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The Presumed Inherent Instability of
the Multiple Reserve-Currency System**

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Inherent Instability of the Multiple Reserve-Currency System

1. Introduction

Economists have been worried for many years about the presumed 'inherent' instability of an international monetary system that is based on reserve holdings denominated in more than one currency. From the early 1960s to 1971, the discussion focused on too rapid or slow global reserve creation with consequent inflationary or deflationary pressures on the reserve-currency countries as diversification proceeded or receded [see e.g. Triffin (1960) or Williamson (1973)]. Accordingly, a scheme for harmonization of reserve composition was discussed. Since the adoption of widespread floating in 1973, the main concern regarding switches in official reserves has been the aggravating of exchange rate instability.

The concern about aggravated exchange-rate instability is based on historical analogies to the bimetallic standard of the 19th century and to the gold-exchange standards of the between-the-wars and postwar periods [see for example Group of Thirty (1980, p. 6)]. Both standards were unstable and eventually broke down. However, Kenen (1981, p. 408) notes that the 'inherent' instability of these standards was caused by "... the authorities' attempts to peg the prices of the reserve assets despite changes in their relative scarcities." This invited self-aggravating speculation which increased the danger of depleting the authorities' holdings of the reserve asset.

Since under the present system authorities manage but do not try to peg the prices of reserve assets, there is no such

incentive for self-aggravating speculation. However, looking at periods of diversification out of dollar holdings and again partly back into them and at periods of dollar depreciation and appreciation, some correspondance of these periods can be noted. Hence, the question is whether central bank reserve switches have aggravated rather than offset the exchange rate instability in these periods. The objective of this paper is to assess this question empirically. In Section 2, portfolio switches of central banks and a reference for the development of exchange rate are calculated. The resulting figures are used to assess the stabilizing impact of the portfolio management of central banks by applying the 'leaning-against-the-wind' criterion, Section 3, and the 'profit criterion', Section 4. Section 5 summarizes the main conclusions.

2. Portfolio Switches and the Development of Exchange Rates

Ideally, the impact of portfolio switches on the development of exchange rates would be empirically assessed by a regression analysis. Such an analysis would use all factors that the generally accepted exchange-rate model indicates as causing exchange-rate movements as independent variables and add official portfolio switches as a further independent variable. The sign of the variable representing portfolio switches would indicate whether the portfolio management of central banks predominantly reinforced or dampened exchange-rate movements. However, since none of the existing exchange-rate models is generally accepted an alternative - 'second-best' - approach has to be taken.

The empirical analysis partly follows Bergsten and Williamson's (1982) study, the only - although unpublished - source available in the literature on this issue. The analysis is

based on the data made available by the International Monetary Fund¹ on the quarterly holdings of the five principal reserve currencies (US dollar, pound Sterling, Deutschemark, Swiss franc, and Japanese yen) of two groups of countries, industrialized and developing, from 1975:1 to 1987:4.²

Following Bergsten and Williamson (1982, p. 26), a portfolio switch was measured as the percentage increase in the holding of a currency in a given quarter, less the percentage increase in the size of total foreign-exchange holdings (in terms of the respective currency) of the respective country group, i.e.

$$\text{Portfolio switch} = (P_t - P_{t-1}) - (PT_t - PT_{t-1}) / PT_{t-1}$$

where P = percentage share of a currency in foreign-exchange holdings of the respective country group

PT = total foreign-exchange holdings of a country group denominated in the respective currency using the SDR exchange rate at the end of (t-1) to convert holdings denominated in SDRs to holdings denominated in the respective currency.

Note that portfolio switches measured in this way are independent of the currency chosen as numeraire.

However, the measure used ignores changes in reserve composition caused by distributional effects within a country group. If, for example, a country which holds the bulk of its

1. The author is indebted to Donald Mathieson for the provision of the data.

2. Note that ECU-holdings in the period from 1979:1 on were decomposed into dollars and gold whose swaps create the ECU claims.

reserves in currency 1 runs a surplus with another country the major part of whose reserves is denominated in currency 2, holdings in currency 1 will increase at the expense of currency 2 without any country changing its portfolio composition. As data disaggregated by country are confidential, the impact of those distributional effects on changes in the aggregate portfolio cannot be singled out. The data on the holdings of a currency, their percentage changes, and the calculated portfolio switches for both industrialized and developing countries are shown in the first six columns of tables 1 to 5.

Since the objective of the analysis is to investigate whether reserve shifts have been stabilizing or not with respect to the development of exchange rates, it is necessary to compare the results obtained for portfolio switches with the behavior of exchange rates. Exchange-rate changes are represented by deviations from trend as expressed by the scaled residuals of a regression on the exchange rate as the dependent variable and a constant and a trend variable as the independent variables over the period 1975:1 to 1988:4.³ A positive (negative) sign signifies that the currency is appreciated (depreciated) in comparison to its calculated trend value.

As it is not clear what the appropriate set of exchange rates employed for the calculation of exchange-rate changes is, four sets have been analysed. Since the dollar is still the major reserve currency and portfolio switches therefore tend to be out of or back into dollars, the dollar rate for currencies other than

3. PC-GIVE was used for these calculations. The program calculates the maximum-likelihood estimator by maximizing the likelihood function concentrated with respect to the constant and the trend factor.

the dollar was used as the first set. The other three sets work with a measure of some kind of multilateral exchange rate: the IMF's effective exchange rate indices (MERM); value-added deflators (VADs) representing the quotient of the current and constant price estimates of value added in the manufacturing sector adjusted for changes in indirect taxes, i.e. composite indicators of the cost (per unit of real value added) of all factors of production - IFS line 99BY - , as a measure of the real exchange rate; and, finally, SDR-exchange rates. While the first three data sets are based on period average values, SDR rates are based on end-of-period figures since IFS does not report period average SDR exchange rates.

Columns 7 to 10 (7 to 9 for the dollar) in tables 1 to 5 show the calculated deviations from trend of the four exchange-rate series. It is apparent that all four measures of the exchange rates move broadly in parallel after detrending. Therefore, in the following, exchange-rate changes will be represented only by the series of SDR rates.

3. The 'Leaning-against-the-Wind' Criterion

As mentioned above, those who hold that a multiple reserve-currency system is inherently unstable argue that a rational central bank would move into appreciating and out of depreciating currencies - thus reinforcing exchange-rate instability. It has been argued on similar grounds that central banks with a commitment to exchange-rate stability should not only refrain from this kind of reserve switching, but also defend exchange rate against destabilizing speculation of private economic agents. Accordingly, official intervention policy should 'lean against the

wind', i.e. buying depreciating and selling appreciating currency [see e.g. Tosini (1977) and Jurgenson Report (1983)].

However, whether leaning against the wind is considered stabilizing depends on the definition of the term 'stabilizing'. Friedman (1953, pp. 176-177, 188) holds that intervention is destabilizing if it counters the underlying forces in the absence of speculation or interferes with fundamental adjustments. Accordingly, leaning against the wind is destabilizing because it causes the exchange rate to deviate from its underlying value. More recently, authors [e.g. Jurgensen (1983, p. 32)] have argued that instability should be equated with the variance of exchange rate changes. In this sense, leaning against the wind is obviously stabilizing. The desirability of this strategy is, however, not entirely clear because it "... might have had adverse implications had it delayed necessary exchange rate adjustments or contributed to sustained periods of one-way exchange rate movements which might have created 'one-way' bets." [Jurgensen (1983, p. 25)] But the very purpose of intervention can be regarded as to finance balance-of-payments deficits and thus avoid adjustment. Hence, the central bank may want to foster domestic economic stability by temporarily avoiding "excessive" adjustment costs through the slowing down of the speed of adjustment in the economy.

Similarly, reserve switches might be interpreted as 'leaning against the wind' if reserves tend to be switched out of appreciating and into depreciating currencies and therefore

counteract or offset the exchange-rate change.⁴ Alternatively, reserve switches might be interpreted as 'bending before the wind' if they tend to counter 'leaning-against-the-wind' intervention and reinforce the exchange-rate change. Consequently, to determine whether reserve switches have involved reinforcing or offsetting exchange-rate changes, the deviations from trend of end-of-quarter SDR exchange rates have been multiplied into the figures for portfolio switches. A positive number indicates reserve switches into a currency in question when it was appreciating, or out when it was depreciating, i.e. reserve switches were reinforcing exchange-rate changes.⁵ Negative numbers indicate reserve switches as leaning against the wind. The results of this operation are shown in the columns headed "Leaning against the Wind" in tables 1 to 5.

As a general feature, the tables suggest that developing countries were reinforcing exchange-rate changes as they often bent before the wind during periods when a specific reserve currency was appreciating or depreciating with respect to trend. This lends support to earlier findings reporting that central banks of developing countries tend to optimally manage their foreign-exchange portfolio [see e.g. Ben-Bassat (1984)]. On the other hand, the figures suggest that industrialized countries were generally more committed to exchange rate stability as they were

4. Note, however, the conceptual difference between reserve switches and intervention. Intervention is characterized by the sale or purchase of domestic currency in exchange for a foreign currency (the intervention currency), while reserve switches involve a sale or purchase of one foreign currency in exchange for another where both are reserve currencies.

5. For example, the figures for the US dollar for 1987:4 suggest that portfolio switches by developing countries were reinforcing dollar-rate changes three times more than portfolio switches by industrialized countries.

predominantly leaning against the wind from 1981 on and were bending before the wind between 1975 and 1980 during shorter periods or to a lesser extent compared to developing countries.

Concerning the dollar, developing countries were bending before the wind over several periods on two occasions, the very weak dollar in 1978 and the very strong dollar between 1984:3 and 1985:1. It is interesting to note that all reserve switches in or out of the dollar until 1985, which involved substantial exchange-rate destabilization (1975:4, 1978:1, 1978:3 - 1978:4, 1980:2, 1984:3 - 1985:1), find correspondance in a similar development in the figures for the Deutschemark. This indicates the high substitutability of dollar and Deutschemark as reserve currencies. However, the figure for 1987:4 corresponds to the development in the figures for the yen. Since 1987:4 is the last quarter of the sample period, one can only speculate as to whether this indicates an increasing importance of the yen as a reserve currency in the very recent past compared to the persistence of the share reached by the Deutschemark before.

The dollar management of industrialized countries can be divided into two subperiods, with the beginning of 1981 as the dividing line. The first subperiod is characterized by a high number of bending-before-the-wind switches. These reserve switches are especially high between 1978-1980, a period characterized by a very weak dollar. Interpreting the reputation of a currency to guarantee real-value stability of holdings denominated in that currency as its 'brand-name capital' [see Klein (1974)], the reserve switches between 1978 and 1980 suggest the adoption of a new attitude of industrialized countries towards dollar holdings at the time. As there was no convertibility constraint on dollar holdings and the performance of the dollar during the 1970s undermined its reputation as a high-quality currency, confidence

of industrialized countries in the capacity or willingness of the United States to guarantee a low-inflationary and stable international monetary system was ebbing. Consequently, the reserve switches might be interpreted as a signal of industrialized countries to the United States that they would not tolerate further exploitation of the brand-name capital of the dollar. Accordingly, the United States either had to accept the erosion of the dollar as a reserve currency or adopt policy measures with the objective of guaranteeing real value stability on outstanding dollar holdings. US authorities indeed adopted a more restrictive monetary policy in November 1978 and October 1979. In addition, they promised to intervene on foreign-exchange markets to influence the dollar exchange rate in the short run.

The second subperiod is characterized by leaning-against-the-wind reserve switches in almost all quarters. Note that these switches were strongest between 1984:1 and 1985:3 - the end of this period coincides with the Plaza Agreement - a period during which developing countries were heavily bending before the wind. The above-mentioned parallelism between reserve switches involving the dollar and switches involving the Deutschemark - the yen replacing the Deutschemark in 1987:4 - can also be noted for the group of industrialized countries.

Concerning the pound Sterling, the tables suggest that developing countries employed a policy of optimal portfolio management. All extended periods of bending before the wind coincide with local maxima or minima in the development of the exchange rate of Sterling (1976, 1978:4 - 1982:3, 1984:3 - 1985:2). The low values of reserve switches into or out of Sterling by industrialized countries may indicate the limited importance of Sterling as a reserve currency for these countries.

Optimal portfolio management by developing countries is also suggested by the tables for the Deutschemark. The long period of bending before the wind between 1981:2 - 1985:1 coincides with the depreciation of the Deutschemark with respect to the dollar. For the group of industrialized countries, the tables suggest the same division into two subperiods as for the dollar, although the pattern is less distinct. It is interesting to note that the accumulation of DM-reserves by EMS-countries, in particular since 1983, seem to have been following a leaning-against-the-wind strategy, i.e. exchange-rate changes have not thereby been reinforced.

The figures for the Swiss franc show few substantial reserve switches for both groups of countries. However, a long period of bending before the wind by developing countries between 1981:4 and 1984:3 coincides with a local maximum and a local minimum of the exchange rate of the Swiss franc against the SDR. This points again to the optimal portfolio strategy of these countries.

Concerning the Japanese yen, the striking feature of the tables is that industrialized countries followed a leaning-against-the-wind strategy throughout the entire sample period only interrupted a few times for one or at most two quarters.

In order to assess whether reserve switches predominantly involved reinforcing or offsetting exchange-rate changes throughout the entire sample period, an index was constructed, as proposed by Bergsten and Williamson (1982, pp. 29-30). For this, the figures in the columns headed "Leaning against the Wind" have been summed for each currency and for the two country groups separately. These sums tend to be dominated by those quarters in which there were both considerable switches and significant exchange-rate changes as the scale of the switch and the degree of

rate changes enter multiplicatively. Then, the absolute values of the figures in the column headed "Leaning against the Wind" have been summed, and used to divide the sum calculated before. The resulting index runs from +1 to -1, the extreme cases indicating that reserve switches were completely reinforcing or offsetting exchange-rate changes, respectively. The resulting indices are shown in table 6.

Table 6: Index of Leaning against the Wind

	Industrialized Countries	Developing Countries
Dollar	-0.166	0.258
Sterling	-0.007	0.093
Deutschemark	-0.131	0.420
Swiss franc	0.026	0.315
Japanese yen	-0.0002	0.333

Source: Tables 1 to 5 and calculations as described in the text. A negative number indicates that reserve switching predominantly offset exchange-rate changes

The table suggests that reserve switching by industrialized countries was indeed such as to generally lean against the wind, i.e. to offset rather than to reinforce exchange-rate changes while the opposite seems to be the case for developing countries. In the light of the above interpretation of reserve switching regarding dollar and Deutschemark during 1978 and 1979, the index underestimates the stabilizing character of reserve switches by industrialized countries for these two currencies. Thus, the difference in the portfolio management of the two country groups becomes even more striking.

Bergsten and Williamson (1982, pp. 31-32) use the described method to calculate a second index of whether reserve shifts were

stabilizing, now on the basis of medium-term equilibrium exchange rates. They define the equilibrium rate as the trend value calculated before in order to determine the exchange-rate series which were used for the calculation of portfolio switches. While the results on their first index led them to conclude that central banks in general lean against the wind, their second index suggests that central banks tend to destabilize exchange rates, i.e. that they tend to push the exchange rate away from its medium term equilibrium level.

But, using an equilibrium exchange rate - however defined - for the calculations is not persuasive. This approach requires knowledge of the equilibrium path of the exchange rate, whereas the exact identification of that equilibrium path is virtually impossible. The most important technical difficulty of defining the nominal equilibrium exchange rate is the choice of a base period. It cannot be expected that a trend value calculated over some specific period (1974:2 to 1981:1 in Bergsten and Williamson (1982)) will necessarily closely correspond to medium-term equilibrium rates. Even if this difficulty could be solved, medium-term equilibrium exchange rates are not a compelling policy target. Foreign-exchange interventions or reserve switches affect the nominal exchange rate and, with sticky prices, the real exchange rate in the short run only, a horizon that is shorter than the medium-term perspective underlying Bergsten and Williamson's calculation of the equilibrium exchange rate. Moreover, Swoboda (1988, p. 98) points out that the real exchange rate is an endogenous variable under both fixed and flexible exchange rates and therefore should not be used as a policy target. In general, as the correct calculation of equilibrium exchange rates is not clear and the real exchange rate is not an independent policy instrument, calculating a leaning-against-the-wind index on the basis of an arbitrarily determined equilibrium

rate tells little about the actual stabilizing merits of reserve switches.

4. The 'Profit Criterion'

A natural question to ask is whether the profits and losses that may arise from reserve switches can be used as a formal criterion to evaluate the stabilizing or destabilizing nature of these switches. Such a use follows from the profit criterion, a controversially discussed yardstick in economic literature on the stabilizing or destabilizing impact of official intervention in the exchange markets. The profit criterion goes back to Milton Friedman's (1953) well-known essay on fixed versus flexible exchange rates. Friedman affirmed that destabilizing speculation implies losses to speculators, and suggested that one criterion of the effectiveness of official intervention in stabilizing exchange rates could be the profits made on that intervention.

Two theoretical problems of the profit criterion are noteworthy here.⁶ On the one hand, Mayer and Taguchi (1983, pp. 10-11) show that even unprofitable speculation can be stabilizing. One example is excessive intervention in the right direction with the exchange rate randomly fluctuating around its equilibrium path. In this case, intervention would push the actual exchange rate beyond the equilibrium path - an overvalued (undervalued) currency would become slightly undervalued (overvalued). Consequently, despite the fact that intervention succeeds in

6. See Jacobson (1983) for a survey on the theoretical debate on the relationship between profitability of speculation and exchange-rate stability in economic literature.

reducing exchange-rate variability, all sales are made at a lower rate than purchases - the central bank incurs losses. On the other hand, the authorities may deliberately lose money by their interventions. This may be the case in two circumstances. One is intervention to finance a temporary payments deficit in order to avoid costly adjustments that would have to be reversed when the effects of the underlying temporary disturbances have passed. The other is when sudden disturbances are believed to be permanent but intervention permits a more gradual, and thereby more balanced and less disruptive adjustment.

In general, using the profit criterion one has to bear in mind that more weight is given to destabilizing than to stabilizing behavior. Due to this negative bias, the usefulness of the profit criterion for evaluating the impact of intervention, or reserve switches, on exchange-rate stability is reduced, and results should therefore be interpreted with caution. Nonetheless, together with the leaning-against-the-wind criterion the profit criterion remains the most useful criterion for this purpose because it is a relatively easily quantifiable measure.⁷

The most serious technical problem of the profit criterion is how to handle net cumulative currency holdings at the end of the period. Taylor (1982) and Corrado and Taylor (1986) value the cumulative net intervention figure at the end-of-period exchange rate. Several authors [Argy (1982), Jacobson (1983) and Pilbeam (1988)] have argued that by examining the entire sample period, results will be biased according to whether the period was

7. Mayer and Taguchi (1983) propose a 'hybrid criterion' as an alternative. However, in order to use it both an equilibrium exchange rate and exchange rate zones around this hypothetical equilibrium level have to be determined.

dominated by net purchases or sales of dollars. Therefore, they propose restricting the calculations to periods in which purchases and sales of foreign exchange are approximately equal to avoid the problem of measuring cumulated net currency holdings.

In the remainder of this section, the profit criterion will be applied to reserve switches. This calculation deviates from Bergsten and Williamson's (1982, pp. 34-35) study since the latter do not provide a meaningful measure of profits. They define profits as the sum of the products of portfolio switches and the percentage appreciation relative to trend in the exchange rate from the quarter in question to the average rate 6 months later. Accordingly, they examine whether portfolios were shifted into (out of) currencies before an appreciation (depreciation) occurred. However, this method arbitrarily determines an investment horizon of six months which neglects any flexibility in investment decisions. Moreover, interest income earned on the currency holdings is ignored. Finally, summing the profits over the entire sample period introduces a bias dependent on whether switches were predominantly into or out of the reserve currency in question during the sample period.

The calculations for the profit criterion involve several steps:

- 1) The holdings of a currency of both industrialized and developing countries have been calculated by multiplying:
 - total foreign-exchange holdings of the respective country group (expressed in end-of-period SDRs) by
 - the share of the currency in the total portfolio of the country group,
 - the end-of-period SDR/US Dollar exchange rate, and
 - the period average US Dollar exchange rate of the respective currency.

This yielded eight series: the period average holdings of industrialized and developing countries of Deutschemark, Swiss franc, pound Sterling, and Japanese yen, each in terms of the currency held.

- 2) Increases and decreases of holdings of the four currencies have been calculated by subtracting holdings in period $t-1$ from holdings in period t . This yielded eight series of net holdings in a period on average. The differences have been summed to calculate eight series of net cumulative holdings of a currency in a period on average.
- 3) In order to minimize the problems inherent in evaluating the end of period cumulative currency holdings, periods have been selected over which net cumulative currency holdings have been close to zero. The net increase (decrease) of currency holdings remaining in the series of net cumulative holdings at the end of a selected period was subtracted from (added to) the difference of holdings - calculated in 2) - in the final quarter of the selected period. This yielded the series of zero net cumulative currency holdings.
- 4) Average balances of holdings denominated in the four currencies have been calculated for each quarter of the selected periods of zero net cumulative holdings, as basis for the calculation of exchange-rate and interest-rate profits of portfolio switches. For this, the net holdings figure for the quarter in question was added to the previous quarter's net figure and divided by two (for the first quarter of a selected period, the net holdings figure was divided by two).
- 5) Exchange-rate profits in terms of US dollars have been calculated by multiplying the average balances of currency

holdings for each quarter of the selected periods of zero net cumulative currency holdings by the average dollar exchange rate of the respective currency. Positive entries represent purchases of the currency against US dollars, i.e. expenditures, and negative entries represent sales of the currency for US dollars, i.e. receipts. Purchases and sales have been summed to calculate the exchange-rate gain or loss for the respective period of net zero cumulative holdings.

6) Interest-rate earnings have been calculated as follows: the absolute figures of average holdings of a currency have been multiplied by US interest rates for each quarter of zero net cumulative currency holdings. The sum of these series indicate the interest income for each period of zero net cumulative holdings, had all holdings been in US dollars. Next, the figures of a period with a positive entry in the series of average holdings of a currency have been multiplied by the interest rate of the country issuing the currency held. US interest-rate earnings have been replaced by these figures of interest income for the respective periods in order to calculate the series of interest income considering the switch from dollar holdings into one of the other four currencies. The interest rate gain or loss of portfolio switches was calculated by subtracting the series of interest income on the basis of US interest rates from the series of interest income on the basis of US interest rates for the periods of dollar holdings and of interest rates for the respective other currency for periods of holdings therein.

7) The net profit from portfolio switches was calculated as the exchange rate profit/loss plus the interest rate gain/loss.

The above calculation is based on the following assumptions:

- All portfolio switches are made out of dollar holdings and back into dollar holdings;
- switches are spread out evenly throughout the quarter;
- profits and losses on intra-quarter trading can be ignored;
- all interest rate gains/losses are converted into dollar at the period average exchange rate;
- compound interest income can be ignored (assuming a compound interest rate of 10 percent on an annual basis, the quarterly interest rate would be the fourth potency of 1 plus the fourth root of 0.1 (1.024) - or 1.0995 - while an interest rate of 1.10 was assumed in the calculation);
- net cumulative portfolio switches at the end of the period can be closed out at the average exchange rate of the final quarter of the period.

As it is not clear what the appropriate set of interest rates employed for the calculation of the profitability of portfolio switches is, two sets have been used. Mayer and Taguchi (1983, p. 16) argue that, for such a calculation to be useful, the interest differential should reflect the underlying trend in the equilibrium exchange rate between two currencies. Considering the forward rate as an unbiased estimate of the future spot rate, the forward discount or premium on foreign currency reflects the trend in the exchange rate expected by the market. On the other hand, the forward discount or premium equals the Euro-currency interest differential when covered interest arbitrage holds. However, central banks do not necessarily invest in the Euromarket but, for example, conduct swap operations at non-market rates. This means that actual interest income may differ from the results obtained by taking Euro-interest rates - the theoretically appropriate set. Therefore, treasury bill rates have been used to see whether the

choice of interest rates resulted in any significant difference.⁸ Accordingly, three-months LIBOR on deposits (IFS line 60EA for Sterling, Deutschemark, Swiss franc and yen, and IFS line 60LDD for US dollar) was used as the first interest-rate set. As an alternative, for the four currencies of the sample included in the SDR basket, the treasury bill rate applied by the IMF for calculating the SDR interest rate was used, i.e. IFS line 60CS for US dollar and pound Sterling and IFS line 60BS for Deutschemark and Japanese yen, while for the Swiss franc the interest rate on three months deposits with large private banks - IFS line 60L - was used.

The results of the calculations are given in tables 7 to 10. The tables suggest that both developing and industrialized countries incurred losses by switching their foreign-exchange holdings out of the dollar into Deutschemark, pound Sterling, Swiss franc, and Japanese yen. Only two of the eight calculations for industrialized countries and only two of the six calculations for developing countries report a profit. There seems to be no general pattern of profitable reserve switches with respect to either country groups, currencies, or periods. However, due to the above mentioned negative bias of the profit criterion, this does not necessarily mean that reserve switches were destabilizing.

8. This method is also used in Jacobson (1983) and Pilbeam (1988).

5. Summary and Conclusions

To summarize, the evidence suggests that central banks have been 'leaning against the wind' in their reserve switching - in particular industrialized countries since 1981. The substantial 'bending before the wind' of industrialized countries with respect to their dollar holdings in 1978 and 1979 can be considered as a signal to the United States to adopt policy measures in order to stabilize the real value of outstanding dollar holdings. In addition, this diversification out of the dollar can be interpreted as the deliberate holding of non-dollar currencies as reserves in order to introduce a certain competition among reserve currencies. This competition can be regarded as a re-introduction of a convertibility constraint on foreign-exchange holdings. Under the classical gold standard, this convertibility constraint consisted in the agreement that each currency had a specific rate in terms of gold at which the issuing central bank had to exchange domestic banknotes for gold coins. Under the Bretton Woods system, the convertibility constraint only applied to the US dollar. It was abolished by the suspension of gold convertibility in August 1971.

However, it appears that reserve switching has been generally unprofitable to central banks that have practiced it. This suggests a commitment of authorities of - in particular - industrialized countries to conduct reserve switches in such a way as to offset exchange-rate changes even if this means dissipating their foreign-exchange reserves. Therefore, the generally expressed fear of an 'inherent instability' of a multiple reserve-currency system seems to be largely overestimated.

Table 1: The US Dollar, 1975-87: Share in Reserve Portfolios, Portfolio Switches, Exchange Rates, and Leaning against the Wind

	Share in Reserve Portfolio			Portfolio Switches*			Exchange Rates**			Leaning against the Wind***	
	Ind. Countries	Dev. Countries	Share Change	Ind. Countries	Dev. Countries	MERM	VAD	SDR	Ind. Countries	Dev. Countries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
75:1	87.09	-1.37	59.42	1.66	-1.351	1.652	-0.19	-0.40	-0.48	-	-
	85.72	1.49	61.08	-0.41	1.455	-0.439	-0.21	-0.44	-0.39	0.527	-0.645
	87.21	0.25	60.67	11.48	0.175	11.383	0.09	-0.05	0.24	0.349	-0.106
76:1	83.59	-3.87	67.7	-4.45	-3.935	-4.463	0.17	0.11	0.18	0.037	2.049
	85.73	2.14	70.09	2.39	2.156	2.303	0.20	0.11	0.31	-1.220	-1.384
	84.53	-1.2	69.5	-0.59	-1.203	-0.672	0.28	0.21	0.40	0.863	0.922
	87.03	2.5	71.86	2.36	2.474	2.298	0.22	0.15	0.29	-0.349	-0.195
77:1	87.77	0.74	69.3	-2.56	0.713	-2.591	0.22	0.12	0.26	0.594	0.552
	88.0	1.13	69.8	0.5	1.063	0.442	0.16	0.09	0.19	0.185	-0.674
	89.64	0.74	68.84	-0.96	0.647	-0.988	0.10	0.02	0.21	0.136	-0.208
	89.01	0.63	69.5	0.66	0.758	0.635	0.07	0.22	0.25	0.190	0.159
78:1	89.92	0.91	66.79	-2.71	0.894	-2.681	-0.32	-0.49	-0.44	-0.394	1.180
	89.56	-0.36	66	-0.79	-0.353	-0.704	-0.44	-0.55	-0.47	0.166	0.331
	88.04	1.57	64.33	-1.67	-1.560	-1.660	-0.78	-0.91	-0.81	1.264	1.345
	86.2	-1.84	62.68	0.65	-1.940	-1.634	-0.92	-1.03	-0.98	1.902	1.602
79:1	85.21	0.99	62.78	0.1	-1.079	0.106	-0.88	-0.94	-0.86	0.928	-0.092
	84.54	-0.67	62.42	-0.36	-0.654	-0.388	-0.77	-0.78	-0.90	0.589	0.350
	85.66	1.12	61.81	0.61	1.111	0.652	0.92	0.90	1.11	1.234	0.724

83:49	-2.17	62.95	1.14	-2.132	1.066	-85	-73	-1.11	2.367	-1.184
80:1	80.98	63.27	0.32	-2.507	0.289	-85	-72	-0.60	1.505	-0.174
	81.4	59.26	-4.01	0.284	-4.080	-88	-70	-1.17	-0.333	4.774
	79.92	60.23	0.97	1.471	0.941	1.07	.86	-1.09	1.604	1.027
81:1	77.61	59.75	-0.48	-2.392	-0.475	-92	-65	-81	1.938	0.385
	79.48	62.27	2.52	1.833	2.480	-66	-20	-43	-0.788	-1.067
	80.15	62.76	0.49	0.633	0.392	-20	.38	.27	0.171	0.106
	79.3	63.2	0.44	-0.868	0.393	.17	.79	.32	-0.278	0.126
	78.74	64.09	0.89	-0.576	0.892	-11	.45	.13	-0.075	0.116
82:1	77.74	64.26	0.17	-0.921	0.216	.16	.65	.63	-0.581	0.136
	77.59	65.11	0.85	-0.176	0.819	.42	.82	.84	-0.148	0.688
	78.48	64.36	-0.75	0.867	-0.767	.78	1.12	.05	0.911	-0.806
	77.05	63.83	-1.43	-1.488	-0.688	.90	1.16	.72	-1.072	0.424
83:1	79.51	64.64	0.81	2.475	0.829	.64	.80	.97	2.401	0.804
	78.62	64.89	0.25	-0.925	0.235	.86	.88	1.08	-0.999	0.254
	77.58	65.59	0.7	-1.073	0.642	1.14	1.15	1.21	-1.299	0.777
	77.37	64.75	-0.84	-0.265	-0.866	1.15	1.18	1.32	-0.351	-1.144
84:1	76.34	64.08	-0.67	-1.046	-0.669	1.18	1.26	1.12	-1.172	-0.749
	74.5	63.35	-0.73	-1.836	-0.765	1.24	1.33	1.49	-2.736	-1.141
	73.09	64.28	0.93	-1.482	0.830	1.76	1.76	1.89	-2.801	1.569
	73.64	64.9	0.62	0.481	0.527	2.00	1.95	2.13	1.026	1.124
85:1	71.25	65	0.1	-2.368	0.125	2.55	2.28	1.98	-4.690	0.249
	71	65.58	0.58	-0.302	0.953	2.25	1.79	1.88	-0.569	1.040
	69.38	64.5	-1.08	-1.602	1.053	1.69	1.21	1.14	-1.827	-1.201
	65.36	62.82	-1.68	-3.968	-1.624	1.01	.55	.71	-2.818	-1.153
86:1	65.72	61.76	-1.06	0.419	-0.962	.45	.03	.30	0.126	-0.289
	64.47	61.17	-0.59	-1.278	-0.549	.08	-43	-0.08	0.102	0.044
	67.04	61.02	-0.15	2.551	-0.117	-27	-79	-40	-1.020	0.047
	68.49	62.16	1.14	1.458	1.142	-36	-18	-49	-0.715	-0.560
87:1	69.05	60.93	-1.23	0.458	-1.232	-82	-14	-00	-0.459	1.232
	71.98	62.1	1.17	2.885	1.153	-1.06	-1.32	.95	-2.741	-1.096
	71.49	62.35	0.192	-0.539	-0.192	-99	-1.21	-96	0.518	-0.185
	70.87	60.30	-2.05	-0.679	-2.029	-1.40	-1.54	-1.94	1.319	3.937

Notes: * Portfolio switches (PS) were calculated according to the following formula

$$PS = (P_t - P_{t-1}) - (PT_t - PT_{t-1}) / PT_{t-1}$$

where P = percentage share of dollars in foreign-exchange holdings of the respective country group.

PT = total foreign-exchange holdings of the respective country group denominated in dollars using the SDR exchange rate at the end of (t-1) to convert holdings into dollars.

The values of $(P_t - P_{t-1})$ are reported in columns (2) and (4) for industrialized and developing countries, respectively. The values of $(PT_t - PT_{t-1})$ are not reported in the table.

** Columns (7) to (9) report the deviations from trend (see footnote 3 in the text) of the IMF's Multilateral Exchange-Rate Model (MEMM), the Value-Added Deflator (VAD), and the Spectral Drawing Right (SDR).

*** Columns (10) and (11) are the products of columns (5) and (9) and (6) and (9), respectively.

Source: Calculations are based on data from the International Monetary Fund and from International Financial Statistics.

Table 2: The Pound Sterling, 1975-87: Share in Reserve Portfolios, Portfolio Switches, Exchange Rates, and Learning against the Wind

	<u>Share in Reserve Portfolios</u>				<u>Portfolio Switches*</u>				<u>Exchange Rates**</u>				<u>Learning against the Wind***</u>		
	Ind. Countries Share Change	Dev. Countries Share Change	(3)	(4)	Ind. Countries Share Change	Dev. Countries Share Change	(6)	(7)	Dollar MERM	VAD	SDR	Ind. Countries	Dev. Countries	(11)	(12)
75:1	1.8	-	8.78	-	-	-	-	1.05	1.29	- .15	1.37	-	-	-	-
	1.63	-0.17	7.89	-0.39	-0.176	-0.423	.82	.90	- .16	.29	-0.051	-0.123	-0.051	-0.123	-0.123
	1.31	-0.32	6.6	-1.29	-0.264	-1.229	.15	.39	- .33	.18	-0.048	-0.221	-0.048	-0.221	-0.221
	1.18	-0.13	2.91	-3.69	-0.128	-3.707	- .15	.09	- .46	.06	-0.008	-0.222	-0.008	-0.222	-0.222
76:1	1.86	0.68	4.59	1.68	0.623	1.675	- .26	2.15	- .49	- .40	-0.249	-0.670	-0.249	-0.670	-0.670
	0.9	-0.96	3.15	-1.44	-0.891	-1.468	- .93	.99	-1.06	-1.10	0.990	1.615	0.990	1.615	1.615
	2.06	1.16	2.63	-0.52	1.226	-0.526	-1.04	-1.23	-1.17	-1.81	-2.221	0.953	-2.221	0.953	0.953
	1.81	-0.25	1.14	-1.49	-0.215	-1.490	-1.45	-1.99	-1.55	-1.63	0.352	2.429	0.352	2.429	2.429
	1.94	0.13	2.78	1.64	0.087	1.593	-1.18	-1.56	-1.13	-1.42	-0.125	-2.263	-0.125	-2.263	-2.263
77:1	1.52	-0.42	2.58	-0.2	-0.497	-0.268	-1.10	-1.55	- .97	-1.41	0.702	0.379	0.702	0.379	0.379
	1.37	-0.15	2.62	0.04	-0.242	0.011	- .97	-1.47	- .86	-1.16	0.282	-0.014	0.282	-0.014	-0.014
	1.66	0.29	1.98	-0.64	0.144	-0.680	- .66	-1.16	- .67	- .58	-0.084	0.395	-0.084	0.395	0.395
	0.6	-1.06	3.38	1.4	-1.168	1.340	- .16	- .82	- .37	-1.02	1.192	-1.367	1.192	-1.367	-1.367
78:1	0.53	0.07	3.17	-0.21	-0.037	0.100	- .49	-1.42	- .76	- .95	0.036	0.095	0.036	0.095	0.095
	0.84	0.31	3.19	0.02	0.267	0.027	- .07	-1.27	- .62	- .59	-0.158	-0.016	-0.158	-0.016	-0.016
	0.68	-0.16	3.17	-0.02	-0.326	-0.064	.17	-1.21	- .66	- .36	0.118	0.023	0.118	0.023	0.023
79:1	0.6	-0.08	3.36	0.19	-0.204	0.165	.37	- .92	- .54	.05	-0.010	0.008	-0.010	0.008	0.008
	0.65	0.05	3.81	0.45	0.049	0.403	.64	- .27	- .05	.66	0.033	0.267	0.033	0.267	0.267
	0.72	0.07	3.93	0.12	0.012	0.027	1.26	.38	.49	.64	0.008	0.018	0.008	0.018	0.018

80:1	0.7	-0.02	3.24	-0.69	0.004	-0.778	1.04	.07	.34	.86	0.004	-0.669
	0.78	0.08	4.2	0.96	0.070	0.917	1.42	.71	1.08	1.25	0.088	1.146
	0.7	-0.08	4.44	0.24	-0.186	0.197	1.58	.99	1.52	1.71	-0.318	0.337
	0.77	0.07	4.61	0.17	-0.010	0.049	2.01	1.32	1.82	2.05	-0.022	0.101
	0.83	0.06	5.04	0.43	-0.034	0.423	2.09	1.84	2.24	2.49	-0.085	1.053
81:1	0.7	-0.13	4.44	-0.6	-0.164	-0.638	1.83	2.12	2.49	2.24	-0.369	-1.429
	0.72	0.02	4.07	-0.37	0.044	-0.402	1.00	1.63	2.17	1.27	0.057	-0.511
	0.73	0.01	3.83	-0.24	0.128	-0.146	.14	.70	1.35	.48	0.062	-0.070
	0.75	0.02	3.63	-0.2	0.078	-0.124	.33	.65	1.20	1.04	0.081	-0.129
	0.8	0.05	3.49	0.14	0.073	-0.150	.26	.89	1.43	.82	0.060	-0.123
82:1	0.7	-0.1	3.86	0.37	-0.058	0.407	.04	.83	1.35	.82	-0.048	0.334
	0.73	0.03	4	0.14	0.032	0.147	-10	1.04	1.43	.79	0.026	0.116
	0.8	0.07	4.29	0.29	0.039	0.259	-.36	.78	1.10	.00	0.000	0.000
83:1	0.64	-0.16	4.48	0.19	-0.099	0.254	-.77	-.32	.09	.62	0.062	0.158
	0.73	0.09	4.51	0.03	0.141	0.100	-.61	.24	.51	-.09	-0.013	-0.009
	0.74	0.01	4.59	0.08	-0.059	-0.1014	-.76	.38	.47	-.15	0.009	0.002
	0.87	0.13	4.41	-0.18	0.098	-0.183	-.86	.20	.24	-.30	-0.030	0.055
84:1	1.17	0.3	4.61	0.2	0.314	0.230	-.97	.04	.02	-.46	-0.145	-0.106
	1.57	0.4	4.81	0.2	0.409	0.169	1.04	-.16	-.12	-.72	-0.295	-0.122
	1.75	0.18	4.54	-0.27	0.174	-0.301	-1.37	-.35	-.31	-1.12	-0.196	0.337
	1.64	0.11	4.41	0.13	-0.095	-0.137	-1.63	-.69	.57	1.57	0.150	0.216
85:1	1.79	0.15	4.27	-0.14	0.243	-0.042	-1.97	-1.03	-.81	-.94	-0.229	0.040
	1.88	0.09	4.07	0.2	0.041	-0.303	1.39	-.06	.01	.55	0.023	0.167
	1.86	-0.02	4.41	0.34	-0.044	0.325	-.89	.42	.34	-.30	0.013	-0.098
	2.06	0.2	4.36	0.05	0.173	-0.071	-.61	.18	.03	-.28	-0.049	0.020
86:1	1.75	-0.31	4.69	0.33	-0.280	0.399	-.57	-.41	-.55	-.29	-0.081	-0.116
	1.67	-0.08	4.84	0.15	-0.137	0.163	-.26	-.23	-.33	-.26	0.036	-0.043
	1.46	-0.21	4.88	0.04	-0.259	0.043	-.29	-.73	-.88	-.97	0.252	-0.042
	1.65	0.19	4.58	-0.3	0.250	-0.245	-.47	-1.18	-.37	-.83	-0.208	0.203
87:1	1.51	0.14	4.82	0.24	-0.260	0.220	-.01	-.90	1.21	-.44	0.114	-0.097
	1.48	-0.03	4.83	0.01	-0.167	-0.096	-.42	-.46	-.84	-.28	0.047	0.027
	1.43	0.05	4.83	0	-0.102	-0.061	.39	.42	.90	.11	0.011	0.007
	1.53	0.10	4.97	0.14	0.027	0.148	-.93	-.07	-.68	.30	0.008	0.045

Notes: * Portfolio switches (PS) were calculated according to the following formula

$$PS = (P_t - P_{t-1}) - (PT_t - PT_{t-1}) / PT_{t-1}$$

where P = percentage share of Sterling in foreign-exchange holdings of the respective country group.

PT = total foreign-exchange holdings of the respective country group denominated in dollars using the SDR exchange rate at the end of (t-1) to convert holdings into Sterling.

The values of $(P_t - P_{t-1})$ are reported in columns (2) and (4) for industrialized and developing countries, respectively. The values of $(PT_t - PT_{t-1})$ are not reported in the table.

** Columns (7) to (10) report the deviations from trend (see footnote 3 in the text) of the bilateral dollar exchange rate, the IMF's Multilateral Exchange-Rate Model (MERM), the Value-Added Deflator (VAD), and the Special Drawing Right (SDR).

*** Columns (11) and (12) are the products of columns (5) and (10) and (6) and (10), respectively.

Source: Calculations are based on data from the International Monetary Fund and from International Financial Statistics.

Table 3: The Deutschemark, 1975-87: Share in Reserve Portfolios, Portfolio Switches, Exchange Rates, and Leaning against the Wind

	Share in Reserve Portfolios			Portfolio Switches*			Exchange Rates**					Leaning against the Wind***	
	Ind. Countries	Share Change	Dev. Countries	Share	Change	Ind. Countries	Dev. Countries	Dollar	MERM	VAD	SDR	Ind. Countries	Dev. Countries
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
75:1	7.08	-	14.78	-	-	-	-	-0.01	-0.28	.60	-0.59	-	-
8	0.92	0.92	13.28	1.5	0.912	-1.535	-0.06	.62	.18	-0.56	-0.511	0.860	0.860
6:94	-1.06	-1.06	13.21	-0.07	-1.090	-0.095	-0.50	-1.22	-0.36	-1.22	1.330	0.116	0.116
6:92	0.02	0.02	9.76	3.45	0.028	-3.419	.60	1.37	.48	-1.15	-0.033	3.933	3.933
76:1	6.63	-0.29	11.27	1.51	-0.371	1.481	-0.57	-1.06	-0.37	-0.72	0.268	-1.066	-1.066
6:56	0.07	0.07	11.13	0.14	-0.086	-0.262	.55	.67	.02	-0.79	0.068	0.207	0.207
7:01	0.45	0.45	11.59	0.46	0.460	0.392	-0.51	-0.62	-0.05	-0.34	-0.157	-0.133	-0.133
6:8	-0.21	-0.21	10.55	-1.04	-0.293	-1.161	-.26	.07	.50	-0.07	0.021	0.081	0.081
6:37	-0.43	-0.43	11.18	0.63	-0.489	0.566	-.24	.03	.53	-0.19	0.093	-0.108	-0.108
6:02	-0.35	-0.35	11.21	0.03	-0.404	-0.016	-0.17	.08	.64	-0.04	0.001	0.001	0.001
5:74	-0.28	-0.28	11.72	0.51	-0.396	0.459	-0.06	.28	.71	.11	-0.044	0.051	0.051
6:02	0.28	0.28	11.79	0.07	0.136	0.031	.14	.50	.88	.65	0.089	0.020	0.020
8:25	2.23	2.23	13.01	1.22	2.116	1.155	.55	1.05	1.14	.89	1.884	1.028	1.028
8:55	0.3	0.3	12.66	-0.35	0.266	-0.301	.53	.74	.97	.53	0.141	-0.160	-0.160
8:7	0.15	0.15	13.33	0.67	0.135	0.704	.74	.46	.55	.93	0.126	0.655	0.655
8:39	-0.31	-0.31	14.57	1.24	-0.487	1.185	1.18	1.21	1.04	1.43	-0.688	1.696	1.696
7:0:1	1.12	1.12	14.21	0.36	0.964	-0.413	1.25	1.39	1.07	1.29	1.244	0.534	0.534
9:49	-0.02	-0.02	14.41	0.2	0.016	0.193	1.09	1.23	.73	1.36	0.073	0.263	0.263
8:16	-1.33	-1.33	14.36	-0.05	-1.349	-0.103	1.37	1.49	.65	1.83	-2.469	-0.189	-0.189

80:1	9.51	1.35	14.79	0.43	1.329	0.291	1.56	2.03	.95	1.90	2.526	0.553
	11.69	2.18	13.68	-1.11	2.176	-1.147	1.52	1.91	.51	1.06	2.307	-1.216
	11.28	-0.41	15.65	1.87	-0.422	1.915	1.36	1.48	.14	1.58	-0.667	3.027
	11.89	0.61	14.58	-0.97	0.514	1.105	1.49	1.34	.11	1.29	0.664	-1.426
	14.43	2.54	15.5	0.92	2.489	0.953	.96	.47	-68	.65	1.618	0.620
81:1	13.31	-1.12	13.82	-1.68	-1.078	-1.641	.37	-.29	1.49	.24	-0.259	-0.304
	12.5	-0.81	13.18	-0.64	-0.776	-0.662	-.16	-.66	1.42	-.51	0.396	0.338
	13.07	0.57	13.63	0.45	0.674	0.529	-.54	-1.03	1.62	-.14	-0.094	-0.074
	13.05	-0.02	12.88	-0.75	-0.066	-0.776	.10	-.73	1.11	-.02	0.001	0.016
82:1	13.58	0.53	12.36	-0.52	0.580	-0.501	-.37	-.46	1.42	-.31	-0.180	0.156
	13.45	0.13	12.08	-0.28	-0.088	0.242	-.45	-.21	1.01	-.33	0.029	0.080
	12.4	-1.05	12.51	0.43	-1.053	0.431	-.69	-.22	-.84	-.45	0.474	-0.194
	12.54	0.14	12.56	0.05	0.109	0.020	-.75	-.05	-.56	-.10	0.011	0.002
83:1	11.8	-0.74	11.92	-0.64	-0.787	-0.683	-.56	-.16	-.36	-.10	0.079	0.068
	12.21	0.41	11.16	-0.76	0.996	-0.753	-.74	.07	-.30	-.54	-0.214	0.407
	13.18	0.97	10.59	-0.57	0.983	-0.579	-1.06	-.49	-.54	-.86	-0.846	0.499
	13.11	-0.07	10.28	-0.31	-0.086	0.298	-1.14	-.65	-.71	-1.12	0.097	0.335
84:1	13.95	0.84	10.13	-0.15	0.855	-0.118	-1.20	-.77	-.75	-.78	-0.667	0.097
	14.75	0.8	10.53	0.4	0.752	0.310	-1.22	-.86	1.12	-1.24	-0.933	-0.385
	15.24	0.49	10.21	-0.32	0.492	-0.342	-1.58	-1.35	1.28	-1.79	-0.882	0.614
	15.15	-0.09	9.68	-0.53	-0.072	-0.535	-1.78	-1.74	1.45	-2.02	0.147	1.081
85:1	16.98	1.83	9.25	-0.43	1.889	-0.366	-2.06	-2.12	1.65	-1.98	-3.742	0.325
	17.29	0.31	9.13	-0.12	0.238	-0.164	-1.86	-1.90	1.62	-1.97	-0.470	0.725
	18.16	0.87	9.66	0.53	0.876	0.545	-1.52	-1.47	1.24	-1.19	-1.043	-0.650
	19.83	1.67	9.85	0.19	1.582	0.107	-1.06	-1.08	-.78	-.72	-1.139	-0.078
86:1	19.21	-0.62	10.35	0.5	-0.640	0.520	-.56	-.51	-.16	-.47	0.301	-0.245
	20.41	1.2	10.1	-0.25	1.107	-0.268	-.33	-.40	-.02	-.27	-0.299	0.073
	18.59	-1.82	10.96	0.86	-1.894	0.840	.11	.11	.56	.36	-0.682	0.303
	17.92	-0.67	10.82	-0.14	-0.749	-0.225	.34	-.23	1.09	.74	-0.554	-0.167
87:1	18.14	0.22	11.14	0.32	0.073	0.276	.92	1.23	1.54	1.01	0.074	0.279
	16.49	-1.65	10.89	-0.25	-1.773	-0.342	1.04	1.02	1.48	-.89	-1.578	-0.305
	17.45	0.96	10.61	-0.28	0.924	-0.323	.89	-.83	1.48	.79	0.730	-0.256
	16.77	0.68	10.63	0.02	-0.735	0.045	1.44	1.24	1.71	1.39	-1.022	0.063

Notes: * Portfolio switches (PS) were calculated according to the following formula

$$PS = (P_t - P_{t-1}) - (PT_t - PT_{t-1}) / PT_{t-1}$$

where P = percentage share of Deutschmarks in foreign exchange holdings of the respective country group.

PT = total foreign-exchange holdings of the respective country group denominated in dollars using the SDR exchange rate at the end of (t-1) to convert holdings into Deutschmarks.

The values of $(P_t - P_{t-1})$ are reported in columns (2) and (4) for industrialized and developing countries, respectively. The values of $(PT_t - PT_{t-1})$ are not reported in the table.

** Columns (7) to (10) report the deviations from trend (see footnote 3 in the text) of the bilateral dollar exchange rate, the IMF's Multilateral Exchange-Rate Model (MERM), the Value-Added Deflator (VAD), and the Special Drawing Right (SDR).

*** Columns (11) and (12) are the products of columns (5) and (10) and (6) and (10), respectively.

Source: Calculations are based on data from the International Monetary Fund and from International Financial Statistics.

Table 4: The Swiss franc, 1975-87: Share in Reserve Portfolios, Portfolio Switches, Exchange Rates, and Leaning against the Wind

	Share in Reserve Portfolios			Portfolio Switches*			Exchange Rates**					Leaning against the wind***	
	Ind. Countries	Dev. Countries	Share Change	Ind. Countries	Dev. Countries	Dollar	MERM	VAD	SDR	Ind. Countries	Dev. Countries		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		
75:1	0.95	-	3.75	-	-	-0.24	-0.56	.28	-1.07	-	-		
	0.95	0	4.04	0.014	3.418	-0.33	-0.84	-0.58	-1.00	-0.014	-0.278		
	0.88	0.07	4.48	-0.113	0.278	-0.62	-1.10	-1.06	-1.31	0.149	-0.525		
	0.92	0.04	4.09	0.059	0.401	-0.63	-1.03	-0.77	-1.05	-0.063	0.409		
76:1	1.62	0.7	4.06	0.582	-0.390	-0.55	-0.75	-0.25	-0.75	-0.437	0.070		
	1.14	-0.48	3.89	-0.497	-0.093	-0.44	-0.38	-0.76	-0.53	0.263	0.155		
	1.21	0.07	3.94	0.041	-0.293	-0.45	-0.47	-0.36	-0.61	-0.025	0.036		
	0.86	-0.35	4	-0.383	-0.059	-0.42	-0.53	-0.03	-0.70	0.268	0.007		
77:1	0.75	-0.11	3.16	-0.138	-0.010	-0.60	-0.95	-1.32	-1.04	0.145	0.908		
	0.7	-0.05	3.26	-0.077	-0.873	-0.62	-1.10	-1.85	-0.89	0.069	-0.072		
	0.57	-0.13	3.31	-0.258	0.081	-0.44	-0.15	-1.43	-0.08	0.021	0.001		
	0.83	0.26	3.67	0.015	-0.012	-0.01	-0.04	-0.16	-0.49	0.008	0.113		
78:1	0.7	-0.13	3.62	-0.263	0.230	-0.64	1.00	1.36	-0.93	-0.245	-0.124		
	0.64	-0.06	3.2	-0.123	-0.134	-0.64	-0.81	-0.86	-0.90	-0.111	-0.359		
	0.86	0.22	3.38	0.173	-0.398	1.47	1.97	2.89	2.55	0.443	0.470		
	0.65	-0.21	3.81	-0.535	0.184	1.64	1.93	2.39	1.72	-0.921	0.419		
79:1	1.3	0.65	3.19	0.612	-0.244	-1.39	1.48	1.24	1.32	0.808	-0.747		
	1.32	0.02	3.27	0.077	-0.566	1.20	1.34	-0.76	1.42	0.110	0.134		
	1.37	0.05	3.42	0.023	0.095	1.47	1.58	-0.64	1.86	0.043	0.166		

80:1	1.46	0.09	3.54	0.12	0.063	0.089	1.49	1.65	.52	1.63	.0103	-0.042
	1.61	0.15	3.69	0.15	0.166	-0.026	1.30	1.28	-.42	.51	0.085	0.069
	1.6	-0.01	4.15	0.46	0.010	0.134	1.17	1.03	-.93	1.17	0.013	0.628
	1.71	0.11	4.23	0.08	-0.012	0.537	1.34	1.09	-.89	.98	-0.012	-0.082
	1.77	0.06	4.73	0.5	-0.000	-0.084	.94	.64	1.14	.52	-0.000	0.273
81:1	1.6	-0.17	4.79	0.06	-0.140	0.524	.29	-.15	-1.80	-.01	0.001	-0.001
	1.67	0.07	4.72	-0.07	0.115	0.087	-.15	-.37	-1.74	.00	0.000	0.000
	1.47	0.2	4.53	0.19	0.160	-0.080	-.36	-.29	-1.04	.30	-0.048	-0.053
	1.78	0.31	4.94	0.41	0.263	-0.177	.40	1.08	1.44	1.06	0.279	0.406
82:1	1.85	0.07	5.06	0.12	0.059	0.383	.21	1.10	1.37	.68	0.040	0.051
	1.85	0	4.8	-0.26	0.045	0.075	-.19	.47	-.27	-.08	-0.004	0.017
	1.71	0.14	4.52	-0.28	0.080	-0.219	-.55	.12	-1.18	-.26	0.021	0.056
	1.77	0.06	4.8	0.28	0.032	-0.216	-.66	.08	-1.18	.25	0.008	0.063
83:1	1.28	-0.49	4.07	-0.73	-0.560	0.253	-.37	.45	.73	-.03	0.017	0.024
	1.34	0.06	3.66	-0.41	0.088	-0.796	-.57	.32	.61	-1.10	-0.007	0.038
	1.43	0.09	3.49	-0.17	0.068	-0.382	-.80	.22	-.83	-.18	-0.012	0.039
	1.48	0.05	3.44	-0.05	0.006	-0.216	-.86	.11	1.04	-.39	-0.003	0.025
84:1	1.55	0.07	3.09	-0.35	0.077	-0.064	-.99	-.20	.74	-.49	-0.038	0.160
	1.79	0.24	3.18	0.09	0.231	-0.326	-1.14	-.58	-.36	-1.04	-0.241	-0.043
	1.74	-0.05	2.76	-0.42	-0.040	0.041	-1.59	-1.18	-.30	-1.47	0.060	0.641
	1.42	0.32	2.8	0.04	0.316	-0.436	-1.76	-1.35	-.13	1.68	0.531	-0.035
85:1	1.66	0.24	2.77	-0.03	0.294	0.021	-2.19	-2.09	-1.05	-1.96	-0.577	-0.056
	1.62	0.04	2.78	0.01	0.079	0.029	-1.97	-1.75	1.02	-1.89	0.150	0.008
	1.67	0.05	2.83	0.05	0.045	-0.004	-1.54	-1.11	-.52	-.96	-0.044	-0.053
	1.87	0.2	2.9	0.07	0.085	0.055	-1.10	-.85	-.41	-.88	-0.075	0.034
86:1	1.74	0.13	3.34	0.44	-0.118	-0.039	-.71	-.74	-.89	-.60	0.071	-0.295
	1.84	0.1	2.8	-0.54	-0.001	0.492	-.41	-.49	-.73	-1.19	0.000	0.108
	1.7	0.14	2.86	0.06	0.240	-0.567	.21	.31	.44	.47	-0.113	0.007
	1.48	-0.22	2.77	-0.09	-0.307	0.015	.26	.20	.09	.42	-0.129	-0.077
87:1	1.35	0.13	2.92	0.15	0.241	-0.183	.75	.49	1.12	.66	0.091	0.091
	1.28	-0.07	2.89	-0.03	-0.196	0.138	.98	.61	.26	.56	-0.110	-0.070
	1.17	0.11	2.73	0.16	-0.150	0.108	.77	.34	.01	.41	-0.062	-0.085
	1.17	0.00	2.80	0.07	-0.053	-0.125	1.41	.84	.56	1.31	-0.070	0.126

Notes: * Portfolio switches (PS) were calculated according to the following formula

$$PS = (P_t - P_{t-1}) - (PT_t - PT_{t-1}) / PT_{t-1}$$

where P = percentage share of Swiss francs in foreign-exchange holdings of the respective country group.

PT = total foreign-exchange holdings of the respective country group denominated in dollars using the SDR exchange rate at the end of (t-1) to convert holdings into Swiss francs.

The values of $(P_t - P_{t-1})$ are reported in columns (2) and (4) for industrialized and developing countries, respectively. The values of $(PT_t - PT_{t-1})$ are not reported in the table.

** Columns (7) to (10) report the deviations from trend (see footnote 3 in the text) of the bilateral dollar exchange rate, the IMF's Multilateral Exchange-Rate Model (MERM), the Value-Added Deflator (VAD), and the Special Drawing Right (SDR).

*** Columns (11) and (12) are the products of columns (5) and (10) and (6) and (10), respectively.

Source: Calculations are based on data from the International Monetary Fund and from International Financial Statistics.

Table 5: The Japanese Yen, 1975-87: Share in Reserve Portfolios, Portfolio Switches, Exchange Rates, and Leaning against the Wind

	Share in Reserve Portfolios			Portfolio Switches*			Exchange Rates**					Leaning against the Wind***	
	Ind. Countries Share Change	Dev. Countries Share	Change	Ind. Countries Share	Dev. Countries Share	Change	Dollar	MERM	VAD	SDR	Ind. Countries	Dev. Countries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
75:1	1.79	-	2.48	-	-	-	.39	.60	-.06	.23	-	-	
	2.05	0.26	2.02	-0.46	0.2551	0.49	.33	.48	.13	.10	0.026	-0.049	
	1.78	-0.26	2.16	0.14	-0.2857	0.12	.18	.43	-.05	.26	-0.074	0.031	
76:1	1.87	0.08	1.34	-0.82	0.0276	-0.89	.03	.25	-.17	.02	0.001	-0.018	
	3.18	1.31	1.97	0.63	1.2527	0.62	-.03	.18	-.09	.12	0.150	0.075	
	2.09	-1.09	2.04	0.07	-1.0916	-0.04	-.05	.19	.02	.12	-0.131	-0.004	
	2.47	0.38	2.22	0.18	0.3687	0.09	-.02	.22	.20	.18	0.066	0.016	
77:1	1.93	-0.54	2.62	0.4	-0.6009	0.30	-.12	.02	.04	-.14	0.084	-0.042	
	1.85	-0.08	3.1	0.48	-0.0882	0.47	-.08	.06	.06	.19	-0.017	0.089	
	1.74	-0.11	2.59	-0.51	-0.2352	-0.63	.01	.16	.24	.32	-0.075	-0.200	
	1.59	0.15	2.62	0.03	0.2828	-0.04	-.08	.23	.43	.27	-0.076	-0.010	
	1.78	0.19	3.45	0.83	0.0517	0.80	.37	.55	.93	.67	0.035	0.534	
78:1	1.28	0.50	3.41	-0.04	-0.6233	0.11	.49	.54	.89	1.11	-0.692	-0.127	
	1.40	0.12	4.3	0.89	0.0479	0.90	.80	.96	1.45	1.82	0.087	1.645	
	1.92	0.52	4.76	0.46	0.3894	0.38	1.52	1.78	2.54	2.20	0.857	0.845	
	1.64	-0.28	4.82	0.06	-0.4708	-0.01	1.52	1.59	2.30	1.56	-0.735	-0.009	
79:1	2.26	0.62	5.07	0.25	0.5609	0.28	1.10	.98	1.49	.77	0.432	0.219	
	2.52	0.26	5.09	0.02	0.3450	0.06	.58	.29	.59	.74	0.083	0.015	
	2.50	-0.02	5.1	0.01	0.0071	0.01	.48	-.01	.22	-.38	-0.003	-0.002	

80:1	2.62	0.12	4.65	-0.45	0.1849	-0.49	-0.04	-0.77	-0.84	-1.16	-0.214	0.572
	3.10	0.48	4.22	-0.43	0.5506	-0.39	-0.22	-1.04	-1.21	-1.20	-0.861	0.468
	3.34	0.24	4.54	0.32	0.1502	0.29	-0.04	-0.80	-0.99	-0.59	-0.089	-0.173
	3.46	0.12	4.77	0.23	-0.0178	0.05	.17	-0.63	-0.71	-0.39	0.007	-0.020
	3.48	0.02	5.25	0.48	-0.0895	0.46	.33	-0.23	-0.30	.23	-0.021	0.106
81:1	3.18	-0.30	4.99	-0.26	-0.3832	-0.35	.41	.13	.06	.08	-0.031	-0.028
	3.28	0.10	5.11	0.12	0.1028	0.06	-.05	-.20	-.28	-.08	-0.008	-0.005
	3.57	0.29	5.02	-0.09	0.3384	-0.07	-.40	-.49	-.39	-.49	-0.166	0.033
	3.78	0.21	4.89	-0.13	0.2239	-0.1	-.30	-.54	-.55	-.20	-0.045	0.020
	3.92	0.14	5.09	0.2	0.1644	0.19	-.58	-.80	-.86	-1.07	-0.176	-0.205
	4.22	0.30	4.95	-0.14	0.3840	-0.06	-.88	-1.15	-1.16	-1.32	-0.507	0.079
	4.16	-0.06	4.98	0.03	-0.0523	0.04	-1.22	-1.52	-1.44	-1.85	0.097	-0.078
	4.55	0.39	5.13	0.15	0.3924	0.15	-1.30	-1.55	-1.51	-.89	-0.349	-0.136
82:1	4.68	0.13	4.94	-0.19	0.0007	-0.31	-.91	-.99	-.93	-.98	-0.001	0.308
	4.70	0.02	4.95	0.01	0.0037	0.01	-1.03	-1.02	-0.99	-1.03	-0.004	-0.014
	5.07	0.37	4.59	-0.36	0.3381	0.42	1.20	-1.12	-1.08	-.88	-0.298	0.367
	5.16	0.09	4.69	0.1	0.0183	0.06	-1.10	-.89	-.81	-.72	-0.013	-0.042
84:1	5.28	0.12	4.88	0.19	0.0868	0.17	-1.09	-.84	-.78	-.67	-0.058	-0.117
	5.55	0.27	5.42	0.54	0.2406	0.47	-1.14	-.88	-.79	-1.08	-0.260	-0.507
	6.45	0.90	5.29	-0.13	0.8857	-0.17	-1.51	-1.22	-1.01	-1.24	-1.098	0.211
	6.77	-0.18	5.04	-0.25	-0.2132	-0.31	-1.63	-1.27	-.99	-1.41	0.301	0.432
85:1	6.55	0.28	5.22	0.18	0.3233	0.23	-1.92	-1.51	-1.10	-1.74	-0.563	-0.396
	6.38	-0.17	5.14	-0.08	-0.2167	-0.10	-1.87	-1.59	-1.23	-1.80	0.390	0.182
	7.14	0.76	5.64	0.5	0.7630	0.51	-1.69	-1.59	-1.22	-1.03	-0.786	-0.528
	8.80	1.66	6.7	1.06	1.5716	0.98	-.99	-.74	-.55	-.63	-0.990	-0.615
86:1	9.33	0.53	7.24	0.54	0.5116	0.56	-.47	-.22	-.01	.21	0.107	0.118
	9.53	0.20	7.32	0.08	0.0518	0.01	.12	.55	.78	.78	0.040	0.007
	8.83	-0.70	7.28	-0.04	-0.8091	-0.09	.70	1.20	1.34	1.25	-1.011	-0.116
	8.17	-0.66	6.83	-0.45	-0.7254	-0.52	.41	.60	.81	.48	-0.348	-0.250
87:1	7.34	-0.83	7.73	0.9	-0.8933	0.93	.68	.58	.72	.89	-0.795	0.830
	6.33	-0.95	6.92	-0.81	-1.0901	-0.92	1.19	1.17	1.09	.72	-0.785	-0.662
	5.94	-0.45	6.6	-0.32	-0.4911	-0.37	.88	.77	.79	.63	-0.309	-0.233
	6.60	0.66	7.87	1.27	0.5953	1.29	1.49	1.25	1.06	1.52	0.905	1.955

Notes: * Portfolio switches (PS) were calculated according to the following formula

$$PS = (P_t - P_{t-1}) - (PT_t - PT_{t-1}) / PT_{t-1}$$

where P = percentage share of yen in foreign-exchange holdings of the respective country group.

PT = total foreign-exchange holdings of the respective country group denominated in dollars using the SDR exchange rate at the end of (t-1) to convert holdings into yen.

The values of $(P_t - P_{t-1})$ are reported in columns (2) and (4) for industrialized and developing countries, respectively. The values of $(PT_t - PT_{t-1})$ are not reported in the table.

** Columns (7) to (10) report the deviations from trend (see footnote 3 in the text) of the bilateral dollar exchange rate, the IMF's Multilateral Exchange-Rate Model (MERM), the Value-Added Deflator (VAD), and the Special Drawing Right (SDR).

*** Columns (11) and (12) are the products of columns (5) and (10) and (6) and (10), respectively.

Source: Calculations are based on data from the International Monetary Fund and from International Financial Statistics.

Table 7: The Profitability of Portfolio Switches into Pound Sterling (in millions of US Dollars)

Sample Period	Dollar Value of Net Cumulative Portfolio Switches (1)	Exchange Rate Profit	Interest Earnings				Net Profit	
			Libor		Treasury Bills		Libor	Treasury Bills
			US Dollar	Dollar/ Sterling	US Dollar	Dollar/ Sterling		
77:1 - 81:1	- 766.31 (7.7%)	-135897.15	17519.68	19206.08	14232.73	17334.66	-134210.65	-132795.22
79:2 - 82:2	+1382.17 (2.3%)	-116181.10	13275.34	13911.50	11043.97	12884.05	-115544.94	-114341.02
84:3 - 86:4	+ 488.72 (0.2%)	- 49920.85	7021.88	8401.39	6362.58	7985.46	- 48541.34	- 48297.17
			Industrial Countries					
			Developing Countries					
84:3 - 87:1	+559.51 (4.6%)	+48244.97	8334.68	8425.73	7606.55	7997.56	+48336.02	+48635.98

Notes: (1) Percentage share of the dollar value of net cumulative portfolio switches on net average portfolio holdings in the last quarter of the sample period in brackets.

Source: Calculations are based on data from the International Monetary Fund and from International Financial Statistics. Series were constructed as described in the text.

Table 8: The Profitability of Portfolio Switches into Deutschemark (in millions of US Dollars)

Sample Period	Dollar Value of Net Cumulative Portfolio Switches (1)	Exchange Rate Profit	Interest Earnings				Net Profit	
			US Dollar	Libor Dollar/DM	US Dollar	Treasury Bills Dollar/DM	Libor	Treasury Bills
80:1 - 83:2	17508.73 (1.3%)	-111422.43	12197.14	8886.11	10114.18	8640.48	114733.46	112896.13
81:2 - 83:4	-5415.17 (0.8%)	+40946.00	4086.22	3664.26	3502.78	3201.49	+40524.04	+40844.71
79:4 - 87:1	+9302.52 (4.3%)	-22884.89	12941.68	9413.85	10173.28	8992.41	-26412.72	-24065.76
			Industrial Countries					
			Developing Countries					

Notes: (1) Percentage share of the dollar value of net cumulative portfolio switches on net average portfolio holdings in the last quarter of the sample period in brackets.
 Source: Calculations are based on data from the International Monetary Fund and from International Financial Statistics. Series were constructed as described in the text.

Table 9: The Profitability of Portfolio Switches into Swiss Francs (in millions of US Dollars)

Sample Period	Dollar Value of Net Cumulative Portfolio Switches (1)	Exchange Rate Profit	Interest Earnings				Net Profit	
			US Dollar	Dollar/ Swiss Franc	US Dollar	Dollar/ Swiss Franc	Libor	Treasury Bills
80:1 - 84:4	+ 752.30 (0.8%)	-16513.74	2811.88	2520.86	n.i.(2)	n.i.(2)	-16804.74	n.i.(2)
82:2 - 85:3	+ 212.07 (0.2%)	+ 5617.42	1296.58	978.72	1150.94	847.80	+ 5289.56	+5314.28
78:4 - 85:2	+1849.74 (1.8%)	-69595.80	6023.66	3715.18	n.i.(2)	n.i.(2)	-71904.28	n.i.(2)
81:3 - 82:3	- 33.17 (0.01%)	+ 3201.51	1966.45	1559.64	1477.62	1147.06	+ 2884.70	+2960.95
81:3 - 87:2	-1140.92 (0.6%)	- 2644.24	3957.12	3181.86	3433.87	2772.45	- 3419.50	-3305.66

Notes: (1) Percentage share of the dollar value of net cumulative portfolio switches on net average portfolio holdings in the last quarter of the sample period in brackets.

(2) Not indicate because treasury bill rates for Swiss franc holdings are not available for the entire sample period. Source: Calculations are based on data from the International Monetary Fund and from International Financial Statistics. Series were constructed as described in the text.

Table 10: The Profitability of Portfolio Switches into Japanese Yen (in millions of US Dollars)

Sample Period	Dollar Value of Net Cumulative Portfolio Switches (1)	Exchange Rate Profit	Interest Earnings				Net Profit	
			US Dollar	Libor Dollar/ Yen	US Dollar	Treasury Bills Dollar/ Yen	Libor	Treasury Bills
80:4 - 82:3	+ 76.67 (4.0%)	- 2.294	0.0913	0.0483	n.i.(2)	n.i.(2)	- 2.337	n.i.(2)
80:4 - 83:3	- 26.26 (1.2%)	- 1.795	0.188	0.131	n.i.(2)	n.i.(2)	- 1.852	n.i.(2)

Industrial Countries

Developing countries

Notes. (1) Percentage share of the dollar value of net cumulative portfolio switches on net average portfolio holdings in the last quarter of the sample period in brackets.

(2) Not indicate because treasury bill rates for yen holdings are not available for the entire sample period.

Source: Calculations are based on data from the International Monetary Fund and from International Financial Statistics. Series were constructed as described in the text.

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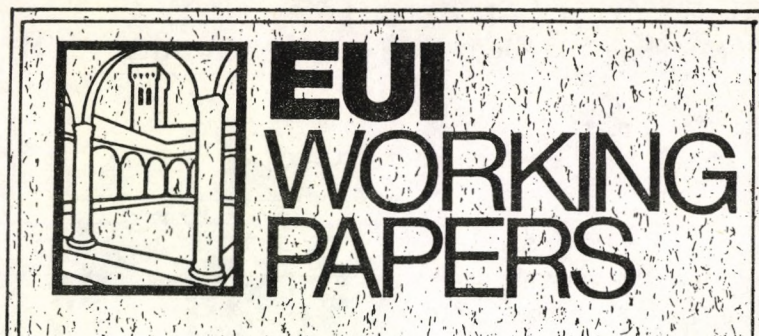
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