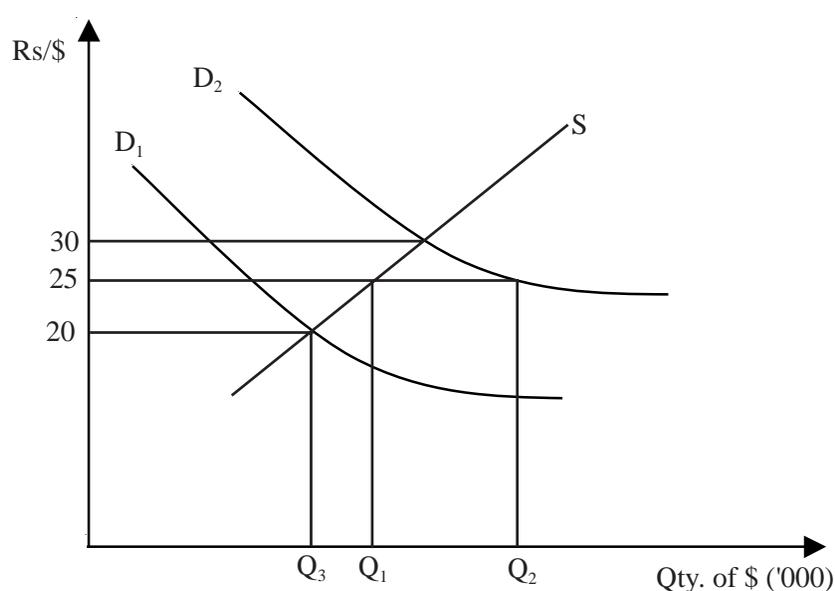


Fig. 18.1: Determination of Fixed Exchange Rate

The buying/selling of the foreign exchange to maintain a given exchange rate implies that the government maintains foreign exchange reserves. (By definition, foreign exchange reserves include foreign currencies, gold reserves and SDRs). For example, BoP deficit (i.e., the demand for foreign currency (imports) is higher than the supply of foreign currency (exports)), is adjusted against the foreign exchange reserves maintained by the country. As such, the monetary authorities will suffer a loss of reserves. Similarly, a BoP surplus implies that there is a rise in the country's foreign exchange reserves. Recall from previous unit that in a flexible exchange rate regime, BoP surplus/deficit results in exchange rate appreciation/depreciation.

At any given point in time the foreign exchange reserves of a country are limited. Therefore, continuous disequilibrium between demand for and supply of foreign exchange cannot be sustained. In such situations, currency is *devalued* (in the case of deficit) and *revalued* (in the case of surplus). When devaluation takes place, exports become cheaper (i.e., rise in supply of foreign currency) and imports become expensive thereby initiating a balance between demand and supply forces.

18.3 PRICE ADJUSTMENTS UNDER FIXED EXCHANGE RATE

In a flexible exchange rate regime trade deficits (surpluses) are automatically corrected by a depreciation (appreciation) of a country's currency. On the other hand, in a fixed exchange rate regime, disequilibrium conditions are corrected by changes in domestic prices. A deficit reduces the country's money supply which in turn reduces the prices. The reduction in the country's money supply will tend to increase the interest rate, which in turn dampens the investment and thereby reduces aggregate demand. Consequently, price level will fall which will encourage exports and discourage imports. At the same time, higher interest rate induces capital inflows that would help in financing the deficit.

The process of price adjustment under the fixed exchange rate regime is similar to that of the price adjustment under the gold standard, i.e., *price-specie-flow-mechanism*. Under gold standard, a country's currency is defined by the gold content. This is to say that a country will be ready to buy or sell any amount of gold at that price. Further, as the gold content in one unit of currency is fixed, exchange rates will also be fixed. For example, assume that a £1 gold coin in the UK contains 113.0016 grains of pure gold, while a \$1 gold coin in the US contains 23.22 grains of gold. This implies that the exchange rate (\$/£) is 4.87 (i.e., $113.0016 \div 23.22$). Assuming no shipping costs, exchange rate will be stable unless there is a change in the gold reserves of any country. This is because no one will be willing to pay more than \$4.87 for a £1 coin as gold worth of \$4.87 can be purchased in the US and exchange it for £1 in the UK. Similarly gold worth £1 can be purchased in the UK and exchanged for \$4.87 in the US.

These gold outflows/inflows measure the size of Balance of Payment deficit/surplus. In a deficit situation, the automatic adjustment mechanism is as follows: With gold outflows under trade deficit, country's money supply will fall, which in turn, triggers a fall in internal prices. As a result, exports will be encouraged and imports will be discouraged until the deficit in BoP is eliminated.

This adjustment mechanism operates in a similar manner even if a country is not following a gold standard. The foreign exchange reserves held by a country is akin to the gold reserves. As such, disequilibrium in trade flows will be reflected in the changes in the foreign exchange reserves which in turn influences the money supply and thereby the domestic prices.

18.4 UNDERSTANDING EXCHANGE RATE MOVEMENTS

18.4.1 Real vs Nominal Exchange Rate

As discussed in the earlier sections, exchange rate movements are influenced by the relative prices in the trading countries. As such, we differentiate between *nominal* and *real* exchange rate. The real exchange rate is defined as the nominal exchange rate adjusted for the ratio of foreign to domestic prices (R).

$$R = \frac{P_f}{P}$$

P_f = Price level in foreign country

P = price level in domestic country

If $R > 1$, foreign prices are higher than domestic prices. That is, goods abroad are more expensive at home. Similarly, if $R < 1$, it implies that domestic prices are higher than foreign prices, i.e., goods at home are more expensive than goods abroad. Thus, the real exchange rate measures a country's competitiveness in international market.

Table 18.1: Construction of Nominal, Real Exchange Rate Index

Period	Nominal Exchange Rate (Rs/\$)	Nominal Exchange Rate Index	Indian Price Index	US Price Index	Real Exchange Rate Index
1	18	100	100	100	100.0
2	25	139	120	100	166.8
3	30	167	120	120	167.0
4	30	167	130	115	189.0
5	35	194	140	110	247.0
6	28	156	150	105	222.9

From Table 18.1 it is evident that the real exchange rate is higher than the nominal exchange rate when domestic prices are higher than foreign prices. Further, the changes in nominal exchange rate are largely on account of the disequilibrium in the trade flows between countries. In Table 19.1 we observe that Indian price index has increased faster than US Price index. As a result real exchange rate index, which is obtained as the ratio of Indian price index to US price index, has increased from 100 in period 1 to 222.9 in period 6. The nominal exchange rate index (which is simply the nominal exchange rate converted to index number) has increased from 100 in period 1 to 156 in period 6.

18.4.2 Purchasing Power Parity (PPP)

The exchange rate is determined by the relative purchasing power of currency within each country. For example, if a product X costs Rs. 100 in India and costs \$2 in USA, then the rupee – dollar exchange rate is Rs. 50 per \$. This illustrates the theory of Purchasing Power Parity (PPP) wherein two currencies are at purchasing power parity when a unit of domestic currency can buy the same basket of goods at home or abroad.

There are two versions of PPP, the *Absolute PPP* and the *Relative PPP*. The Absolute PPP postulates that the equilibrium exchange rate between two currencies is equal to the ratio of price levels in the two countries. Specifically,

$$R = \frac{P_1}{P_2}$$

Where P_1 is the price level in the home country and P_2 is the price level in the foreign country.

The Relative PPP postulates that the change in exchange rate is equal to the difference in changes in the price levels in the two countries. Specifically,

$$R' = P'_1 - P'_2$$

Thus, the percentage change in exchange rate (R') will be equal to the percentage change in domestic prices (P'_1) minus the percentage change in foreign prices (P'_2). This would be true as long as there are no changes in transportation costs, obstruction to trade (tariff and non-tariff barriers) and the ratio of traded to non-traded goods. Since trade and commodity arbitrage respond sluggishly (due to the above factors), relative PPP can be approximated in the long run.

Thus, in the long run, the real exchange rate will return to its average level. In other words, if real exchange rate is above long run average level, PPP implies that the exchange rate will fall.

18.4.3 NEER Vs REER

In a situation where there are multiple trade partners, the effect of cross-currency movements are judged by nominal effective exchange rate (NEER) and real effective exchange rate (REER). The construction of export weighted NEER index is shown in the Table 18.2.

Table 18.2: Construction of NEER Index

Period	Nominal Exchange Rate Index(Rs/£)	Nominal Exchange Rate Index (Rs/\$)	Nominal Effective Exchange Rate Index
1	100 (x0.3)	100 (x0.7)	100
2	100 (x0.3)	90 (x0.7)	93
3	120 (x0.3)	90 (x0.7)	99
4	90 (x0.3)	80 (x0.7)	83

We make the following assumptions:

- i) India's trading partners are the UK and the US
- ii) Share of the US in India's trade = 70%
- iii) Share of the UK in India's trade = 30%

The NEER index is the trade weighted average of the trade flows between India and the UK, and between India and the US. For example, for period 2 the NEER index is $100 \times 0.3 + 90 \times 0.7 = 93$. With unchanging trade shares, when rupee-dollar nominal exchange rate falls by 10%, NEER falls by 7% (that is, 70% of 10%). When the Rupee-pound nominal exchange rate increases by 20%, then NEER increases by 6% (that is, 30% of 20%). Thus, the exchange rates of the major trading partners influence the movements of NEER.

When NEER is adjusted for the differences in relative prices between trading partners, the trade weighted REER is obtained. Table 18.3 presents the comparative NEER and REER indices of India for the period 1991-2003. We find that rupee has been strengthening against the currencies of major trading partners. A comparison with the REER shows that the except for 1996-97 and 2003-04, the percentage increase in domestic prices has been more than that in the major trading partners. However, this has been neutralized, to some extent, by the rupee depreciation against the dollar.

Table 18.3: NEER and REER Indices of India (Base: 2000–01=100)

Sluggish Price Adjustment

Year	Exchange Rate (Rs/\$)	NEER (5-Country index)	REER (5-Country index)
1991-1992	24.47	180.40	103.72
1992-1993	30.65	148.29	95.58
1993-1994	31.37	136.74	92.11
1994-1995	31.40	132.59	95.78
1995-1996	33.45	121.25	95.17
1996-1997	35.50	118.43	97.60
1997-1998	37.16	118.49	102.26
1998-1999	42.07	104.87	98.25
1999-2000	43.33	100.99	96.94
2000-2001	45.68	99.54	96.17
2001-2002	47.69	98.47	99.36
2002-2003	48.40	93.13	96.89
2003-2004	45.95	92.07	101.21

Source: Economic Survey, 2004-05

The REER and NEER indices in Table 18.3 are export-weighted indices with weights based on direction of India’s exports during 1992-97. The 5-Country index includes: USA, Japan, UK, Germany and France.

Check Your Progress 1

- 1) If PPP holds and if a basket of goods is priced at \$100 in the US costs in £80 UK, what will be exchange rate between £ and \$?

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- 2) Suppose if UK prices rise by 10% while the US prices rise by 5%, what will be the new exchange rate?

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- 3) Following a BoP crises in 1990-91, the Indian government devalued the rupee by over 30%. Explain why.

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- 4) Explain the following:
- a) To maintain a fixed exchange rate regime, foreign exchange reserves have to deplete.
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 - b) Fixed exchange rate regime always leads to a rise in domestic prices.
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- 5) Select the appropriate alternative and explain:
- i) If the United States fixes its exchange rate, such as four Belgian francs per dollar, then to keep it fixed at the four-francs-per-dollar rate,
 - a) Belgian and American exporters and importers must agree to keep their mutual trade in balance.
 - b) Belgain and American exporters and importers must agree not to trade at any other exchange rate.
 - c) The U.S. government does the exporting and importing for the United States.
 - d) Both the U.S. and Belgian governments do the exporting and importing for their respective countries.
 - e) The U.S. government must buy and sell U.S. dollars on the foreign exchange market.
 - ii) The nominal effective exchange rate is
 - a) an unweighted index of several bilateral exchange rates.
 - b) a weighted index of several bilateral exchange rates.
 - c) a lateral exchange rate that is adjusted for inflation.
 - d) a bilateral exchange rate that is unadjusted for inflation.
 - iii) The real effective exchange rate is
 - a) a weighted index of several bilateral exchange rates, adjusted for inflation.
 - b) a weighted index of several bilateral exchange rates, unadjusted for inflation.
 - c) a bilateral exchange rate that is adjusted for inflation.
 - d) bilateral exchange rate that is unadjusted for inflation.
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18.3 LET US SUM UP

Under the *fixed exchange rate* regime fluctuations in exchange rate are managed through intervention by the government or kept fixed. The implications are that in spite of changes in export and import trends, the exchange rate remains fixed. In this regime, adjustments in exchange rate are made through policy on *devaluation* and *revaluation* of domestic currency.

If a country's imports rise relative to exports, the supply of domestic currency will be higher relative to the demand for domestic currency. This leads to BoP deficit. Adjustments in BoP deficit are made against the foreign exchange reserves maintained by a country. In deficit situation, reserves deplete and in surplus situation they rise. If the imbalances persist, currency devaluation or revaluation takes place to facilitate adjustments. Trade imbalances also gets adjusted through changes in domestic prices. In a deficit situation, money supply reduces thereby initiating a fall in domestic prices. Similarly, a surplus situations leads to rise in domestic prices.

Various measures are used to analyze the exchange rate movements. The price difference between the domestic and foreign countries is reflected in the difference between nominal and real exchange rates. Thus, the real exchange rate highlights the competitiveness of domestic goods in the foreign markets. With multiple trade partners, the effect of cross currency volatility can be examined through the NEER and REER indices. These indices are trade weighted indices with respect to major trading partners.

18.4 KEY WORDS

- Depreciation** : A fall in the value of a currency relative to other currencies in the foreign exchange market.
- Devaluation** : An action by the Central Bank to reduce the value of domestic currency vis à vis foreign currencies.
- Exchange Rate** : The rate at which domestic currency is exchanged with foreign currencies.

18.5 SOME USEFUL BOOKS

Baumol, W. J. and Alan S. Blinder, 1999, *Economics: Principles and Policy*, Harcourt College, Publishers, Chapter 36.

Dornbusch, R., S. Fischer and R. Startz, 2004, *Macroeconomics, Ninth Edition*, Tata McGraw-Hill, New Delhi

Mankiw, N. G., 2000, *Macroeconomics*, Fourth Edition, Macmillan, New Delhi.

Salvatore, D., 2005, *Introduction to International Economics*, John, Wiley & Sons, New York, Chapter 13 & 4.

18.8 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISESSS

Check Your Progress 1

- 1) Exchange rate between £ and \$

$$R = \text{£ } 0.8 / \$$$

- 2) New Exchange rate = $0.8 \times \frac{110}{105} = 0.838$

$$\text{Thus } R' = \text{£}0.838/\$$$

Open-Economy Macro-Modelling

- 3) BoP crisis implies BoP deficit. Under a fixed/pegged exchange rate regime, BoP deficit is adjusted against the available foreign exchange reserves. With depletion in foreign exchange reserves, disequilibrium in the BoP can be corrected through currency devaluation whereby exports become cheaper and imports become costlier.
- 4)
 - i) In a fixed exchange rate regime, BoP deficit leads to depletion of foreign exchange reserves while a BoP surplus leads to a rise in reserves. Therefore, this statement will be true only under conditions of deficit.
 - ii) Under a fixed exchange rate regime, BoP surplus leads to an increase in money supply and therefore leads to a rise in domestic prices. BoP deficit, on the other hand, leads to a fall in domestic prices.
- 5)
 - i) The U.S. government must buy and sell U.S. dollars on the foreign exchange market.
 - ii) The nominal effective exchange rate is a weighted index of several bilateral exchange rates.
 - iii) The real effective exchange rate is a weighted index of several bilateral exchange rates, adjusted for inflation.