Chapter 3

An Analysis of the Exchange Rate Determination

Certain fundamental economic factors can be identified which influence the exchange rate. They include interest rates, inflation, money supply growth, output, among others. Some factors are hypothesized to have a direct effect in the short term, while others have an indirect effect due to intermediate variables. The long term effect is likely to become less important over opposite effect. Many theorems have attempted to explain the relationship in both the same and opposite directions, and in short and long-term projections. Among the main theories usually considered are the quantity theory of money, the interest rate parity, the purchasing power parity and news.

- **One of theories which can explain the exchange rate in short run is "news"**

News[1]

The exchange rate change in response to anticipated events and unanticipated events that unanticipated events are frequently referred to as "news" or "surprises".

So the *role of news* is unanticipated changes in the important situation that affects the exchange rate.

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[1] Richard G. Lipsey, An introduction to position economic (London : Harper and Row, 1989)

In addition, exchange rates respond to news by interesting foreign exchange markets. As exchange rates are closly related to expectations, the foreign exchange dealers have to keep an eye on all major new events affecting the economic environment. Since all the players in the foreign exchange markets are professionals, they are all well informed, not just about what has happened but also about forecasts of what is likely to happen. Accordingly, the exchange rates, at any point in time, reflects not just history, but also current expectations of what is going to happen in the future .

As soon as future event comes to expectation, it will be reflected in the current exchange rate . Events expected to happen soon will usually be given more weight than distant events. The only component in today's news that will cause the exchange rate to change is what was not expected to happen. Economists attribute the unforecastable component of news to a random error in the sense that it has no detectable pattern to it and it is unrelated to the information available before it happens.

Some events are clearly unforecastable, like an earthquake. Others are the production of economic statistics for which forecasts have generaly been published. In the latter case, it is the deviation of announced figures from their forecast value which tend to move exchange rates.

Exchange rates are moved by news which is randomed and unpredictable, so the exchange rate will tend to move at random.

According to **Frenkel's model** (1981)[2] which examined how exchange rates respond to news reflecting on the unexpected interest rate differentials, the regression equation can be expressed as

$$\ln S_t = a + b F_{t-1} + \alpha\left\{\left[(\iota - \iota^*)\right]_t - E_{t-1}\left[(\iota - \iota^*)_t\right]\right\} + u_t \quad \text{----(9)}$$

(the bracketed term is "news")

where S_t and F_t denote the spot and forward exchange rates respectively. The exchange rates used are Dollar/Pound, Dollar/DM and Dollar/Franc. ι represents the US interest rate and ι^* represents British, German and French interest rate in each case.

- "News" was computed from $\left[(\iota - \iota^*)\right]_t - E_{t-1}\left[(\iota - \iota^*)_t\right]$

  where $\left[(\iota - \iota^*)\right]_t$ is the actual interest rate differential.

  $E_{t-1}\left[(\iota - \iota^*)_t\right]$ is the expected interest rate differential which was computed from a regression of the interest differential on a constant, on two lagged values of the differential, and on the lagged forward exchange rate.

It can be expressed as

$$E_{t-1}\left[(\iota - \iota^*)_t\right] = a + b(\iota - \iota^*)_{t-1} + c(\iota - \iota^*)_{t-2} + d \ln F_{t-1} + u_t$$

[2] Frenkel, Journal of political economy, p. 687.

The result of his study concluded that the exchange rates adjust rapidly in response to new information. Hence, the unexpected interest rate differential expressed as news in this study.

- **Theories that explain exchange rate in long run.**

Purchasing power parity : (Gustav Cassel)[3]

This approach assumes that equilibrium rates of exchange remain over time and nominal exchange rate movements tend to offset relative price movements. Three versions of purchasing power parity (PPP) have traditionally been used in the literature.

1) **The law of one price**, which relates exchange rate to prices of individual, homogeneous goods in different countries. Assuming there are no transaction costs and trade barriers such as quotas, the prices of identical goods sold in different countries should be the same when expressed in a common currency.
2) **Absolute PPP** extends the law of one price to the general price level under the same assumptions as the law of one price, the same basket of goods and services should cost the same amount in all countries when expressed in a common currency. Empirically, this is defined as the rate that equalizes the prices of a common basket of goods in two different countries. When the market exchange rate differs from this PPP, profits can be made

[3] Peter Clark, Bartolino, and Symansky, "Exchange rate and Economic Fundamentals : A Framework for analysis," Occasional paper (December 1994)

market exchange rate differs from this PPP, profits can be made by purchasing goods in one country and selling them to another, but a situation will tend to push the exchange rate back toward its equilibrium value.

The general expression can be stated below

$$P_t = E_t P_t^* \qquad \text{---- (1)}$$

3) **Relative PPP** is an even weaker condition than absolute PPP and assumes only that the rate of change in the nominal exchange rate will be equal to the difference between the domestic and foreign rates of inflation on equivalent baskets of goods. Sometimes the relative PPP expressed in the notion as real exchange rates, stated that nominal exchange rates adjusted for different inflation rates between countries are constant.

The relative PPP is expressed as :

$$P_t = E_t P_t^* / U_t \text{ ---- (2)}$$

where P_t = domestic price level

P_t^* = foreign price level

E_t = nominal exchange rate

U_t = real exchange rate

This theory was widely accepted during the 1960s when the volume of trade increased substantially. It is now seen as only one pointer to making

long-term projections of the exchange rates and not necessarily the best. Nowadays, capital movements across borders are much larger and can be transferred much faster. Therefore, interest rates are now believed to be more sensitive to exchange rates than price adjustments.

Interest rate parity Theory:[4]

This is now believed to have a more significant effect on determining exchange rates.

The movement of funds between two countries which use the different currency to take advantage of interest rate differentials is also a major determinant of the spread between forward and spot rates. The forward discount or premium is closely related to the interest differential between the two currencies. The currency of the country with a lower interest rate should be at a forward premium in terms of the currency of the country with the higher rate. More specifically, in an efficient market with no transaction costs, the interest differential should be equal to the forward differential. The forward rate is said to be at interest parity and equilibrium prevails in the money markets.

Interest parity ensures that the return on a hedged foreign investment will just equal the domestic interest rate on investments of identical risk. The *covered interest differential*, which is the difference between the domestic interest rate and the hedged foreign rate, is zero. If the covered interest differential between two money markets is nonzero, there is an arbitrage

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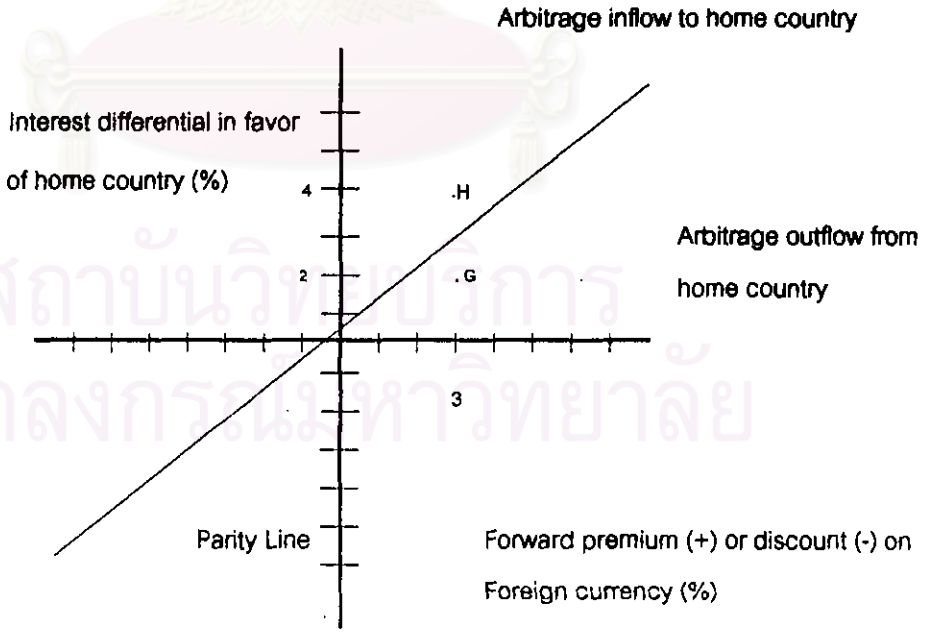
[4] Paul R. Krugman and Maurice Obstfeld , Internatoinal economics : Theory and policy , Third Edition (New York : HarperCollins College Publishers , 1994)

incentive to move money from one market to the other. This movement of money to take advantage of a covered interest differential is known as *covered interest arbitrage.* The transactions associated with covered interest arbitrage will affect prices in both the money and the foreign exchange markets. The process of covered interest arbitrage will continue until interest parity is achieved, unless there is a governmental interference. If this process is interfered with covered interest differentials between national money markets will not be arbitraged away. Interference often occurs since many governments regulate and restrict the flows of capital across their borders. Moreover, only the risk of controls will be sufficient to yield prolonged deviations from interest rate parity.

The relationship between the spot and forward rates and interest rates in a free market can be shown graphically as follow:



The interest parity line joins those points for which the forward exchange rate is in equilibrium with the interest differential.

Point G indicates a situation of disequilibrium. Here, the interest differential is 2%, where as the forward premium on the foreign currency is 3%. The transfer of funds abroad with exchange risks covered will yield an additional 1% annually. At point H, the forward premium remains at 3%, but the interest differential increases to 4%. Now it becomes profitable to reverse the flow of funds. The 4% higher interest rate makes up for the 3% loss on the forward exchange transaction, leading to a 1% increase in the interest yield.

The covered interest arbitrage relationship can be stated formally. Let e_0 be the current spot rate (dollar value of unit of foreign currency),and f_1 the end-of-period forward rate. If r_h and r_f are the prevailing interest rates in home and foreign country, respectively, then one dollar invested in home country will yield $1+ r_h$ at the end of the period, the same dollar invested in foreign country will be worth $(1+ r_f) f_1 / e_0$ dollars at maturity. This latter result can be seen as follows: one dollar will convert into $1/ e_0$ pounds that, when invested at r_f will yield $(1+ r_f) / e_0$ pounds at the end of the period. By selling the proceeds forward today, this amount will be worth$(1+ r_f) f_1 / e_0$ dollars when the investment matures.

It can be seen that funds will flow from a home country to a foreign country if and only if

$$1 + r_h < \frac{(1 + r_f)f_1}{e_0}$$

Conversely, funds will flow from a foreign country to a home country if and only if

$$1 + r_h > \frac{(1 + r_f)f_1}{e_0}$$

Interest rate parity holds when there are no covered interest arbitrage opportunities. On the basis of the previous discussion, this no-arbitrage condition can be stated in the following equation :

$$\frac{1 + r_h}{1 + r_f} = \frac{f_1}{e_0}$$

$$r_h - r_f = \frac{f_1 - e_0}{e_0}$$

In sum, the forward rate is calculated from the interest differential between the two currencies using the no-arbitrage condition. However, deviations from interest parity do occur between national capital markets, resulting from capital controls, the imposition of taxes on interest payments to foreigners, and transaction costs.

Quantity Theory of Money[5] :

Irving Fisher[6], the American quantity theorist held that the quantity theory of money is the equation of exchange, which is an identity relating the volume of transaction at current prices to the stock of money times the turnover rate of each dollar. The turnover rate for money, called the velocity of money, measures the average number of times each dollar is used in transactions during the period.

In addition, another expression of the equation of exchange focuses merely an income transactions that the level of real output was a measure of real economic activity and the important assumption was that quantity of money was controlled exogenously by the monetary policy authority.

According to the equation of exchange, if velocity is a predetermined constant and volume of output fixed from the supply side, the equation of exchange expresses a relationship of proportionallity between the exogenously given money stock and the price level.

$$MV = PY$$

where M is the quantity of money

V is the income velocity of money, the number of times the average dollar is used in a transaction involving current output (income)

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[5] Richard T. Froyen, Macroeconomics theories & policies, (London : Prentice-Hall, 1996)

[6] Irving Fisher , The Purchasing power of money (New York : Macmillan, 1922)

P is price index for currently produced output

Y is the level of current output

From the equation, the quantity of money expressly determines the price level.

Then, the Cambridge economists represent a step toward more modern monetary theories. They focus on the quantity theory as a theory of the demand for money, and also demonstrate a proportional relationship between the exogenous quantity of money and the aggregate price level.

Marshall and the other Cambridge economists assume that the demand for money will be a proportion of income and wealth by neglecting the distinction between income and wealth.

The equation has been written as :

$$M^d = kPY$$

where M^d is money demand

k is proportion of national income

P is the price level

Y is real income

It indicates that money demand (M^d) is assumed to be a proportion (k) of nominal income, the price level (P) times the level of real income (Y). The demand for money depends on the level of transactions which may be vary closely with the level of income. The proportion of income that will be optional

to hold in the form of money (k) is assumed to be relatively stable in the short run.

In equilibrium, the exogenous stock of money must equal the quantity of money demand.

$$M = M^d = kPY$$

where k treated as fixed in the short run

Y is real output determined by supply conditions

The equation also reduces to a proportional relationship between the price level and money stock.

$$M(1/k) = PY$$

From the equation, the proportion relationship between the quantity of money and the price level results from the fact that the proportion of nominal income people wishing to hold in the form of money (k) is constant and the level of real output is fixed by supply conditions.

This is the direct link in the classical system between money and prices which leads to an increased demand for commodities and upward pressure on the price level. Then, the changes of price level are effective to the fluctuation of exchange rate.

According to a simple model of the exchange rate [7] implied by the quantity theory of money and purchasing power parities, a simple expression for the exchange rate can be derived from the quantity theory of money and exchange rate that follows its PPP value.

Let the foreign country be denoted by an asterisk (*), so that it has an equation linking money, prices, income, and velocity.

$$M^*V^* = P^*Y^*$$

Using values for home money supply, prices, velocity, and income,

$$M\bar{V} = P\bar{Y}$$

the relationship implied by purchasing power parities is that prices will be the same in both economies when converted at the current exchange rate.

$$PE = P^*$$

where P is the home country price level

P* is the foreign country price level

E is the exchange rate

[7] Richard G. Lipsey, An introduction to position economic, 1989.

The equation can rearranged as follows:

$$E = (M^*/M)(Y/Y^*)(V^*/V)$$

The first term is the ratio of the home and foreign money supplies. E falls in proportion to the home money supply and rises in proportion to the foreign money supply. When the home money supply rises, the exchange rate depreciates in the same proportion because a rise in home money supply leads to a proportional increase in the home price level and then a rise in the home price level leads to a proportional depreciation of the home currency to preserve purchasing power parities.

The second term, domestic real national income is positively related to E. Assuming other things being equal, a rise in domestic national income leads to an appreciation of the home currency because an increase in Y leads to an increase in transactions demand for the home currency, so the exchange rate will appreciate.

Many more complicated factors affecting interest rates and expectations can be incorporated by a more detailed specification of the determinants of V. However, the main elements of this model are recognizable in many of the exchange rate models in the last two decades.