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NATIONAL MONETARY INDEPENDENCE AND MANAGED FLOATING EXCHANGE RATES*

by

Leroy O. Laney

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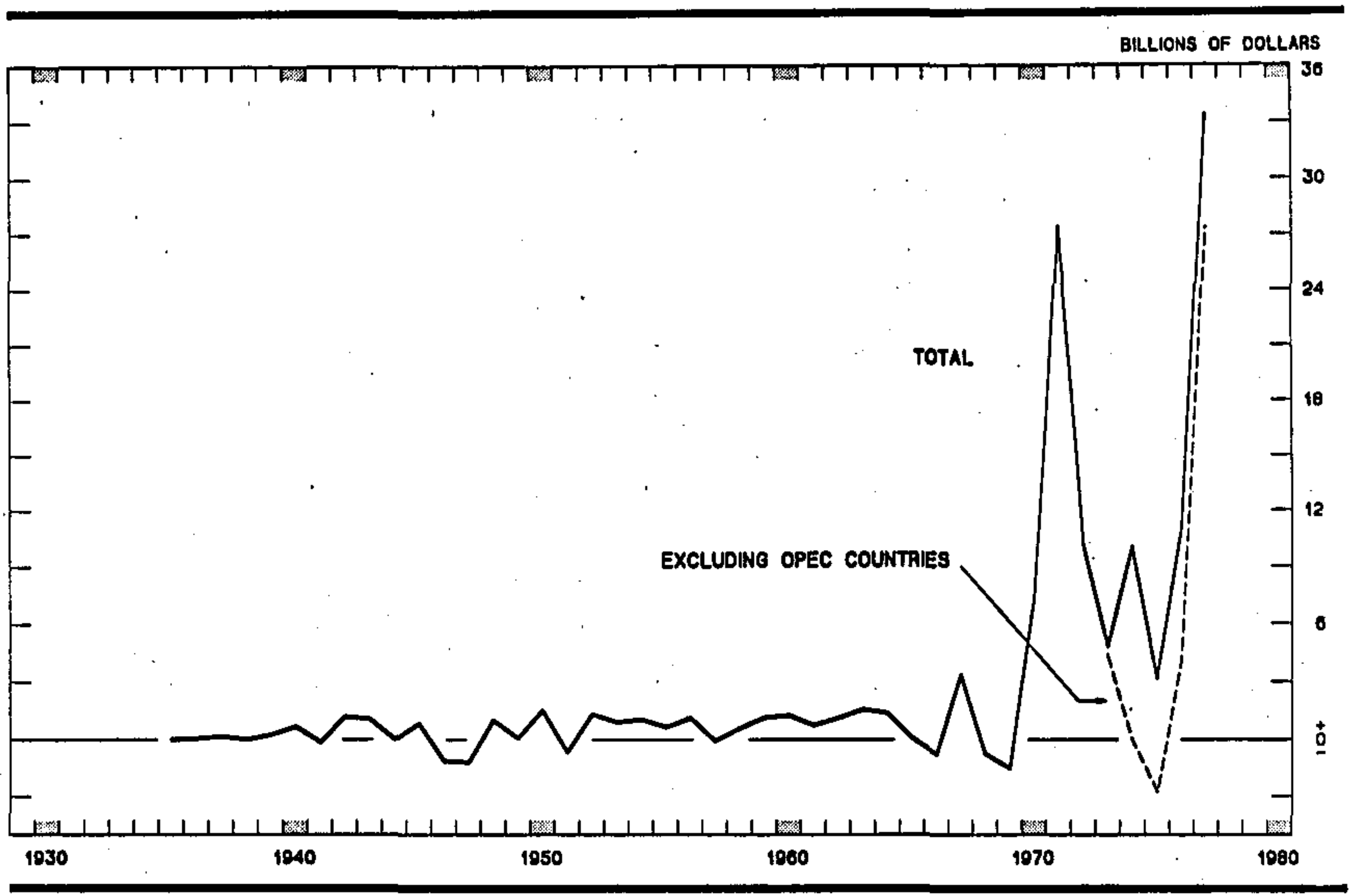
One of the major advantages cited for more flexible exchange rates is greater national monetary independence. The official intervention that is required under fixed exchange rates augments or depletes foreign assets of the monetary authorities, changing the international component of the monetary base. With no such changes under purely floating rates the base money stock is insulated from such foreign influence. Under fixed rates varying degrees of abililty to sterilize autonomous international reserve flows by opposite movement of the domestic component of base money are possible, and from the other direction autonomous domestic monetary policy can be thwarted to varying degrees by opposite movements in the international component of the base. If the exchange rate were determined solely by private supply and demand, there would be no such effects to consider.

In the early 1970's the international adjustment mechanism for most major industrialized countries changed significantly from the adjustable peg system that had prevailed throughout the postwar period to one of managed floating, but regarding the above effects the change can be considered to be one of degree rather than kind. Although intervention is not dictated by international rules at a certain percent either side of an established U.S. dollar parity, a great deal of discretionary intervention has occurred frequently during generalized floating. This is true both for independently floating countries and for those countries that choose to fix their currencies to each other via arrangements such as the European joint float. Figure 1 illustrates, for example, how the increase in foreign official reserves held in the United States continued to surge as the U.S. dollar again came under pressure later in the seventies. Even when the oil-producing nation accretions are excluded, the build-up rivals that earlier in the decade when the Bretton Woods system verged on collapse. If countries whose currencies were under upward pressure against the U.S. dollar during this period had difficulty in sterilizing official reserve inflows, their control over the monetary base could have been less than under fixed rates. In

Figure 1

CHANGES IN U.S. LIABILITIES TO FOREIGN OFFICIAL AGENCIES



addition, the increased role of expectations in exchange markets under managed floating could have caused greater offsetting changes in the international component of the monetary base resulting from attempts to manipulate the domestic component.

It is not clear a priori, therefore, that greater national monetary autonomy generally has been achieved by the revocation of intervention limits against the U.S. dollar. This paper undertakes to measure changes that have occurred in this regard for fourteen industrialized countries, each of which formerly pegged to the U.S. dollar but which now either float independently or together with other currencies as a group. Results indicate that greater monetary independence has been achieved for most countries, but evidence is also presented to suggest that in some cases managed floating has been characterized more by "management" than "floating."

Section I below quite briefly reviews the background, measurement techniques, and some pitfalls encountered in this area. Empirical methodology to be applied to all investigated countries is developed in Section II, and Section III presents empirical results. Implications of these results are summarized in Section IV.

I. Background

The empirical literature in this area in recent years has been quite extensive, developing concurrently with a broader interest in the monetary approach to international adjustment.1/ It has centered basically around the estimation of the

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1. For a collection of seminal contributions to the monetary approach, see Frenkel and Johnson (1976). For surveys see Whitman (1975) and Kreinin and Officer (1978).

effect of domestic monetary policy on changes in international reserves (measured by an "offset coefficient") and the effect of changes in international reserves on domestic monetary policy (measured by a "sterilization coefficient"). Most applications have focused on the pegged exchange rate period, partly because the theory as originally conceived was assumed to apply to a system of "fixed" rates, and also because until recently there has not been enough data available on the managed floating rate period for an adequate comparison of the two regimes.2/ A theoretical counterpart of the monetary approach under flexible exchange rates concentrates on exchange rate determination rather than balance of payments determination. The direction of much empirical research has been shifted from measuring monetary independence, or absence of it, to investigating determinants of the exchange rates as asset prices of national money stocks, incorporating both purchasing power parity

2. An adequate survey of empirical work, detailing countries studied, empirical methodologies, time intervals focused upon, and conclusions regarding monetary independence, is beyond the scope of this paper. A list of relevant work that contains the estimation of some form of either a monetary offset or a sterilization relationship, or both, would include: Aghevli and Khan (1974), Argy and Kouri (1974), Artus (1976), Bean (1976), Connally and Taylor (1976), Connally and Taylor (1979), De Grauwe (1975), De Grauwe (1976), Genberg (1976), Guitian (1976), Girton and Roper (1977), Herring and Marston (1976), Hickman and Schleicher (1979), Hodjera (1976), Kohlhagen (1977), Koning (1977), Kouri and Porter (1974), Kouri (1975), Luan and Miller (1979), Miller (1976), Miller (1979), Miller and Askin (1976), Neumann (1978), Porter (1972), Rousslang (1978), Willms (1971), and Zecher (1974). Among the above, Hickman and Schleicher analyze sterilization for sixteen countries over a period that extends into managed floating (1958-1976), but they do not distinguish between fixed and more flexible exchange rates regimes. Likewise Girton and Roper analyse offset relationships for Canada from 1952 through 1974, during which the country first floated, then fixed to the U.S. dollar and floated again, but the different intervals are not segmented. Kohlhagen investigates offsets to Canadian monetary policy, fitting data from 1951 through 1970, and does separate the earlier Canadian float from the fixed rate period of the sixties. Artus estimates a sterilization coefficient for West Germany, focusing exclusively on the period of managed floating. Other work is concerned with empirical verification under fixed exchange rates.

relationships and the role of expectations.3/ But since the managed float is a hybrid arrangement in reality the former theoretical paradigm still has relevance. Reserve use under managed floating as apposed to the adjustable peg system has been the subject of some research,4/ and is evidence of an awareness that a priori in some respects we cannot treat a managed float as fundamentally different from an adjustable peg exchange rate system.

Empirical work in measuring national monetary independence can be difficult. First, biased offset and sterilization coefficients can result if it is not recognized that the domestic component of the monetary base and the international component are simultaneous functions of each other. Domestic monetary policy can be an instrument to sterilize international reserve changes but at the same time it can cause changes in international reserves.5/ Second, neither offsets to domestic monetary policy via changes in foreign reserves nor sterilization of unwanted exogenous changes in the latter can be addressed without recognition of other goals of national monetary policy. This underlines the desirability of including in a model monetary reaction function targets for the management of both the domestic and the international component of base money, the purpose being to identify disturbances and distinguish their effects.6/

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3. See, for example, Frenkel (1976) and Keran (1979). For a recent development of the approach and a survey of empirical work see Bilson (1979).
4. See Williamson (1976), Suss (1976), Heller and Khan (1978), and Frenkel (1978).
5. Some researchers have dealt with this simultaneity by constructing more complex formal models in which offset and sterilization coefficients are estimated by techniques such as two stage least squares. While Kouri-Porter (1974) use ordinary least squares in estimating their offset coefficients for Australia, Germany, Italy, and the Netherlands, they derive an expression for offset coefficient bias if sterilization also occurs, arguing that such bias is likely to be small as long as their capital flow equation is well specified and as long as discretionary monetary policy dominates automatic sterilization in the observed changes in net domestic assets of the central bank.
6. For arguments on the incorporation of monetary reaction functions in this kind of work, see Sweeney and Willett (1977).

Third, caution has to be exercised in interpreting results that may have fallen out from the estimation of accounting identities rather than behavioral relationships.7/ This problem arises from the fact that one resorts to the balance sheet of the monetary authorities for data. If estimations reflect accounting relationships only, causation or behavioral relationships are obscured. For example, in a period when the change in the monetary base M is zero, because the base can be divided into international and domestic components, we have $\Delta M = 0 = \Delta R + \Delta D$, so that $\Delta R = -\Delta D$. To the extent that this relationship is picked up in time series estimation, offset and sterilization coefficients will tend toward minus one. These coefficients may not be equal to one because there is a change in the total monetary base, but it is important to note how results can be affected by accounting principles rather than true economic behavior.

The above points argue against simply fitting concurrent observations of changes in the foreign and domestic assets of the monetary authorities, and certainly should warn one against using single equation estimations of offset or sterilization effects without taking into account other behavioral relationships that affect domestic or international monetary policy.

The empirical procedure presented below is aimed partly at reducing these problems. Monthly data is regressed using polynomial distributed lags and targets entering government reaction functions for both the conduct of domestic monetary policy and exchange rate intervention are used as instrumental variables in a two-stage procedure. While this approach may not be ideal it does go some distance toward abstracting from the difficulties that plague work in this area. Instruments used, moreover, are generally applicable in both a fixed rate and a managed floating

7. See Johnson (1977).

rate environment, since the purpose of this investigation is to observe direction and magnitude of changes in coefficent values in the move from fixed to more flexible rates.

II. Empirical Procedure

The use of instrumental variables was chosen over the construction of a complex formal model for application to all fourteen countries analyzed here because of data limitations and computational expense of fitting the entire model. While a more complete model might be practical for application to a single country, problems are compounded in a multicountry approach such as this. It is not clear, moreover, that any single model would be appropriate institutionally for all countries.

Beginning with the monetary base identity, we know that

$$M = R + D \qquad (1)$$

where M is the base money stock, R is the level of international reserves, and D is the domestic component of the base. It then follows that

$$\Delta M = \Delta R + \Delta D \qquad (2)$$

and sterilization and offset relationships respectively may be defined as:

$$\Delta D = a_0 + a_1 \Delta R \qquad (3)$$

$$\Delta R = b_0 + b_1 \Delta D \qquad (4)$$

where theoretically $-1 \leq a_1 \leq 0$ and $-1 \leq b_1 \leq 0$. If the sterilization coefficient a_1 is near minus unity then independence from exogenous changes in international reserves is indicated, since the domestic component of the base moves to neutralize them, while nearness to zero indicates absence of such independence with foreign asset flows being allowed by the monetary authorities to influence the monetary base. If the offset coefficient b_1 is near minus unity then any exogenous change in the domestic component of the base is cancelled by international reserve movements which the authorities find necessary in order to maintain an exchange rate target, while nearness to zero is some evidence that such effects are negligible.

Simultaneity bias in coefficients a_1 and b_1 is obvious however, and as mentioned in the previous section both offset and sterilization phenomena do not occur in a vacuum but rather in relation to other targets of the monetary authorities. For this reason ΔD and ΔR were regressed on several variables hypothesized to enter a monetary reaction function of the authorities, and the fitted values resulting from such a process were then entered as independent variables in modifications of equations (3) and (4) to estimate true offset and sterilization effects.

Five instrumental variables were chosen for their relevance in reaction functions for the conduct of both domestic and international monetary policy. Each is taken to be exogenous here reflecting the very short run nature of phenomena to be investigated. Monetary authorities following a non-inflationary money growth guideline will wish to expand money in line with changes in real economic activity.8/ Also, because unemployment reduction is often an overriding goal for monetary policy, the authorities feel pressure to accommodate or validate exogenous wage push pressure.9/ In addition to wage push there is also typically a "government push" emanating from pressure on monetary authorities to finance the public sector deficit, in order to prevent higher interest rates and crowding out in domestic capital markets. Specifically with respect to international reserve and exchange rate management, balance of payments variables such as trade or current account flows are exogenous here and obviously important. And the relationship of domestic prices to foreign prices is also a proxy for pressures on both international reserves and the exchange rate. Some monetary authorities under managed floating might even use

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8. For an analysis which considers domestic income endogenous, see Miller (1979), who concludes that if domestic monetary expansion sufficiently stimulates income in the short run the net effect may be an inflow rather than the more typically assumed offsetting outflow of international reserves.
9. For a more detailed account of reasoning behind the inclusion of this variable and empirical results for eight countries, see Gordon (1975 and 1977).

perceived changes in purchasing power parity relationships as a guide to what an appropriate exchange rate should be, even though such an approach has many problems in application.

On the above reasoning, instruments for each country were specified as:

(1) Changes in real income, with lower frequency observations on GNP distributed to monthly frequency on the basis of changes in the industrial production index;

(2) percentage changes in a national wage index;

(3) the government budget deficit (surplus), cyclically-adjusted in order to abstract from a more simple synchronous correspondence of monetary and fiscal policy over the economic cycle and in order to more properly capture crowding out type pressure, by regressing the observed deficit on changes in real GNP and seasonal dummy variables;

(4) the difference in nominal exports and imports, representative of balance of payments effects;10/

(5) a ratio of the domestic consumer price index to the foreign consumer price index, where the U.S. CPI is taken as a proxy for the foreign price level variable.11/

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10. Such a variable might have been defined as a more inclusive balance in the external accounts, such as the current account balance or even a basic balance, since in this short run time frame many capital flows also are exogenous. There is some danger here, however, of including most of the important items in the balance-of-payments other than ΔR, so that accounting relationships are the primary reason for empirical correspondence, and we wish to avoid this. Moreover, for some countries analyzed here monthly and even quarterly balance of payments flows are not published, so that the chosen proxy is the only one available.

11. Choice of the U.S. CPI as a proxy for the foreign price level might be more obvious for the fixed rate period, when the U.S. dollar bilateral rate was explicitly the focus of intervention. It is not clear, however, that any other single bilateral rate, or national price level, would be more appropriate under more flexible rates, since the U.S. dollar bilateral rate has remained an important focus for exchange rate policy. Some experimentation with other national price levels during the managed float, such as that of Germany for joint float participants, did not yield overall results much different from those reported here.

All five of the above variables were used as instruments on both ΔD and ΔR.12/ One might expect the first three to be more important in a reaction function of the domestic component ΔD and the last two to enter logically into a reaction function for ΔR, but influences are hard to separate. The government deficit, for example, also influences ΔR,13/ and income changes can influence ΔR by both current and capital account channels. A very small and open economy can find it easier to manage its money supply by managing its external balance than by manipulating the relatively much smaller domestic component of the base. By its actions the country therefore manages the international component with domestic targets in mind.

The first stage estimation utilized third degree polynomial distributed lags unconstrained at both ends. Some experimentation was conducted on the appropriate length of the lag at this stage, but generally it was taken to be six

12. ΔD and ΔR were computed as the changes in the net domestic and net foreign assets on the balance sheet of the monetary authorities. (A data refinement that would be useful, and that frequently has been performed, is the adjustment of the domestic component of the base for changes in required reserves. Unfortunately this information is difficult to obtain for most countries included here, and it was judged better to be as consistent as possible across countries given the nature and purpose of the analysis.) The source for practically all data was the International Monetary Fund, International Financial Statistics (IFS). One exception was the wage index for some countries, which was taken from the Organization for Economic Cooperation and Development, Main Economic Indicators when an hourly wage rate index was not available in the former source. Monthly data was taken for all countries except the U.K., for which the components of the monetary base were only available quarterly. (It was also necessary occasionally to go directly to national sources, such as for data on the Canadian budget deficit which was only available over a very short interval in IFS. Data tapes of Data Resources Incorporated, Lexington, Massachusetts, were utilized for all other series.)

13. See Borts and Hanson (1977).

months. Fitted values $\Delta\hat{R}$ and $\Delta\hat{D}$ were then entered into equations (3) and (4) modified to account for lagged offset or sterilization responses 14/ as

$$\Delta D_t = a_o + \sum_{i=0}^{n} a_i \Delta\hat{R}_{t-i} \qquad (5)$$

$$\Delta R_t = b_o + \sum_{i=0}^{n} b_i \Delta\hat{D}_{t-i} \qquad (6)$$

In (5) and (6) a six month third degree polynomial was estimated initially. These results were then inspected and the lag was truncated at the point at which estimated lag coefficients became weak as judged by their standard errors. The equation was then re-estimated with a polynomial of the degree that seemed most appropriate. This varied in practice from a linear (first degree) polynomial to a third degree one.

Equations (5) and (6) were run over the entire period of available data, and then re-run over the fixed rate and more flexible rate intervals separately. A Chow test was performed in all cases to determine whether the structural shift was statistically significant. 15/ The month after the final break with the U.S. dollar was taken to demarcate the transition to managed floating for the various countries. No single date is applicable to all of them of course. Canada was first among major countries to float independently in the seventies, breaking the fixed ties that it had maintained with the U.S. dollar since 1962. This move occurred on May 31, 1970. Speculation against the pound sterling forced its independent floatation by the United

14. For an approach that analyzes lagged responses between R and D and their implications for observed countemporaneous relationships between the two, see Phaup and Kusinitz (1977).
15. See Chow (1961).

Kingdom on June 23, 1972.16/ Early 1973 marked the final end of adjustably pegged rates for most countries investigated here, as the overvaluation of the dollar even after its December 1971 Smithsonian devaluation of ten percent became too much to bear.17/ The Swiss National Bank suspended intervention on January 23, 1973. The following month, on February 13 and 14, respectively, Italy and Japan announced that margins vis-a-vis the U.S. dollar would not be observed.18/ On March 19, 1973, the link with the U.S. currency was severed by the Federal Republic of Germany, the Netherlands, Belgium-Luxembourg, France, Denmark, Sweden, and Norway.19/ Also in March 1973 Austria announced that no margins would be maintained formally for any currency.20/ Australia remained fixed to the U.S. dollar until September 25, 1974.21/

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16. The United Kingdom quite briefly participated in the European Common Margins Agreement from May to June of 1972. On the above date however it floated against both the U.S. dollar and snake currencies.
17. Some countries had floated briefly against the dollar as a result of monetary crises in 1971, but returned to fixed parities with the Smithsonian Agreement. Since this interval did not truly represent the final break with the dollar and was really quite short, it is included within the fixed rate period for applicable countries.
18. For Italy this also marked withdrawal from the European snake, in which it had participated since April 1972.
19. All of these countries continued to float together as part of European joint float, which had been in existence formally since the Basle Agreement of April 10, 1972, among Belgium, Federal Republic of Germany, France, Italy, Luxembourg and the Netherlands. The United Kingdom and Denmark joined on May 1, 1972 and Norway on May 23. As noted above, the U.K. left in June 1972 and Italy in February 1973. Denmark left on June 22, 1972 but returned the following October 10. Sweden did not join until the break with the U.S. dollar on March 19, 1973, remaining in until August 29, 1977. France withdrew on January 19, 1974, returned on July 10, 1975, but then withdrew again on March 15, 1976. (Other countries have revalued or devalued within the snake but have continued to participate.) See Monthly Report of the Deutsche Bundesbank (1976), and International Monetary Fund, Annual Report on Exchange Restrictions, various issues.
20. Austria has not participated in the European snake formally, but this country de facto and without obligations observed margins for the schilling of 2.25 percent either side of cross-parity against snake participants until May 17, 1974, when it widened the band to 4.5 percent either side of cross-parities.
21. After this time a trade-weighted system determined daily the exchange rate to be maintained, in a fashion which kept the value of the weighted basket constant.

While this was sufficient for comparing shifts in offset coefficients to test the hypothesis that the move allowed greater or less leeway for authorities to manipulate domestic money bases without having to intervene because of exchange rate effects of these domestic changes, it still left something to be desired in the calculation of sterilization coefficients that judge the extent to which reserve flows, from the other direction, themselves affect monetary policy. This is primarily because included in the fixed rate interval is that period in the early 1970's when massive accumulations due to the overvaluation of the U.S. dollar are alleged to have caused a shift in abilities of dollar peggers to sterilize. With respect to the sterilization coefficient then, one actually has three interesting sub intervals: that through the end of the sixties decade, that from the early seventies until the advent of managed floating, and that after greater flexibility began.

The division between the second two sterilization periods was discussed above, but to separate the first two is somewhat arbitrary and can depend on individual countries. Looking at each country entails looking at the actual changes in international reserves in the period surrounding the reserve buildup, and one faces the methodological conflict of allowing the data itself to dictate research procedure. Figure 1 indicates, however, that for the aggregate of industrialized countries the buildup in foreign exchange reserves was sharply higher beginning in 1970. Results to be presented below for the sterilization coefficients of investigated countries therefore include two tests for a significant shift in their values: one which simply compares results before and after the break with the U.S. dollar, and one which compares the interval ending with the last observation in 1969 to that after the above break.

The sample of fourteen countries chosen here includes the major industrialized nations with the kinds of currencies and capital markets which make analysis of these effects interesting and important. Although some verifications of the monetary approach have been applied to the United States,22/ this country was excluded from the sample. As the world's primary reserve currency country the United States finances it balance-of-payments primarily by changes in liabilities to official foreigners rather than by changes in its own monetized reserves.23/

V. Results

Results from equation (5) and (6) for all countries are presented in Tables 2 through 15. The lag structures estimated as explained in the previous section generally do not extend past three periods. While it is possible that effects could be felt past these periods, they did not appear as significant here.

Offset coefficient lags are generally greater than sterilization coefficients lags, which is not surprising. One might expect the effects of domestic component movements on international reserves to be dissipated more slowly. The fact that sterilization coefficients usually have a shorter lag structure may be reasonable since unwanted foreign asset variations can be recognized immediately by the authorities. Steps can be taken to reverse them, if this is possible at all, by opposite movements of the domestic component of the base in the period in which they occur or shortly thereafter.

There are actually two channels through which the offset can operate. Newly created money can cause money supply to exceed money demand in the economy generally, so that non-money real and financial assets are substituted for

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22. See Luan and Miller (1979).
23. See Darby (1978). The point at which to divide the interval between fixed and more flexible rates would also not be clear and would not have the same meaning for the United States, since for the other countries this point was taken to be that at which they ceased to peg to the U.S. dollar and de facto undertook other arrangements.

TABLE 2 - AUSTRALIA

	OFFSET			STERILIZATION			
	Total Interval (66:4-77:8)	Prefloat (66:4-74:9)	Postfloat (74:10-77:8)	Total Interval (66:1-77:8)	Prefloat to end-1969 (66:1-69:12)	Prefloat (66:1-74:9)	Postfloat (74:10-77:8)
Constant	.01	.01	-.003	.01	.02	-.01	.07
(t-statistic)	(.80)	(.90)	(-.11)	(.58)	(1.09)	(-.40)	(1.39)
Coefficient (standard errors)							
Lags 0	-.65(.07)	-.59(.07)	-.69(.17)	-.54(.07)	.007(.07)	-.39(.07)	-.75(.17)
1	-.32(.07)	-.36(.07)	-.28(.16)	-.27(.04)	.004(.04)	-.19(.04)	-.37(.09)
2	-.10(.06)	-.16(.06)	-.05(.14)				
Sum	-1.07	-1.11	-1.02	-.81	.011	-.58	-1.12
(t-statistic)	(-6.67)	(-6.79)	(-2.60)	(-7.33)	(.10)	(-5.30)	(-4.38)
$\bar{R}^2$	.50	.61	.36	.45	.12	.46	.44
F(d.f.)	46.24	54.02	7.36	58.89	4.30	45.62	14.52
	(3,133)	(3,98)	(3,31)	(2,137)	(2,45)	(2,102)	(2,32)
D.W.	1.92	1.95	1.90	2.04	1.87	1.98	2.01
rho1	.41	.55	.28	.50	.41	.52	.42
rho2							
S.E.	.09	.07	.14	.11	.06	.08	.16
Chow test (d.f.)		.80			3.74*	1.82	
		(7,123)			(5,73)	(5,130)	

TABLE 3 - AUSTRIA

	OFFSET			STERILIZATION			
	Total Interval (58:6-77:5)	Prefloat (58:6-73:3)	Postfloat (73:4-77:5)	Total Interval (59:1-77:5)	Prefloat to end-1969 (59:1-69:12)	Prefloat (59:1-73:3)	Postfloat (73:4-77:5)
Constant (t-statistic)	.22 (2.38)	.28 (3.78)	.04 (.11)	.09 (.85)	.01 (.17)	.003 (.04)	.44 (1.16)
Coefficient (standard errors)							
Lags 0	-.41(.06)	-.41(.06)	-.41(.14)	-.37(.07)	-.08(.05)	-.24(.06)	-.55(.17)
1	-.20(.03)	-.21(.03)	-.21(.08)	-.19(.03)	-.04(.03)	-.12(.03)	-.27(.08)
Sum (t-statistic)	-.61 (-6.86)	-.62 (-6.53)	-.62 (-3.02)	-.56 (-5.51)	-.12 (-1.44)	-.36 (-3.86)	-.82 (-3.28)
$\bar{R}^2$	.16	.19	.12	.12	.01	.08	.17
F(d.f.)	22.68 (2,225)	21.52 (2,175)	4.39 (2,47)	30.32 (1,219)	2.08 (1,130)	14.88 (1,169)	10.73 (1,48)
D.W.	1.99	1.96	2.01	1.97	2.36	2.12	2.02
rho1	-.11	-.07	-.14				
rho2							
S.E.	1.59	1.04	2.81	1.64	.64	1.14	2.69
Chow test (d.f.)		.25 (5,218)			3.14* (4,174)	1.93 (4,213)	

TABLE 4 - BELGIUM

	OFFSET			STERILIZATION			
	Total Interval (64:8-77:6)	Prefloat (64:8-73:3)	Postfloat (73:4-77:6)	Total Interval (64:2-77:6)	Prefloat to end-1969 (64:2-69:12)	Prefloat (64:2-73:3)	Postfloat (73:4-77:6)
Constant	.86	.95	.61	.25	-.02	-.07	.89
(t-statistic)	(3.12)	(3.10)	(1.08)	(.74)	(-.10)	(-.28)	(.95)
Coefficient (standard errors)							
Lags 0	-.35(.05)	-.24(.08)	-.40(.07)	-.69(.09)	-.39(.13)	-.60(.10)	-.75(.17)
1	-.18(.03)	-.12(.04)	-.20(.04)				
Sum	-.53	-.36	-.60	-.69	-.39	-.60	-.75
(t-statistic)	(-6.85)	(-2.99)	(-5.40)	(-7.64)	(-3.05)	(-5.91)	(-4.53)
$\bar{R}^2$	.24	.08	.36	.28	.14	.30	.28
F(d.f.)	25.17	5.23	15.08	31.97	6.65	24.44	10.69
	(2,152)	(2,101)	(2,48)	(2,158)	(2,68)	(2,107)	(2,48)
D.W.	2.01	2.00	2.02	1.98	2.08	2.09	1.97
rho1	-.23	-.10	-.36	-.14	-.26	-.34	-.02
rho2							
S.E.	4.22	3.42	5.42	4.81	2.60	3.48	6.80
Chow test (d.f.)		1.26			1.79	2.11	
		(5,145)			(3,116)	(3,155)	

TABLE 5 - CANADA

	OFFSET			STERILIZATION			
	Total Interval (63:1-77:11)	Prefloat (63:1-70:5)	Postfloat (70:6-77:11)	Total Interval (63:1-77:11)	Prefloat to end-1969 N/A	Prefloat (63:1-70:5)	Postfloat (70:6-77:11)
Constant	.01	.02	.003	.04		.01	.09
(t-statistic)	(1.14)	(1.55)	(.20)	(3.42)		(-1.07)	(5.50)
Coefficient (standard errors)							
Lags 0	-.22(.10)	-.48(.13)	-.15(.14)	-.19(.16)		-.64(.19)	-.15(.22)
1				-.44(.11)		-.36(.11)	-.59(.16)
2				-.37(.11)		-.14(.14)	-.54(.17)
Sum	-.22	-.48	-.15	-1.00		-1.14	-1.28
(t-statistic)	(-2.17)	(-3.71)	(-1.04)	(-3.78)		(-4.89)	(-3.37)
$\bar{R}^2$	.03	.27	.01	.09		.19	.15
F(d.f.)	3.26	16.98	.51	5.19		6.11	5.06
	(2,176)	(2,86)	(2,87)	(4,174)		(4,84)	(4,85)
D.W.	1.99	1.86	2.00	1.90		1.82	1.93
rho1	.06	.40	-.05	-.004		-.20	-.08
rho2				-.17		-.22	-.27
S.E.	.12	.08	.14	.18		.11	.20
Chow test (d.f.)		3.54*				3.50*	
		(3,173)				(8,163)	

TABLE 6 - DENMARK

	OFFSET			STERILIZATION			
	Total Interval (63:1-77:12)	Prefloat (63:1-73:3)	Postfloat (73:4-77:12)	Total Interval (63:1-77:12)	Prefloat to end-1969 (63:1-69:12)	Prefloat (63:1-73:3)	Postfloat (73:4-77:12)
Constant (t-statistic)	.04 (.84)	.03 (1.51)	.06 (.39)	-.002 (-.04)	.03 (.81)	-.03 (-.68)	.04 (.29)
Coefficient (standard errors)							
Lags 0	-.68(.06)	-.45(.06)	-.84(.11)	-.84(.08)	-.82(.08)	-.85(.08)	-.83(.16)
1	-.11(.05)	-.05(.04)	-.18(.11)				
2	.12(.05)	.10(.04)	.10(.10)				
Sum (t-statistic)	-.67 (-5.40)	-.40 (-4.24)	-.92 (-3.72)	-.84 (-10.23)	-.82 (-10.79)	-.85 (-11.25)	-.83 (-5.29)
$\bar{R}^2$	.44	.33	.52	.38	.55	.55	.33
F(d.f.)	48.23 (3,176)	20.88 (3,119)	21.14 (3,53)	56.86 (2,177)	51.30 (2,81)	75.67 (2,120)	14.84 (2,54)
D.W.	1.95	1.99	1.97	1.90	2.01	1.94	1.89
rho1	.28	-.04	.64	.21	.32	.36	.18
rho2							
S.E.	.43	.25	.44	.56	.20	.26	.94
Chow test (d.f.)		2.72* (7,166)			.19 (3,135)	.39 (3,174)	

TABLE 7 - FRANCE

	OFFSET			STERILIZATION			
	Total Interval	Prefloat	Postfloat	Total Interval	Prefloat to end-1969	Prefloat	Postfloat
	(63:8-77:9)	(63:8-73:3)	(73:4-77:9)	(63:8-77:9)	(63:8-69:12)	(63:8-73:3)	(73:4-77:9)
Constant	.47	.28	.92	-.02	.27	.34	-1.03
(t-statistic)	(2.06)	(1.88)	(1.43)	(-.06)	(1.36)	(1.51)	(-1.25)
Coefficient (standard errors)							
Lags 0	-.46(.04)	-.11(.04)	-.51(.06)	-1.20(.09)	-.38(.10)	-.35(.11)	-1.40(.14)
1	-.05(.03)	-.03(.03)	-.06(.04)				
2	.10(.03)	.01(.03)	.11(.04)				
Sum	-.41	-.13	-.46	-1.20	-.38	-.35	-1.40
(t-statistic)	(-6.65)	(-1.79)	(-4.30)	(-13.40)	(-3.77)	(-3.14)	(-9.84)
$\bar{R}^2$	.51	.20	.56	.52	.12	.07	.64
F(d.f.)	60.37	10.77	23.62	94.22	6.39	5.30	48.80
	(3,166)	(3,112)	(3,50)	(2,167)	(2,74)	(2,113)	(2,51)
D.W.	1.99	1.88	2.00	2.00	2.08	2.02	2.02
rho1	-.09	.32	-.14	-.10	-.20	-.13	-.21
rho2							
S.E.	3.25	1.09	5.37	5.00	2.05	2.70	7.31
Chow test (d.f.)		2.57*			6.49*	9.62*	
		(7,156)			(3,125)	(3,164)	

TABLE 8 - GERMANY

	OFFSET			STERILIZATION			
	Total Interval (64:6-77:9)	Prefloat (64:6-73:3)	Postfloat (73:4-77:9)	Total Interval (64:2-77:9)	Prefloat to end-1969 (64:2-69:12)	Prefloat (64:2-73:3)	Postfloat (73:4-77:9)
Constant	.35	.70	-.21	.16	.03	.13	.20
(t-statistic)	(1.87)	(3.19)	(-.70)	(.89)	(.24)	(.78)	(.47)
Coefficient (standard errors)							
Lags 0	-.50(.05)	-.74(.07)	-.31(.07)	-.68(.08)	-.62(.06)	-.64(.07)	-.81(.22)
1	-.20(.04)	-.29(.06)	-.13(.06)				
2	-.03(.04)	-.04(.05)	-.03(.05)				
Sum	-.73	-1.07	-.47	-.68	-.62	-.64	-.81
(t-statistic)	(-7.02)	(-7.44)	(-3.58)	(-8.93)	(-10.06)	(-9.78)	(-3.66)
$\bar{R}^2$	.36	.49	.29	.33	.56	.46	.19
F(d.f.)	46.53	50.93	11.68	40.77	46.05	48.20	7.26
	(2,157)	(2,103)	(2,51)	(2,161)	(2,68)	(2,107)	(2,51)
D.W.	1.92	1.86	2.04	1.92	2.11	2.02	1.83
rho1				-.26	-.37	-.22	-.30
rho2							
S.E.	2.36	2.25	2.15	2.91	1.54	2.16	4.11
Chow test (d.f.)		3.93*			.30	.14	
		(6,148)			(3,119)	(3,158)	

TABLE 9 - ITALY

	OFFSET			STERILIZATION			
	Total Interval	Prefloat	Postfloat	Total Interval	Prefloat to end-1969	Prefloat	Postfloat
	(66:6-77:10)	(66:6-73:2)	(73:3-77:10)	(66:2-77:10)	(66:2-69:12)	(66:2-73:2)	(73:3-77:10)
Constant	100.62	.71	298.92	100.42	53.44	77.76	151.86
(t-statistic)	(2.12)	(-.06)	(2.81)	(2.53)	(1.20)	(2.08)	(1.76)
Coefficient (standard errors)							
Lags 0	-.47(.07)	-.06(.03)	-.61(.11)	-.83(.10)	-.26(.21)	-.20(.18)	-.95(.14)
1	-.23(.03)	-.03(.01)	-.30(.05)				
Sum	-.70	-.09	-.91	-.83	-.26	-.20	-.95
(t-statistic)	(-7.14)	(-2.03)	(-5.73)	(-8.38)	(-1.23)	(-1.14)	(-6.79)
$\bar{R}^2$	.27	.04	.37	.31	.00	.01	.42
F(d.f.)	51.03	4.14	32.77	33.09	1.00	1.50	20.60
	(1,135)	(1,79)	(1,54)	(2,138)	(2,44)	(2,82)	(2,53)
D.W.	1.96	1.56	2.21	1.99	1.86	2.09	1.94
rho1				-.11	-.11	-.15	-.17
rho2							
S.E.	555.3	105.8	793.3	574.4	332.5	393.2	756.9
Chow test (d.f.)		6.26*			1.60	2.60	
		(4,129)			(3,97)	(3,135)	

TABLE 10 - JAPAN

	OFFSET				STERILIZATION			
	Total Interval	Prefloat	Postfloat	Postfloat alternative lag structure	Total Interval	Prefloat to end 1969	Prefloat	Postfloat
	(66:3-77:10)	(66:3-73:2)	(73:3-77:10)	(73:3-77:10)	(66:3-77:10)	(66:3-69:12)	(66:3-73:2)	(73:3-77:10)
Constant	39.39	13.12	35.02	21.95	48.41	44.45	29.31	70.67
(t-statistic)	(2.29)	(.48)	(1.14)	(.49)	(2.33)	(2.70)	(1.73)	(1.48)
Coefficient (Standard Errors)								
Lags 0	-.20(.03)	-.38(.05)	-.09(.03)	-.08(.02)	-1.12(.15)	-.43(.51)	-1.02(.13)	-1.21(.33)
1	-.09(.02)	-.14(.04)	-.06(.03)	-.07(.03)	-.57(.08)	-.22(.26)	-.51(.06)	- .60(.17)
2	-.04(.02)	-.05(.04)	-.04(.03)					
3	-.03(.02)	-.04(.04)	-.04(.03)					
4	-.04(.02)	-.09(.04)	-.03(.03)					
5	-.05(.02)	-.14(.04)	-.03(.03)					
6	-.06(.02)	-.14(.04)	-.03(.03)					
7	-.02(.03)	-.04(.05)	-.02(.03)					
Sum	-.52	-1.01	-.34	-.15	-1.69	-.65	-1.53	-1.81
(t-statistic)	(-5.47)	(-4.86)	(-2.65)	(-3.44)	(-7.52)	(-.85)	(-8.10)	(-3.66)
$\bar{R}^2$	.34	.42	.47	.51	.39	.27	.47	.33
F(d.f.)	12.77	10.91	9.27	20.11	30.64	6.60	25.15	9.97
	(6,133)	(6,77)	(6,49)	(3,52)	(3,136)	(3,42)	(3,80)	(3,52)
D.W.	1.99	1.96	1.78	1.62	2.05	1.83	2.00	2.04
rho1	.15	.16	.64	.68	-.59	-.65	-.65	-.59
rho2	.08	.17	-.17		-.45	-.54	-.52	-.43
S.E.	155.5	158.6	114.7	110.7	499.5	217.6	330.4	694.9
Chow test (d.f.)		1.81*				.02	.06	
		(15,110)				(6,90)	(6,128)	

TABLE 11 - NETHERLANDS

	OFFSET			STERILIZATION			
	Total Interval (58:1-77:11)	Prefloat (58:1-73:3)	Postfloat (73:4-77:11)	Total Interval (58:1-77:11)	Prefloat to end-1969 (58:1-69:12)	Prefloat (58:1-73:3)	Postfloat (73:4-77:11)
Constant	.08	.08	.07	-.02	-.02	-.02	-.06
(t-statistic)	(3.60)	(3.69)	(1.27)	(-.88)	(-1.30)	(-1.00)	(-.61)
Coefficient (standard errors)							
Lags 0	-.65(.04)	-.42(.06)	-.79(.07)	-.80(.05)	-.73(.06)	-.48(.05)	-1.04(.09)
1	-.19(.03)	-.08(.04)	-.25(.04)				
2	.08(.03)	.10(.04)	.06(.05)				
3	.14(.02)	.13(.03)	.14(.04)				
Sum	-.62	-.28	-.84	-.80	-.73	-.48	-1.04
(t-statistic)	(-7.12)	(-2.34)	(-6.03)	(-16.32)	(-13.08)	(-9.01)	(11.41)
$\bar{R}^2$	.50	.21	.72	.53	.52	.31	.70
F(d.f.)	119.3	24.46	72.02	135.60	78.26	42.04	63.69
	(2,236)	(2,180)	(2,53)	(2,236)	(2,141)	(2,180)	(2,53)
D.W.	2.03	1.77	2.15	1.98	2.05	1.93	2.03
rho1				.14	-.23	.07	.29
rho2							
S.E.	.33	.29	.41	.34	.17	.24	.49
Chow test (d.f.)		2.85*			11.11*	14.57*	
		(7,225)			3,194)	(3,233)	

TABLE 12 - NORWAY

	OFFSET			STERILIZATION			
	Total Interval	Prefloat	Postfloat	Total Interval	Prefloat to end-1969	Prefloat	Postfloat
	(61:2-76:9)	(61:2-73:3)	(73:4-76:9)	(62:1-76:9)	(62:1-69:12)	(62:1-73:3)	(73:4-76:9)
Constant (t-statistic)	.05 (3.19)	.04 (2.95)	.10 (1.92)	-.001 (-.09)	.002 (.12)	-.01 (-.62)	.02 (.45)
Coefficient (standard errors)							
Lags 0	-.53(.04)	-.34(.05)	-.65(.08)	-.28(.05)	-.28(.08)	-.51(.07)	-.74(.09)
1	-.27(.02)	-.17(.03)	-.32(.04)	-.33(.03)	-.14(.04)	-.25(.04)	-.37(.04)
Sum (t-statistic)	-.80 (-12.21)	-.51 (-6.45)	-.97 (-7.72)	-1.00 (-12.93)	-.42 (-3.46)	-.76 (-6.82)	-1.11 (-8.21)
$\bar{R}^2$	.43	.23	.58	.49	.24	.31	.60
F(d.f.)	71.00 (2,185)	22.34 (2,143)	29.69) (2,39)	87.38 (2,174)	15.96 (2,93)	30.78 (2,132)	32.33 (2,39)
D.W.	2.03	2.14	1.95	2.07	2.09	2.00	2.15
rho1	-.24	-.29	-.27	-.48	-.43	-.40	-.56
rho2							
S.E.	.28	.22	.42	.34	.20	.26	.52
Chow test (d.f.)		3.17* (5,178)			2.50* (5,128)	1.50 (5,167)	

TABLE 13 - SWEDEN

	OFFSET			STERILIZATION			
	Total Interval	Prefloat	Postfloat	Total Interval	Prefloat to end-1969	Prefloat	Postfloat
	(62:8-77:5)	(62:8-73:3)	(73:4-77:5)	(62:8-77:5)	(62:8-69:12)	(62:8-73:3)	(73:4-77:5)
Constant	.06	.04	.13	.04	.05	.02	.08
(t-statistic)	(1.77)	(1.85)	(1.18)	(.75)	(1.26)	(.61)	(.49)
Coefficient (standard errors)							
Lags 0	-.27(.04)	-.20(.04)	-.31(.08)	-1.13(.14)	-.85(.23)	-.98(.19)	-1.16(.25)
1	-.14(.02)	-.10(.02)	-.16(.04)				
Sum	-.41	-.30	-.47	-1.13	-.85	-.98	-1.16
(t-statistic)	(-7.16)	(-5.60)	(-3.90)	(-8.14)	(-3.71)	(-5.24)	(-4.56)
$\bar{R}^2$	.38	.33	.38	.27	.13	.17	.29
F(d.f.)	54.34	32.77	15.71	66.23	13.76	27.41	20.77
	(2,175)	(2,125)	(2,47)	(1,176)	(1,87)	(1,126)	(1,48)
D.W.	1.97	2.02	1.93	2.07	2.55	2.47	1.94
rho1	.31	.35	.26				
rho2							
S.E.	.33	.17	.58	.68	.39	.41	1.12
Chow test (d.f.)		.54			.30	.26	
		(5,168)			(2,135)	(2,174)	

TABLE 14 - SWITZERLAND

	OFFSET			STERILIZATION			
	Total Interval (63:4-77:6)	Prefloat (63:4-73:1)	Postfloat (73:2-77:6)	Total Interval (63:4-77:6)	Prefloat to end-1969 (63:4-69:12)	Prefloat (63:4-73:1)	Postfloat (73:2-77:6)
Constant (t-statistic)	.11 (2.42)	.12 (2.15)	.05 (.71)	-.01 (-.32)	.001 (.08)	.0001 (.01)	-.02 (-.43)
Coefficient (standard errors)							
Lags 0	-.50(.14)	-.81(.25)	-.34(.15)	-.07(.02)	-.05(.03)	-.04(.02)	-.17(.07)
Sum (t-statistic)	-.50 (-3.64)	-.81 (-3.27)	-.34 (-2.22)	-.07 (-2.79)	-.05 (-1.37)	-.04 (-2.12)	-.17 (-2.29)
$\bar{R}^2$	.48	.31	.70	.45	.55	.49	.42
F(d.f.)	53.11 (3,167)	18.57 (3,144)	40.83 (3,49)	47.75 3,167	34.12 (3,77)	39.11 (3,114)	13.63 (3,49)
D.W.	1.77	1.89	1.75	1.31	1.59	1.61	1.81
rho1	-.73	-.63	-.85	-.63	-.71	-.66	-.63
rho2	-.62	-.46	-.80	-.62	-.74	-.66	-.65
S.E.	1.35	1.28	1.36	.49	.26	.34	.74
Chow test (d.f.)		4.01* (4,163)			.75 (4,126)	.88 (4,163)	

TABLE 15 - UNITED KINGDOM

	OFFSET			STERILIZATION			
	Total Interval (64:1-77:2)	Prefloat (64:1-72:2)	Postfloat (72:3-77:2)	Total Interval (64:1-77:2)	Prefloat to end-1969 (64:1-69:4)	Prefloat (64:1-72:2)	Postfloat (72:3-77:2)
Constant	.06	.08	.04	.06	.04	.03	.22
(t-statistic)	(1.19)	(1.70)	(.25)	(1.05)	(1.92)	(-.54)	(2.09)
Coefficient (standard errors)							
Lags 0	-.57(.10)	-.34(.09)	-.67(.17)	-1.31(.27)	-.18(.18)	-.67(.19)	- 1.80(.51)
1							
Sum	-.57	-.34	-.67	-1.31	-.18	-.67	-1.80
(t-statistic)	(-5.79)	(-3.56)	(-3.86)	(-4.92)	(-1.00)	(-3.53)	(-3.56)
$\bar{R}^2$	.42	.50	.40	.27	.45	.32	.41
F(d.f.)	19.92	17.27	7.26	7.50	7.32	6.29	5.32
	(2,51)	(2,31)	(2,17)	(3,50)	(3,20)	(3,30)	(3,16)
D.W.	1.89	1.94	1.88	1.96	1.95	1.67	1.92
rho1	.25	.39	.35	-.16	-.68	-.17	-.13
rho2				-.12	.06	.42	-.48
S.E.	.29	.16	.43	.54	.15	.27	.73
Chow test (d.f.)		1.29			3.80*	4.36*	
		(3,48)			(4,36)	(4,46)	

money both domestically and internationally. To the extent that this drives the external current and capital accounts into deficit, a loss of official reserves is forthcoming, but this may take some time to occur, and temporal response of the current and the capital accounts can be different. The other channel is a more direct one caused by exchange markets discounting the money supply increase instantaneously. This channel would basically be the same as that under the view that exchange rates are determined in an asset market, such as has been expostulated under the flexible rate variant of the monetary approach. If an increase in the domestic component caused an instantaneous downward pressure on the exchange rate in line with an asset approach, authorities which resist such movements with intervention could lose reserves more immediately via this route as well as the former one.

The lag structure for Japan's offset coefficient presents an interesting illustration of these two offset channels. In the concurrent period the coefficient is large, perhaps an indication of the second channel mentioned. It then decreases but rises again in the fifth and sixth lagged months when effects from the first channel perhaps are felt. Japan is the only country here that demonstrates this structure, however, and an inspection of the strength of estimated lagged coefficients for the postfloat period indicates that a basic change in the lag structure may have occurred. For Japan an alternative lag structure that seems to fit the postfloat period somewhat better is also presented.

The estimated sum of individual lags, the total offset or sterilization coefficient, usually falls between zero and minus one as hypothesized. In the one case in which it is positive (the prefloat to end-1969 sterilization coefficient for Australia) it is quite insignificant (perhaps indicating that there was no attempt by this country to sterilize in this period rather than that reserve flows were unimportant). Occasionally the estimated absolute values of these coefficients are greater than one, but they are always within a standard error of minus unity except for the postfloat sterilization coefficients of France and the United Kingdom (which causes the total interval's sterilization estimate also to be outside of a standard error of one in both cases), and both the total prefloat and the postfloat sterilization coefficient for Japan.

In many cases the offset and sterilization coefficients presented in the tables are close to estimates found by others for given countries, but in some cases they are not. Across the spectrum of previous work, however, not only the interval of estimation but also the basic methodology often differs. For example, effects on the current and capital accounts have sometimes been computed separately.

Table 16 summarizes the direction of movement of offset coefficients in going from prefloat to postfloat, and movements from both pre-1970 and pre-1972 sterilization coefficients to the postfloat estimates. Cases in which the Chow test indicates a statistically significant shift are also shown.

For the offset coefficient, the direction of movement from the prefloat to the postfloat period is nonuniform. For some countries, there is little change at all. Australia's computed offset moves downward marginally but both estimates are close to minus unity, indicating little ability to conduct an independent monetary policy. Austria's offset coefficient is exactly the same for the prefloat and postfloat periods.

Countries that show a statistically significant downward movement in the offset coefficient from prefloat to postfloat periods are Canada, Germany, Japan, and Switzerland. Canada's post-1970 offset coefficient falls to -.15 from -.48 before floating, but the postfloat coefficient is not significant. Both the prefloat and postfloat offset coefficients for Germany are significant, and the value falls from

TABLE 16 - Direction of Absolute Value Movement of Coefficient from Adjustable Peg to Managed Floating Period

	OFFSET	STERILIZATION	
		From period prior to end - 1969 to managed float	From total fixed rate period to to managed float
Australia	Down	Up*	Up
Austria	NC	Up*	Up
Belgium	Up	Up	Up
Canada	Down*	Up*	N/A
Denmark	Up*	NC	NC
France	Up*	Up*	Up*
Germany	Down*	Up	Up
Italy	Up*	Up	Up
Japan	Down*	Up	Up
Netherlands	Up*	Up*	Up*
Norway	Up*	Up*	Up
Sweden	Up	Up	Up
Switzerland	Down*	Up	Up
United Kindgdom	Up	Up*	Up*

* Chow test significant at 95% level.
NC = No change
† = Both prefloat intervals are essentially the same for Canada, which floated in May, 1970.

close to minus unity to -.47, indicating a good bit more ability to achieve a domestic monetary target without counteractive movements in the international component of the monetary base. The same cannot be said for other participants in the European joint float, as discussed below. Japan's offset coefficient results are similar to Germany, moving from minus unity to -.34 (or -.15 using the above mentioned alternative lag structure), as are Switzerland's to an extent which move from -.81 to -.34. This group includes two of the world's most important trading currencies behind the U.S.dollar, the deutschmark and the yen, and two currencies that are often mentioned as havens of "hot money" or speculative short-term capital flows, the mark and the Swiss franc. The insignificance of Canada's postfloat estimate prevents firm conclusions regarding that country,24/ but for the others the evidence seems to support the efficacy of flexible rates in imparting monetary independence. All of these countries except for Germany, it may be noted, float independently of other countries.

On the other hand, Denmark, France, Italy, the Netherlands, and Norway have offset coefficients that move upward significantly from the prefloat to the postfloat periods. The offset coefficients of three other countries--Belgium, Sweden, and the United Kingdom--rise in the move to generalized floating, but the shift is not significant as measured by the Chow test. For some of these countries the loss of offset independence appears dramatic. Denmark's coefficient rises to -.92 from -.40, Italy's from an almost negligible -.09 to -.91, the Netherlands' from -.28 to -.84, and Norway's from -.51 to -.97. Others seem to have at least some monetary independence even after the postfloat rise. France, Belgium, Sweden, and the United

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24. For some evidence that floating has resulted in greater monetary independence for Canada, see Abrams, Froyen, and Waud (1979).

Kingdom have postfloat offset values of -.46, -.60, -.47 and -.67 respectively. An interesting point concerning all countries in this group, however, is that most of them are, or have been during the floating rate interval, participants in the European snake. Belgium, Denmark, the Netherlands, Norway, and Sweden participated over the entire flexible rate interval taken here, and so did France for a considerable portion of it. (The fact that France was out during much of the floating interval may be one reason its offset coefficient is still relatively low after floating.)

The other two countries whose offset coefficients move upward from fixed to floating rates, Italy and the United Kingdom, were not associated with the snake in the latter interval. The currencies of both of these countries were weak over this period, however, reflecting generally higher rates of domestic inflation than abroad. In this sense it is not surprising that exchange markets may have reacted strongly to money supply increases that could augur future inflation by selling the lira or the pound. Insomuch as this activated official intervention to shore up the falling currency, the offset to the original monetary expansion could easily have occurred.

The dominance of European snake members in the group of countries that lost offset independence in moving to generalized floating underlines the apparently high cost of participation in such a currency union. It is also noteworthy that Germany, the major snake member, gains offset independence in the floating interval. If movements in the deutschmark dictate overall movement of the snake, then it is not surprising that Germany would gain monetary independence while other members, who sometimes must struggle to match their currency's movement to the mark, would lose independence. These results indicate that, differences in institutional arrangements notwithstanding, matching movements in the deutschmark has had a greater cost in terms of monetary independence than pegging to the dollar under Bretton Woods.

Moving now to sterilization coefficient results, a more consistent picture emerges across countries. In almost all cases the absolute value of the sterilization coefficient rises in the move to generalized floating, indicating greater ability of foreign monetary authorities to neutralize unwanted official reserve flows. This greater independence seems to operate in both directions, applying to those weaker currency countries that have lost reserves as well as the stronger currency countries that have gained reserves. Greater ability (or desire) to sterilize applies, moreover, both to the movement from the total prefloat period and to movement from the before-1970 prefloat interval. The coefficient shifts in moving from the total adjustable peg interval to managed floating are discussed below first.

The change in the sterilization coefficient in moving from prefloat to postfloat is less dramatic for some countries than others. Denmark's coefficient is almost exactly the same. Belgium, Canada, Germany, Japan, Sweden, and Switzerland also do not demonstrate observably large shifts. All of these countries except for Switzerland indicate a considerable ability to sterilize before the float as well as after. (Switzerland's coefficient changes from -.04 to -.17, and while this may be a noticeable shift, it still marks this economy as more vulnerable to foreign monetary flows than any others investigated here.) Prefloat sterilization coefficients of -.60 for Belgium and -.64 for Germany are lower than most. Canada and Sweden have prefloat coefficients that are quite close to minus one, and Japan's coefficient for this interval as mentioned above even exceeds minus unity by more than one standard error. Canada's prefloat coefficient of -1.14 and postfloat coefficient of -1.28 are both within a standard error of minus one, and the shift is not so great, but the Chow test indicates that this change is significant. Perhaps this is related to an apparent change in the lag structure, similar to that discussed above for Japan's offset. Using a second degree polynomial to fit both lag structures, a monotonically declining distribution is observed in the earlier interval and one that rises and then falls is observed in the postfloat period.

For other countries the upward movement in the sterilization coefficient's absolute value is more noticeable. This is true for Australia, Austria, France, Italy, the Netherlands, the United Kingdom, and to some extent for Norway. In only four cases, however, does the Chow test judge the shift to be statistically significant at the 95 percent level. In addition to the Canadian result mentioned above, these countries are France, the Netherlands, and the United Kingdom.

In moving from interval truncated at the end of 1969 to the postfloat period, there are a total of seven cases (also including Canada, to which the 1970-1972 period does not apply here since it actually floated in 1970) in which the Chow test indicates a significant upward shift. These are Australia, Austria, Canada, France, the Netherlands, Norway, and the United Kingdom. One would expect fewer, not more, cases here than for the interval including the 1970-1972 period of U.S. dollar overvaluation if this latter episode was important in fostering massive reserve inflows which dollar peggers could not neutralize. This result might be taken on the surface to indicate that the official reserve accumulations of the early seventies were less of a problem than some have argued.25/ Only for the Netherlands does one find a smaller absolute value for the sterilization estimate in the total fixed rate interval (-.48) than for the pre-1970 interval (-.73). This kind of result for more countries might have supported an argument that neutralization of the 1970-1972 reserve inflows was attempted but that it met with little success due to insufficient depth of domestic capital markets relative to the foreign flows.

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25. See, for example, Goldstein (1974), Meiselman (1975), and Heller (1976).

Considerably more of the sterilization coefficient estimates in the pre-1970 interval are statistically weak. Low t-statistics characterize Australia, Austria, Italy, Japan, Switzerland, and the United Kingdom in this period. A reason for this coud be that some of these countries simply did not attempt to sterilize reserve flows in this period, reacting more passively to them and allowing them to automatically influence the base money stock.26/ As reserve accumulations grew in the early seventies, a greater awareness of their magnitude and liquidity effects could have caused a more active effort to counter them by opposite movements in the domestic component of the monetary base.

VI. Conclusions

Overall results of the presented tests of greater national monetary independence under managed floating are summarized below.

(1) Offset coefficients show a mixed picture across countries regarding the extent to which official reserve flows counteract exogenous opposite

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26. This may be less likely for the United Kingdom than for other countries. On the U.K. policy of requiring that any pounds obtained by the Exchange Stabilization Fund be used to purchase government bonds, so that there is a tendency toward automatic sterilization, see Hodgeman (1974, p. 173).

The at least quasi-reserve center status of the United Kingdom during the adjustable peg era, it can be argued, may have made international reserve asset influences negligible enough to be ignored. In work which relates to this aspect, Putnam and Wilford (1978) have concluded that failure to find a causal role for U.K. money on U.K. nominal income, such as Sims (1972) found for the United States, could be understandable. If the U.S. as the major reserve center is insulated from foreign monetary influences since there are no significant effects of changes in international reserve assets on its monetary base, they argue, it has control over its money stock and this leads nominal income. But in an outer country (the U.K. here) money and income are simultaneously determined because the economy is more open and has prices set in "unified world markets" (ibid., pp. 425-426). Such a view does not weigh very heavily the reserve center status of the U.K. under Bretton Woods. Mixon, Pratt, and Wallace (1979), on the other hand, taking a cross-national approach of U.S. money to U.K. nominal income, find no causal relationship under Bretton Woods but do find one under the managed float. They therefore question whether more flexible rates have actually insulated U.K. income from U.S. monetary policy. But results in Table 15 at least support a case that the U.K. has actually sterilized more since floating.

movements in the domestic component of the monetary base. More offset coefficients move upward than downward, indicating less independence under managed floating, but the independent floaters generally show downward movement (Canada, Japan and Switzerland significantly). One participant in the European joint float, Germany, also shows a significant downward movement. Other snake members show less offset independence as participants in this currency union than they did when they fixed their currencies to the dollar. This emphasizes the deutschmark as the most important key currency in the snake, and suggests that other snake members must match movements in the German currency rather than vice versa. While it is true that the mutual band within which snake currencies move is marginally wider under managed floating than it was when all currencies pegged to the dollar,27/ considerable intervention frequently has been conducted. More divergent price levels and generally more turbulent underlying economic conditions have imparted much volatility to exchange rates. What is important here may not be the width of the band but rather how far outside of it private supply and demand for a given currency find instantaneous equilibrium, creating a wider gap to be filled by official intervention.

(2) There does appear to be greater ability for all countries to sterilize exogenous by opposite movements in the domestic component of the monetary base under managed floating than under the adjustable U.S. dollar pegging system.

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27. When U.S. dollar parity was maintained intervention occurred within a margin of approximately ± .75 percent, allowing a maximum difference in cross rates of ± 1.5 percent. The Smithsonian Agreement in 1971 changed these figures to ± 2.25 percent and ± 4.5 percent respectively, prompting the institution of the Basle Agreement in April 1972 which halved the last figure (the tunnel) to 2.25 percent (the snake). In March 1973 the tunnel ceased to exist but the snake remained. In the total process the maximum difference in snake country cross rates had widened to ± 2.25 percent from ± 1.5 percent.

(3) Some evidence presented here suggests that greater actual sterilization occurred in the early seventies episode, when the overvalued U.S. dollar caused larger official reserve inflows to countries still pegging to the U.S. unit, than occurred during most of the sixties when reaction to such flows may have been more passive.

On balance these results do point to greater overall monetary independence under managed floating than existed under fixed rates. They also highlight the fact that it cannot be an automatic presumption, as is illustrated by the offset coefficient results for joint float participants (except for Germany) and some other countries. The policy prescription for these cases is not that managed floating does not work, but it should be recognized that certain tradeoffs still exist between monetary independence and some forms of exchange rate fixity.28/

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28. Others have reached similar conclusions in comparing managed floating to fixed rates. Frenkel (1978), investigates the demand for international reserves during 1963-72 as compared to 1973-75, and concludes that "economic behavior seems to be more stable than legal arrangements" (p. 18). The offset coefficient results presented here generally do not conflict with the conclusions on reserve use under different exchange rate regimes by Suss (1976), who finds that Canada, Denmark, France, West Germany, Japan, and Switzerland indicate reduced reserve use under floating, but that Italy, the Netherlands, and Norway increased reserve use. Results here, which find lower offsets corresponding to the above countries that showed less reserve use and higher offsets for countries indicating greater reserve use, agree except for Denmark and France.

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