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Is the EMS a DM Zone? — Evidence from the Realignments*

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Abstract: Most analysis of the relative importance of different countries in the EMS has focused on the interaction of monetary policies. This paper addresses more directly the interdependence of exchange markets. Guided by the desire to know to what extent developments in one EMS country can influence the value of another's currency, we look at exchange rate movements around realignments. We find no evidence of a systematic effect of realignments on the US dollar/DM rate, while the US dollar value of other currencies has clearly changed as a result of the realignments. Furthermore, realignments have tended to influence the forecastability of the US dollar/DM rate less than that of other EMS currency/dollar rates. We conclude that the realignments provide no evidence against the proposition that the DM is a dominant currency, and that movements in the other member currencies have little effect on the external value of the DM. In this limited sense, we maintain that the EMS is a DM zone.

I INTRODUCTION

The question of the relative importance and independence of participant members in the European Monetary System has both theoretical interest and practical, political importance. By joining the EMS, have countries subordinated their monetary policy to that of Germany? Are the movements of their currencies now entirely determined by those of the DM?

Clearly there are a number of different aspects to this question. One important one, to which much attention has been paid in the literature, relates to monetary policy, and to the market and political pressures placed on member countries to align their monetary policies. Our focus is on market pressures rather than on political ones, and on the market interaction between the currencies rather than on policy effects. While it is clear that German monetary policy actions influence monetary and exchange market conditions in other member currencies, is the converse true? Does, say, Danish or Irish monetary

*The views expressed should not be taken as those of the World Bank. We received helpful comments from the referees.

policy influence the US dollar/DM exchange rate, for example? If such causality from other members to the DM is weak, then one may say that the EMS is a DM zone.

The question of DM dominance has been approached from a variety of different perspectives by various authors. Starting from the stylised fact of reduction in and convergence of inflation rates among EMS countries, Canzoneri and Gray (1985) and Collins (1988) have worked within a game-theoretic framework to provide *a priori* restrictions on policy interactions consistent with this fact.[1] They found that the EMS will be deflationary if Germany leads by setting monetary policy, while the others subordinate their monetary and fiscal policy in order to maintain a fixed exchange rate system.

Melvin (1985) found empirical evidence for the presence of currency substitution in Western Europe. In demand for money equations he used a "monetary quality index", based on moving inflation prediction errors for each currency rather than foreign interest rates. Currency substitution was strongest in the demand for DM, a fact which he thought might explain why Germany had been the leader of the EMS movement.

Giavazzi and Giovannini (1986) observed that movements in the DM value of other EMS currencies have been associated with fluctuations in the US dollar, and that realignments of the EMS occurred after sharp changes in the value of the dollar.[2]

The approach of this paper, like that of Giavazzi and Giovannini, is to look at the exchange rates themselves, and in particular at the realignments. We start with the assertion that, if the EMS is a DM zone, then the movements of the DM against third currencies will hardly be influenced by exchange market conditions in other EMS countries.

Long-term movements in the value of other EMS currencies against the dollar have not followed the dollar/DM rate in the ten years of operation of the system (Table 1). The cause of this divergence has been, of course, the size and direction of the relatively frequent realignments. But even between realignments there have been notable divergences in the dollar movements of the different currencies. The typical pattern has been for a downward realigning currency to move to the top of its band of fluctuation[3] immediately following a realignment; subsequently the currency moves lower in the band. The opposite is true of an upward realigning currency. Even for those members observing 2.25 per cent margins of fluctuation, this offers the potential of a 4.5 per cent shift in bilateral exchange rates of member currencies even between realignments.

1. Note, however, that a convergence of disinflation also occurred among non-EMS currencies (cf. Ungerer, *et al.* 1986).

2. Giavazzi and Giovannini emphasised the role of exchange controls in the operation of the EMS.

3. Cf. Honohan (1979).

Table 1: *Features of EMS Exchange Rates March 1979 to July 1988*

	DM	*FF*	*Lit*	*DG*	*BF*	*DK*	*IRL*
US $ values:							
% Change	0.6	-37.0	-48.1	-3.6	-27.2	-29.6	-33.5
Ratio max/min	2.19	2.65	2.75	2.21	2.52	2.44	2.42
Coeff. variation	0.195	0.252	0.253	0.201	0.247	0.228	0.225
DM values:							
Ratio max/min		1.49	1.73	1.05	1.33	1.40	1.46
Coeff. variation		0.135	0.159	0.013	0.102	0.086	0.119

With such large bilateral exchange rate movements occurring in practice, it is not surprising that previous analysts have not looked to exchange rate movements as defining the DM dependence of the system. Is there any sense, then, in which movements in the third currency values of member currencies could reveal a dominant role for the DM?

One possibility is that the large exchange rate movements around the time of realignments could reveal a pivotal role for the DM. Thus, with bilateral rates between member currencies moving sharply immediately after a realignment, a dominant currency would expect to experience less US dollar variability after the realignment than the other currencies. In other words, a realignment would have no predictive power for the US dollar/DM rate, but it would have predictive power for the rate against currencies which had realigned against the DM.

In this paper we explore essentially this hypothesis: it seems to capture an important aspect of what people have in mind when they speak of the dominant role of the DM. However, it is clear that other aspects, such as whether the German monetary authorities take the considerations of other member countries into account when they formulate monetary policy, are not covered by our analysis.

The paper is organised as follows: Section II outlines a simple theoretical framework in which our hypothesis can be formulated. After all, many commonly used, but oversimplified, models assume away the kinds of interaction between different markets which is central to our hypothesis. It is desirable to have a model of currency substitution within which the hypothesis of our analysis can be expressed as a special case.

The remaining sections look at the realignments to see to what extent DM dominance has prevailed: Section III at exchange rate levels and Section IV at prediction error variances. Section V provides some concluding remarks. Our conclusions are that (i) in terms of their effect on the US dollar value of EMS currencies, realignments chiefly affect currencies other than the DM and (ii) in terms of their effect on forecast error variance (of the US dollar values), realignments tend to increase forecast errors more for currencies other than the DM. To this extent, the EMS behaves like a DM zone.

II THEORETICAL FRAMEWORK

Some commonly used formal models of exchange rate determination are not really well suited to considering realignments in a multi-currency system especially when they do not allow a role for short-run policy in affecting exchange rates. Therefore it may be useful to sketch the outlines of a simple theoretical framework which guides the formulation of our econometric analysis. It is based on the notion idea of investors' preferred habitats. The hypothesis of DM dominance represents a special case of this model.

2.1 *A Model*

Each currency has its own particular usefulness in the portfolio of agents. While it is possible to buy and sell currencies, this has some cost. Furthermore, neither exchange rates nor domestic purchasing power is certain, nor do exchange rate movements perfectly compensate for changes in domestic purchasing power. Thus, depending on the currency denomination of future purchases, each agent will have a preferred currency mix for his portfolio of liquid assets. This transactions and precautionary motive for holding different currencies is moderated by the pure investment or speculative motive, so that agents can be lured from their preferred habitat by higher expected rates of return.

The rate of return on a currency holding includes not only the explicit interest rate on this holding[4] but also the expected capital value change. More formally, the one period rate of return on a currency i may be written as

$$y^i_t = r^i_t + (s^i_t - s^i_{t-1}), \qquad (1)$$

where r is a real rate of interest (measured for each currency in terms of a common basket) and s is the log of the real exchange rate (in terms of the same basket).

The preferred habitat model can be represented in a simplified form by a demand function for real currency of the form:

4. Currency holding in this context include not only fiduciary issue, but all financial liabilities whose value is fixed in terms of fiduciary issue. Thus interest bearing government bonds, for example, are included; hence the relevance of interest rates.

$$x^i_t = x^i(y_t) + u^i_{1t},^5 \tag{2}$$

where x^i_t is the log of real balances of currency i at time t and y represents the vector of all the y^is.

We will model the quantity of each currency as evolving over time with systematic differences in the average rate of expansion. The interest rate paid on assets denominated in the currency will be supposed to be under the control of the authorities, at least in the short run, with some tendency to converge to a world level. Thus, suppose the (log of the) nominal supply of currency to be given by z^i_t, a process which evolves according to the random walk with drift:

$$z^i_t = z^i_{t-1} + b^i + u^i_{2t}. \tag{3}$$

Further, suppose the real interest rate to be subject to stochastic, but transitory deviations from a long-run value r^*, the same for each currency:

$$r^i_t = r^* + c^i.(r^i_{t-1} - r^*) + u^i_{3t}. \tag{4}$$

Here $0 < c^i < 1$, and the u's are serially uncorrelated disturbance terms with mean zero.

The disturbance term in Equation (3) represents a long-term or permanent shift in the expected supply of the currency, and can be thought of as summarising exogenous structural factors influencing the market for the currency. In contrast, the conservative properties of Equation (4) ensure that a disturbance in that equation will only have temporary effect. This disturbance u_3 summarises the role of short-run policy, including steps taken by the authorities to support the intervention limits.[6]

The equilibrium value of each currency is determined by imposing the supply equals demand condition (bearing in mind that the terms are in logs and that s is the price that converts nominal currency z into real currency x):

$$z^i_t + s^i_t = x^i_t. \tag{5}$$

Doing so leads to a difference equation in the exchange rate s^i which can be solved uniquely for the current exchange rate only by the imposition of an end-point or transversality condition ruling out bubbles.

5. With some gain in simplicity, we ignore the stochastic term in this equation in the remainder of the section. It could be included without affecting any conclusions.

6. The model is very stylised and simplified: thus in reality temporary steps to defend the currency might in practice involve intervention purchases of currency on the foreign exchange market; in the model all temporary policy is consigned to the interest rate equation.

If considerations of covariance between currency returns are irrelevant to the process of currency demand and that only expected returns matter[7] – then the vector demand function $x = (x^i)'$ can be taken as linear in the returns y:

$$x = A_0 + A_1.y,$$

and the difference equation to be solved is a linear one:

$$s_t = (I + A_1)^{-1} [A_0 - z_t + A_1 r_t + A_1 s_{t+1}].$$

Imposing a no-bubble condition[8] and bearing in mind the evolution of r and z, the solution for the current exchange rate vector may be written:

$$s_t = D_1 (r_t - r^* e) - D_2 z_t + D_3, \qquad (6)$$

where e is the unit vector and

$$D_1 = (I + A_1)^{-1} [I - (I + A_1)^{-1} A_1 C]^{-1} A_1,$$
$$D_2 = (I + A_1)^{-1} [I - (I + A_1)^{-1}]^{-1},$$

and $$D_3 = (I + A_1)^{-1}.D_2.b + D_2.[A_0 + r^* e],$$

with $C = \text{diag} \{c^i\}$ and $b = (b^i)'$.

The current real equilibrium price of a particular currency will thus, given our assumptions, depend on the amount of the currency in circulation and on the interest rates at home and abroad. In the present context the important implications of thinking about exchange rate determination in this way are that:

(i) Short-run policy can affect exchange rates. Equation (6) brings out the potential role of short-run policy effects through the impact of the rate of interest r.[9]

7. This is a strong assumption. However, in the present context, if one were to retain covariances in the asset demand equation, as is done by Frankel (1986), it would complicate the notation without adding much insight in the present context to the point that the amount of interaction between the currencies depends on cross-elasticities in the demand functions.

8. For example, that the limiting present value of s_t, discounted at the rate r^*, be zero as t grows to infinity.

9. In particular, taking the first difference of (6), and eliminating r suggests that the expected intercept and slope in a regression of current on past exchange rates need not always be zero and unity respectively. The following section employs a variable coefficient model taking account of this. If the formal model were strictly true interest rate and quantity of assets data could be used to test it. But the model is not to be thought of as strictly testable; anyway that is not the route we wish to follow here.

(ii) Long-run considerations such as the expected long-run trend in or level of the supply of currency also affect exchange rates.

(iii) Policy or long-run developments relating to one currency can affect the exchange rate between two other currencies. An interesting question in our context is the size of these cross effects. If the interest rate response vector A_1 is diagonal, then so is D_1 and D_2 and currency values are not interdependent at all.[10] The smaller the response of the demand for one currency to the return on another currency the less impact changes in the interest rate on the other currency will have on the real exchange rate of the first.[11]

2.2 *Application*

Consider now a "small" currency whose return is not important in the demand function for all other currencies. Policy actions by the authorities of that currency, such as measures to increase interest rates in order to protect a given parity against the DM, will have a negligible impact on the real exchange rate of other currencies, or on cross exchange rates between other currencies. To the extent that such a currency is pegged to the DM, its real value, and its value *vis-à-vis* third currencies such as the US dollar, will be dependent on German and US policy, and other exogenous factors, and hardly at all on domestic policy. A loosening of monetary policy will cause the currency to fall to the bottom of the band, but will not lower the value of the DM against the US dollar unless the German authorities choose to respond with an accommodating monetary expansion. Likewise, a decision by the authorities to continue the weaker monetary policy by realigning the intervention limits will have no effect on the US dollar value of the DM.

By saying that the currencies of the EMS would form a DM zone one might mean that (i) all but the DM are "small" currencies in the sense that we have discussed or that (ii) the German authorities pursue an independent monetary policy. In this paper we do not consider (ii).

The empirical tests reported below address (i) by looking at the behaviour of each currency following a currency realignment, which can be seen as a short-run policy intervention analogous to a disturbance (u_{3t}) in Equation (4) above. For the reasons given, if all but one of the currencies are small in the above sense, one would not expect the realignment to affect the US dollar value of the large currency. Nor should the forecastability of the large currency's dollar value be much affected.

10. Likewise, if all other currencies $j = i$ are always in steady state with $y^i = r^*$, then the expression for s^i_t reduces to:

$$s^i_t = [a^i/(1+a^i)1-b^i)].(r^i_t - r^*) - z^i_t + d^i.$$

11. Note that indirect effects also matter. A currency whose return is not directly important may, through its effect on the return of another currency, have an impact on the value of the currency under consideration. These effects are taken account of in the general formula above.

III IMPACT OF REALIGNMENTS ON DOLLAR RATES

There have been eleven realignments in the EMS. Without exception the realignments involved only depreciations relative to the DM; each currency had depreciated at least once against the DM. But so far as relative movements of member currencies are concerned the realignments could just as well be seen as revaluations of the DM. Which view is closer to reflecting the actual subsequent movements of the EMS currencies against non-members? In this section we provide evidence that the parity depreciation of each member currency against the DM is a good predictor of the likely future depreciation of that currency against the US dollar. In this sense, the EMS behaves like a DM zone.

We examined the impact of the parity realignments on the US dollar market value of each currency 5, 10, 30 and 60 working days after each realignment. If the EMS is a DM zone in the sense that we have been discussing, the magnitude of the realignments should have no explanatory power for the DM/$ rate, but should have a coefficient of close to unity after some days for the other currencies. The possibility of movements within the band means that the coefficient would not necessarily be exactly one.

We employed two variables to measure the magnitude of realignment. The first variable R1 was, for each currency, including the DM, the percentage parity depreciation against the DM. For each observation the second variable R2 equalled the DM's weighted average parity appreciation against the other currencies.

For each interval (5, 10, 30 and 60 days) we ran regressions in which the dependent variable was the percentage change in the dollar value of each currency during that interval after each realignment. Thus there were up to 77 observations for each regression, made up of the product of 7 member currencies and 11 realignments. The explanatory variables could include an intercept shift dummy for each realignment as well as one or both of the realignment magnitude variables.

Results for the regressions including dummies are shown in Part I of Table 2. The dummies exclude the effects of extraneous movements in the value of the dollar affecting all member currencies equally. These equations show the pattern of exchange rate movements between currencies within the zone following a realignment. R1 is a significant explanatory variable with its coefficient increasing monotonically as the number of days after the realignment increases. If the Italian lira and DM are omitted (Equation (a)), the estimated coefficient on R1 increases to 0.9 for the 60 days interval, and the estimate is insignificantly different from unity. The inclusion of the lira, with its wide margins of fluctuation, reduces the value of the estimate and worsens the fit, but the monotonicity property continues to hold. It makes little difference whether or not the DM is included.

Table 2: *Regressions Results**

			Part I: *With Intercept Dummy for Each Realignment*						
No. of days:	5	10	30	60	*No. of days:*	5	10	30	60
(a) All currencies except DM or Lit.			#Obs. =55; d.f.=43		(c) All currencies			#Obs.=77; d.f.=65	
Coefficient of R1	0.693	0.705	0.768	0.893	Coefficient of R1	0.540	0.548	0.584	0.678
(Standard error)	(.04)	(.05)	(.05)	(.06)	(Standard error)	(.04)	(.04)	(.05)	(.06)
RSQ	0.965	0.959	0.970	0.986	RSQ	0.937	0.934	0.942	0.972
(b) All currencies except DM			#Obs.=66; d.f.=54		(d) All currencies except Lit.			#Obs.=60; d.f.=49	
Coefficient of R1			0.617	0.708	Coefficient of R1	0.625	0.641	0.701	0.832
(Standard error)			(.06)	(.07)	(Standard error)	(.04)	(.04)	(.05)	(.05)
RSQ			0.927	0.971	RSQ	0.950	0.953	0.962	0.984
			Part II: *Without Realignment Dummies*						
No. of days	5	10	30	60	*No. of days*	5	10	30	60
(e) All currencies except Lit.			#Obs.=66; d.f.=64		(h) All currencies			#Obs.=77; d.f.=75	
Intercept	0.787	1.052	−0.522	−0.103	Intercept	0.808	1.095	−0.477	−0.015
(Standard error)	(0.45)	(0.49)	(0.63)	(1.08)	(Standard error)	(0.42)	(0.46)	(0.59)	(1.02)
Coefficient of R1	0.478	0.546	0.462	0.748	Coefficient of R1	0.450	0.518	0.440	0.704
(Standard error)	(0.13)	(0.14)	(0.18)	(0.31)	(Standard error)	(0.11)	(0.12)	(0.16)	(0.27)
RSQ	0.171	0.189	0.091	0.082	RSQ	0.176	0.193	0.095	0.083
(f) All currencies except Lit. Without intercept			#Obs.=66; d.f.=65		(j) All currencies Without intercept			#Obs.=77; d.f.=76	
Coefficient of R1	0.343	0.366	0.552	0.765	Coefficient of R1	0.317	0.337	0.519	0.706
(Standard error)	(0.11)	(0.12)	(0.15)	(0.25)	(Standard error)	(0.09)	(0.10)	(0.12)	(0.21)
RSQ	0.132	0.130	0.082	0.081	RSQ	0.136	0.132	0.087	0.083
(g) All currencies except Lit.			#Obs.=66; d.f.=63		(k) All currencies			#Obs.=77; d.f.=74	
Coefficient of R1	0.510	0.536	0.533	0.664	Coefficient of R1	0.494	0.520	0.531	0.636
(Standard error)	(0.15)	(0.16)	(0.20)	(0.35)	(Standard error)	(0.13)	(0.14)	(0.18)	(0.31)
Coefficient of R2	0.082	−0.025	0.180	−0.212	Coefficient of R2	0.107	0.006	0.219	−0.162
(Standard error)	(0.16)	(0.17)	(0.21)	(0.37)	(Standard error)	(0.14)	(0.16)	(0.20)	(0.35)
RSQ	0.175	0.190	0.102	0.086	RSQ	0.182	0.193	0.109	0.086

*Regressing (percentage change in US$ value of each EMS currency over given number of days after each realignment) on parity change measures R1 or R2, with or without intercept dummies for each realignment.

These results illustrate the pass-through of the realignment on to market exchange rates, but they do not establish the DM-zone theory as the dummy terms not only take account of extraneous exchange rate movements, but also capture any realignment effects on the DM/$ exchange rate.

Of course removal of the dummies results in a drastic drop in goodness of fit (Part II of Table 2). But despite the noise in the residuals the upward trend in the coefficient on R1 as the time after the realignment lengthens is still evident; by 60 days the coefficient is insignificantly different from unity (though measured with little precision).

Since R1 measures depreciations *vis-à-vis* the DM, a test of the DM-zone theory is the significance of the intercept. Equations (e) and (h) illustrate that, by 60 days, the intercept is insignificant implying no realignment effect on the DM. (The point estimate would imply a 0.1 per cent appreciation after 60 days.) Although the precision of the estimate is not good, it is significantly lower than +2 per cent per realignment. A further test is based on the significance of the "size of realignment" variable R2. If the DM moved against the dollar significantly following realignments then it might be reasonable to suppose that a "big" realignment would result in a big DM/$ movement. Again, however, the data provide no evidence of such behaviour: R2 is insignificant (Equations (g) and (k)).

Altogether the regressions identify no realignment effect for the DM/$ rate and thus provide support for the DM-zone theory.

IV IMPACT OF REALIGNMENTS ON PREDICTION ERROR VARIANCES

Many exchange rates can be predicted reasonably well by a simple first order autoregression. Usually the intercept will be close to zero and the coefficient of the lagged term is close to unity. Frankel and Meese (1987) for example, report that it is now "widely recognized" that a linear time-series model of the log of the spot rate is best represented by a random walk process.

Using a time varying coefficient[12] model, this section examines whether realignments increase the prediction error variances for EMS currencies other than the DM.

We use the Kalman filter, which gives a one-period forecast for time (t+1), which is optimal among forecasts using only information available at time t. The difference between Kalman filtering and rolling regressions, in which least squares regressions are continually updated with new observations, is that the Kalman filter provides optimal weighting or discounting of past obser-

12. In Section II it was observed that the expected value of the coefficients in this equation could be time-dependent.

vations, through an error-learning mechanism, to produce the best one-period forecasts.[13]

The Kalman filter was applied to daily EMS exchange rates 1979-87, and for each day the forecast error was computed as the difference between the actual exchange rate and the predicted.[14]

In order to evaluate the effects of the EMS realignments on exchange rate forecasting, we computed the forecast error variances for each exchange rate for 10 observations before, and for 10 after, the realignment date. If the non-DM currencies are small in the sense of Section II above, a realignment will affect the forecastability of their US dollar rates more than that of the DM. Depending on the circumstances of each realignment, the effect could be to reduce or to increase the error variance; but in either event the effect on the DM should be smaller.

The forecast error variances before and after the first 10 realignments are shown in Table 3. Some realignments (notably the first three) show a general increase in forecast error variances after the realignment, but this pattern is not general; the fifth realignment, for example, showing a fall in forecast error variance for all but the BF.

In order to assess whether, in line with the DM dominance hypothesis, forecast error variances were affected least for the DM, we computed, from the data in Table 3, the percentage change between before and after forecast error variances for each realignment and each currency. At each realignment, the absolute percentage change in forecast error variance for the DM was smaller than the average for all the currencies. This was not true for any other currency, the nearest being the Dutch guilder: its change was less than the average for 8 out of the 10 realignments.

To this extent we may say that, relatively speaking, the Deutschemark remained the more stable currency in terms of forecast error variance, than the other EMS currencies. This confirms the regression results and leads to the conclusion that, in our limited sense, the EMS is a DM zone.

13. Kalman filtering is treated in Pagan (1980), Harvey (1981) and Bomhoff (1983). An intuitive application is in McNelis and Neftci (1982); the present analysis follows the methodology adopted in that paper.

14. The Kalman filter estimates for intercept and slope were insignificantly different from zero and unity respectively for almost all dates, consistent with the random walk model.

Table 3: *Forecast Error Variance Before and After Realignments*

Realignment		*DM*	*Dkr*	*DG*	*Lit*	*BF*	*FF*	*IR£*
24.9.79	Before	31	37	27	5	25	19	30
	After	48	45	46	17	37	48	53
30.11.79		29	28	11	5	13	28	16
		48	78	48	16	33	45	45
23.3.81		41	43	45	16	38	38	44
		54	55	50	48	49	49	61
5.10.81		175	196	220	49	180	229	159
		147	62	147	36	89	77	123
22.2.82		42	41	35	15	25	32	30
		20	32	17	7	248	14	24
14.6.82		65	39	63	17	54	52	51
		64	62	41	34	63	395	72
21.3.83		32	52	32	22	108	102	26
		19	15	38	48	40	137	207
22.6.85		66	59	68	22	59	67	89
		99	36	93	61	52	87	76
7.4.86		86	58	92	76	70	81	80
		128	115	124	87	102	323	117
4.8.86		36	37	37	31	35	37	44
		31	30	35	35	31	42	454

Notes: Error variances are computed for each currency for 10 days before the realignment (appearing in the same line as the date of realignment), and for 10 days after the date of realignment, and including that date (shown below).
The numbers shown represent the one-period predictions of the logarithm of the exchange rate (multiplied by 10,000), based on a first order autocorrelation estimated by a Kalman filter with identity matrix as the initial transition matrix.

V CONCLUDING REMARKS

Most analysis of the relative importance of different countries in the EMS has focused on the interaction of monetary policies. This paper has addressed more directly the interdependence of exchange markets. Guided by the desire to know to what extent developments in one EMS country can influence the value of another's currency, we have looked at exchange rate movements around realignments. We have found no evidence of a systematic effect of realignments on the US dollar/DM rate, while the US dollar value of other currencies has clearly changed as a result of the realignments. Furthermore, we have found that realignments have tended to influence the forecastability of the US dollar/DM rate less than that of other EMS currency/dollar rates. We conclude that the realignments provide no evidence against the proposition that the DM is a dominant currency, and that movements in the other member currencies have little effect on the external value of the DM. In this limited sense, we maintain that the EMS is a DM zone.

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