The Movement of Exchange Rates and the Role of News:

Some theoretical Considerations

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1.0 Abstract :

The objective of this paper is give a theoretical background of the movement of exchange rates and the role of news. The first section shows how exchange rates have been volatile during the last sixteen years. The second section puts into perspective the relationship between exchange rates and national price levels, whereas the third section considers the relationship between exchange rates and interest rates. The implementation of 'News' to the (Efficient Markets Hypothesis) EMH framework is discussed in section 4, then it should be more appropriate to implement exchange rate models. In this section, the attempt is to build a model of exchange rate determination as a news format into the EMH framework. Thus, the research is carried out for both monetarist and portfolio balance theories, in order to explain the behaviour of each variable within the model taken.

Finally, in section 5, we show how cointegration technique can be used for testing the long run equilibrium relationship in exchange rate determination models.

1.1. Introduction

Since 1973, the 0move to generalised floating exchange rates between major countries, large fluctuations have been displayed. As a result of this turbulence, considerable efforts have been devoted to empirical investigations concerning exchange rate dynamics. Frenkel and Mussa (1980) pointed out that this turbulence is an important concern of government policy and its explanation is a challenge for theories of foreign exchange market behaviour.

Empirical research inside the asset-market approach has not given a consensus view about how the flexible exchange rate system has really been working during the last sixteen years. Highly conflicting findings have indeed been achieved on relevant questions pertinent to the asset-market framework, such as the exchange rate volatility, the validity of interest rate parity and the existence of an efficient exchange rate market.

Many empical works have been done investigating the theoretical issues of efficient markets hypothesis and the implication of cointegration for these markets. This paper extends the notion of EMH using a news approach, since it is known that the new information plays a predominant role in foreign exchange markets.
The first section of this paper shows how exchange rates have been volatile during the last sixteen years. The second section puts into perspective the relationship between exchange rates and national price levels, whereas

the third section considers the relationship between exchange rates and interest rates. The implementation of 'News' to the EMH framework is discussed in section 4. In the context of exchange rate determination, as emphasised by Dornbush (1980), the predominant cause of exchange rate movements is 'news' which could not be anticipated. If new information is important in the foreign exchange market, then it should be more appropriate to implement exchange rate models. In this section, the attempt is to build a model of exchange rate determination as a news format into the EMH framework. Thus, the research is carried out for both monetarist and portfolio balance theories, in order to explain the behaviour of each variable within the model taken.

Finally, in section 5, we show how cointegration technique can be used for testing the long run equilibrium relationship in exchange rate determination models. By doing so, the variables that are cointegrated with the exchange rate (i.e. there exists an equilibrium relationship within the exchange rate model) can be used as a news term within the EMH framework. As mentioned earlier, considerations are first given to exchange rate volatility.

1.2. Exchange Rate Volatility

A useful starting point may be represented by an inspection of figures (1.1) and (1.2) reported below. Looking at the German/US dollar exchange rates over the period 80M1 to 96M6, figure (1.1) compares the first differences of the spot exchange rate with the forward discount (or premium) relative to the preceding period. Exchange rate has been notably high during the sample period: the standard deviation of the variable spot exchange rate (0.047) is in fact about four times greater than that of the forward premium (0.013).

The lagged forward premium represents predicted exchange rate changes: it appears from the figure that these changes account only for a very small fraction of the effective ones. This finding, in line with the asset-market literature, confirms that the role of "News" is crucial in explaining exchange rate dynamics. This findings, in fact, are similar to Frenkel's (1981). Predicted changes (at time t-1) are poor forecasters of effective changes (occurring between t-1 and t) because new events, appearing in every period, cause the unexpected component of a vector of exogenous variables to the main force driving exchange rate performance.

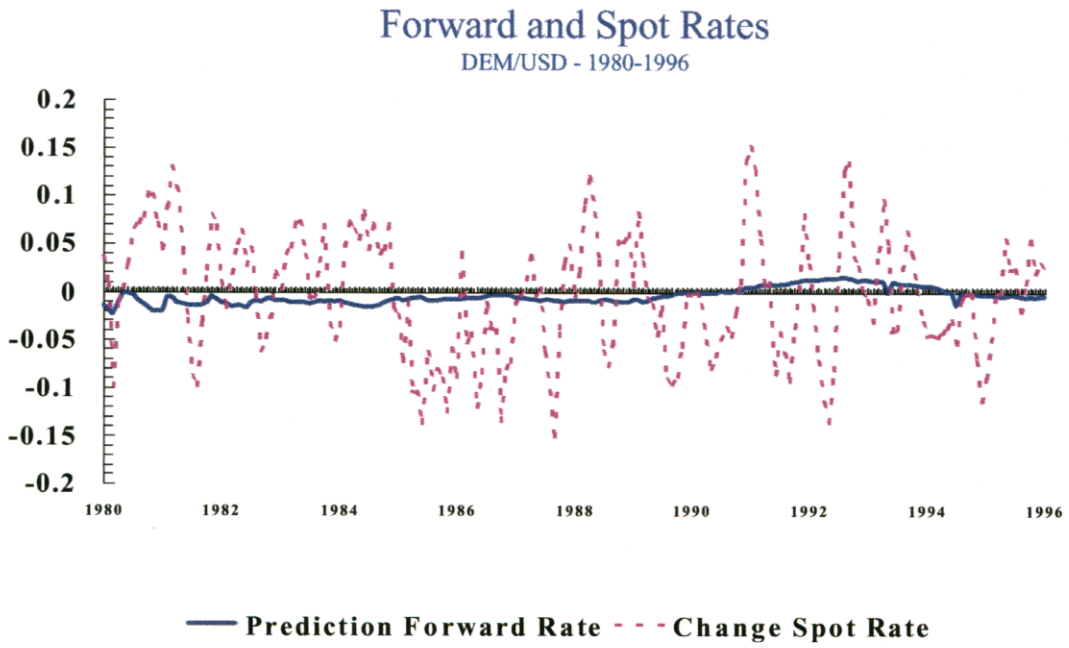
Crucial additional insights are found in figure (1.2) where indices of the logs of the spot and the forward German Mark/US Dollar exchange rates are reported over the period 80M1 to 96M6.

According to the aforementioned approach, spot and forward rates should be closely tied together, since both current spot rate and its current expectations for the future (forward rate) depend upon the same vector of exogenous variables.

To explain this behaviour of exchange rates, Frenkel and Mussa (1980) suggested the following equation:

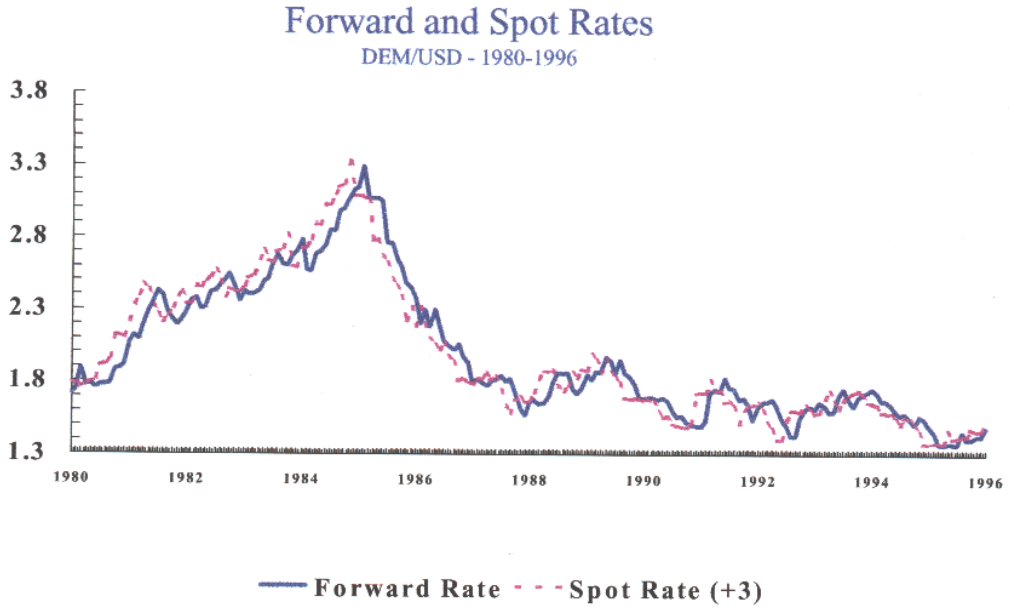
$$\ln S_t = Z_t + bE_t(\ln S_{t+1} - \ln S_t) \qquad (1.1)$$

where $E_t(\ln S_{t+1} - \ln S_t)$ denotes the expected percentage change in exchange rate between t



Spot Exchange Rate Changes and lagged forward premium

FIGURE 1.1



The Spot and Forward rate Relationship

FIGURE 1.2

and t+1 based on the information available at t, and where Z_t is the factors of supply and demand which affect the exchange rate at time t.

From the assumption that, current exchange rate and current expectations of future exchange rates are linked because both depend on expectations on what the future will be, we may write $\ln S_t = E_t \ln S_t$ which should also be linked to the current expectation of the next period's exchange rate Et $\ln S_{t+1}$ and so on. This can seen clearly from figure (1.2). It indicates that the new information appears to alter views concerning current and expected exchange rates by approximately the same amount. This comovement of spot and forward rates is evidence of the close link between current and expected future exchange rates, as proved by Frenkel (1981) who used the following equation, which is the same above equation but with forward iteration:

$$E_t InS_{t+1} = \frac{1}{1+b} \sum_{k=0}^{\infty} \left(\frac{1}{1+b} \right)^k E_t Z_{t+j+k} \qquad (4.2)$$

Thus, following Frenkel, the current exchange rate (j=0) and current expectations of future exchange rates are linked, because both depend on expectations concerning the future Z's.

The important remark that can be drawn here, is that the general view of looking to exchange rates as asset prices is vital in explaining the volatility and turbulence of the exchange rates. This perspective implies that exchange rates will not adjust slowly but like other asset prices will display random fluctuations in response to new information that is continually being received by the market.

1.3. Exchange Rates and National Price Levels

1.3.1. The Purchasing Power Parity (PPP)

The Purchasing Power Parity (PPP) concept is one of the oldest and most controversial relationship in the theory of exchange rates. Among the most popular versions of PPP, there exist the "absolute" version which states that the exchange rate between two currencies of any pair of countries should equal the ratio of the aggregate price levels in the two currencies, and the "strict" version which relates changes in exchange rates to in inflation differential rates.

The earlier promises of the flexible exchange rates were that long-run trends in exchange markets would be denominated by relative rates of inflation, i.e. that exchange rates would follow the PPP (Friedman , 1953), and that temporary factors such as shifting interest rates might cause temporary deviations from PPP but such deviations are reduced because speculators force the market towards its long long-run equilibrium.

The two mentioned versions can be written as follows:

Absolute Version

$$\ln S_t = a + b \ln (p / p^*)_t + U_t \qquad (1.3)$$

Relative Version

$$\Delta \ln S_t = b \Delta \ln (p / p^*) + V_t \qquad (1.4)$$

where S_t = the exchange rate

(p / p^*) = the ratio of domestic to foreign price indices, the asterisk denotes the foreign country.

U_t, V_t = error terms

Δ = the first difference operator

a = the intercept term

b = the slope coefficient.

There is not, however, a unique view about which price index should be used in these versions. According to one extreme view, exchange rates should be held in line with general price indices, i.e. prices of both traded and non-traded goods. Advocates of this view emphasise the role of asset equilibrium in determining the exchange rate (Cassel, 1930). A second view focuses on commodity arbitrage as the international mechanism that correct purchasing power disparities and therefore argues that only prices of traded goods should be included in the calculation of the ratio of price indices. Supporters of this view are, for example, (Angell, 1922; Bunting, 1939; Hecksher, 1930; Pigou, 1930; Viner, 1937).

The third view goes further to account for non-traded goods only. According to Keynes, the use of prices of traded goods only, is no more than a tautology, because it simply means that the price of a commodity must be the same elsewhere when converted into a common currency. Hansen and Hodrick (1980) for example claimed for the use of production indices.

The choice of the price index is not the only deficiency to the PPP, other factors such as the choice of base period for relative PPP and the transportation costs may also bias the calculation of PPP. These deficiencies have weakened the theoretical basis of PPP.

The PPP doctrine is seen as an equilibrium relationship between an exchange rate and some designated ratio of price indices. This relationship implies that any divergence from the ratio will set in motion corrective forces acting to restore equilibrium. The question that can be asked here is which causes which? is it the changes in prices that cause exchange rate movements or is it the opposite?

The majority of authors recognised that prices and exchanges rates are determined simultaneously. A minority, however, argued that there exists a causal relationship between prices and exchange rates. Cassel (1930), for example, claimed that the causality goes from prices to the exchange rate, Einzig (1937) claimed the opposite.

1.3.2. Violation of Purchasing Power Parity

This section considers some empirical results concerning the validity of purchasing power parity. Frenkel (1978, 1981), tested both the absolute and relative versions of the PPP for two different periods. The first period was the interwar period, whereas the second coincides with the 1970's and the recent floating exchange rates.

Frenkel estimated the following equations:

Absolute PPP $lnS_t = \alpha + \beta\, lnP_t - \beta^* lnP_t$ (1.5)

Relative PPP $\Delta lnS_t = \beta\, ln\Delta P_t - \beta^* ln\Delta P_t$ (1.6)

Where for the PPP to hold, it is expected that α=0, β=1 and β^*=1.

The above equations were estimated for the US/UK, France/US and France/UK exchange rates. He used the ratio of material price indices, the ratio of food price indices and the ratio of wholesale price indices for the period February 1921 - May 1921. The results are supportive to the PPP in both versions. For the relative version the inclusion of a constant term is shown to be statistically insignificant.

The same equations are used by Frenkel for the second period (floating exchange rates) 1973-1979. The results, were extremely poor and the estimates were extremely imprecise. Moreover, the poor performance of both versions of PPP during the 1970's was augmented by the fact that in some cases the estimates did not remain stable during the sample period. Frenkel concluded that the PPP doctrine did not hold during the 1970's, and he pointed out that this failure could be a US phenomenon. Accordingly, after reexamination for various exchange rates which do not include the US dollar or the US price level, the results were much more improved. His explanation to this, is that this phenomenon is due to :

i)- Transportation costs, where PPP is expected to hold better among European countries than if it is between a European country and the US.

ii)- Commercial policies and non-tariff barriers to trade have been more stable within Europe than between Europe and the US.

iii)- The effects of institutional agreements.

1.3.3. Cointegration and Purchasing Power Parity

Following the aforementioned concept of PPP, the central idea underlying this assumption is that exchange rates and prices should not diverge from each other by too far apart, at least in the long-run. In the short-run, they may drift apart due to some seasonal factors, but economic forces, such as commodity arbitrage, will tend to bring them together again. Clearly , this notion of long-run equilibrium coincides with the concept of cointegration. Cointegration suggests that if exchange rates and prices form a long-run equilibrium relationship, they must be cointegrated.

The cointegration technique was used by Taylor (1988) who examined the long-run PPP relationship for the UK, West Germany, France, Canada and Japan exchange rates, against the US Dollar. He tested the PPP over the period June 1973 through December 1985. The results obtained were not supportive to the PPP. In fact, he found that exchange rates and prices are not cointegrated. Thus, there is not long-run purchasing power parity relationship.

1.4. Exchange Rates and Interest Rates

Einzig (1970) pointed out that the concept of interest rate parity is credited to Keynes (1923). This concept focuses on relationships between exchange rates and interest rates.

Interest rate parity implies that investors have the choice between holding assets denominated in domestic currency, that yield the own rate of interest i_d, and holding assets denominated in foreign currency, that yield the own rate of interest i_f. Anyone investing a unit of domestic currency have to compare the return $(1+ i_d)$ with the option to convert it at the spot rate into s units of foreign currency, and arranging to convert back $(1+i_d)$ at the forward rate f into $s(1+ if) / f$ units of domestic currency for delivery at the end of the interest payment.

Their exists two different views of the above mentioned concept of interest rate parity. The first one is the Covered Interest Parity (CIP), the other is the Uncovered Interest Parity (UIP).

1.4.1. Covered Interest Parity (CIP)

Assuming perfect capital mobility, the covered interest parity implies that the premium on forward exchange is equal to the difference in interest rates between a given pair of currencies. This can be expressed as follows:

$$(1+ i_d) = s\,(1+i_f) / f \qquad (1.7)$$

or, for sufficiently small values

$$(f - s) / s = (1+i_f) / (1+i_d) - 1$$

$$= (i_f - i_d) / (1+i_d) \approx i_f - i_d \qquad (1.8)$$

Setting the forward premium $(f - s) / s = p$, and replacing in (1.8), we obtain

$$P = i_f - i_d \qquad (1.9)$$

Thus, if $i_f > i_d$, forward sterling is at premium.

Rearranging equation (1.9), the covered interest differential (CID) is obtained

$$\text{CID} = (i_f - i_d) - p \qquad (1.10)$$

Just as water flows downhill, so capital always flows where the return are greatest. Thus if CID > 0, funds will flow from the UK to the US (taking UK, US as home and foreign countries respectively). Assuming that $(i_f - i_d)$, the profit of investing at the high interest rate will be greater than the cost of forward cover (p). When CID = 0, arbitrageurs portfolios are in equilibrium, and when CID < 0 funds will flow to the UK.

1.4.2. Uncovered Interest Parity (UIP)

If we now add to the above analysis of CIP, the assumption that arbitrageurs are risk neutral, so that they do not use the forward market for cover, there exists the relationship of Uncovered Interest Parity (UIP), which must hold at any moment of time. UIP means that assets denominated in different currencies are perfect substitutes; in other words, agents are indifferent as to the currency composition of their portfolios (Tronzano, 1992).

In formal terms, UIP implies that the nominal interest differential between bonds denominated in different currencies is just equal to the expected change of the exchange rate during the corresponding period. Following the same above notations of CIP, and instead of using the forward rate for cover, arbitrageurs use the expected future spot rate se. In this case, equilibrium requires that if $(i_f - i_d)$, there must be a premium on the expected future spot rate, s^e, to offset the interest rate disadvantage.

The premium (p) in equation (1.9) will be $(s^e - s)/s$. Rearranging (p) into (1.8), the UIP implies:

$$(s^e - s) / s = (i_f - i_d) / (1 + i_d) \approx i_f - i_d$$

That is, the expected proportionate appreciation of the dollar is equal to the difference in nominal interest rates.

1.4.3. The Empirical Validity of Covered and Uncovered Interest Parities

Although there exists some confusion in some of the literature on the CIP condition, it is agreed that departures from the CIP is due to transportation costs and the influence of capital controls. Dooley and Isard (1980) added that deviations from CIP is due to the fact that the empirical data on interest rates do not refer to sufficiently comparable foreign and domestic assets. Chrystal, K.A (1982) argued that the CIP does hold if the chosen interest rates are eurocurrency deposit rates of the same duration. In other words, if for the US interest rate, we take the three-month deposit rate in Paris and for the UK interest rate we take the three-month euro sterling deposit rate in Paris, then the CIP will hold just about exactly.

As regards the UIP, the validity remains controversial. The empirical evidence regarding its validity is rather inconclusive. Indeed, the majority of works which the UIP proposition directly, indicate a failure (see, for example, Cumby and Obsfeld (1981), Hodrick and Srivastava (1984)). Frankel (1982), by contrast, draws opposite conclusions.

It must, however, be noted that many other tests have looked for indirect evidence by relying on the assumption that expectations are taken rationally such as UIP implies that the forward rate is an unbiased predictor of the spot rate. In this case, provided that the CIP holds, market efficiency implies the validity of UIP.

Since CIP is well supported by the data (Frenkel and Levich (1977), McCormick (1979)), the highly conflicting empirical evidence surrounding the market efficiency hypothesis may also be regarded as a inconclusive evidence about the uncovered interest parity (UIP).

As seen from this section, the UIP implies that the expected proportionate appreciation of the spot rate is equal to the difference in nominal interest rates. Clearly , if the UIP holds, there exists an equilibrium relationship. Accordingly, the test we propose to see whether this equilibrium exists or not is similar to the one we will be using for the long-run PPP, namely the cointegration technique. The latter implies that, if the UIP holds, then the expected appreciation of the spot rate and the difference in nominal interest rates should be cointegrated.

1.5. Exchange Rates and "News"

It has been suggested by Dornbush (1980) and Frenkel (1981) among others, that exchange rates movements basically respond to new information that is made available to economic agents in every period.

Unanticipated events "News", play a predominant role in affecting real variables and asset yields. In the context of exchange rate determination, as emphasised by Dornbush (1980), the predominant cause of exchange rate movements is "news", which could not have been anticipated.

Although the Efficient Markets Hypothesis implies that anticipated changes in the exchange rates will be orthogonal to the forecast error, unanticipated changes in the determinants of exchange rates, will be correlated with the error term (i.e. "News" represents the update of agents expectations).

If new information is important in foreign exchange markets, then it should be more appropriate to implement exchange rate models. The question now is how this "News" can be modeled in foreign exchange markets.

1.5.1. How To Model the "News"

As regards the above question about how the news can be modeled, following Hallwood and MacDonald (1986), this can be shown as follows:

Where using the monetary model as the relevant exchange rate model, and as shown below, *Z* captures the influence of money supplies etc., on the exchange rate.

$$S_{t+1} = \gamma Z_{t+1} + \varepsilon_{t+1}$$

Agents use the above equation to form their expectations and thus:

$$S_{t+1}^{e} = \gamma Z_{t+1}^{e}$$

Subtracting the first equation from the second we find that the forecast error is seen to be composed of a news term and a random term as shown in this equation:

$$S_{t+1} - S_{t+1}^{e} = \gamma\left(Z_t - Z_{t+1}^{e}\right) + \varepsilon_{t+1}$$

If agents are risk neutral thus:

$$S_{t+1} - f_t^{t+1} = \gamma\left(Z_t - Z_{t+1}^{e}\right) + \varepsilon_{t+1} = Q_{t+1}$$

where the term in parenthesis represents the 'news'. Clearly in any attempt to implement the news the researcher must decide which model of the exchange rate he will be using and what are the elements which are thought to be the 'News'.

The earliest attempt of Frenkel (1981) to implement the news approach was not based on a specific model of exchange rate but rather by adding the elements which he thought reflect the news rapidly. Frenkel has used the following formulae:

$$ln\, S_t = a + b\, ln\, F_{t-1} + "News" + w_t \qquad (1.11)$$

which shows the role of news as the determinants of the exchange rate, where (lnS_t) is the logarithm of the spot exchange rate and (lnF_{t-1}) is the logarithm of the forward exchange rate. More precisely, he used the following model:

$$ln\, S_t = a + b\, ln\, F_{t-1} + \alpha\, [(i - i^*)_t - E_{t-1}(i - i^*)_t] + w_t \qquad (1.12)$$

expected exchange rate

News

where $(i - i^*)$ is the interest rate differential.

This equation was tested for the US Dollar/UK Pound, US Dollar/French Franc, and the US Dollar/German Mark exchange rates over the period June 1973 to June 1979, using essentially an autoregression to measure the expected interest differential series. The results of the above equation, using two stage Least Squares, show that in all cases α, the coefficient of the unexpected interest differential is positive, and in the case of the US Dollar/UK Pound exchange rates is statistically significant. This positive association between the exchange rate and the unexpected interest differential, according to Frenkel, is due to the fact that the sample period was taken in a period in which the interest rate reflects inflationary expectations.

However, when again estimating the same equation using the actual interest differential, the results state that the coefficient on the actual interest differential is insignificant in all cases.

Edwards (1982) expanded his tests to a multi-currency world. In this world, it is possible to see that U_t (the white noise error term) will be correlated across exchange rates. This correlation can be incorporated to the analysis using Zellner's Seemingly Unrelated Regressions procedure (SURE), Zellner (1962).

Following Edwards, it is possible to show that t0he error term U_t, in a simple EMH equation can be a linear function of unanticipated "News" of money differentials, real income differentials and real interest differentials. In fact, he estimated the FMAER (flexible price monetary approach to the exchange rate) reduced form in a news format for the same currencies considered by Frenkel plus the Italian Lira over the period June 1973 to September 1979. The equation that was tested can be expressed as follows:

$$S_t = a + bf_{t-1} + \left[\alpha_0\left(m_t^u - m_t^{u*}\right) + \alpha_1\left(y_t^u - y_t^{u*}\right) + \alpha_2\left(r_t^u - r_t^{u*}\right)\right] + w_t$$

where,

$\left(m_t^u - m_t^{u*}\right)$ = unanticipated changes in the log of money at home and abroad.

$\left(y_t^u - y_t^{u*}\right)$ = unanticipated changes in the log of real incomes.

$\left(r_t^u - r_t^{u*}\right)$ = unanticipated changes in real interest rates.

Under the assumption that markets are efficient, it is expected that in the above equation $a=0$, $b=1.0$, $\alpha_0 > 0$, $\alpha_1 < 0$, $\alpha_2 \geq 0$ and w_t to be a white noise error. The results are supportive to the FMAER news equation. the Hypothesis that a=0 and $b=1.0$ cannot be rejected at the conventional levels. With respect to the role of 'News', the coefficients for unanticipated money growth differentials are significantly positive, and as expected, for the Franc/Dollar and the Mark/Dollar exchange rates. It was found that a 10 % unanticipated increase in money differentials for the currencies would result in a depreciation of the domestic currency of about 3.5 % over and above what had been expected. α_1, however is only significant and positive for the case of Pound/Dollar exchange rates, whereas α_2 is only significant for the Lira/Dollar exchange rates.

Clearly, from the work of Frenkel and Edwards, in any attempt to implement the 'News' model, a researcher must decide on an appropriate model to the exchange rate determination, and on some method of generating the expected values of the determining variables. Frenkel and Edwards have generated the expected values using regressions analysis.

Other studies have been carried out and are supportive of the model used (see, for example, Dornbush (1980), MacDonald(1983), Bomhoff and Kortwegg (1983) and Branson (1983). The interesting results of these studies is the finding that lagged 'news' is statistically significant, and also that these studies are reasonably supported by the data.

1.5.2. Looking for a Better 'News' Model

In this section we do not attempt to give a different news format for the EMH condition. In fact we will be using the same models used by previous studies, but the test we propose for generating the expected values of the news, however, is rather different. The models that we will be dealing with, are those of exchange rate determination, namely the monetary and portfolio balance models. To test for the existence and long-run cointegrability of these models, cointegration technique is used. Using this technique we can decide on the appropriate model for the news format. The main idea is that the appropriate model should be cointegrated. If not all the variables are cointegrated, some of them, at least, should pass the cointegrability test, thus suggesting an equilibrium relationship. So we think that the variables which reflect the news immediately are those that are cointegrated with exchange rate.

Considerations are fist given to some properties of each model of exchange rate determination by taking up the more important question on how the flexible spot rates themselves are determined.

Since the resolution of the Bretton Woods system, models of asset stock have dominated professional thinking about exchange rate determination. Accordingly, exchange rate adjusts instantly to equilibrate the international demand for stocks of national assets rather than the international demand for flows of goods as under the traditional view. All asset market models share the assumption of perfect capital mobility. They differ according to whether or not domestic and foreign bonds are assumed to be perfect substitutes in asset holders' portfolios, which implies uncovered interest parity (UIP).

One class of asset-market models assumes perfect substitutability between foreign and domestic bonds, this is the "monetary approach". By contrast, another class assumes that domestic and foreign bonds are imperfect substitutes, this is called the "portfolio-blance approach".

1.5.2.1. The Monetary Approach

There are two different views within the monetary approach. The first one is the flexible-price monetary model, whereas the other is the sticky-price ("overshooting") monetary model.

a). The Flexible-Price ('Monetarist') Monetary Model

The Flexible-Price model assumes perfect substitutability between domestic and foreign goods, this is the idea of purchasing power parity (PPP) which states that the domestic price level is equal to the foreign price level times the exchange rate. The flexible-price model or, as sometimes called the "Chicago" theory has been developed by Frenkel (1976, 1977, 1980), Mussa (1976), Girton and Roper (1977), Hodrick (1978), and Bilson (1979). The fundamental equation in the monetary approach is a conventional money demand function:

$$m = p - \phi y - \lambda i \qquad (1.13)$$

Where,

m = log of the domestic money supply,
p = log of the domestic price level,
y = log of domestic real income,
i = the domestic short term interest rate,
ϕ= the money demand elasticity with respect to income,
λ= the money demand semielasticity with respect to the interest rate.

Assuming a similar money demand function for the foreign country:

$$m^* = p^* + \phi y^* - \lambda i^*$$

Where asterisks denote foreign variables and the parameters are assumed to be equal in home and foreign country. If we take the difference of the two equations we obtain the relative money demand function:

$$(m - m^*) = (p - p^*) + \phi(y - y^*) - \lambda(i - i^*) \qquad (1.14)$$

The uncovered interest parity implies:

$(i - i^*) = \xi(\Delta e)$ = the expected depreciation in domestic currency (5.15)

Replacing it, i.e $\xi(\Delta e)$ into (1.14) we obtain, by solving for the relative price level:

$$(p - p^*) = (m - m^*) - \phi(y - y^*) + \lambda\xi(\Delta e) \qquad (5.16)$$

The assumption of purchasing power parity implies:

$s = p - p^*$, (1.17)

where s = the log of the spot exchange rate. In the long run the expected depreciation is equal to the expected inflation differential:

$$\xi(\Delta e) = \xi(\Delta p) - \xi(\Delta p^*) \qquad (5.18)$$

Combining (1.16), (1.17), and (1.18) we obtain the monetarist equation of exchange rate determination:

$$S = (m - m^*) - \phi(y - y^*) + \lambda(\xi(\Delta p) - \xi(\Delta p^*)) \qquad (1.19)$$

One implication from regarding exchange rates as asset prices is that expectations are important in determining the current spot rate. Assuming the rationality of the agents, the stability of the system, and that income growth is exogenous (for simplicity equal to zero, so $y - y^* = \bar{y} - \bar{y}^*$). Then the expected inflation rate is equal to the rationally expected monetary growth, which we will represent by (Π - Π^*). Equation (1.19) becomes:

$$S = (m\text{-}m^*) - \phi(\bar{y} - \bar{y}^*) + \lambda(\Pi - \Pi^*) \qquad (1.20)$$

which is the flexible price monetary approach reduced form.

b). The Sticky-Price "Overshooting" Monetary Model

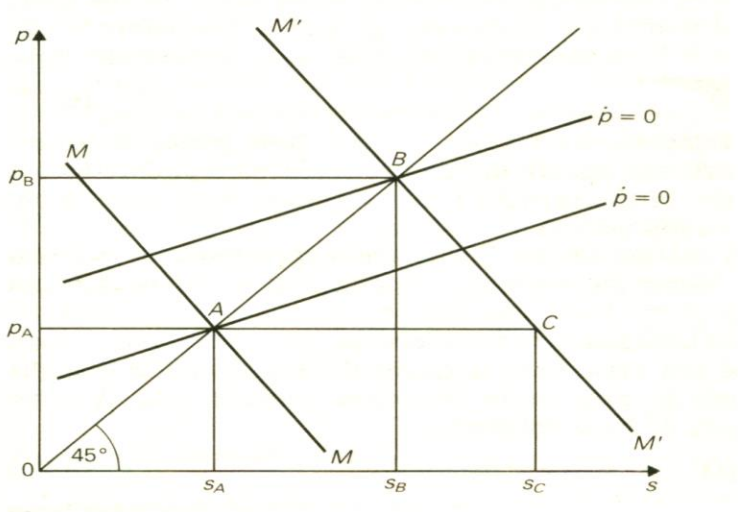
This version is due to Dornbush (1976). The model is also called "fixed-price", because it assumes that prices are sticky, so the PPP is no longer valid in the short run. The demand for money function as in (1.13), and the UIP, however, are still maintained.

The important model of this feature of this model is that it gives another example of exchange rate volatility in terms of "overshooting". This can be best explained in the following way using figure (1.3).

The line p=s plots the long-run relationship between the price level and the exchange rate with 45° representing one to one unity. The schedule MM represents combinations of *s* and *p* consistent with asset market equilibrium: It is assumed that at all points in time the UIP holds continuously and the money market is assumed to clear.

The initial equilibrium is at A. A monetary expansion shifts MM to M'M', and the new long run equilibrium is at B. But in the short run prices are sticky so that they do not adjust quickly, thus the exchange rate moves to C and then slowly moves back up to B at a rate known in Dornbush model as "the speed of adjustment", which reflects the degree of stickiness of prices.

Figure 1.3 *The Overshooting Model*



From the figure we can see that the economy is always on MM, which means that asset markets are continuously in equilibrium. Secondly , the appreciation from C to B is fully consistent with rational expectations because the exchange rate appreciates at exactly the rate which is expected. Thirdly, money is not neutral in the short run. At a point like C the PPP has been violated, the domestic currency has depreciated but domestic prices have not changed.

We now return to how this model is determined. First, we replace the PPP by a long-run version:

$$\bar{S} = \bar{p} - \bar{p}^* \qquad (1.21)$$

where a bar denotes long run, or equilibrium, value. Thus the monetarist exchange rate equation (1.19) is replaced by a long run version:

$$\bar{S} = (\bar{m} - \bar{m}^*) - \phi(\bar{y} - \bar{y}^*) + \lambda\left(\bar{\xi}(\Delta p) - \bar{\xi}(\Delta p^*)\right) \qquad (1.22)$$

and, adding the same assumptions as those given in (1.19) we get:

$$\bar{S} = (m - m^*) - \phi(y - y^*) + \lambda\,(\Pi - \Pi^*) \qquad (1.23)$$

In the short run, when the exchange rate deviates from its equilibrium path, it is expected to close the gap with a speed of adjustment θ. In the long run, when the exchange rate lies on its equilibrium path, it is expected to increase at $(\Pi - \Pi^*)$:

$$\xi(\Delta S) = -\theta(S - \bar{S}) + (\Pi - \Pi^*) \qquad (1.24)$$

Combining (1.24) with the UIP in (1.15) we obtain:

$$S - \bar{S} = -\frac{1}{\theta}\left[(i - \Pi) - (i^* - \Pi^*)\right] \qquad (1.25)$$

The gap between the exchange rate and its equilibrium level is proportionate to the real rate of interest. If we combine (1.25), which is the short run overshooting effect, with (1.23) we obtain the general monetary model of exchange rate determination:

$$S=(m-m^*)-\phi(y-y^*)+\lambda\,(\Pi-\Pi^*)-\frac{1}{\theta}\left[(i-\Pi)-(i^*-\Pi^*)\right] \qquad (1.26)$$

If the fix-price monetary model is correct then in an estimated version of equation 1.26we would expect $1/\theta$ to be negative and λ to be zero. where in the flex-monetary approach we would expect λ to be positive and $1/\theta$ to be zero.

Equation (1.26) can be reproduced in another form:

$$S = (m - m^*) - \phi(y - y^*) + \alpha\,(i - i^*) + \beta\,(\Pi-\Pi^*) \qquad (1.27)$$

where $\alpha = -1/\theta$ is hypothesized negative and $\beta = 1/\theta + \lambda$ is hypothesized positive and greater than in absolute value.

Many other alternatives have been discussed in the literature of exchange rate determination, and they can be summarised in term of equation (1.27) as follows:

Chicago, or flexible model:

Bilson $\alpha > 0$, $\beta = 0$

Frenkel $\alpha = 0$, $\beta > 0$

Keynesian, or sticky-price model:

Dornbush $\alpha < 0$, $\beta = 0$

Real Interest Differential $\alpha < 0$, $\beta > 0$

A number of empirical studies tended to support the implications of the monetary approach, but such studies produced different results. For instance, the evidence from the Pound/Dollar exchange rates by Bilson (1978) supported the flexible price model, Hodrick (1978) claimed support for the sticky-price version while the results of Frankel (1979) were supportive to the real interest differential model.

1.5.2.2. The Portfolio Balance Model

a). The effect of the current account

Although the interest rate differential was highly favourable to the United States, and money growth was lower in US than other countries like Japan, West Germany and Switzerland, the dollar depreciated sharply in 1978 against the afore mentioned exchange rates.

The most popular explanation for the decline was the large US current account deficit. Moreover, the correlation between current account deficits and exchange rates has been undeniably strong when the pattern was

reversed in 1979and 1980. That is, the currencies of Japan and West Germany depreciated while the Dollar appreciated. The US having current account surplus, and West Germany and Japan having a deficit account.

Frankel (1983) states that there are three main channels through which current account imbalances are thought to affect exchange rates. the first one is that current accounts development have been largely dominated by oil. Since The United States produces oil while West Germany and Japan produce none, the sharp increase in oil prices in 1979 raised the demand for the dollar at the expense of the Mark and Yen. Financial analysts argued, however, that this increase in oil prices hurts the dollar because the US has not decontrolled domestic oil prices. The second channel through which current account imbalances are viewed to influence exchange rates is the effect of current account surprises on equilibrium exchange rates; the release of unexpected figures on current account can have immediate effects on the exchange rate. The third one is the effects of wealth transfers on portfolio balance, since the counterpart of a current account imbalance is a transfer of wealth between regions (i.e. foreign and domestic residents).

Each of the above channels could be interpreted in a model, we focus on the third one which gives us the "portfolio-balance" effect.

b). The Portfolio-Balance Model

The important feature of this model is that, in contrast with the monetary models, it assumes imperfect substitutability of bonds, and thus allows a role for portfolio diversification between countries. The Portfolio balance model is due to the work by Mckinnon and Oates (1966); McKinnon (1969); Branson (1968, 1975).

This model has been applied to the exchange rate determination by Branson (1977); Isard (1978); Dornbush and Fisher (1980) among others.

From the above, the UIP assumption in (1.15) does not hold but instead we write:

$$i - i^* - \xi \Delta s = \varphi \qquad (1.28)$$

Where φ represents the risk premium, which was equal to zero in the case of the previous model (i.e. monetary approach).

There are many reasons why two assets can be imperfect substitutes such as liquidity, political risk, tax treatment, default risk, and exchange risk. The majority of the studies, however concentrates mainly on the latter factor which is the exchange risk.

We assume that wealth holders distinguish between domestic and foreign bonds only by their currency of denomination. In order to diversify the risk that comes from exchange variability, investors balance their portfolios between domestic and foreign bonds in proportions that depend on the expected relative rate of return (or risk premium).

Frankel (1979) presented the above relationship as follows:

We can write (φ) as a function of relative supplies of bonds:

$$\varphi = \frac{1}{\gamma} B/F_S \qquad (1.29)$$

Combining this equation with (1.28) we obtain:

$$B/F_S = \gamma\left(i - i^* - \xi\Delta s\right) \qquad (1.30)$$

where ***B***, ***F*** are domestic and foreign bonds respectively. Making (4.30) in logs we get:

$$b - s - f = a_0 + \gamma\left(i - i^* - \xi\Delta s\right) \qquad (1.31)$$

Assuming that expectations are static, i.e. $\xi\Delta s = 0$, the exchange rate will be determined by relative bond supplies and interest differential:

$$s = a_0 + \gamma\left(i - i^*\right) + b - f \qquad (1.32)$$

Equation (1.32) represents the portfolio balance model under the assumption of 'uniform preference' (Dornbush (1980)). Such assumption means that all agents consume the same goods or the same basket of goods.

An alternative model assumes that the home country is too small and thus domestic bonds are held by domestic residents only. Branson (1975), and others developed this assumption:

$$S = -a_H - \gamma_H (i - i^*) + b - f_H \qquad (1.33)$$

where γ_H is the asset demand function shared by all home residents. A model of small domestic country is unrealistic for most countries, at least with floating exchange rates. A realistic model, however, would recognise that residents of both countries hold bonds issued by both countries. Such model goes under the name of "Preferred Local Habitat" Kouri (1976).

Table (1.1) provides a summary of the coefficients signs implied by various models that were discussed previously.

Table (1.1)

Implied regression coefficients of asset market models

	(m-m)*	*(y-y*)*	*(i – i*)*	*(□-□*)*	*(b – f)*
1 -Monetary Approach					
- Monetarist eq(1.20)	+	-	+	+	
- Overshooting eq(1.27)	+	-	-		
- Real Interest differential eq(1.26)	+	-	-	+	

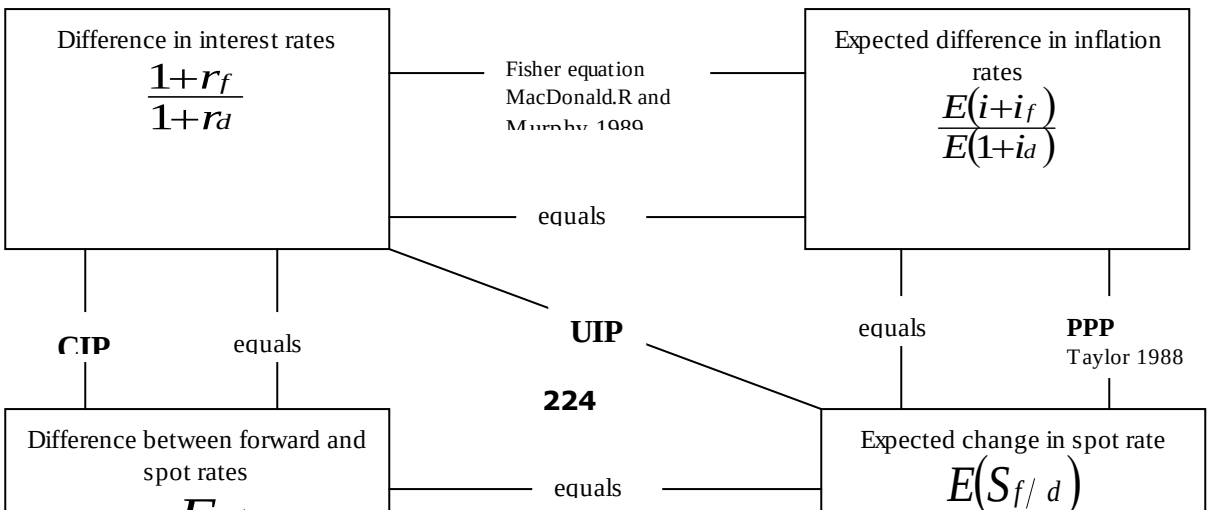
2 –Portfolio Balance Model (1.32)			-		+

As seen from the table the implications are so conflicting that one would find that a regression could hardly help but reject some models in favour of others.

1.6. Conclusion

The paper has considered the various models of exchange rate determination. Initially, the first section states that the exchange rates were very volatile during the last sixteen years. The poor performance of exchange rate models to explain exchange rate behaviour, concerning this high volatility and variability, has raised many questions about the reasons for this failure. To some extent this failure is due to the imperfect foresight of stances of monetary and fiscal policies and, of the consequences of those policies for inflation rates, interest rates, and other economic conditions. Another explanation that may have caused exchange rate movements, could be "news" that would not have been anticipated, since the new information plays a predominant role in determining the exchange rate pattern. In addition, the statistical tests that have been used indicated that the explanatory power of exchange rate models has been extremely poor during this period.

Section 1.3 and 1.4 give some elements of truth about relationships between exchange rates, national price levels and interest rates. Thus both implications and empirical validity of purchasing power parity (PPP) and interest rate parity assumptions are discussed. Since both concepts are based on a long-run equilibrium relationship, cointegration techniques could be used to detect this equilibrium. Many studies , as mentioned previously, have used the cointegration techniques in the context of exchange rate determination. Figure (1.3) is a simple chart that links exchange rate to other variables, and gives some recent studies concerning the above assumptions.



As seen from Fig (1.3), most of the studies in exchange rate relationships were pioneered by MacDonald R. and Taylor M (1988, 1989). The chart , however, show that there is still to come, and future research would be fruitful using this new technique. Consequently, in this research the UIP is tested using the aforementioned method. Considerations are also given to the PPP and the problem of causality.

As far as the "news" approach is concerned, section 1.5 has provided a description of the candidate models that can be used as a "news" term in the context of EMH framework. Where again, using the aforementioned technique, the variables that are cointegrated are detected within each model of exchange rate determination. If the model is not entirely cointegrated (i.e. not all the variables are cointegrated in the model), there must be at least one or two variables that could form a long-run relationship with the exchange rate. These variables, that are cointegrated reflect the news term and will be used in a news format.

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