Applied Financial Economics, 2005, **15**, 757–764

Routledge
Taylor & Francis Group

Third country news in the monetary model of the exchange rate

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With third country bonds added to the monetary model of exchange rate news, third country news would have a theoretical effect on exchange rate news. The present paper uncovers empirical evidence of third country (USA) news for a number of exchange rates. Further, insignificant income, interest rate, and inflation variables in the two country model become significant with third country news, suggesting model misspecification. The unexplained variance of exchange rates may not be due to speculative bubbles as supposed, and foreign exchange markets may not be as efficient as they have appeared.

I. Introduction

The recurring question of '... why monetary models of exchange rate determination cannot forecast much of the variations in exchange rates' is asked by Neely and Sarno (2002) who suggest there may be potential for monetary fundamentals in forecasting long run but not short run exchange rates. Their review of the empirical literature indicates that concern over model specification as a potential explanation of model weakness as in Meese and Rogoff (1983a, b) has given way to concern over time series properties of expectations and forecasting as in Chinn and Meese (1995), Mark (1995) and Rapach and Wohar (2002). Neely and Sarno recognize the potential failure of purchasing power parity and uncovered interest parity as well as unstable money demand, but attribute the shortcomings of the monetary model of the exchange rate to volatile expectations and irrational bubbles.

The present paper offers an alternative explanation, namely model misspecification by not including third country or 'outside' news. While not addressing the issue of extra sample forecasting per se, news concerning exchange rate determinants in a third country explains a significant portion of the future spot exchange rate not forecast by the forward rate in the present data set. Omitting third country news can generate errors or 'bubbles.' This result has implications for tests of market efficiency and models of expectations.

The following section reviews the monetary theory of exchange rates and shows that third country or 'outside' news is irrelevant with assets of only two countries. The third section allows agents to hold third country assets and expands the model to include several potential exchange rate determinants. The following section considers methodological issues, developing an *ex ante* measure of 'news' and three sets of joint hypotheses to test whether third country news has an effect. The penultimate section presents estimation results for third country (US) news, followed by a conclusion.

II. Exchange Rates and Third Country News

The monetary exchange rate model introduced by Frankel (1976) and Mussa (1976) has a foundation of money supply and money demand with the

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Applied Financial Economics ISSN 0960–3107 print/ISSN 1466–4305 online
http://www.tandf.co.uk/journals
DOI: 10.1080/09603100500108139

exchange rate as the relative price of one currency in terms of the other. The assumption in a world of two open economies is that asset holders hold domestic currency, domestic bonds and foreign bonds.

Money market equilibrium in country k is given by equality of the real money supply (M_k/P_k) with the demand for real money balances (L_k) as an increasing function of real income and a decreasing function of home and foreign nominal interest rates. In country k, the demand for money is written $L_k(Y_k,\ i_k,\ i_h)$ where $k \neq h$. Using Cagan (1956) money demand in double log form, money market equilibrium in country k is

$$m_k - p_k = a_k + \beta_k y_k - \gamma_{k1} i_1 - \gamma_{k2} i_2, \quad k = 1, 2, \quad (1)$$

where m_k is the natural log of the money supply in country k, p_k is the price level, a_k is a demand shift parameter, β_k is the income elasticity of money demand, y_k is the log of national income, and γ_{kh} is the semi-elasticity of money demand with respect to the interest rate in country h.

Purchasing power parity, $P_1 = E_{12}P_2$ where E_{12} is the exchange rate of currency 2 in terms of currency 1, is written in log form as $p_1 = e_{12} + p_2$ which combines with Equation 1 to imply

$$e_{12} = (a_2 - a_1) + (m_1 - m_2) + (\beta_2 y_2 - \beta_1 y_1) + \gamma_1 i_1 + \gamma_2 i_2 \quad (2)$$

where $\gamma_k \equiv \gamma_{1k} - \gamma_{2k}$, $k = 1, 2$. A lognormal stochastic disturbance $\exp(\varepsilon)$ with null mean and a constant variance σ^2 is added to Equation 2.

A currency depreciates due to a nominal money supply increase or income decrease. A higher interest rate in either country has an ambiguous effect on the exchange rate because it lowers demand for that currency by domestic residents but increases the demand of foreign residents who want to buy the currency in order to buy the higher yielding bonds. Money demand elasticities might be assumed identical across countries and interest rate parity might be assumed to hold, but these simplifications come at the cost of generality.

In a 'news' version of the model, economic agents form Muth (1961) rational expectations on future values of the spot rate. Forecasts into the more distant future are riskier. Consider an economic agent at the end of period $t-1$ (or the beginning of period t) with full knowledge up to and including period $t-1$, using all relevant information to form expectations for period t, $E_{t-1}(z_t) \equiv z_t^E$ for variable z.

Predictions of the exchange rate come from Equation 2,

$$e_{12}^E = (a_2 - a_1) + \left(m_1^E - m_2^E\right) + \left(\beta_2 y_2^E - \beta_1 y_1^E\right) + \gamma_1 i_1^E + \gamma_2 i_2^E + \varepsilon. \quad (3)$$

With an efficient foreign exchange market, this forecast will fully reflect all available information as developed by Fama (1970). The forward rate would summarize information on the future spot rate and systematic mistakes would be arbitraged away. The forward rate f is then an unbiased predictor of the future spot rate,

$$f_{12} = e_{12}^E \quad (4)$$

'News' is unanticipated information, the difference between an optimally forecast and actual variable. For variable z in country k, news is $z_k^* \equiv z_k - z_k^E$. Exchange rate news is $e_{12}^* = e_{12} - e_{12}^E = e_{12} - f_{12}$. Subtracting Equation 3 from Equation 2,

$$e_{12}^* = (m_1^* - m_2^*) + (\beta_2 y_2^* - \beta_1 y_1^*) + \gamma_1 i_1^* + \gamma_2 i_2^* \quad (5)$$

the model of Frankel (1979), Bomhoff and Korteweb (1983), Copeland (1984), and MacDonald (1985).

Money market equilibrium in a third country is

$$p_3 = -a_3 + m_3 - \beta_3 y_3 + \gamma_3 i_3 \quad (6)$$

and triangular arbitrage requires

$$e_{12} = e_{13} - e_{23} = (p_1 - p_3) - (p_2 - p_3) = p_1 - p_2 \quad (7)$$

equivalent to Equation 4. Activity in a third country affects money markets in countries 1 and 2 proportionately and outside news is a wash. Arbitrage implies $f_{12} = f_{13} - f_{23}$ and outside news has no effect on exchange rate news. Third country effects cancel each other, leaving the exchange rate unaffected and explaining why outside news has not been a focus of study.

III. Exchange Rates and Third Country Assets

Extend the model to include third country assets, with agents holding domestic money, domestic bonds, foreign bonds, and outside bonds. Analogous to Equations 1 and 2, money market equilibrium implies

$$p_k = -a_k + m_k - \beta_k y_k + \gamma_{k1} i_1 + \gamma_{k2} i_2 + \gamma_{k3} i_3, \quad k = 1, 2, 3 \quad (8)$$

and the exchange rate can be written

$$e_{12} = (a_2 - a_1) + (m_1 - m_2) + (\beta_2 y_2 - \beta_1 y_1) + \gamma_1 i_1 + \gamma_2 i_2 + \gamma_3 i_3 \quad (9)$$

Economic activity in the third country affects the exchange rate. The news version of the outside asset model is

$$e_{12}^* = (m_1^* - m_2^*) + (\beta_2 y_2^* - \beta_1 y_1^*) + \gamma_1 i_1^* + \gamma_2 i_2^* + \gamma_3 i_3^* \quad (10)$$

and third country interest rate news affects exchange rate news.

The third country money market mechanism suggests a potential influence of third country money supply and income news. Consider an unexpected increase in the money supply of country 3, expected to lower i_3. The expected increase in money demand in countries 1 and 2 would lower their price levels and unless their price levels fell proportionately, there would be an unexpected change in e_{12}. Unexpected changes in third country income would have similar effects. Empirical models of exchange rate news might include explicit third country variables, short of a general equilibrium model of the world exchange markets.

Consider the estimating equation

$$e_{12}^* = \alpha_0 + \alpha_1 m_1^* + \alpha_2 m_2^* + \alpha_3 m_3^* + \alpha_4 y_1^* + \alpha_5 y_2^* + \alpha_6 y_3^* + \alpha_7 i_1^* + \alpha_8 i_2^* + \alpha_9 i_3^* + \varepsilon \quad (11)$$

Comparing estimates of Equations 11 and 5 might provide insight into the question of whether ignoring third country news leads to biased or unreliable estimates.

Studies concerned with specifying the monetary model suggest the possibility of expanding the set of variables. The assumption that assets of different countries might not be perfect substitutes provides motivation for including outside news. Differences in liquidity, tax laws, default risk, political risk, and exchange risk motivate imperfect substitution. Unanticipated changes in the trade balance (B), the government budget deficit (D), the employment rate (R), and expected inflation (π) might affect the exchange rate either directly or via their effects on the money market. Expand the exchange rate news model by adding $z_k^* = z_k - z_k^E$ for $z_k = B_k$, D_k, R_k, π_k

If these variables are appropriate and not included, any conclusions concerning outside news would be subject to the misspecification criticism levelled at the two country model. These additional variables increase the likelihood that inferences concerning outside news are based on a more appropriately specified model.

IV. Methodological Issues in Estimating News

Deriving exchange rate news is straightforward. The literature has been clear for some time that the forward rate is not a particularly good forecaster but is unbiased. The difference between the future spot exchange rate and the forward rate is an unbiased measure of exchange rate news. Money supply, real income, and interest rate news are less straightforward.

One approach is to use univariate time series techniques such as ARIMA for the forecasts. Wold's theorem guarantees any stationary time series is composed of self deterministic and moving average portions. Difference each series sufficiently to attain stationarity. The Box-Jenkins procedure identifies the appropriate time series process, estimates its parameters, and tests its residuals to ensure white noise. News is the difference between these forecasts and actual values.

There are two general approaches to measuring news, ex post or ex ante. Measuring ex post is simpler but almost certainly misleading. To measure ex post, estimate an ARIMA model with data for the entire sample as in Edwards (1982a, 1982b), Hoffman and Schlagenhauf (1983), and McDonald (1983). This procedure generates news with the same time series parameters for the entire sample, implicitly assuming agents have information at the beginning of the period that could only be available at the end. Such an estimate does not mimic the decision process and erroneous measures during idiosyncratic periods are more likely.

An ex ante measure involves agents at the beginning of period t using knowledge of relevant economic data through period $t-1$ to form a forecast for period t. Begin with data through period $t-1$, estimate the time series process, check residuals to ensure they are white noise, and use the estimated model to forecast period t. The difference between this forecast and the actual value is ex ante news. To generate news for period $t+1$, repeat the process with data through period t. Continue until either the sample is exhausted, or the null hypothesis of white noise residuals is rejected. If the hypothesis of white noise residuals is rejected at iteration n, re-specify and re-estimate until white noise residuals are found. This 'ex ante Saurman' filter[1] allows parameters of the data generating process to change each period and allows the process to change when its forecasts cease to produce white noise residuals.

Data on each explanatory variable passes through a Saurman filter to generate ex ante news. Four models of e_{12}^* are estimated in linear form as in Table 1 with constants and error terms similar to Equation 11 with z_j^* representing a vector of additional variables (B_j^*, D_j^*, R_j^*, j^*).

[1] David Saurman first suggested this filter, and his recent unexpected passing deeply sorrowed all of his friends and colleagues.

Table 1. Estimated exchange rate news models

Model 1	m_1^*	m_2^*		y_1^*	y_2^*		i_1^*	i_2^*				
Model 2	m_1^*	m_2^*	m_3^*	y_1^*	y_2^*	y_3^*	i_1^*	i_2^*	i_3^*			
Model 3	m_1^*	m_2^*		y_1^*	y_2^*		i_1^*	i_2^*		z_1^*	z_2^*	
Model 4	m_1^*	m_2^*	m_3^*	y_1^*	y_2^*	y_3^*	i_1^*	i_2^*	i_3^*	z_1^*	z_2^*	z_3^*

Each of the models is estimated for each of the six exchange rates between the Canadian dollar ($C), British pound (£), German mark (DM), and Japanese yen (¥) using ordinary least squares (OLS). Triangular arbitrage implies only three independent exchange rates among these six currencies. If outside news affects ¥/£ and DM/£, for instance, it would have an implied effect on DM/¥. Each of the six exchange rates, however, are examined for that particular pair of countries assuming those residents hold bonds of those two countries as well as third country (US) bonds.

Quarterly data are from 1972 : 1 through 1991 : 2 on the money supply, industrial production as a proxy for income, interest rates, trade balances, government deficits, wholesale prices, and employment rates. This unique period covers the introduction of floating exchange rates prior to the euro, and includes the relatively unsettled 1970s and 1980s.

For each of the variables, the first 20 observations form initial forecasts, yielding a news sample of the remaining 58 observations. Table 2 summarizes generation of the news variables.

OLS produces reasonable results in terms of R^2 and Durbin–Watson statistics but ignores the error correlation implied by triangular arbitrage. Zellner's seemingly unrelated regressions (SURE) produce more efficient estimates but these results depend on which of the several three equation systems are considered. Zheng (1994) shows that OLS results are similar to SURE, and the present paper reports OLS estimates.

Three joint hypothesis tests examine the importance of third country news. One question is whether outside news affects exchange rate news in the traditional sense, a question addressed by an *F*-test of the joint significance of outside news coefficients in Model 2. The null hypothesis to be tested is

$$H_0: \alpha_3 = \alpha_6 = \alpha_9 = 0 \text{ vs } H_1: \alpha_3 \neq \alpha_6 \neq \alpha_9 \neq 0 \quad (12)$$

with Model 1 the restricted model and Model 2 the unrestricted model.

A second test is whether expanding the specification of money demand by adding variables that might affect real income or the interest rate would add explanatory power. An *F*-test of the joint significance of the additional explanatory variables addresses this question,

$$H_0: \alpha_{10} = \cdots = \alpha_{17} = 0 \text{ vs } H_1: \alpha_{10} \neq \cdots \neq \alpha_{17} \neq 0 \quad (13)$$

with Model 1 the restricted model and Model 3 the unrestricted model.

A stronger test of outside news uses Model 3 as the restricted model and Model 4 as the unrestricted model. The *F*-test of the joint null hypothesis is

$$\begin{aligned} &H_0: \alpha_3 = \alpha_6 = \alpha_9 = \alpha_{17} = \cdots = \alpha_{20} = 0 \text{ vs} \\ &H_1: \alpha_3 \neq \alpha_6 \neq \alpha_9 \neq \alpha_{17} \neq \cdots \neq \alpha_{20} \neq 0 \end{aligned} \quad (14)$$

on the parameters of Model 4. This is a stronger test than Equation 12 because it does not allow third country news to 'steal' significance from correlated but excluded money demand variables.

V. Estimates of the Third Country News Model

Estimates of news versions of the model do not find many significant explanatory variables, consistent with the literature. If forecasted portions of explanatory variables explain the exchange rate, news should be random. Insignificant news has been interpreted as supporting hypotheses of efficient markets and rational expectations. Edwards (1982a) provides an archetypical set of news results for four exchange rates, finding money supply news significant for franc/$ and DM/$, income news for £/$, and interest rate news for lira/$. Such results make it clear why there has been little success forecasting exchange rates. Accurate forecasts are unlikely if a substantial part of exchange rate is news, and if news cannot be explained.

Results for Model 1 in Table 3 do not differ substantively from Edwards (1982a) and if anything are weaker. No explanatory variables in any of the models are significant at the 5% level. Money supply news for $C/DM, income news for DM/¥, and interest rate news for DM/£ are significant at 10% levels. Such results imply rational expectations, efficient markets, and a lack of arbitrage potential.

Table 4 includes the third country (US) news in Model 2, a specification that amounts to adding news variables for the US money supply, income, and interest rates. All of the US news measures are significant at the 5% level and many at the 1% level in every model, with the exception of money supply news for £/$C and income news for $C/¥, significant at 10% levels. It is possible to explain some portion

Table 2. Forecasting time series processes

	US	CN	GE	JP	UK
m	AR(1)	AR(1) 73 AR(2)	AR(1) 30 AR(5)	AR(1) 41 AR(2)	AR(1)
i	AR(1) 51 AR(3)	AR(1) AR(4)	AR(1) 26	AR(4)	AR(1) 45 AR(4)
y	AR(1)	AR(1) 49 AR(4)	AR(1)	AR(1) 29	AR(1) AR(4)
B	AR(1)	AR(1) 30 AR(4)	AR(1)	AR(1) 51 AR(4)	AR(1) 55 AR(3)
D	AR(1) 64 ARMA(3, 3)	AR(1) 23 ARIMA(3, 3, 3)	AR(1) ARMA(2, 3)		AR(1) 25
R	AR(1)	ARMA(1, 3) 62 ARMA(2, 3)	AR(5)	AR(1)	AR(1)
π	AR(1)	AR(1)	AR(1)	AR(1)	AR(1)

Table 3. Two-country models

	¥/£	$C/DM	DM/¥	DM/£	$C/¥	£/$C
Intercept	−0.031	−0.359***	−0.005	0.284***	0.046**	0.056**
m_{CN}		2.073			0.0066	1.330
m_{GE}		7.522**	−0.049	−6.219*		
m_{JP}	0.311		−0.005		−1.046	
m_{UK}	−0.0007			−0.295		−0.9985
y_{CN}		−0.284			−4.498	−1.49
y_{GE}		−2.151	0.947	2.665		
y^{JP}	−0.348		−2.527**		0.7183	
y_{UK}	0.0638			−22.72		0.8242
i_{CN}		−0.008			0.0239*	0.0004
i_{GE}		−0.073	−0.0014	−0.058		
i_{JP}	−0.0096		−0.0058		−0.0163	
i_{UK}	0.0043			−0.067		−0.0005
R^2	0.45	0.34	0.27	0.46	0.35	0.47
DW	1.6	1.54	1.77	1.67	1.86	1.62

Note: *20%; **10%; ***5%; ****1%.

of exchange rate news with third country news. In the improved specification some of the previously insignificant variables have become significant, for example, interest rate news for ¥/£. The R^2 values rise on the order of 50%.

The final row of Table 4 presents calculated F-statistics for hypothesis tests. Critical values of the F-statistic with three numerator and 47 denominator degrees of freedom are 2.9 (5%) and 4.2 (1%). Third country news coefficients for DM/¥ and DM/£ are jointly significant at 5%, and 1% for the other models. Outside news has a significant impact on exchange rate news, a result with implications for models of market efficiency and arbitrage.

Table 5 reports estimates of Model 3 and the additional variables do not appreciably improve results. The other variables are insignificant except for inflation, two coefficients on the unemployment rate, and one on the trade balance (all 10%), The bottom row of Table 5 presents F-tests of joint significance of these additional variables, jointly significant at 10% for ¥/£, 15% for $C/DM, and at least at 5% in each of the other four models. Adding news on inflation is almost solely responsible.

Model 4 in Table 6 adds third country news to the expanded models, and results are less consistent than in Table 4. Two of the variables for money news, one for income news, and one for interest rate news are insignificant. Only one news coefficient on the US trade balance and none for the US government deficit or unemployment are significant. Four of the coefficients on US inflation news are significant at 5% and one of the remaining two is significant at 10%. The F-statistics for the joint hypothesis of US news variables are in the last row. The null hypothesis is rejected at the 1% level for each model, implying third country news is a determinant of exchange rate news.

Table 4. Third-country models

	¥/£	$C/DM	DM/¥	DM/£	$C/¥	£/$C
Intercept	−0.459	−0.127***	−0.016	0.106***	0.046**	0.056**
m_{CN}		1.114			1.196	0.617
m_{GE}		−4.512**	0.243	1.126**		
m_{JP}	1.385**		−0.017		−0.872	
m_{UK}	−0.241			1.114		−2.090
m_{US}	1.217****	2.891***	3.147***	−0.985***	−2.174****	−5.104**
y_{CN}		−0.4712			−1.751	−2.13
y_{GE}		0.894**	1.021	−1.687*		
y_{JP}	−1.416		−1.627**		0.175	
y_{UK}	0.647			0.982		0.415
y_{US}	2.041***	4.017***	3.181***	1.372***	2.171**	−1.783***
i_{CN}		0.019			0.0517	0.0012
i_{GE}		−0.001	−0.042	0.019		
i_{JP}	0.0181***		−0.0104		−0.0413	
i_{UK}	−0.0114			−0.0012		−0.875
i_{US}	0.102****	−0.035***	0.037***	0.095****	0.126***	0.890****
R^2	0.71	0.42	0.53	0.61	0.58	0.67
DW	1.86	1.74	1.97	2.07	1.89	1.82
F-tests	5.117****	4.286***	3.861***	4.113***	5.004****	6.14****

Note: *20%; **10%; ***5%; ****1%.

Table 5. Two-country extended models

	¥/£	$C/DM	DM/¥	DM/£	$C/¥	£/$C
Intercept	0.7841**	0.0208	0.9175****	0.3581****	0.1044****	0.2587
m_{CN}		0.2875			2.236**	0.845
m_{GE}		0.2711	1.175**	−5.8956**		
m_{JP}	1.204*		−0.0542		1.491*	
m_{UK}	−0.127**			0.117		−1.457*
y_{CN}		−1.258**			0.259	1.923
y_{GE}		−1.118	0.077*	−3.1021		
y_{JP}	0.108		−0.478		0.2523	
y_{UK}	−12.62			−1.369		6.478
i_{CN}		−0.0035			0.0022	0.0004
i_{GE}		−0.033*	0.1854	0.0008		
i_{JP}	0.0151		0.0194		−0.021*	
i_{UK}	−0.201			−0.3218		−0.0172
B_{CN}		−0.000005			−0.00002	−0.000001
B_{GE}		−0.000001	0.000005	0.00002**		
B_{JP}	−0.0000002		−0.000004		0.000006	
B_{UK}	0.000005			−0.000009		0.000006
D_{CN}			0.0055		0.0015	0.0476
D_{GE}			0.0006	−0.00001	−0.0019	
D_{UK}				−0.000005		0.000007
R_{GE}		0.3448		0.997		
R_{CN}		−0.7496			−0.033	−0.412
R_{JP}	4.951**		0.0005		5.41**	
π_{GE}		7.026****	4.152*	12.17***		
π_{CN}		−0.3037			−0.635	−1.025
π_{JP}	1.381		−1.793**		3.318***	
π_{UK}	0.235*			1.677		1.347***
R^2	0.64	0.53	0.48	0.66	0.57	0.61
DW	1.64	1.58	1.81	1.87	1.94	1.75
F-tests	$F^*(6,45)=1.9$	$F^*(8,40)=1.6$	$F^*(7,41)=3.6$	$F^*(8,43)=3.4$	$F^*(8,43)=3.7$	$F^*(8,45)=2.1$

Note: *20%; **10%; ***5%; ****1%.

Table 6. Three-country extended models

	¥/£	$C/DM	DM/¥	DM/£	$C/¥	£/$C
Intercept	0.3671**	0.1123	0.3698	2.0735	0.2104**	1.3895
m_{CN}		0.4764			2.6997**	−0.7824
m_{GE}		−1.2295**	3.3727***	10.163*		
m_{JP}	0.9607		−0.0176		−2.3149**	
m_{UK}	−0.3999***			−0.3217*		0.5712
m_{US}	1.587***	3.2798	0.8343***	3.7749	5.7923***	2.1578***
y_{CN}		−0.4379			0.2487	2.457
y_{GE}		1.6678	0.6407	−0.7547		
y_{JP}	−0.745		0.0588		0.1883	
y_{UK}	−18.455			6.5545		−5.8721
y_{US}	5.021***	8.849***	−1.0321**	5.477***	1.5048	2.843***
i_{CN}		0.00028			−0.0043	−0.0008
i_{GE}		−0.02024	0.0219	0.054		
i_{JP}	0.0253		0.0096		−0.0336***	
i_{UK}	−0.0137			−0.025****		−0.0072
i_{US}	−0.0075***	0.0745***	0.002****	−3.775****	−0.0449****	0.0048
B_{CN}		0.000009			−0.000016	−0.0000024
B_{GE}		−0.000008	0.000006	0.000008		
B_{JP}	0.000008		−0.000002		0.000071	
B_{UK}	−0.000018			−0.000001		0.000003
B_{US}	0.000005	−0.000005	0.0003***	0.000009	−0.000003	−0.000007
D_{CN}		0.068			0.1374**	0.0257
D_{GE}		0.0009	−0.00026	0.00053		
D_{UK}				0.000007		0.00035
D_{US}	−0.00017	−0.0003	0.00029	0.00058	0.0002	0.00028
R_{GE}		0.2533		0.3161		
R_{CN}		0.2532			−0.2371	−0.721
R_{JP}	−6.3769		0.0012		7.132**	
R_{US}	−0.0002	−3.5265	0.0004	1.386	−3.088	2.784
π_{GE}		7.9526**	8.567**	5.924**		
π_{CN}		−1.3192			−1.085	−1.531
π_{JP}	2.7282		−2.531		3.014**	
π_{UK}	−0.5728			−0.177		0.8542
π_{US}	−14.325***	3.948***	7.842**	−23.284***	2.3875	3.124***
R^2	0.65	0.74	0.59	0.57	0.64	0.68
DW	1.87	1.94	2.01	1.82	1.79	1.86
F-tests	$F^*(7,34)=4.7$	$F^*(7,36)=4.6$	$F^*(7,35)=3.9$	$F^*(7,35)=4.1$	$F^*(7,35)=3.9$	$F^*(7,35)=6.6$

Note: *20%; **10%; ***5%; ****1%.

VI. Conclusions

The present paper finds third country news affects exchange rate news in monetary exchange rate models, implying misspecification in models limited to two countries. The influence of third country or outside news suggests the market for information may not be fully efficient. Whether expectations are rational, exchange markets are efficient, and there is short run arbitrage profit potential appear to be open questions.

Regarding forecasting with monetary fundamentals, the present study does not explicitly consider extra sample forecasting but suggests an explanation for forecast error. Additional country factors might improve short term forecasting in monetary exchange rate models.

Results on additional macroeconomic variables are mixed. News on expected inflation may be significant but other additional variables do not contribute to exchange rate news. Re-specification of the monetary exchange rate model does not improve its forecasting ability.

The conclusion is that third country news can explain a portion of the previously unexplained component of exchange rate news. There would appear to be potential for arbitrage profit, and models of exchange rate news should include news about major third countries.

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