

Chapter 4

Empirical Study of the Exchange Rate Determination

The determination of exchange rate in the short-run

The Role of News¹

This analysis is primarily based on the Frenkel's model that news is immediately reflected in (unexpected) changes in the rate of interest².

There are many approaches to be used for the empirical test of the exchange rate determination. This study focuses on the *role of news* which is unanticipated changes in determining the movement of the spot exchange rate.

Under the flexible exchange rate regime, this study analyzes the efficiency of the foreign-exchange market by examining the relationship between the spot and the forward exchange rate and their volatility³.

From the monetary approach, exchange rate, being a relative price of two assets, is determined in a manner similar to the determination of other asset prices. It states that the expected current prices have reflected all currently

1 Laurence S. Copeland, Exchange rates and international finance, p. 342.

2 Frenkel, Journal of political economy, P. 667.

3 Ibid. p. 668.

available information and the expectations concerning future exchange rate should be reflected in the forward exchange rate.

To examine the efficiency of the market, we apply the Frenkel's model which can be stated as the following :

$$\ln S_t = a + b \ln F_{t-1} + u_t \quad \text{----- (1)}$$

where S_t is the logarithm current spot exchange rate
(Baht/US \$)

F_{t-1} is the logarithm of the 1-month forward exchange rate
prevailing at the previous month (Baht/US \$)

u_t is the residual term.

Equation (1) assumes that the forward exchange rate measures the unobservable value of the expected future spot exchange rate. If the market for foreign exchange is efficient, then the residual (u_t) should contain no information and should be serially uncorrelated with each other. In addition , the constant term should not differ from zero⁴ and the slope coefficient should not differ from unity.

We also assume the rational expectation hypothesis for this test. The rational expectations⁵ states that *the market's expectations are in fact the*

⁴ Under risk neutrality, the forward rate equal the expected future spot rate neglect the effects of the stochastic in prices, (Jacob A. Frenkel 1981)

⁵ Laurence S. , Exchange rates and international finance , 1994.

same as the expected value, conditional on the set of all available information.

Therefore the equation can be expressed as:

$$\ln S_t = E_{t-1} \ln S_t + \epsilon_t \quad \text{--- (2)}$$

where $E_{t-1} \ln S_t$ is expected logarithm of the spot exchange rate for period t based on the information available at period $t-1$ (Baht/US \$)

ϵ_t is the error term

However, the forward exchange rate at $t-1$ is a *noisy* proxy for the expected future value of the spot rate, we would obtain

$$a + b \ln F_{t-1} = E_{t-1} \ln S_t + V_{t-1} \quad \text{--- (3)}$$

With the assumption that :

$$E(V_t) = 0$$

and substituting equation (3) into equation (2) yields :

$$\ln S_t = a + b \ln F_{t-1} + (\epsilon_t - V_{t-1}) \quad \text{--- (4)}$$

$$u_t = \epsilon_t - V$$

Testing the efficiency of the foreign-exchange market can be performed by applying the ordinary least squares procedure to equation (1) which tests the hypothesis that $\text{cov}(u_t, F_{t-1}) = 0$ and the constant term should be zero and also the slope coefficient should not differ significantly from unity.

As it is well known, during the same period exchange rate has been very volatile. The strong fluctuation in prices are typical for the organized asset markets. Under such markets, current prices reflect expectations concerning the future course of event and new information which induces changes in expectations is immediately reflected in corresponding changes in prices. The strong dependence of asset prices on expectations implies that the periods which are dominated by uncertainties, new information, rumors, and news, which influence frequent changes in expectations, are likely to be the periods in which changes in expectations are the prime cause of fluctuations in asset prices. It indicates that the exchange rate changing seems to be due to new information which could not have been anticipated.

The concept of the foreign-exchange market can be shown in terms of the following simple model which may be expressed as a reduced form that can be derived from a variety of models of exchange rate determination.

Let the logarithm of the spot exchange rate on day t to be determined by

$$\ln S_t = z_t + bE_t(\ln S_{t+1} - \ln S_t) \quad \text{----- (6)}$$

where $E_t (\ln S_{t+1} - \ln S_t)$ is the expected percentage change in the exchange rate (Baht/US \$) between t and $t+1$, based on the information available at t

z_t is the ordinary factors of supply and demand that affect the exchange rate on day t which may include domestic and foreign money supplies, incomes and levels of output, etc.

Assuming that expectations are rational, equation (6) applies to expectations of future exchange rate by forward iteration

$$E_t \ln S_{t+j} = \frac{1}{1 + b^{k-j} (1 + b)^k} \sum_{k=0}^{\infty} (b)^k E_t z_{t+j+k} \quad \text{--- (7)}$$

Hence, the current exchange rate ($j = 0$) and current expectations of future exchange rate ($j > 0$) are linked because both depend on expectations concerning the future z 's. From the equation (7), the current exchange rate ($S_t = E_t S_t$) should be closely linked to the current expectation of the next period's exchange rate ($E_t S_{t+1}$) which in turn should be closely linked to the exchange rate expected for the following period ($E_t S_{t+2}$) and so on.

It indicates that spot and forward exchange rate have a high correlation in the movements. The high correlation between movements in spot and forward exchange rate is as expected, since the two rates respond at the

same time to the same flow of new information. In conclusion, the market's best forecast of the future spot rate is (approximately) the current spot rate.

Therefore, we can use the forward rate as one of the explanatory variables to determine the movement of the spot rate. The other explanatory variables are the fundamental factor especially the monetary factors , such as interest rate differential , inflation and money supply. If there is any change in these variables , there will also be a change in the movement of the exchange rate. Therefore ; in this study we will focus on the relation between the interest rate differential and the exchange rates .

The relationship between interest rate and exchange rate is negative .Theoretically , the high rate of interest should attract the foreign capital inflow which creating a surplus in the capital account of the balance of payments. This will bring about the appreciation of the domestic currency (lower exchange rate) . The distinction between the nominal and the real rates of is not included in this analysis.

Therefore , the foregoing analysis indicated that the spot rate at period t can be explained by the sum of the factors which were anticipated by the lagged forward rate, and the factors which represent news , The model can be expressed as the following .

$$\ln S_t = a + b \ln F_{t-1} + \alpha \text{ news} + u_t \quad \text{----- (8)}$$

The testing hypothesis is that the coefficient of b equal to 1 and α is significantly different from zero

Assuming that the news is immediately reflected in (unexpected) changes in the rates of interest⁶, the equation (8) may be rewritten as:

$$\ln S_t = a + b \ln F_{t-1} + \alpha \left\{ \underbrace{[(1 - i^*)]_t}_{\text{news}} - E_{t-1} \left[\underbrace{[(1 - i^*)]_t}_{\text{exc. rate}} \right] \right\} + u_t \quad \text{---(9)}$$

where the bracket term is the innovation in the (1-month) interest rate differential

$E_{t-1} (1 - i^*)_t$ ²⁴ is the interest rate differential which was expected to prevail in period t based on the information available at t-1 (the expected interest rate differential was computed from a regression of the interest differential on a constant, on a lagged values of the differential⁷, and the logarithm of the lagged forward exchange rate, $\ln F_{t-1}$)

The expected interest differential can be expressed as:

$$E_{t-1} (1 - i^*)_t = a + b (1 - i^*)_{t-1} + c \ln F_{t-1} + u_t$$

⁶ Frenkel , Journal of political economy, p. 687.

⁷ ibid.

- i is domestic interest rates (which is Bank of Thailand interbank middle rates)
- i^* is foreign interest rates which is US Federal Funds effective middle rates.

The sign of the coefficient of news (α), in fact, may be either positive or negative, depending on the sources of news.

The determination of exchange rate in the long-run.

According to the Purchasing Power Parity (PPP)⁸ theory, The exchange rate is supposed to balance the real price of goods between two countries in the long term, it states that the exchange rate and the price level have relationship under the purchasing power parity doctrine

From the above, purchasing power parities requires that the real exchange rate should be constant in the long term unless there is some external shock to the system reflecting in the real economic activity(oil embargo, supply shocks and so on). This changes are affecting to the equilibrium relative price structure and also affecting the systematic deviations from the purchasing power parities. This indicated a large deviations from the purchasing power parities.

⁸ Richard G. Lipsey, An introduction to position economic, 1989.

We can also observe the pattern of the deviation of the exchange rate and the price level, and use that pattern to explain the deviation from the purchasing power parities.

The difference between the characteristics of the exchange rate and the price level is also reflected in their time series properties and is fundamental for interpreting the deviations from purchasing power parities.

The deviation from purchasing power parities for consumer price indices is defined as:

$$\Delta_t = \ln S_t - \ln (P/P^*)_t \quad \text{--- (10)}$$

where Δ_t is the deviation from purchasing power parity during month t

P is the consumer price indices of Thailand

P^* is the consumer price indices of US

$\ln S_t$ is the logarithm of the current spot exchange rate (Baht / US dollar)

The equation (10) was estimated by applying the cointegration method to test whether there are the long run relationship between the current spot exchange rate and the price level in the logarithm form. In order to examine the patterns of deviations, the autocorrelation functions and the partial autocorrelation functions of the deviations for the consumer price indices have been computed.