International Transmission under Floating Exchange Rates

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In theory, floating exchange rates increase the degree to which countries are insulated from fluctuations abroad. In practice, according to some recent studies, this has not happened. Over the past two and a half decades -- a period that in the main has been one of floating rates -- business contractions have been more closely synchronized across countries than under the earlier regime of fixed rates. And, more disturbing from the standpoint of the insulation hypothesis, the same thing appears to have been true for nominal variables, most notably inflation. This paper examines these issues.

The information that it provides is important from two standpoints. The first is what it tells us about the actual functioning of the world monetary system over the past several decades. The second is the broader set of implications that it has for the choice of an exchange-rate regime. If the conclusions reached in recent studies were correct, the most powerful argument in favor of floating exchange rates -- that they insulate countries from the effects of foreign monetary disturbances -- would be substantially weakened.

I. Motivation

In 1973 the fixed exchange rate regime that had been established at the Bretton Woods monetary conference three decades earlier broke down. Since that time exchange rates of most major countries have floated. The one exception, and that only partial, has been within Europe, where various arrangements have been introduced to stabilize (though not completely fix) the exchange rates of European Union (EU) currencies vis-à-vis one another.

The reason that floating exchange rates were adopted was the desire on the part of many major countries to avoid the inflation that was then being generated by excessive monetary expansion in the United States and transmitted abroad through the fixed exchange rate Bretton Woods system in which the United States was the principal player (Darby and Lothian, et al., 1983). The theoretical rationale for the move to floating rates can be illustrated via the purchasing power parity equation, which relates the nominal exchange rate between two countries' currencies to the real exchange rate (the terms of trade) and the ratio of the two countries' price levels. Stated in growth rates, this relation can be written as:

$$\hat{e} = \hat{q} + \pi - \pi^F, \qquad (1)$$

where $\hat{e}$ and $\hat{q}$ are the percentage changes in the nominal and the real exchange rates, π and π^F are the domestic and the foreign inflation rates. This equation has the following implications: If the nominal exchange rate is fixed (in which case $\hat{e} = 0$), and the real exchange rate does not change in an offsetting fashion, then inflation rates in the two countries eventually will converge to equality. The two countries' monetary policies in this instance will be completely interdependent. If the nominal exchange rate floats, and if the real exchange rate again does not act as an offset, inflation rates in the two countries can, and most likely will, differ. Floating rates, under such circumstances, will offer insulation from foreign-country inflation and monetary policies will be independent.[1]

Initially the evidence appeared fully consistent with this latter description. After exchange rates had floated for close to a decade, long-term average inflation rates did indeed differ substantially across countries and by much more than they did under Bretton Woods (Lothian, 1985). At the same time, however, there was evidence of continued short-run links between both inflation rates and real GDP growth rates internationally (Darby and Lothian, 1989). But given the findings of long-term differences in behavior of inflation across countries, these short-run links still appeared to be consistent with theory.

More recently this interpretation has begun to be questioned. Using the longer span of data now available, a number of researchers have reported findings in apparent conflict with the earlier results. According to these researchers, money growth, inflation and real growth have actually been more closely related across the major countries than they were under Bretton Woods.[2]

Lastrapes and Koray (1990) for instance

estimate a VAR system for the UK, France and Germany that include domestic and US money supply, interest rates, prices and real output and the bilateral US exchange rate for the floating rate period. Monthly data from January 1959 to July 1971 are used to represent the fixed rate period while data for March 1973 to December 1985 are used for the floating rate period. They then look at the variance decomposition (VDC) of each variable in the system. The authors use the partial correlation coefficients of the residuals from each equation in the system to analyze the short-run relationship between domestic and US variables. The results are not consistent across all three countries. They differ primarily in what the authors call the "... channels through which US impulses are transmitted..." (Lastrapes and Koray, 1994, p. 409). With US prices and real output providing the main channels under the floating exchange rate period. The VDC show that the UK and France were strongly affected and Germany to a lesser extent by US shocks under the fixed exchange rate regime. Under the floating exchange rate regime the authors find evidence that only the UK was less affected by US innovations. The authors go on to look at the long-run relationships through cointegration techniques. They find evidence under fixed exchange rates for a long-run relationship only between US and UK interest rates and US and French money supplies. Under floating exchange rates, as would be expected, the US and French money supplies are no longer cointegrated but "... weak evidence that cointegration does exist for some of the variables in the UK system." (Lastrapes and Koray, 1990, p. 420).

Joyce and Kamas (1994) start from the theoretical conclusion that under floating exchange rates domestic monetary policy has greater control over prices which in turn provides greater control domestic and foreign demand for the country's output. This greater control of domestic monetary policy over domestic output is then set up as the accepted manifestation of monetary independence under floating exchange rates. They argue that the data for the United States appears to suggest that there is no greater influence of domestic monetary policy over domestic output under floating exchange rates than under fixed exchange rates. The fixed rate period data covers January 1959 to July 1971 and the floating rate period is April 1974 to December 1990. They test the relationships between real output, prices, money, interest rates, exchange rates and the trade balance and their empirical results show that "... no cointegration among the variables can be rejected at the 1 percent level of confidence for both periods." (Joyce and Kamas, 1994, p. 685). This evidence calls the conclusion of greater monetary independence into question but they believe that independence takes a different form than predicted by the theory because there is a greater influence of monetary policy on the trade balance under floating exchange rates. To support this argument they analysis the variance decomposition of the forecast errors and find that the domestic monetary policy through its influence on the country's trade balance has a greater impact on output under floating rates.

Crowder (1996) examines the evidence of convergence of inflation rates of the G7 economies (USA, UK, Canada, Germany, Japan, Italy and France), particularly the transmission of inflation from the reserve-currency country to the other countries in his sample. He uses data from February 1957 to July 1971 for the fixed-rate period and from March 1973 to October 1991 for the floating rate period. Crowder's cointegration tests for fixed and floating exchange rate regimes examine the long-run relationship between the inflation rates. In particular, he is interested in whether there is a common trend which would imply convergence and if the US inflation rate is the source of this common trend. For the fixed exchange rate period his cointegration test results provide weak support for convergence but strong support for the hypothesis that US is the source of the common trend. For the floating exchange rate period there is evidence of convergence, but no country's inflation rate, including that of the US, can be identified as the source of the common trend. The question that we address in this paper is why the earlier and the later studies have produced different results. As we see it, there are three possible explanations for the disparity. One is that the recent studies suffer from statistical problems -- potentially the most important of which is confusion of long-run and short-term relations. A second possibility is that the results are more or less due to happenstance. Floating rates may in fact provide insulation and hence monetary independence, but domestic monetary policies within the various countries may well have become more convergent. Elected officials and central bankers in the higher inflation countries may have decided purely on the basis of domestic considerations that inflation had to be reined in. In this instance, rates of money supply growth and inflation would have become more nearly the same, but that convergence would provide no information about the degree of insulation afforded by alternative exchange rate regimes. A third possibility is that the theoretical description of exchange-rate regimes may be too limiting, in the sense that it implicitly assumes that real variables (and hence factors that affect the real exchange rate) are unimportant. It could be that real shocks -- things such as changes in productivity and cutbacks in oil production -- became much more important during the floating-rate period than previously, that these had common effects across countries, and hence that they were responsible for the increased cross-country correlations of both real income growth and inflation under floating. Discriminating among these three potential explanations is the object of the econometric investigation described below.

II. Data and empirical results

The data that we use are quarterly observations of consumer prices for the United States and 19 other

OECD countries over the period 1957:1-1999:1 as reported by the International Monetary Fund in International Financial Statistics.

II.A. Hypotheses to Be Tested and Methods of Testing

The hypotheses to be tested revolve around the three competing explanations that we have just outlined. One simple method of testing the first explanation (confusion of short run with long run) is to compute cross-country standard deviations of inflation rates, real growth rates and money-supply growth rates for various temporal aggregations of the data (e.g. yearly observations, five-year averages, full-period averages) for all countries in the sample and for important subgroups of counties (e.g. the EU) to compare these standard deviations both across regimes and over time within regimes. A second method of testing focuses on the time-series dimension of our data set. We estimate models for cross-country inflation spreads for the various countries vis-à-vis the US and Germany We then conduct tests for differences in the average spreads across subperiods. A third set of methods that we plan to use but that we do not include in this paper is analysis of the factors affecting monetary policies in the major countries (the G7 and/or G10 subgroups) in the sample. Here there are two questions to be answered. One is whether there were common domestic influences on monetary policies in the various countries that led to greater harmonization of money-supply growth as the floating-rate period wore on. The other is the extent to which periodic attempts by governments to stabilize exchange rates were a factor.[3]

II.B. Inflation Rates Across Countries

Figure 1 presents a time series plot of the cross-country standard deviations of the quarterly inflation rates of the 20 countries in our sample for the period 1957:2 to 1999:1. The first thing to notice in the chart is the rather abrupt increase in inflation dispersion that occurs in the early 1970s in the period in which the fixed exchange rate regime instituted by Bretton Woods broke down. Under that regime, cross-country inflation differences were non-zero but generally quite small. In the absence of revaluation or devaluation, inflation rates and monetary policies could not wander too far from inflation and monetary policy in the United States, the reserve-currency country.

That regime however had a relatively short life. In August 1971, the United States unilaterally floated. The European countries, after futile attempts to maintain some exchange-rate fixity, gave up the ghost a little over a year and a half later and let their exchange rates float relative to the rest of the world and each other. Following this latter change inflation dispersion across the full sample of countries increased dramatically. In 1972 the cross-country standard deviation averaged roughly 2.5 per cent per annum; by 1974 it had risen to more than twice that level, where it remained for well over a decade.

Such increased cross-country inflation dispersion is consistent with theoretical predictions. Floating exchange rates in principle allow monetary policies to be independent of one another. If this independence translates into differences in the actual conduct of policy, then inflation rates will differ among countries. This appears to have happened. It did not, however, last. By the late 1980s the cross-country inflation rate standard deviations had fallen back to the 3 per cent range and by the late 1990s they were half that figure. There thus appears to have been two inflation regimes since the advent of floating exchange rates.[4]

To attach somewhat more precision to the dating of the changes in inflation dispersion, we ran the following regression:

$$SD_t = b_0 + b_1\, SD_{t-1} + b_2\, D2 + b_3\, D3 + e_t \qquad (2)$$

where SD_t is the cross-country standard deviation of the inflation rate in quarter t, D2 and D3 zero-one are dummy variables for shifts in regime, b_0 through b_3 are coefficients to be estimated and e_t is an error term.

We let the data define the periods covered by the two dummies. To do so we searched over a grid bounded by 1972:4 to 1973:3 on the one hand and 1984:4 to 1985:3 on the other. We then chose the combination of breakpoints that minimized the standard error of the regression. The dates chosen by this procedure were 1973:3 and 1985:2 respectively. Results of these regressions are summarized in Table 1.

The equation that we settled on shows inflation dispersion to be positively serially correlated but not highly persistent. The coefficient of SD_{t-1} was 0.35 and strongly significant. The coefficients of D2 and D3 were 1.381 and -0.565, respectively. Both were significantly different from zero, thus implying significant higher inflation dispersion in the second period than during Bretton Woods and significantly lower inflation dispersion in the third period. The estimated long-run means for the three periods were 3.43, 5.66 and 2.56, respectively.[5]

The first breakpoint that we estimate is of course associated with the shift in the exchange rate regime to floating rates. Identification of the second is somewhat more problematic. One possible explanation is that it simply reflects the change in Europe to more rigid adherence to the Exchange Rate Mechanism (ERM). That however cannot be anything close to the full story as a glance at Figures 2 and 3 indicates. Shown there are plots of cross-country standard deviations for the 8 ERM countries and the 12 non-ERM countries separately. Inflation dispersion declines earlier for the ERM countries, than for the non-ERM countries in the sample. But otherwise there is no essential difference between the two. In the end, inflation dispersion for both groups of countries appears virtually identical. In this limited sense, the ERM and the move to a single European currency matter. From a broader perspective, however, they appear irrelevant.

These patterns are further confirmed by the subperiod averages of the cross-country standard deviations shown in Table 2. Also reported in Table 2 are subperiod mean inflation rates for both the full group of countries and the ERM and non-ERM subgroups. These tell a quite interesting story in their own right. Clearly there are marked and very nearly coincident declines in all three during the course of the 1980s. The decline in the mean inflation rate for the full sample of countries moreover appears to occur at roughly the same time as the decline in inflation dispersion.

What could account for this behavior? According to one prominent explanation oil-price shocks were largely, if not totally responsible for the rise in inflation in the mid-1970s as well as its subsequent flare up at the end of that decade. The absence of such shocks thereafter is seen as the reason inflation is no longer a problem.

This explanation, however, does not square at all with the breakpoints that we have uncovered in cross-country inflation dispersion or with the time path of the average inflation rates. Consider inflation dispersion first. If oil prices had been the major culprit, we should see a lower dispersion of inflation rates across countries rather than higher dispersion. The two oil-price shocks were common shocks, affecting all of the countries in the sample at the same time in both instances. With regard to average inflation rates the principal problem with the oil-price explanation is the timing of the movements. The early 1970s runup in inflation has its genesis in the second half of the 1960s and thus begins before the first oil-price shock; the decline in the 1980s takes place well after the effects of the second could have been expected to have dissipated. That leaves monetary policy behavior as the likely explanation for what we observe.

The 1985 breakpoint, as it turns out, comes right at the time of the Plaza Agreement. At the time, this was viewed as simply an agreement with regard to dollar exchange rates. There was, moreover, a good deal of skepticism about its effectiveness. Some observers regarded it as rhetoric without substance, the decline in the dollar real exchange rates having been well underway before the finance ministers' meeting. In retrospect, it may have been a signal that the goal of lower inflation was going to be pursued on a broader geographical basis, that the shift in monetary policy, which took place in the UK in 1979, the US in 1980 and even earlier in Germany and Japan, had caught on among the higher inflation developed countries too. We intend to take this matter up in future research. Now we review results for individual countries.

II.C. Individual Country Results

Table 3 contains the results of AR(1) regressions where the dependent variable is the difference between 19 countries' inflation rate and Germany's inflation rate. Table 4 contains the results for the same regressions with the dependent variable the inflation differential with the United State. The regressions include dummy variables to test for differences in the intercept and slope coefficients for the two parts of the floating rate period, D2 for 1973:3 to 1985:1 and D3 for 1985:2 to 1999:1. These regressions took the form:

$$d\pi_t = b_1 + b_2\, D2 + b_3\, D3 + b_4\, d\pi_t + b_5\, (D2\times d\pi_{t-1}) + b_6\, (D3\times d\pi_{t-1}) + e_t \qquad (2)$$

where $d\pi$ is the inflation differential, the b's are coefficients to be estimated and e_t is an error term. The reference point therefore is the fixed-rate period. The dummies allow behavior in the two floating rate subperiods to differ from that behavior. From this regression we can derive estimates of the long-run inflation differential for the three periods. These are, respectively $b_1 / (1 - b_4)$, $(b_1 + b_2) /(1 -(b_4 + b_5))$, $(b_1 + b_3) /(1- (b_4 + b_5))$. A significant value of b_2 or b_3 tells us that the second or third period differs significantly from the first. So, for example, consider the results for Australian vs. German inflation reported in the first regression in Table 3. The estimated values of b_2 and b_3 are 5.303 and 0.504, respectively. Only the b_2 coefficient is significantly different from zero at conventional levels. From this we can conclude that the inflation differential for the first part of the floating rate period is significantly different that the inflation differential for the fixed rate period.

We find similar results for most of the countries in our comparison of inflation relative to Germany. In Table 3 the b_2 coefficient is significant for 15 out of the 19 comparisons. The b_3 coefficient is significant for only 3 of the 19 comparisons. For all of the countries with a significant b_2 coefficient the long-run inflation differential with Germany is substantially larger during the first part of the floating rate period than in the fixed rate period. From these results we can conclude that these countries had a greater degree of monetary independence with floating exchange rates during the subperiod 1973:3 to 1985:1.

The evidence from these regressions also shows that there are two distinct parts to the floating rate period. The coefficient on D2 indicates that the average difference in inflation rates between 19 countries and Germany was greater in the first period 1973:1 to 1985:1 than in the fixed exchange rate period. The results for the second part of the floating exchange rate period are less conclusive. The coefficients on D3 indicate that during the second part of the floating exchange rate period the average difference in inflation rates in each country and Germany was greater for seven countries, but smaller for 12 of the 19 countries considered. The periods make little difference in the slope coefficients of the AR(1) processes for the difference in inflation rates between each country and Germany.

Table 4 contains the results for AR(1) regressions described in Table 3 but where the dependent variable is the difference between each country's inflation rate and United States' inflation rate. The regressions still support the hypothesis of two distinct floating rate periods, but are less uniform than those presented in Table 3. The regressions show increases in the inflation differential in 11 of 19 countries in the first floating rate period and in 8 of 19 for the second floating rate period. Of the eight countries in which the inflation differential decreased in the first part of the floating rate period, it also decreased in the second part. The periods have a somewhat greater impact on the slope coefficients for these comparisons then those reported in Table 3.

Looking at the details of Table 3, we see that the coefficient for the dummy variable for the first part of the floating rate period, D2, is significant at least at the 5% level for 15 out 19 countries. Of these 15 countries, the D2 coefficient is significant at the 1% level for 12 countries, Australia, Belgium, Canada, Denmark, Finland, France, Ireland, Italy, Norway, Portugal, Sweden and the United States and at the 5% level for 3 countries, New Zealand, Spain and the United Kingdom. The first part of the float does not have a significant incremental effect for Austria, Japan, the Netherlands and Switzerland. The coefficient for the dummy variable for the second part of the floating exchange rate period, D3, is statistically significant for only 3 countries: Japan at the 1% level; the Netherlands at the 5% level; and the US at the 10% level. The coefficients for both periods are only significant for the US. While D3 is not significant for most countries in the second period, the signs on the coefficients for the two dummy variables are interesting to examine. For sixteen of the 19 countries considered, 15 of which have a significant D2 coefficient, the results indicate that holding the other variables fixed the difference in the inflation rates increases during the first part of the floating exchange rate period compared to the fixed rate period. The D3 coefficients indicate that for seven countries the difference in the inflation rates also increased in the second floating rate period compared with the fixed rate period. Of the 12 countries that experienced a decrease in the second floating rate period, 3 countries, Japan, the Netherlands and Switzerland, also showed a decrease in the first floating rate period.

The lagged dependent variable is only significant for four countries, Austria at the 10% level, the US at the 5% level and Finland and France at the 1% level. The slope terms for the interaction of the lagged dependent variable and the first and second parts of the floating exchange rate period were only significant for 3 and five countries respectively.

In the regressions reported in Table 4 the coefficients of D2, the dummy variable for the first part of the floating exchange rate period, are significant at the 1% level for nine out of 19 countries. These countries are Australia, Austria, Germany, Ireland, Italy, Japan, the Netherlands, Portugal and Switzerland. The coefficients of D3, the dummy variable for the second part of the floating exchange rate period are significant for 11 out 19 countries at least at the 10% level. It is significant at the 1% level for

Austria, Belgium, Denmark, France, Ireland and the Netherlands; at the 5% level for Finland and Switzerland; and at the 10% level for Germany, Norway and Spain.

Both D2 and D3 are significant at least at the 10% level for 6 countries, Austria, Germany, Ireland, Japan, the Netherlands, and Switzerland. In the countries with statistically significant coefficients for D2 and D3, all but Ireland show declining differentials in both floating rate periods Over all this pattern of declines in the difference in inflation rates for both periods occur in 8 (Austria, Belgium, Denmark, Germany, Japan, the Netherlands, Norway, and Switzerland) of the 19 regressions. Of the remaining countries, the signs of the coefficients for 3 (Australia, Italy and Portugal) show increased differentials in both periods and 8 (Canada, Finland, France, Ireland, New Zealand, Spain, Sweden and the United Kingdom) show increases in the first part of the floating exchange rate period and decreases in the second.

The coefficient for the lagged dependent variable is statistically significant at least at the 10% level for 9 of 19 countries. It is statistically significant at the 1% level for Australia, Finland, France, Italy, and Switzerland; the 5% level for Belgium, Germany, and New Zealand; at the 10% level for Japan. The dummy variable used to test if there is a difference in the slope coefficient for the first floating rate period is statistically significant for at least the 10% level for 8 out 19 regressions (at the 1% level for Belgium; the 5% level for Austria, Canada, the Netherlands, and New Zealand; and at the 10% level for Australia, Japan and Norway). The dummy variable used to test if there is a difference in the slope coefficient for the second floating rate period is statistically significant for at least the 10% level for only 3 countries: Japan and Norway at the 1% level; and Austria at the 10% level.

III. Conclusions

The central issue that we address in this paper is international inflation rate behavior since the advent of floating exchange rates in the early 1970s. The principal motivation for investigating this issue is the rather widespread recent finding that it has differed little from behavior under Bretton Woods, a finding that has led the authors of these studies to question the insulating properties of floating rates.

What we show is that the floating exchange rate period has been characterized by two quite distinct inflation regimes, with mid-1985 marking their dividing line. In the first, inflation is high on average in the 20 OECD countries that we study, and behaves very much as expected, differing across the countries by more than twice as much as under the pegged rate system set up at Bretton Woods. In the second, the differences in inflation rates among countries shrink dramatically, in many instances becoming less than under Bretton Woods. This behavior moreover is not dependent upon country groupings – being just as prevalent in countries that are not part of the European Exchange Rate Mechanism as in countries that adhered to it.

Our explanation for what has happened to inflation over this period revolves around changes in monetary policies in the countries in our sample. As the 1980s progressed, low inflation became a policy goal to at least some extent in all of the countries that we study. This in turn has translated into lower and less divergent inflation rates in the entire sample. In subsequent research, we intend to test this explanation directly.

Table 1. Standard errors of estimate of AR(1) models of standard deviations of inflation rates across countries with dummies for different periods for the second and third period[a]

$$SD_t = b_0 + b_1\, SD_t + b_2\, D2 + b_3\, D3 + e_t$$

$$SD_t = 2.225 + 0.352\, SD_{t-1} + 1.381\, D2 + -0.565\, D3 \quad R^2=.562,\ SEE=1.113$$

$$(7.950)\quad (5.044)\qquad (5.426)\qquad (-2.676)$$

Start Date of D2	**Start Date of D3**			
	1984:4	**1985:1**	**1985:2**	**1985:3**
1972:4	1.143	1.157	1.131	1.137
1973:1	1.131	1.146	1.119	1.125
1973:2	1.131	1.147	1.118	1.125
1973:3	1.126	1.142	**1.113**[b]	1.119

[a]Data are quarterly from 1957:2 to 1999:1. The dummy variable D2 takes the value 1 from the Start Date of D2 through one period before the start Date of D3 and 0 otherwise. The dummy variable D3 takes the value 1 from the Start Date of D3 through 1999:1 and otherwise.

[b]Estimated equation with the lowest SEE. Choice of period breakpoints based on these equations are: 1957:2 to 1973:2; 1973:3 to 1985:1; and 1985:2 to 1999:1.

Table 2. Period averages of cross-country means and standard deviations[a]

Means			
	57:2 - 73:2	**73:3 - 85:1**	**85:2 - 99:1**
All	4.169	9.797	3.237
ERM	4.188	9.635	2.753
Non-ERM	4.156	9.905	3.559
Standard deviations			
	57:2 - 73:2	73:3 - 85:1	85:2 - 99:1
All	3.481	5.528	2.608
ERM	2.977	4.630	1.918
Non-ERM	3.478	5.747	2.849

[a] The group of countries in the ERM are Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands and the United Kingdom

Table 3: AR(1) for Difference in Country Inflation Rate and Germany's Inflation Rate with Dummy Variables for Intercept and Slope

$$P_t = b_0 + b_1 * D2 + b_2 * D3 + b_3 * P_{t-1} + b_4 * (D2 * P_{t-1}) + b_5 * (D3 * P_{t-1})$$

1957:3 to 1999:1

Dependent Variable: Country Inflation Rate - Germany Inflation Rate, P_t

D2: 1973:3 to 1985:1 value = 1 and = 0 otherwise

D3: 1985:2 to 1999:1 value = 1 and = 0 otherwise

T-Stat in parenthesis

	Constant	D2	D3	P_{t-1}	D2*P_{t-1}	D3*P_{t-1}		SEE
AL	0.141	5.303	0.504	0.180	-0.159	0.521		3.7673
	(0.301)	(5.421)***	(0.686)	(1.190)	(0.832)	(2.776)***		
AU	0.904	0.442	-0.416	-0.161	0.154	-0.219		3.3958
	(2.116)**	(0.628)	(0.664)	(1.873)*	(0.673)	(1.289)		
BE	0.072	1.872	0.048	0.103	0.290	0.116		2.5182
	(0.229)	(3.152)***	(0.103)	(0.785)	(1.672)*	(0.572)		
CA	-0.067	3.278	0.612	0.164	0.026	0.198		3.2262
	(0.165)	(3.605)***	(1.023)	(1.272)	(0.124)	(1.149)		
DE	2.099	3.228	-1.395	0.016	-0.064	0.068		4.4910
	(3.494)***	(2.783)***	(1.624)	(0.145)	(0.353)	(0.330)		
FI	1.301	3.504	-0.738	0.397	-0.168	-0.009		3.5495
	(2.555)***	(3.201)***	(1.037)	(3.500)***	(0.962)	(0.048)		
FR	1.376	3.681	-1.109	0.402	-0.279	-0.134		3.4297
	(2.925)***	(2.909)***	(1.678)	(4.521)***	(1.358)	(0.681)		
IR	1.680	5.915	-1.153	0.144	0.017	0.033		4.5685
	(2.670)***	(4.389)***	(1.294)	(1.095)	(0.097)	(0.132)		
IT	0.736	6.239	0.858	0.228	0.103	0.151		3.2571
	(1.749)*	(4.945)***	(1.170)	(1.574)	(0.577)	(0.722)		

Table 3: Continued								
	Constant	D2	D3	P_{t-1}	D2*P_{t-1}	D3*P_{t-1}		SEE
JA	2.035	-0.998	-3.012	0.033	0.442	-0.340		4.2490
	(3.446)***	(1.108)	(3.637)***	(0.251)	(2.592)***	(1.621)		
NE	1.638	-0.353	-1.765	-0.081	0.171	-0.053		3.6922
	(3.383)***	(0.449)	(2.550)**	(0.827)	(0.779)	(0.262)		
NZ	1.145	3.178	-0.112	0.160	0.312	0.406		4.8571
	(1.804)*	(1.990)**	(0.118)	(1.198)	(1.468)	(2.506)***		
NO	1.280	2.728	-0.598	0.111	-0.039	0.511		3.6118
	(2.667)***	(2.770)***	(0.838)	(1.009)	(0.203)	(3.091)***		
PO	1.508	13.479	1.359	0.019	0.067	0.407		6.5170
	(1.804)*	(6.371)***	(0.915)	(0.142)	(0.385)	(2.008)**		
SP	3.805	4.279	-1.523	-0.010	0.230	0.216		5.1400
	(5.038)***	(2.401)**	(1.302)	(0.097)	(1.313)	(0.987)		
SE	1.393	3.287	-0.183	-0.065	0.139	0.398		3.8293
	(2.677)***	(3.163)***	(0.240)	(0.413)	(0.656)	(2.081)**		
SW	0.492	-0.619	-0.343	0.071	0.119	0.253		2.7714
	(1.393)	(1.151)	(0.668)	(0.559)	(0.648)	(1.325)		
UK	1.385	2.479	0.727	-0.028	0.487	0.070		4.3442
	(2.342)**	(2.161)**	(0.823)	(0.150)	(2.311)**	(0.305)		
US	-0.104	1.704	1.005	0.272	0.207	0.007		2.7867
	(0.299)	(2.546)***	(1.870)*	(2.308)**	(1.200)	(0.039)		

* indicates that the coefficient is significant at the 10% level,
** indicates that the coefficient is significant at the 5% level,
*** indicates that the coefficient is significant at the 1% level.

Table 4: AR(1) for Difference in Country's Inflation Rate and US Inflation Rate with Dummy Variables for Intercept and Slope

1957:3 to 1999:1

$P_t = b_0 + b_1 * D2 + b_2 * D3 + b_3 * P_{t-1} + b_4 * (D2 * P_{t-1}) + b_5 * (D3 * P_{t-1})$

Dependent Variable: Country Inflation Rate - US Inflation Rate, P_t

D2: 1973:3 to 1985:1 value = 1 and = 0 otherwise

D3: 1985:2 to 1999:1 value = 1 and = 0 otherwise

T-Stat in Parenthesis

	Constant	D2	D3	P_{t-1}	D2 * P_{t-1}	D3 * P_{t-1}		SEE
AL	0.159	1.684	0.131	0.623	-0.382	0.033		3.3399
	(0.378)	(2.470)***	(0.208)	(3.472)***	(1.892)*	0.143		
AU	0.990	-2.130	-2.212	-0.049	0.382	-0.375		3.9165
	(2.004)**	(2.649)***	(3.011)***	(0.530)	(2.260)**	(1.824)*		
BE	0.153	-0.035	-1.272	0.302	0.394	-0.350		2.3742
	(0.514)	(0.076)	(2.672)***	(2.379)**	(2.626)***	(1.517)		
CA	0.051	0.356	-0.317	0.204	0.338	0.132		1.9396
	(0.212)	(0.930)	(0.886)	(1.497)	(1.947)**	(0.690)		
DE	2.003	-0.013	-2.546	0.129	-0.147	-0.316		4.0781
	(3.581)***	(0.016)	(3.240)***	(1.173)	(0.880)	(1.372)		
FI	1.128	0.473	-1.340	0.507	-0.010	-0.131		3.2779
	(2.374)**	(0.637)	(2.071)**	(4.957)***	(0.067)	(0.590)		
FR	1.366	0.220	-2.029	0.443	-0.032	-0.197		2.8901
	(3.358)***	(0.312)	(3.359)***	(5.480)***	(0.188)	(0.663)		
GE	0.104	-1.704	-1.005	0.272	0.207	0.007		2.7867
	(0.299)	(2.546)***	(1.870)*	(2.308)**	1.200	0.038		
IR	1.871	3.231	-2.395	0.112	0.027	-0.007		4.7895
	(2.788)***	(2.860)***	(2.562)***	(0.796)	(0.159)	(0.023)		
IT	0.581	4.686	0.208	0.529	-0.248	-0.137		3.2835
	(1.373)	(4.981)***	(0.297)	(4.460)***	(1.629)	(0.542)		

Table 4: Continued								
	Constant	D2	D3	P_{t-1}	D2 *P_{t-1}	D3 * P_{t-1}		SEE
JA	1.814	-2.386	-4.674	0.205	0.278	-0.664		4.0915
	(3.181)***	(2.883)***	(5.284)***	(1.692)*	(1.789)*	(2.765)***		
NE	1.685	-2.721	-2.702	-0.016	0.429	0.246		4.1202
	(3.139)***	(3.208)***	(3.234)***	(0.171)	(2.268)**	(0.958)		
NZ	1.079	0.663	-0.527	0.283	0.398	0.238		4.0591
	(1.959)**	(0.641)	(0.668)	(2.008)**	(1.998)**	(1.424)		
NO	1.424	-0.658	-1.237	0.100	0.284	0.516		3.6462
	(2.899)***	(0.895)	(1.769)*	(0.878)	(1.754)*	(2.463)***		
PO	1.661	9.447	0.923	0.011	0.157	0.319		6.7763
	(1.901)*	(5.132)***	(0.622)	(0.078)	(0.900)	(1.442)		
SP	3.531	1.748	-2.149	0.099	0.175	0.059		5.2006
	(4.611)***	(1.243)	(1.917)*	(0.934)	(1.059)	(0.227)		
SE	1.383	0.103	-0.971	0.048	0.207	0.237		3.8927
	(2.632)***	(0.128)	(1.298)	(0.345)	(1.130)	(1.202)		
SW	0.315	-1.773	-1.069	0.530	0.006	-0.266		2.6036
	(0.938)	(2.902)***	(2.113)**	(4.357)***	(0.035)	(1.306)		
UK	1.381	1.423	-0.202	0.079	0.235	-0.266		4.3396
	(2.342)**	(1.487)	(0.238)	(0.482)	(1.229)	(1.111)		

* indicates that the coefficient is significant at the 10% level,
** indicates that the coefficient is significant at the 5% level,
*** indicates that the coefficient is significant at the 1% level.

Fig. 1. Standard deviations of inflation across all countries

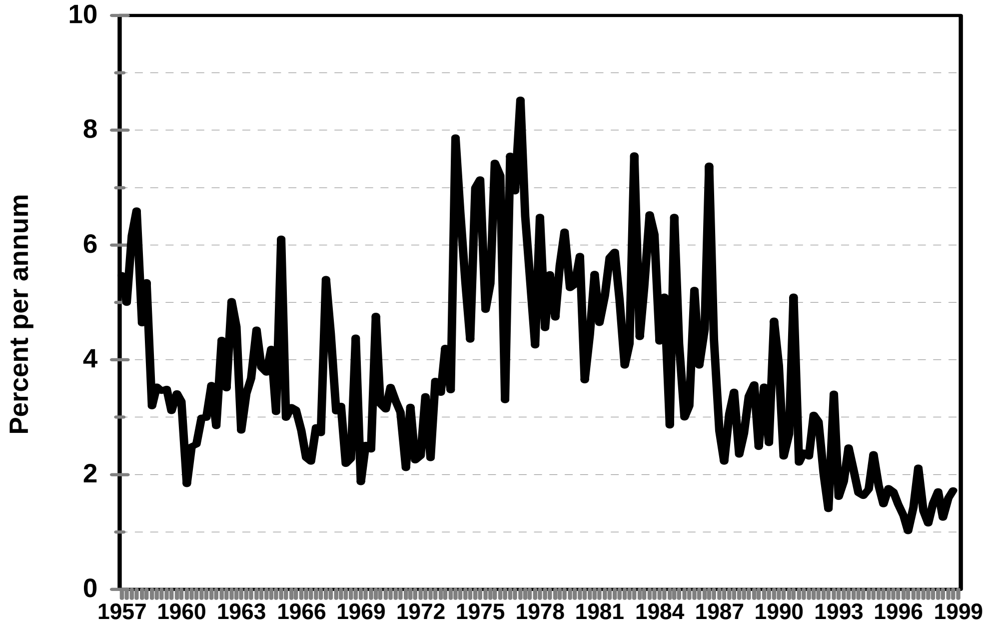


Fig. 2. Standatrd deviations of inflation across ERM countries

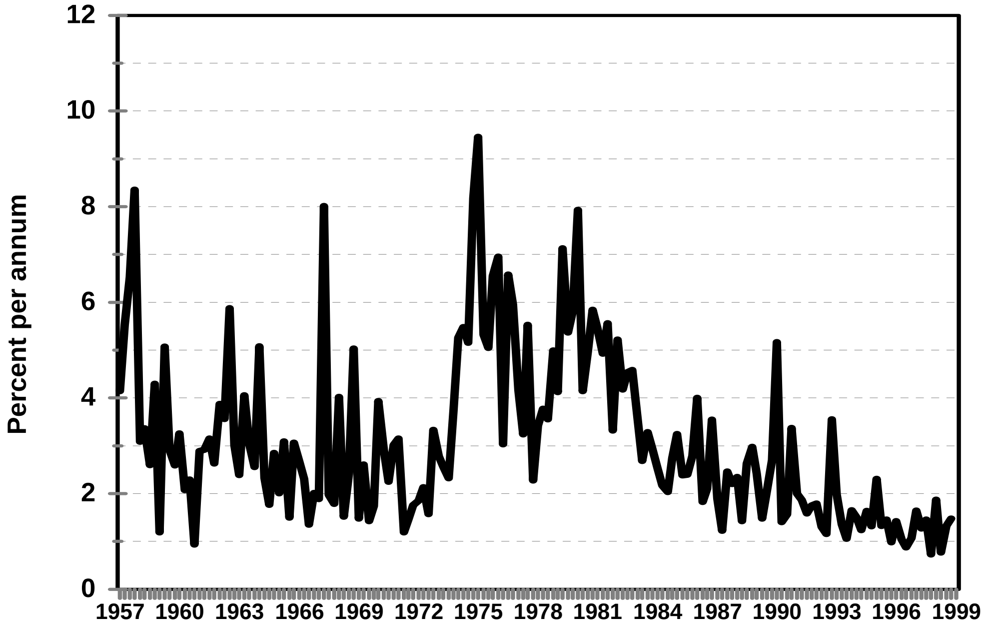


Fig. 3. Standard deviations of inflation across non-ERM countries

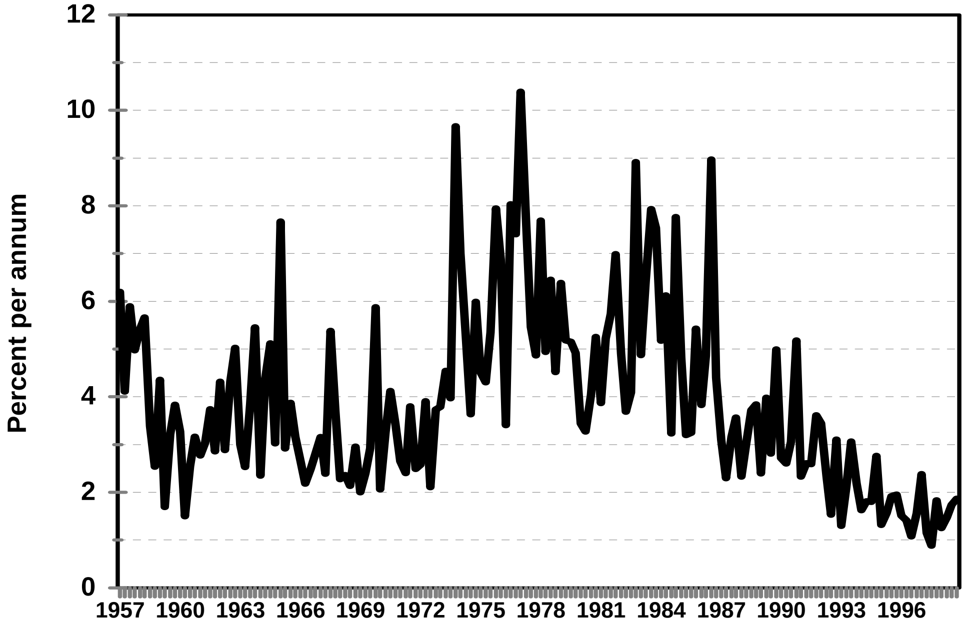


Fig. 4. Differences in Inflation by Periods, Country vs. Germany

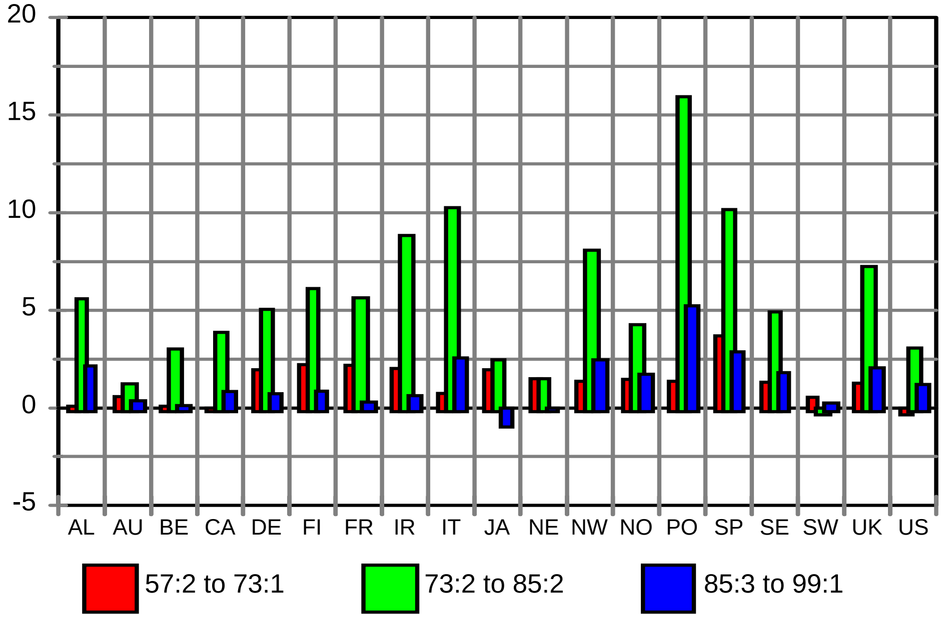
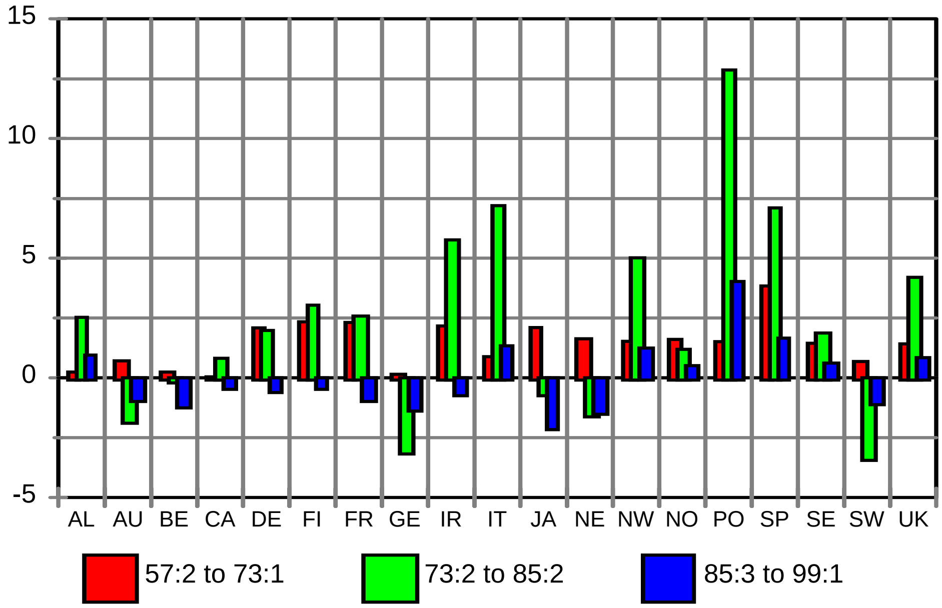


Fig. 5. Differences in Inflation by Periods, Country vs. US



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Notes

1. As an empirical matter these two extreme outcomes -- complete monetary interdependence under fixed rates and complete independence under floating -- are regarded as much more likely to occur over the long run as opposed to the short run.

2. Lastrapes and Koray (1990), Joyce and Kamas (1995) and Wheeler and Pozo (1995) all report such findings. See Rose, (1994), Stockman (1992), and Stockman and Ohanian (1993) for related discussions.

3. For an application of regression analysis in this area see Darby and Lothian (1989). Lothian (1986) and (1990) illustrate the types of historical analysis that we have in mind. The first provides comparisons of monetary base growth and changes in the balance of payments in Germany and Japan with monetary base growth and changes in the balance of payments in the United States, along with an examination of policy statements by central bankers at the Bundesbank and Bank of Japan during the five years leading up to the 1980 inflation upsurges. The second examines the Federal Reserve Open Market Committee's "minutes," in particular the ranking of domestic and international goals in the "directive" -- the marching orders that the FOMC gives to the Open Market Desk at the Federal Reserve Bank of New York, the group that actually executes monetary policy.

4 Papell (1997) in his analysis of exchange rate behavior since the advent of floating rates reaches a similar conclusion. He divides the float into two subperiods, 1973:3 to 1985:1 and 1985:2 to 1994:4.

5 These are found as $b_0/(1-b_1)$, $(b_0+b_2)/(1-b_1)$, and $(b_0+b_3)/(1-b_1)$.