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THE ROLE OF NEWS APPROACH IN EXPLAINING EXCHANGE RATE VOLATILITY

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Özet

Bretton Woods sistemine son verildikten sonra geliştirilen esnek fiyat para modeli, yapışkan fiyat para modeli ve portföy denge modeli gibi modeller döviz kurlarındaki dalgalanmaları açıklamakta kısmen başarılı olmuşlardır. Dolayısıyla, bu alanda yapılan çalışmalar ekonomiyle ilgili açıklamaların döviz kurları üzerindeki etkisini tespit etmeye yoğunlaşmıştır. Bu makalenin amacı, para modeli ile ilgili yapılan ampirik çalışmaların ekonomiyle ilgili açıklamaların ya da beklenmeyen olayların döviz kurlarındaki dalgalanmaları açıklamakta başarılı olup olmadıklarını belirlemektir.

Anahtar Kelimeler: *Döviz kurları, döviz kuru dalgalanmaları, para modeli, ekonomik açıklamalar yaklaşımı.*

Abstract

Since the breakdown of the Bretton Woods system, existing structural models of exchange rate determination such as flexible-price monetary model, sticky-price monetary model, and portfolio balance model have been partly successful in explaining exchange rate volatility. Therefore, the focus of this line of study has shifted to capture the role of economic news on exchange rates. The purpose of this paper is to review the literature related to the role of news or unexpected events within the framework of the monetary approach to exchange rate determination and to indicate whether the news framework has been successful in explaining volatility in exchange rates.

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1. INTRODUCTION

After the breakdown of the Bretton Woods system, structural models of exchange rate determination, such as flexible-price monetary model, sticky-price monetary model, and portfolio balance model, have been partly successful in explaining large fluctuations in exchange rates. For instance, the predictions of the flexible-price and sticky-price monetary models have been supported by the empirical studies for the period of 1973-1980, while the studies have given mixed results after 1978. Even though the portfolio balance model has performed well in explaining the behavior of exchange rates, its success comes from income variables rather than from portfolio balance effect[1]. Meanwhile, it has been observed that periods that are dominated by rumors, announcements, and news that change expectations are likely to induce a relatively large degree of exchange rate volatility[2]. Naturally, researchers have explored the role of news in exchange rate volatility and have tested models of exchange rate determination. Frenkel and Mussa (1980), Frenkel (1981), and Dornbusch (1980) originally emphasize this idea in the asset market approach to the exchange rate determination. These researchers consider the exchange rate as an asset price, which is significantly affected by new information that is made available to economic agents in every period. One particular asset market approach that has received significant attention is the monetary model of the exchange rate.

It is important to find the source of exchange rate volatility because of its social costs and its effect on the efficiency of price system. Volatility in exchange rates affect the relative prices of traded to non-traded goods, which has a direct effect on consumption decision and resource allocation. When relative prices of traded to non-traded goods vary, investment and consumption decisions may be affected adversely.

The aim of this paper is to review the literature related to the role of news or unexpected events within the framework of the monetary approach to exchange rate determination and to indicate whether the news framework has been successful in explaining volatility in exchange rates. Empirical studies of the monetary approach to exchange rate determination have given

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[1] See for example, Frankel (1976), Hodrick (1978), Frankel (1979), Smith and Wickens (1986), Meese and Rogoff (1988), Stockman (1980), Driskill (1981), Baxter (1993), MacDonald and Taylor (1994), Branson et al. (1977) for the empirical studies of these structural models.

[2] This view is emphasized by Frenkel and Mussa (1980) and Frenkel (1981).

mixed results in explaining the role of news in exchange rate volatility. One probable explanation for the insufficient empirical performance of this model is that it puts so little emphasize on the market structure of the foreign exchange market. The plan of the paper is as follows: The following section presents the theoretical economic news framework based on the monetary approach to exchange rate determination in an open economy. Section 3 contains several empirical studies. Section 4 summarizes the paper and provides conclusions.

2. THE MONETARY MODEL OF EXCHANGE RATE DETERMINATION: A NEWS FRAMEWORK

The monetary approach to exchange rate determination assumes that the relative supplies and demands of two currencies determine the exchange rate. Since the exchange rate is the relative price of two currencies, movements in the exchange rate can be explained by changes in both demands and supplies of domestic and foreign currencies. One of the main implications of the monetary approach to exchange rate determination is that the exchange rate market is efficient. For an asset market to be efficient, the price of an asset must fully incorporate all the relevant information that is currently available in the market. Therefore, in an efficient market it should be impossible for a trader to earn excess returns to speculation. Similarly, if the exchange rate market is efficient, we should expect that spot rates reflect all currently available information and expectations concerning forward rates should be incorporated and reflected in forward exchange rates. This suggests that new information in subsequent periods will lead to revisions of market expectations about future spot rates. Thus, new information in period t, for example, will also have an effect on the difference between the spot rate in period t and the expectation of the market made about it in the t-1 period when the information was not available. In other words, in every period economic agents will use the news to revise their forecast about future spot rates [3].

These implications can be achieved by four fundamental assumptions:

(i) The purchasing power parity (PPP): PPP is a relationship which states an equality between domestic price level and foreign price level converted into domestic currency. In other words, a particular commodity will have a similar price when it is expressed in a common currency [4].

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[3] See for example, Dornbusch (1976), Frenkel (1981), and Isard (1983).

[4] The consequences of sluggish price adjustment are modeled as sticky-price monetary model by Dornbusch (1976).

(ii) Interest rate parity: There is a perfect substitutability and mobility between domestic and foreign non-money assets so that the real returns on these assets will be equal and independent of their currency denomination.

(iii) The Fisher equation: The nominal rate of interest equals to the real rate of interest rate plus the expected rate of inflation.

(iv) The rational expectations hypothesis: Expectations concerning market price are the same as predictions of the relevant theory.

These assumptions state the relationships among endogenous variables. In the monetary model, the current and expected price level is determined by money supply and real income. Afterwards, the expected inflation and term structure of nominal interest rates are reached through Fisher equation. PPP and interest rate parities are used to derive the spot and forward exchange rates. In the monetary model, the money demand equations for domestic and foreign currencies are specified by,[5]

$$m = p + \psi y - \varnothing i \quad (1)$$

$$m^* = p^* + \psi^* y^* - \varnothing^* i^* \quad (2)$$

where

m, m* = logs of domestic and foreign money supplies,

p, p* = logs of domestic and foreign price levels,

y, y* = logs of domestic and foreign real income, and

i, i* = domestic and foreign interest rates.

The demand for money depends on price level, the real income, and the nominal interest rate and equates the money supply that is exogenous in the monetary approach. Equations (1) and (2) indicate stable demand functions for both monies and instantaneous money market equilibrium.

To show the relationship between the money market equilibrium and the exchange rate we subtract (2) from (1) and solve for the relative price level:

$$p - p^* = m - m^* - \psi y + \psi^* y^* + \varnothing i - \varnothing^* i^* \quad (3)$$

Then the PPP can be stated as,

$$e = p - p^* \quad (4)$$

where e denotes the log of the exchange rate. Assuming that the elasticities are identical in both countries, the combination of equation (3) and (4) gives the fundamental exchange rate equation of the model.

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[5] The algebraic forms of equations are adopted from Bilson (1976), Frankel (1982), Frenkel (1976), and Mussa (1976).

$$e = (m - m^*) + \psi(y^* - y) + \varnothing(i - i^*) \quad (5)$$

From equation (5) recognize that an increase in domestic money demand relative to foreign money demand will lead to an appreciation of the exchange rate. An increase in domestic real income or a decrease in domestic nominal interest rate relative to foreign real income or nominal interest rate will also appreciate the exchange rate. The prediction of the model is that the coefficient of (m - m*) is one, since the money is completely natural in the model. Also, ψ should be one.

The previously stated assumption of perfect substitutability and mobility between domestic and foreign non-money assets implies that uncovered interest parity condition holds,

$$\chi = i - i^* \quad (6)$$

where χ is the expected rate of depreciation of the domestic currency. When the derivative of (4) is taken with respect to time, the expected rate of depreciation should be equal to the expected inflation differential:

$$\chi = \pi^e - \pi^{*e} \quad (7)$$

where π^e and π^{*e} are expected inflation rates for domestic and foreign countries, respectively. Since both interest differential and the expected inflation differential equal the expected rate of exchange rate depreciation, the expected inflation differential equals the interest rate differential:

$$i - i^* = \pi^e - \pi^{*e} \quad (8)$$

Therefore, the exchange rate equation, (5), can be rewritten in the following form,

$$e = (m - m^*) + \psi(y^* - y) + \varnothing(\pi^e - \pi^{*e}) \quad (9)$$

The Fisher equation states that the nominal rate of interest equals the real rate of interest plus the expected rate of inflation. This relationship is shown in the following form,

$$i = r + \pi^e \quad (10)$$

$$i^* = r^* + \pi^{*e} \quad (11)$$

The notion of rational expectations implies that expectations are the same as the predictions of the relevant theory, since expectations are informed predictions of future events (Muth, 1961). In the Muth sense, if a particular economic model is applied to explain the behavior of agents, it is also assumed that the agents formed their expectations based on that particular economic model. Applied to the foreign exchange market, the notion of rational expectations -assuming no risk premium- can be expressed in the following form,

$$F_t = E_t (e_{t+1}/I_t) \quad (12)$$

where E_t denotes the conditional expectation of the e_{t+1}, given the information set, I_t available to all economic agents at time t [6]. e_{t+1} is the natural logarithm of the spot rate at time t+1, and F_t is the natural logarithm of the forward rate at time t.

One of the most important implications of the monetary model is that the exchange rate market is efficient. This implication is made possible through the last eight equations in which the possibility for a trader to earn excess returns to speculation is eliminated. For example, interest parity eliminates excess returns from asset arbitrage since real returns from domestic and foreign assets are equalized; PPP eliminates excess returns from commodity arbitrage since same goods have the same price in domestic and foreign countries; the Fisher equation eliminates excess return from intertemporal arbitrage in commodities; and the assumption of rational expectations eliminates excess returns from marketing of information and exchange speculation (Bilson, 1978).

Fama (1965) stated that an efficient market consists of a large number of rational and profit maximizing economic agents who compete with each other to predict future values of individual securities, and most importantly, where current information is freely available to all participating economic agents. Applied to the foreign exchange market, expectations concerning future exchange rates should be incorporated and reflected in forward exchange rates, while the spot exchange rates reflect all currently available information. This relationship is expressed in equation (12).

The equation (12) is estimated in the following form,

$$e_t = \alpha_t + \beta_t F_{t-1} + u_t \quad (13)$$

where α and β are time invariant parameters and u_t is an error term. Frenkel (1981) argues that the notion of the efficient exchange rate market implies that the forward rate is an unbiased predictor of spot exchange rates, then the constant term in equation (13) should not differ significantly from zero, and the coefficient on the one-period lagged forward rate, β, should not differ significantly from unity. It is also assumed that the residuals in equation (13), u_t, contains no information; hence, it should be serially uncorrelated.

Chiang (1988) estimates equation (13) using monthly exchange rate data over the period January 1974 to August 1983. He applies seemingly unrelated regression and OLS techniques to the Canadian dollar/US dollar,

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[6] If it is assumed that economic agents are risk averse; the forward rate may also contain a risk premium, RPt. In this case, equation (12) can be expressed as $F_t = E_t (e_{t+1}/I_t) + RPt+1$.

French frank/US dollar, German mark/US dollar, and British pound/US dollar exchange rates. Even though his empirical analysis supports the unbiased forward rate hypothesis for the four markets, the results of Brawn-Durbin-Evans (1975) and the Chow tests do not confirm that α and β are constant coefficients. Furthermore, the results of pint rolling regressions reject the unbiased forward rate hypothesis. He concludes that the parameters α and β are very sensitive to new information and vary throughout the sample periods and therefore, the forward rates are imprecise predictors of future spot rates.

Edwards (1983) argues that the observed strong dependence of exchange rates on expectations implies that changes in expectations, induced by uncertainties, announcements, and news, are the only causes of fluctuations in exchange rates. Furthermore, since the information which causes revision of expectations should be newly arrived, the resulting movements in exchange rates can not be predicted by lagged forward exchange rates, F_{t-1}, which are based on past information. Therefore, the lagged forward rates cannot be considered precise forecasts of future spot rates.

The studies of exchange rate determination focus on the effects of anticipated and unanticipated movements in the exogenous variables on exchange rate behavior [i.e. Dornbusch (1978), Mussa (1979), Frenkel (1981), and Frenkel and Mussa (1980)]. Since only unanticipated movements in the exogenous variables can cause unexpected movements in the exchange rate, news (i.e., new information) has been indicated as a predominant cause of exchange rate fluctuations [7].

Assumption of covered interest parity guarantees that in international markets, a single price should prevail for securities or assets that the same risk and liquidity characteristics should yield the same return in equilibrium. Combining covered interest parity, $(i-i^*)=F_t-e_t$, equation (12), and (5), equation (5) can be rewritten as,

$$e_t = z_t + \varepsilon\,[E(e_{t+1}) - e_t] \tag{14}$$

where $z_t = (m - m^*) + \psi(y-y^*)$. By collecting terms:

$$e_t = [1/(1+\varepsilon)]\, z_t + [\varepsilon/(1+\varepsilon)]\, E(e_{t+1}) \tag{15}$$

Equation (14) indicates that the spot rate is determined by current economic variables such as z_t, which consists of relative money supplies, relative real incomes, and expected spot rates in next period. It is evident from (14) and (15) that previous periods expected spot rates will depend on

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[7] See, for example, Frenkel (1981), Isard (1981), the essays collected in Frenkel and Johnson (1978), Dornbusch (1980), and Chiang (1988).

the expected spot rates of subsequent periods. For example, E (e_{t+1}) will depend on E (e_{t+2}); E (e_{t+2}) will depend on E (e_{t+3}), and so on. Applying the forward iteration, we reach the following equation [8].

$$e_t = [1/(1+\varepsilon)]\sum [\varepsilon /(1+\varepsilon)]^c E (z_{t+c}) \quad (16)$$

Equation (16) states that the current spot rate is determined by a discounted sum of expected future changes in the z_{t+c} 's. In other words, the current exchange rate reflects all the relevant information. Alternatively, equation (16) states that changes in exchange rates can be explained by unanticipated events or news, (i.e., news concerning about unexpected changes in real income or money supply).

In most of the empirical studies, equation (16) is estimated in the following form,

$$e_t = \alpha_t + \beta_t F_{t-1} + \text{news} + u_t \quad (17)$$

and test the joint hypothesis that $\beta=1$ and the coefficient of news is significant. In equation (17) the spot rate, e, at time t is expressed as a function of factors indicated by the lagged forward rate that is the expected exchange rate component, as well as a function of the news consisting of unexpected events. However, it is hard to identify the variable measures the news. The next section focuses on this subject and gives several examples of empirical studies in which the role of news in determination of exchange rate movements are tested.

3. THE EMPIRICAL STUDIES OF MONETARY MODELS IN THE FRAMEWORK OF NEWS

The econometric modeling of news into the exchange rate determination is hard since it involves measurement of unanticipated events. Therefore, tests of these kind of models are generally joint tests of the specification of the anticipated and unanticipated parts of the events and the validity of the model.

Frenkel (1981) states that it is difficult to identify the variable that measures the news. Frenkel uses unanticipated changes in the term structure of interest rates as news, because it is convenient to examine the relationship between exchange rates and unanticipated changes in the term structure of interest rates whose time series is likely to precisely manifest the news. He estimates equation (17) in the rewritten form,

$$e_t = \alpha + \beta F_{t-1} + \rho[(i-i^*)_t - E_{t-1}(i-i^*)_t] + v_t \quad (18)$$

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[8] The algebraic form of equation (16) is adopted from Levich (1985).

where $\alpha+\beta F_{t-1}$ is the expected exchange rate; $[(i-i^*)_t - E_{t-1}(i-i^*)_t]$ is the news measured from the innovation in the 1-month interest differential; and where $E_{t-1}(i-i^*)_t$ indicates the expected interest differential in period t, formed based on the information at t-1. He computes the expected interest rate differential, $E_{t-1}(i-i^*)_t$, as

$$E_{t-1}(i-i^*)_t = a + b\,(i-i^*)_{t-1} + c\,(i-i^*)_{t-2} + d\,F_{t-1} + n_t \qquad (19)$$

where F_{t-1} is the natural logarithm of the forward exchange rate at t-1. Then he estimates equation (18) for three exchange rates -US dollar/British pound, US dollar/French Franc and US dollar/German mark- over the period of June 1973-July 1979 by applying the 2SLS method.

Frenkel argues that the relationship between exchange rates and interest rates are most likely to be positive since most of the variations in nominal interest rates can be explained by variations in inflationary expectations. His interpretation fits the prediction of the monetary approach that states that in the inflationary environment of the 1970s, the unexpected interest differential reflects news about inflationary expectation. Hence, the coefficient ρ in equation (18) is most likely to be positive. For example, according to the monetary approach, in an inflationary environment a rise in the domestic interest rate, which is primarily due to inflationary expectations, leads to a decline in demand for domestic currency. The higher domestic prices can be maintained only through a depreciation of its currency, since the domestic price level is linked to the foreign price level through PPP (assuming foreign price level is fixed). While the news coefficient was significant only for the US dollar/British pound exchange rate, Frenkel found that all the estimated news coefficients for three exchange rates had the positive signs predicted by the monetary approach of exchange rate determination.

However, it is evident that there is some ambiguity about the sign of ρ in equation (18). Since in a non-inflationary environment a rise in the relative domestic interest rate leads to an appreciation of domestic currency, i.e., a lower spot exchange rate, and hence, ρ is likely to be negative. This mechanism may operate through a higher forward premium to compensate for a rise in domestic interest rates and covered interest parity.

Frenkel concludes that the monetary approach of exchange rate determination indicates that news is one of the most important factors which influence movements in exchange rates. His key finding is that movements in exchange rates can be explained by unexpected changes in interest rates. This implication is coincide with the prediction of the monetary approach that spot exchange rates incorporate current expectations about the future and arrival of new information or news leads to revision of expectations concerning spot exchange rates. This is in turn reflected in changes in spot

exchange rates. Therefore, lagged forward rates are imprecise forecasts of future spot rates. Dornbusch (1980) uses unexpected changes in current account and real output as a measure of news to explain movements in exchange rates. He defines the actual rate of depreciation as the sum of the anticipated depreciation, which equals the nominal interest differential, i-i*, and the effect of news, which is given by the difference between the actual and anticipated depreciation. This is the same form of interest parity and stated as,

$$x = (i-i^*) + (x- \chi) \qquad (20)$$

where x and χ denote actual and anticipated depreciation, respectively. He defines unanticipated depreciation as the difference between the actual depreciation and the interest differentials, x - (i-i*). Thus, the equation (20) becomes,

$$x - (i-i^*) = [\alpha_o + \alpha_1 CAE + \alpha_2 CYC - \alpha^*_3 CYC^* + \alpha_4 INN] \qquad (21)$$

where CAE, CYC, and INN denote the news about the current account, cyclical movements or unanticipated growth in real output, and interest rates, respectively. α_0 is expected to be zero if there is no risk premium. In equation (21), Dornbusch measures unanticipated depreciation for the US dollar/Japanese yen and US dollar/German mark exchange rates between 1973-1979. An unanticipated surplus in the Japanese current account depreciates the dollar. On the other hand, an unanticipated growth in the real output depreciates the yen. Both the coefficients of CAE and CYC are found to be significantly different from zero and they explain most of the unanticipated depreciation in the dollar/yen exchange rate. However, the evidence from empirical findings of the dollar/mark exchange rate show that unanticipated movements in the dollar/mark exchange rate are not dominated by news about unanticipated changes in current account or real output growth. Even though unanticipated changes in the current account of Germany depreciate the value of dollar, the coefficients of CAE and CYC are not significant.

Edwards (1983) points out that the behavior of exchange rates is affected by new information made available to economic agents in every period. He investigates the role of new information to explain the fluctuations in exchange rates and the relationship between the exchange rate market efficiency and new information. He agrees with Frenkel that the lagged forward exchange rates are imprecise forecasts of future spot rates. Starting from this point, he establishes a model for e_t and F_{t-1} to figure out the way to state the market forecasting error, $e_t - F_{t-1}$. $e_t - F_{t-1}$ is the difference between the spot rate and the forward rate in period t-1, existing because of unanticipated changes in exchange rates determinants (i.e., real income,

nominal interest rate and money supply), or news. Thus, he estimates the following equations by applying OLS and seemingly unrelated regression (SURE) techniques for the British pound/US dollar, French franc/US dollar, German mark/US dollar, and Italian lira/US dollar rates:

$$et+1 = Ft + [v\ t+1 + (1/1+b)\ n\ t+1 - (1/1+b)\ w\ t+1 - (a/1+b)\ u\ t+1 - v^*\ t+1 + (1/1+b^*)\ n^*\ t+1 - (1/1+b^*)\ w^*\ t+1 - (a^*/1+b^*)\ u^*\ t+1] \quad (22)$$

where v_{t+1} denotes news about a permanent increase in the domestic quantity of money in period t+1; n_{t+1} denotes news about a temporary increase of the quantity of money at home in period t+1; w_{t+1} is news about unexpected real shocks on income at home in period t+1; and u_{t+1} is news about unexpected changes in the real interest rate in home in period t+1 [9].

Equation (22) states that the difference between the future spot rate, e_{t+1}, and the forward rate can be stated by the news about unanticipated changes in real income, money, and real interest rates, shown by the terms in square brackets. The second equation is the general equation that is used in most empirical works to test the efficiency of the exchange rate market.

$$e_{t+1} = a + b_{Ft} + \varepsilon_{t+1} \quad (23)$$

where the forward rate in t is assumed to be an unbiased predictor of e_{t+1}; a=0; b=1; and ε_{t+1} is a white noise process.

Since empirical results have not been supportive of the market efficiency hypothesis, Edwards follows a different route by stating ε_{t+1} as a linear function of unanticipated changes of domestic and foreign monies, domestic and foreign real incomes, and of unanticipated changes in domestic and foreign real interest rates.

Equation (23) can be rewritten in the following form,

$$e_{t+1} = a + b_{Ft} + [\alpha_0 v_{t+1} + \alpha_1 u_{t+1} + \alpha_2 w_{t+1} + \alpha^*_0 v^*_{t+1} + \alpha^*_1 u^*_{t+1} + \alpha^*_2 w^*_{t+1}] \quad (24)$$

where v_{t+1}, u_{t+1}, w_{t+1}, v^*_{t+1}, u^*_{t+1} and w^*_{t+1} are forecasting error terms from the monies, real income and real interest rates equations, or news about the unexpected changes in aforementioned variables.

First, he estimates equation (23) by applying OLS to test the market efficiency hypothesis. The efficient exchange rate market hypothesis is rejected for the French franc/US dollar and Italian lira/US dollar rates while it is accepted for the British pound/US dollar and German mark/US dollar rates. Afterwards, he estimates equation (24) using SURE. The efficiency market hypothesis is accepted in the case of lira/dollar, pound/dollar, and mark/dollar rates while, as in the OLS case, it is rejected for the franc/dollar

[9] '*' indicates foreign country.

exchange rate market. Furthermore, Edwards estimates values of the α's, parameters of the news component of the exchange rate forecasting error. Only in eight of twenty-four cases does the α's have the expected signs. He concludes that the difference between the actual spot rate and the expected future spot rate determined in the previous period can be explained by news. Therefore, the inclusion of news into market efficiency tests highly improves the power of these tests. His findings support the previous findings of Dornbusch (1980) and Frenkel (1981) that new information has an important role in explaining observed market forecasting errors.

Hoffman and Schlapenhauf (1985) estimate several exchange rate models -flow, monetarist, and portfolio balance - using both quarterly and monthly data between 1973 -1981. These models are estimated for the US dollar/French franc, US dollar/British pound, US dollar/German mark, and US dollar/Japanese yen exchange rates to evaluate the role of news in exchange rate fluctuations. The news is determined as unexpected changes in relative money supplies, real incomes, interest rate differentials and inflation differentials. The unexpected changes of variables are defined as the differences between actual and expected values of variables. Both quarterly and monthly period estimates indicate that unanticipated changes in relative money supplies do not have very important role in explaining exchange rate fluctuations. The coefficients are generally statistically insignificant and with wrong signs. In the quarterly period estimates, unanticipated changes in relative incomes are the most important variable in explaining fluctuations in dollar/franc, dollar/pound, and dollar/mark exchange rates. In the monthly period, the unanticipated changes in real interest rate differentials successfully explain fluctuations in mentioned exchange rates.

Hardouvelis (1988) applies event study approach to measure the role of news, such as announcements of macroeconomic series, in explaining the fluctuations in the US exchange rates vis-à-vis to German mark, Japanese yen, Swiss franc, British pound, French franc, Canadian dollar, and Italian lira. He estimates following equation,

$$e_t = a_o + \sum_i a_i X^n_{it} + v_t \qquad (25)$$

where e_t denotes the percentage change in the exchange rate at time t; X^n_{it} is the unanticipated component of the economic series of X_i. X_i is computed using survey forecasts. The independent variables are M1, nonborrowed reserves (RES), discount rates (DISC), surcharge rates (SUR), consumer price index (CPI), producer price index PPI, unemployment rate (UN), industrial index (IP), personal income (PI), orders of durable goods (DG), index of leading indicators (LI), retail sales (RS), consumer installment credit (CC), housing starts (HS), and trade deficit (TD). The period for the empirical test is from October 1979 through August 1984. His empirical

findings show that four monetary variables, M1, RES, DISC, and SUR, are very powerful to explain fluctuations in all the exchange rates tested. For example, the dollar appreciates after an unanticipated increase in M1, depreciates after announcements about reserves, Federal Reserve discount and surcharge rates. An unanticipated change in PPI leads to an appreciation in the value of the dollar. On the other hand, the significant effect of the announcements of the UN, PI, DG, and RS are present only after the announcements. The announcements of the IP, LI, CC, HS, and TD do not have any significant role in explaining fluctuations in all the exchange rates tested.

Klein et al. (1991) also apply an event-study approach to determine the response of exchange rates to unexpected changes or news in the US trade balance. They use daily data on US dollar exchange rates vis-à-vis the German mark and Japanese yen over the period 1980 to 1988. The difference between the official monthly values and forecasts developed by the money market services is measured as news about the trade balance. Their empirical estimates indicate that before the Plaza Agreement (September 1985) where industrial countries agreed to actively manage exchange rates, the unexpected changes in trade balance did not have a significant role in explaining the fluctuations in dollar exchange rates, whereas after the agreement unexpected changes in trade balance did lead to fluctuations in dollar exchange rates.

Engle et al. (1990) accept a different approach that tests the effect of country specific news on the conditional volatility in the subsequent markets [10]. They conclude that the Tokyo news, is measured by intervention of Bank of Japan, has the most important role in explaining volatility spillovers of the Japanese yen/US dollar exchange rate. While this effect is strong in the short run, it dies out gradually.

Dominguez (1999) investigates the role of the intervention operations performed by the G-3 central banks, namely Federal Reserve Bank of the USA (FED), Bank of Japan, and Bundesbank, on both the level and volatility of exchange rates. In particular, she focuses on the reaction of the foreign exchange market at the moment that central bank intervention and/or macro announcements are made public. She uses an event-study methodology and intra-daily FXFX (Olsen and Associates) data. The empirical findings show that whenever the FED intervenes in the US dollar/German mark and US dollar/Japanese yen markets, this intervention plays a significant role in intra-day returns and in volatility in these markets. Similarly, the interventions by Bundesbank and Bank of Japan also affect the intra-daily US dollar/German mark and US dollar/Japanese yen volatility.

[10] Engel et al. apply test to Tokyo, Europe, New York, and Pacific markets.

She concludes that central bank intervention news is regarded as fundamental information by market participants and thus affects dealer inventories. Her empirical evidence clearly supports the idea that the news has a significant role in the volatility of exchange rates.

Almeida et al. (1998), using high frequency exchange rate data, study reaction of the DEM/USD exchange rate to macroeconomic news emanating from both U.S. and Germany over the period 1.1.1992 to 31.12.1994. They find that the most announcements have significant impacts on the exchange rate change in the 15 minutes post-announcement.

Evans and Lyons (2003) investigate whether any part of the effect of macroeconomic news on exchange rates is transmitted via signed transaction volume (order flow). They find that at least half of the effect of macroeconomic news on DEM/USD exchange rate is transmitted via order flow.

4. CONCLUSION

The important role of news or unanticipated events in explaining fluctuations in exchange rates has been suggested by Mussa (1979), Dornbusch (1980), Frenkel and Mussa (1980), Frenkel (1981), Edwards (1983), and Hoffmen and Schlagenhaug (1985). In general, these researchers find that news is a significant factor in explaining exchange rate behavior, but not for every country. In these studies, news is measured in only a limited number of variables, such as foreign and domestic interest rates, money supplies, and incomes or output levels. Since the monetary approach defines the exchange rate as relative supplies and demands of two currencies in the two countries, any variable that can alter money supplies or demands of foreign and domestic countries may be considered as a determinant of exchange rates within a news framework. Therefore, later empirical studies [i.e., Hardouvelis (1988), Klein et al. (1991)] include other variables such as trade balance, nonborrowed reserves, discount rate, unemployment rate, industrial index, and personnel income to measure news. Such empirical findings support news framework.

In conclusion, it is evident that the monetary approach to exchange rate determination is successful in characterizing the types of news that should affect exchange rate movements, but there has been little attention paid on how new information is incorporated by the foreign exchange market participants. Dominguez (1999), for instance, finds out that central bank interventions are regarded as fundamental information by market participants and affect the dealer inventories. Evans and Lyons (2003) attain that at least half of the effect of macro news on exchange rates is via signed transaction volume (order flow). Thus, the future line of empirical work

might well focus on the microstructure of the foreign exchange market to determine role of news in explaining fluctuations in exchange rates.

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