

ESSAYS IN INTERNATIONAL FINANCE

No. 131, December 1978

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RESERVE-CURRENCY PREFERENCES  
OF CENTRAL BANKS

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AND  
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INTERNATIONAL FINANCE SECTION

DEPARTMENT OF ECONOMICS

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Princeton, New Jersey

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**PETER B. KENEN, Director**  
**International Finance Section**

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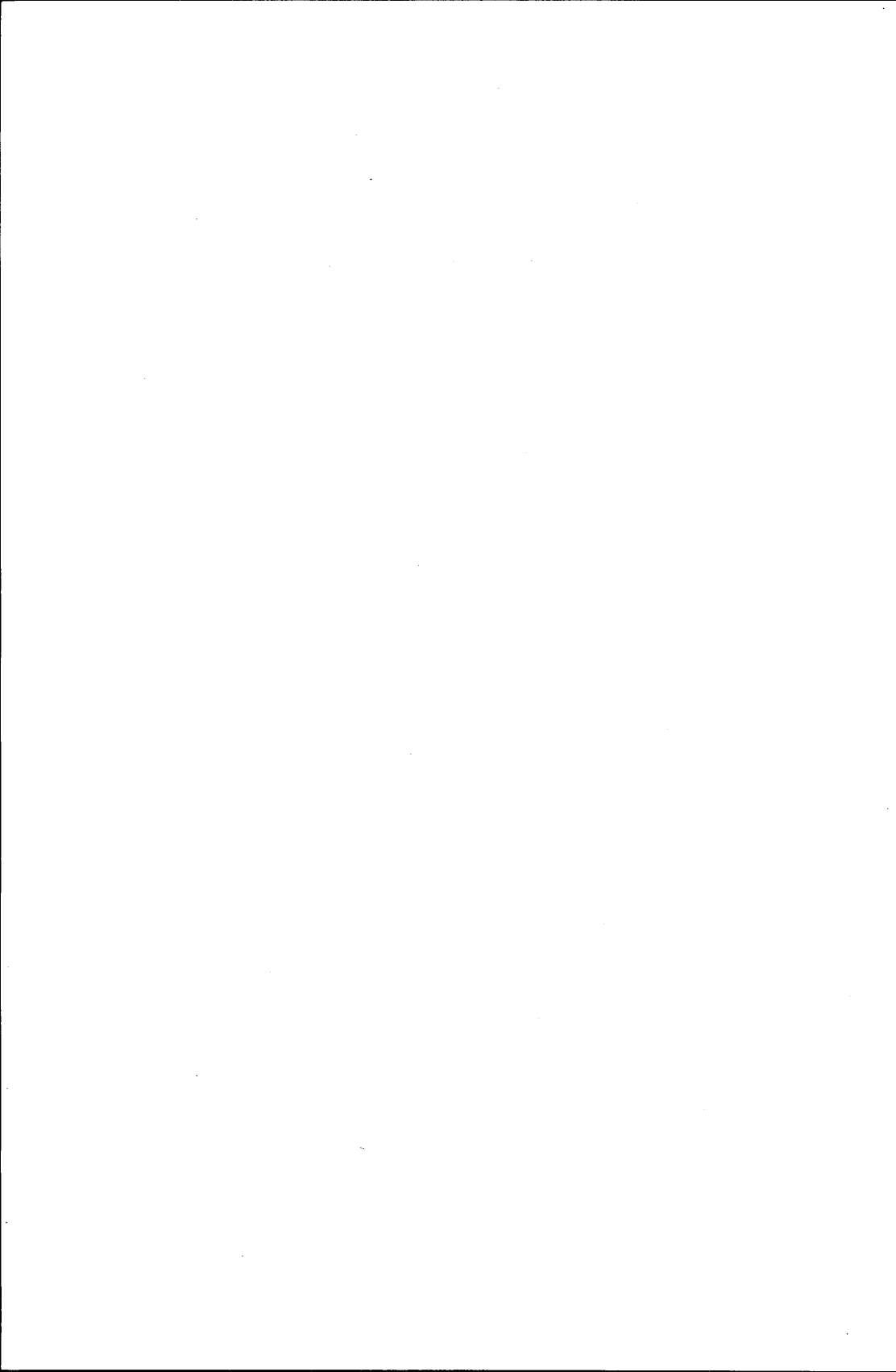
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## Introduction

Although foreign-exchange holdings constitute the major component of international reserves, there has been little analysis of the determinants of the currency composition of these holdings either for individual countries or for the world as a whole. The reason is easy to explain: while central banks regularly publish data on the aggregate amount of their foreign-exchange holdings, little information is available regarding the currency composition of their portfolios. The well-known studies of Kenen (1963), Hagemann (1969), and Makin (1971) examined the behavior of central banks with respect to the broader choice between gold, foreign exchange, and IMF assets, but data limitations prevented them from undertaking a detailed examination of the components of currency reserves. Furthermore, these studies were made in the institutional setting of a par value system and their relevance to current international monetary arrangements may therefore be somewhat limited.

The analysis of official foreign-exchange reserves in this essay is based on a set of data supplied to the International Monetary Fund on a regular basis by a large number of central monetary institutions. Certain general conclusions are drawn regarding the reserve-currency preferences of central banks, but care has been taken not to disclose the currency composition of the reserve portfolio held by any individual country.

A wide variety of factors is likely to influence a central bank's decisions about the total size of its international reserve holdings, the proportion of these reserves to be held in the form of foreign exchange, and the particular reserve currencies and other assets to include in its foreign-exchange portfolio. In addition to the economic considerations of safety, liquidity, risk aversion, and yield, political and institutional factors are likely to influence these decisions. In particular, international monetary arrangements are apt to play an important role. The adoption of more flexible exchange rates by a large number of countries, including virtually all nations whose currencies are held as foreign-exchange reserves, introduces a new source of variation in the relative values of international reserve assets, owing to more frequent exchange-rate changes. Thus it is hardly surprising that reserve-asset management has become more important for central bankers since the abandonment of the par value system.

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We are grateful to Kellett Hannah and Fernando Santos, who provided very competent research assistance. The views expressed represent the personal opinions of the authors and do not necessarily reflect the views of the institutions with which they are associated.

And because the global stock of foreign-exchange reserves and its distribution among different currencies are the result of the decisions of individual central banks, reflecting intervention and portfolio policies, the reserve-asset preferences of these banks are important for the system as a whole.

This essay traces recent trends in the foreign-exchange composition of central banks' portfolios and analyzes the effect of exchange arrangements on official holdings of various currencies. It explores the determinants of the demand by central banks for individual reserve currencies, and it examines the special factors influencing their Eurodollar holdings.

### **Trends in Central-Bank Holdings of Foreign-Exchange Reserves**

Before analyzing the determinants of currency reserves, it is useful to review recent trends in the foreign-exchange holdings of central banks. Table 1 presents the currency composition of foreign-exchange reserves held by the 76 countries included in our sample. (These data comprise a moving sample in the sense that they include some countries that did not report on all the dates indicated.) Total foreign-exchange holdings of the 76 countries increased from \$35 billion at the end of 1970 to a peak of \$116 billion at the end of 1976. These data can be compared with total foreign-exchange holdings by all countries, as reported in the IMF's *International Financial Statistics*, which amounted to \$45 billion at the end of 1970 and to \$176 billion at the end of 1976. Thus, 77 per cent of all foreign-exchange reserves were covered by our sample at the beginning of the period under study, and about 66 per cent at the end. The major reason for this decline in coverage is that several important OPEC countries are not included in our sample.

The dollar and sterling holdings of these 76 countries can be compared with the total liabilities to foreign official institutions, as reported by the United States and the United Kingdom. Table 2 shows that the total dollar holdings reported by the 76 countries are larger than the liabilities reported by the United States on all dates. In the case of the United Kingdom, the reporting countries show larger totals than the U.K. authorities up to 1974, but the tendency has been reversed since 1975. These divergences are due to two factors. On the one hand, the 76 reporting countries exclude some important holders of foreign-exchange reserves, as is evident from the comparison of the totals for the sample countries and the totals for all IMF member countries included in *International*



TABLE 1  
CURRENCY COMPOSITION OF FOREIGN-EXCHANGE RESERVES,  
76 REPORTING COUNTRIES, 1970-76

<i>End of</i>	<i>Total</i>	<i>U.S. \$<sup>a</sup></i>	<i>£</i>	<i>DM</i>	<i>Francs</i>	<i>Other Reserve Currencies<sup>b</sup></i>	<i>Other Assets<sup>c</sup></i>
<i>In Billions of Dollars</i>							
1970	\$ 35.2	\$28.7	\$3.0	\$0.7	\$0.0	\$ 1.9	\$0.8
1971	66.4	52.1	5.0	2.0	0.3	4.1	3.0
1972	83.0	67.8	5.2	3.8	0.5	5.2	0.5
1973	95.1	75.8	4.7	6.2	0.6	7.5	0.3
1974	114.6	92.5	6.2	6.6	0.6	8.4	0.2
1975	106.7	85.6	3.6	6.7	1.1	9.2	0.5
1976	116.4	94.0	2.0	7.8	0.8	11.2	0.7
<i>In Per Cent</i>							
1970	100	81.5	8.6	2.1	0.1	5.5	2.2
1971	100	78.4	7.5	3.0	0.4	6.2	4.5
1972	100	81.7	6.3	4.6	0.5	6.3	0.6
1973	100	79.7	5.0	6.5	0.7	7.8	0.3
1974	100	80.7	5.4	5.8	0.5	7.3	0.2
1975	100	80.2	3.3	6.3	1.1	8.7	0.5
1976	100	80.8	1.7	6.7	0.7	9.6	0.6

<sup>a</sup> All dollar-denominated assets held by central monetary authorities of the 76 countries are included here, *whether or not they are liabilities of the United States*. In particular, this item includes all U.S. Treasury securities, whether marketable or nonmarketable, claims on other U.S. residents, IBRD and IDB dollar bonds or notes, dollar claims on the Bank for International Settlements, and other (e.g., Eurodollar) claims.

<sup>b</sup> The most important of these are Swiss francs, Japanese yen, and Dutch guilders, but full coverage is not available.

<sup>c</sup> The bulk of this item consists of U.S. Treasury securities issued to certain central banks in the late 1960s and denominated in the currency of the holder (Roosa bonds). As the table indicates, these assets reached their peak in 1971 and remained small thereafter. However, the item also includes small amounts of assets held by regional clearing unions, whatever their currency of denomination, and a very small residual error due to reporting anomalies.

*Financial Statistics.* On the other hand, the liabilities reported by each reserve center exclude official holdings of that country's currency in the offshore currency markets.

The data presented in Table 1 include certain countries that did not report their foreign-exchange holdings on all reporting dates. To make a more accurate comparison of time trends that is unmarred by changes in the composition of the sample, Table 3 presents the foreign-exchange holdings of the 53 central banks that reported to the IMF on all year-end

TABLE 2  
DOLLAR AND STERLING FOREIGN-EXCHANGE RESERVES FOR 76 COUNTRIES  
AND U.S. AND U.K. LIABILITIES  
(in billions of dollars)

End of	U.S. \$		Pound	
	76 Reporting Countries	Liabilities Reported by U.S.	76 Reporting Countries	Liabilities Reported by U.K.
1970	28.7	23.8	3.0	2.5
1971	52.1	51.2	5.0	3.2
1972	67.8	61.5	5.2	3.6
1973	75.8	66.8	4.7	3.7
1974	92.5	76.8	6.2	4.6
1975	85.6	80.7	3.6	4.1
1976	94.0	91.9	2.0	2.6

SOURCES: Board of Governors of the Federal Reserve System, *Federal Reserve Bulletin*; U.K. Central Statistical Office, *Financial Statistics*; and IMF.

TABLE 3  
CURRENCY COMPOSITION OF FOREIGN-EXCHANGE RESERVES,  
CONSTANT SAMPLE OF 53 COUNTRIES, 1970-76\*

End of	Total	U.S. \$ <sup>a</sup>	£	DM	Francs	Other Reserve Currencies <sup>b</sup>	Other Assets <sup>c</sup>
<i>In Billions of U.S. Dollars</i>							
1970	\$ 33.4	\$27.1	\$3.0	\$0.7	\$0.0	\$ 1.8	\$0.7
1971	62.1	48.2	4.9	1.9	0.1	4.0	3.0
1972	76.4	61.9	5.0	3.6	0.3	5.1	0.5
1973	88.9	70.9	4.3	5.8	0.4	7.2	0.2
1974	106.3	85.9	5.7	6.0	0.4	8.1	0.2
1975	102.6	82.9	3.3	6.2	0.9	8.9	0.4
1976	109.6	89.3	1.7	7.2	0.6	10.5	0.3
<i>In Per Cent</i>							
1970	100	81.3	9.0	2.1	—	5.4	2.2
1971	100	77.6	7.9	3.1	0.2	6.5	4.8
1972	100	81.0	6.6	4.8	0.4	6.7	0.6
1973	100	79.7	4.9	6.5	0.5	8.1	0.3
1974	100	80.8	5.4	5.7	0.4	7.6	0.2
1975	100	80.8	3.2	6.1	0.9	8.6	0.4
1976	100	81.5	1.6	6.6	0.5	9.5	0.3

\* For notes see Table 1.

dates between December 1970 and December 1976. The close correspondence between the totals in Tables 1 and 3 indicates that the countries which reported irregularly or for only part of the period hold relatively small amounts of exchange reserves, so that the two samples give virtually the same picture of trends in currency composition. Total foreign-exchange reserves of the 53 countries at the end of 1970 were \$33 billion (compared with \$35 billion for the entire sample) and amounted to \$110 billion at the end of the period under review. The percentage distribution among currencies is virtually identical for the 53-country sample and the 76-country sample.

The composition of the official foreign-exchange reserves held by the 76-country sample during the period 1971-76 is depicted in Figure 1. The graph shows that the dollar component of foreign-exchange reserves has remained fairly stable, accounting for approximately 80 per cent of total holdings. The sterling component declined rather consistently over the period shown, while deutsche mark holdings increased. French franc reserves consistently accounted for 1 per cent or less of the total, leaving a residual of other reserve assets ranging between 5 and 11 per cent.

The data on the currency composition of foreign-exchange reserves held by countries adhering to different exchange-rate regimes are also of interest. They are described in detail in Figure 2 and presented in summary form in Table 4 for December 31, 1970, and December 31, 1976. The classification by exchange-rate regime is the one used by the IMF in its Annual Reports. Each country's exchange-rate regime on July 1, 1976, is used for classification purposes.

*Independent floaters* (Fig. 2a) hold approximately one-third of the total foreign-exchange reserves of the 76 countries included in the survey. Countries with floating exchange rates tend to hold a large proportion of their exchange reserves in the form of dollars, but there has been a persistent decline in the dollar component since 1970. For a brief period in 1974-75, the group held a substantial fraction of its foreign exchange in sterling, but virtually all these sterling reserves were accounted for by a single country that has sharply reduced its sterling holdings since then. Floaters have acquired larger holdings of deutsche marks during the period under consideration.

The *snake* countries, comprising Belgium-Luxembourg, Denmark, Germany, the Netherlands, Norway, and Sweden (Fig. 2b), are predominantly dollar holders. Even for 1970, the \$904 million held in "other" currencies represents to a large extent U.S. liabilities in the form of "Roosa bonds," which are denominated in the holding country's own

FIGURE 1  
CURRENCY COMPOSITION OF FOREIGN-EXCHANGE RESERVES,  
76 REPORTING COUNTRIES, 1971-76

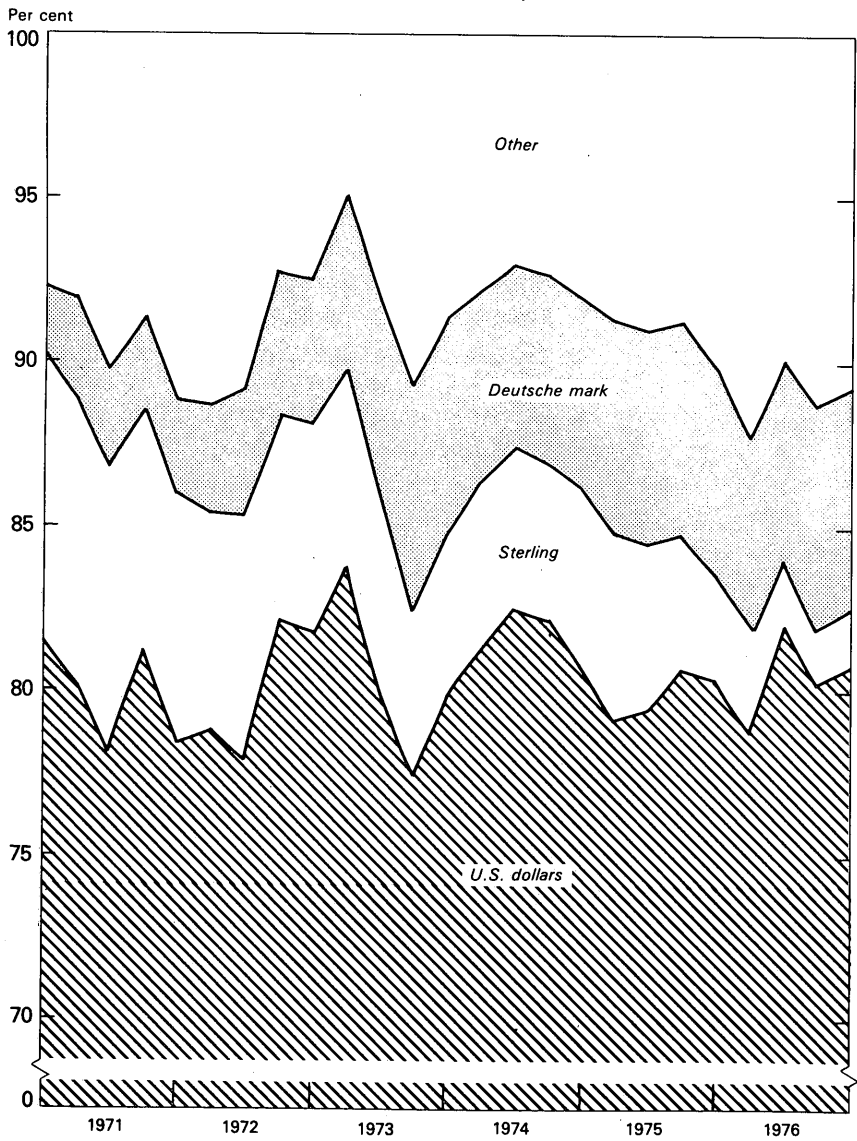


TABLE 4  
CURRENCY COMPOSITION OF FOREIGN-EXCHANGE RESERVES  
BY EXCHANGE-RATE REGIME, 1970 AND 1976

Exchange Arrange- ments	Number of Countries	End of 1970				End of 1976			
		\$	£	DM	Others	\$	£	DM	Others
<i>In Millions of Dollars</i>									
Floaters	11	11,681	264	409	584	28,096	935	3,095	5,752
Snake	6	10,471	10	38	904	34,782	6	463	346
U.S. \$ peggers	27	3,417	250	33	258	16,430	273	1,010	1,720
£ peggers	4	116	480	2	68	827	432	408	327
Basket peggers	21	2,476	2,034	173	740	12,377	332	2,671	4,248
<i>In Per Cent</i>									
Floaters	11	90.3	2.0	3.2	4.5	74.2	2.5	8.2	15.1
Snake	6	91.7	0.1	0.3	7.9	97.7	0.02	1.3	1.0
U.S. \$ peggers	27	86.3	6.3	0.8	6.5	84.6	1.4	5.2	8.9
£ peggers	4	17.4	72.1	0.2	10.2	41.5	21.7	20.5	16.4
Basket peggers	21	45.6	37.5	3.2	13.6	63.1	1.7	13.6	21.6

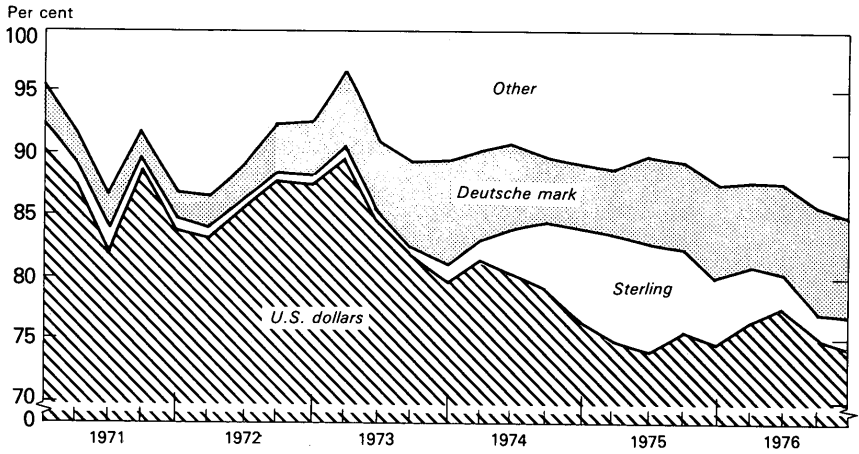
currency. Half of these Roosa bonds were held by Germany and the other half by Switzerland.<sup>1</sup> In accordance with the Basle Agreement of April 10, 1972, limiting to working balances a snake country's holdings of the currencies of other members of the European Narrower Exchange Rate Margins Agreement, we find only insignificant holdings of currencies other than the dollar.

*U.S. dollar peggers* (Fig. 2c) reduced the dollar proportion in their portfolios considerably during the period of the dollar's decline from 1971 to 1973, only to rebuild their dollar holdings thereafter. The deutsche mark has replaced the pound sterling as the second most important currency held by this group of countries.

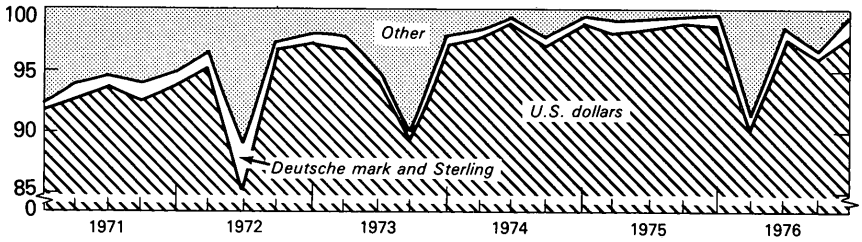
*Sterling peggers* (Fig. 2d) greatly reduced the sterling component of their reserves, while the dollar component of their portfolios increased. Holdings of deutsche mark and other currencies rose sharply.

<sup>1</sup> For data, see the *Federal Reserve Bulletin*. The U.S. liability data differ slightly from the asset data presented here because of valuation differences associated with exchange-rate changes.

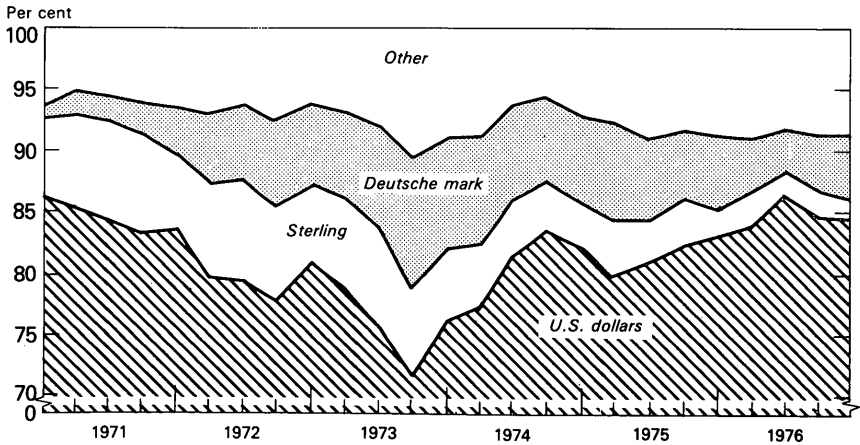
**FIGURE 2**  
**CURRENCY COMPOSITION OF FOREIGN-EXCHANGE RESERVES BY EXCHANGE-RATE REGIME, 1971-76**



a. Independent Floaters

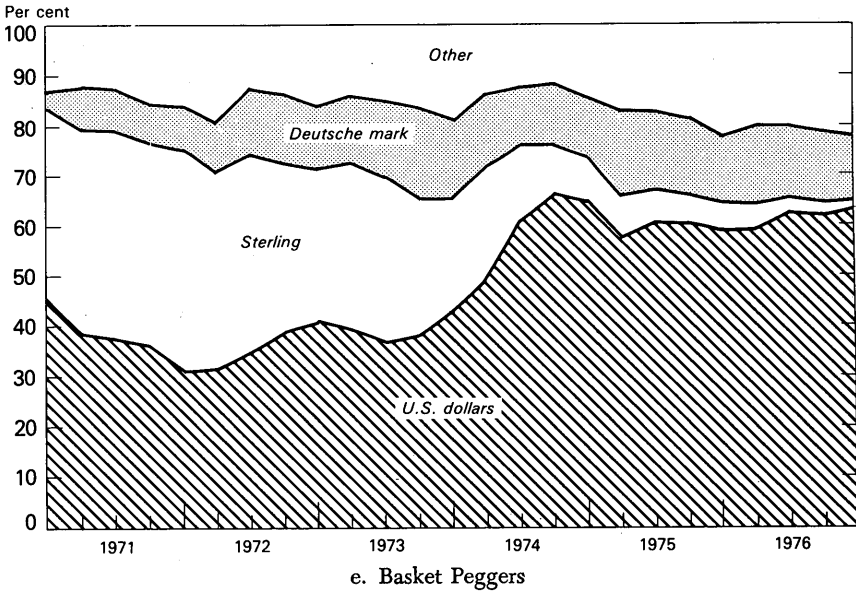
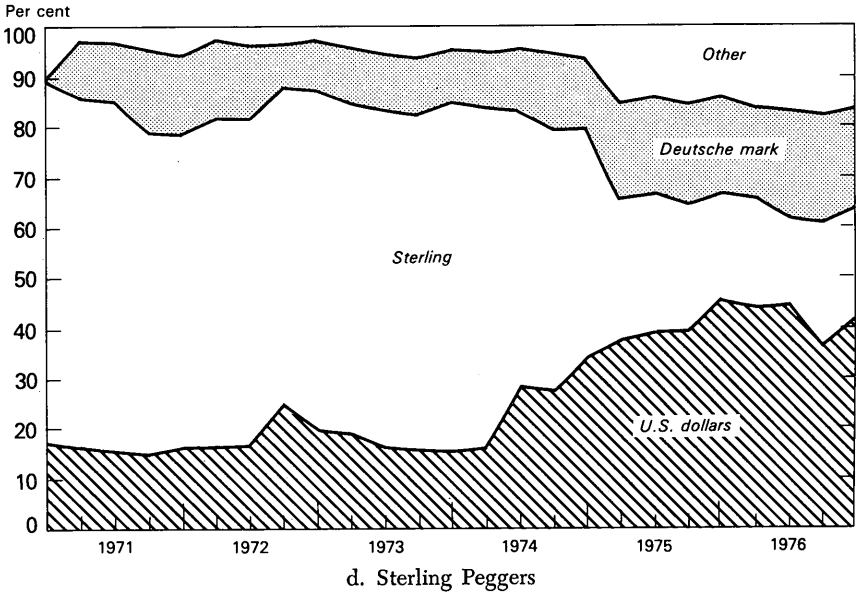


b. Snake Countries



c. Dollar Peggers

FIGURE 2 (continued)



*French franc peggers* have traditionally held almost all their reserves in the form of French francs. The lowest share of French francs observed for this group during the period under review was 88 per cent. However, more than for most other groupings, the data are marred by incomplete reporting, so that franc peggers are omitted from both Figure 2 and Table 4.

*Basket pegging* (Fig. 2e), which includes SDR as well as "other" basket peggers, is a relatively new exchange-rate practice. Many former sterling peggers (Fig. 2d) have switched to the SDR or to a self-defined basket of currencies. The countries that pegged to a basket at the end of July 1976 had held a substantial proportion of their foreign-exchange reserves in pounds at the end of 1970, but had moved almost totally out of sterling by 1976. The decline in sterling holdings was reflected in a move into dollars and to a lesser degree into deutsche marks and other currencies.

Only two countries in our sample are classified as *crawlers*, that is, countries with currencies whose value is adjusted according to a set of indicators. Presenting the data for the two countries combined could reveal the foreign-exchange portfolio holdings of one country to the other, and consequently the data are omitted.

Perhaps the clearest impression given by Figure 2 is that since 1970 the currency composition of exchange reserves has varied widely both across countries and over time. Since central banks are free within certain constraints to determine the currency composition of their foreign-exchange portfolios on the basis of their own preferences, what factors influence their choice? The following sections address this question.

### **Factors Determining the Composition of Foreign-Exchange Reserves**

It is clear that the portfolio-selection problem faced by a central bank is very different from that for an individual private transactor in the financial markets. The standard Markowitz-Tobin mean-variance analysis of portfolio selection assumes that an individual with given wealth can choose among a group of assets on the basis of their anticipated risks and returns. The individual first finds the combination of assets that minimizes the risk associated with each level of expected return (the efficient portfolio) and then chooses the portfolio that maximizes the expected utility of his wealth. Under certain assumptions about the form of the utility function and the probability distribution of anticipated returns, it



can be shown that the demand for each asset is homogeneous of degree 1 in wealth, with asset shares depending only on mean returns and on risk, as measured by the variances and covariances of returns.

These assumptions, however, do not appear to be particularly relevant to the problem of portfolio choice for central-bank holdings of foreign-exchange reserves. In the first place, central banks have broader objectives than simple portfolio optimization. Secondly, since the monetary authorities control the growth rates of domestic monetary aggregates, policies affecting the levels of the spot and forward exchange rates cannot be taken as exogenous. Therefore, such general considerations as a country's exchange arrangements and the structure of its trade and payments may be important determinants of its decision about how concentrated or diversified its foreign-exchange portfolio should be and what proportions should be held in each currency.

While countries with relatively small foreign-exchange reserves can readily swap one currency for another in order to optimize their holdings, some countries with very large holdings could not do so without significantly affecting exchange rates. To take a hypothetical example, the Deutsche Bundesbank could not convert a substantial portion of its U.S. dollars into, say, Swiss francs without causing a large change in the rate of exchange between these two currencies. Thus the currency composition of a large country's reserves is basically the outcome of its choice of intervention currency. If this choice is constrained by transactions costs, by agreement (as in the case of the countries in the European snake), or by other factors, the currency composition of reserves may be largely a consequence of the volume of past intervention, and the scope for optimization may be quite limited. However, it is reasonable to assume that all but a few of the countries included in our sample are small enough that they are relatively free to hold foreign-exchange portfolios that reflect their preferences.

In choosing the composition of its foreign-exchange portfolio, a central bank must seek an optimal tradeoff between two competing objectives. On the one hand, transactions costs are incurred in exchanging one currency for another, and the possibility of economies of scale in asset-exchange costs gives a central bank an incentive to concentrate its holdings in a single foreign currency. On the other hand, the risks involved in holding a single reserve asset act as an inducement to portfolio diversification. The most important of these risks arise from uncertainty about future movements in exchange rates between the currencies in which reserve assets are denominated.