

PRINCETON STUDIES IN INTERNATIONAL FINANCE NO. 26

A Quantitative Framework  
for the  
Euro-Dollar System

Klaus Friedrich

INTERNATIONAL FINANCE SECTION  
DEPARTMENT OF ECONOMICS  
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Klaus Friedrich is Assistant Professor at the Pennsylvania State University. The present paper and a paper entitled "The Euro-Dollar Market and International Liquidity" (*Journal of Money, Credit, and Banking*, August 1970) are part of a broader study of the Euro-dollar system that the author hopes to complete shortly.

This series is intended to be restricted to meritorious research studies in the general field of international financial problems, which are too technical, too specialized, or too long to qualify as ESSAYS. The Section welcomes the submission of manuscripts for this series.

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# A QUANTITATIVE FRAMEWORK FOR THE EURO-DOLLAR SYSTEM

## I. INTRODUCTION

One of the most striking aspects of the rapidly growing Euro-dollar literature is the fact that so much has been written on the basis of so few data.<sup>1</sup> The problems one faces when working with Euro-dollar data are both conceptual and institutional. Conceptual problems arise because Euro-dollar balances cannot easily be separated from conventional types of dollar balances in the statements of the reporting foreign banks and because the interbank structure of the Euro-dollar system leads to double counting.<sup>2</sup> The institutional problems are basically due to the short history of the Euro-dollar market, which has

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I am indebted to Michael P. Dooley and Frank B. Arisman, both graduate students at Penn State, for their valuable suggestions and help.

<sup>1</sup> The early Euro-dollar literature includes Alan R. Holmes and Fred H. Klopstock, "The Market for Dollar Deposits in Europe," *Federal Reserve Bank of New York Monthly Review*, Vol. 42 (November 1960); Oscar L. Altman, "Foreign Markets for Dollars, Sterling and Other Currencies," *International Monetary Fund, Staff Papers*, Vol. VIII (December 1961); and "Recent Developments in Foreign Markets for Dollars and Other Currencies," *ibid.*, Vol. X (March 1963). More recent contributions include Alexander K. Swoboda, *The Euro-Dollar Market: An Interpretation*, Essays in International Finance No. 64 (Princeton: International Finance Section, February 1968); Fred H. Klopstock, *The Euro-Dollar Market: Some Unresolved Issues*, Essays in International Finance No. 65 (Princeton: International Finance Section, March 1968); Charles P. Kindleberger, "The Euro-Dollar and the Internationalization of United States Monetary Policy," *Banca Nazionale del Lavoro Quarterly Review*, No. 88 (March 1969); Milton Friedman, "The Euro-Dollar Market: Some First Principles," *The Morgan Guaranty Survey* (October 1969); Klaus Friedrich, "The Euro-Dollar System and International Liquidity," *Journal of Money, Credit, and Banking* (August 1970); and Helmut W. Mayer, *Some Theoretical Problems Relating to the Euro-Dollar Market*, Essays in International Finance No. 79 (Princeton: International Finance Section, February 1970). Notable exceptions, in the sense that they are specifically quantitative contributions: *Bank for International Settlements (B.I.S.), 34th-40th Annual Reports* (1964-1970); Patrick H. Hendershott, "The Structure of International Interest Rates: The U.S. Treasury Bill Rate and the Euro-Dollar Deposit Rate," *Journal of Finance*, Vol. 22 (September 1967); and Andrew F. Brimmer, "Eurodollar and the U.S. Balance of Payments," *Euromoney*, Vol. 1 (December 1969).

<sup>2</sup> See, for example, "U. K. Banks' External Liabilities and Claims in Foreign Currencies," *The Bank of England Quarterly Bulletin*, Vol. 4 (June 1964), p. 105. Also, B.I.S., *35th Annual Report* (June 1965), p. 132.

not yet provided the various central banks with sufficient time to gear their systems of data collection and publication to the requirements of the new system. Furthermore, the primary sources of detailed monetary data—the central banks—are national in orientation, while the Euro-dollar market requires internationally consistent coverage.

This study attempts to show that, while available Euro-dollar data leave much to be desired, a comprehensive framework can be constructed which may be helpful in analyzing a number of important aspects of the system.

It may be useful, at the outset, to postulate a set of data that could be considered satisfactory and then to approximate this potential set as closely as possible with actually available data.

The Euro-dollar market is an international market in which commercial banks place and take on deposit short-term U.S. dollar funds. The ultimate purpose of the market is to provide financial intermediation between nonbank depositors of dollar funds and nonbank borrowers of dollar funds. The extent to which such intermediation is being provided at any given time could conceivably be measured by the volume of short-term dollar claims on, and liabilities to, nonbanks held by the commercial banks that conduct Euro-dollar business. Even if such data were available, a number of conceptual problems would remain.

At any stage of the process of intermediation, which normally involves interbank transactions, dollar balances may be converted into other currencies and passed on in the form of balances in other currencies. If the other currency is not the domestic currency of the country in which the conversion takes place, the deposit becomes part of the broader Euro-currency market. A bank in Switzerland, for example, may convert a Euro-dollar deposit into a Euro-sterling claim on a bank in France. The terminal stage of Euro-dollar intermediation in this case is a bank rather than a nonbank borrower. The quantitative significance of this problem in the present context is reduced by the fact that about 80 per cent of all Euro-currency balances are Euro-dollar balances.<sup>3</sup>

A related problem arises, however, in case a bank converts Euro-dollar balances into its domestic currency, in order, for example, to make domestic commercial loans on the basis of funds obtained in the

<sup>3</sup> The distribution of Euro-currency deposits at the end of 1968 was as follows: U.S. dollars, 80.1 per cent; Swiss francs, 9.0 per cent; D-Marks, 6.8 per cent; sterling, 2.4 per cent; and guilders, French francs, lire, 1.7 per cent. *The Economist*, Vol. 232 (August 30, 1969), p. 40.



Euro-dollar market. While the source of credit has been the Euro-dollar market, its use is obtained in the domestic currency. Once more the bank is the terminal stage of Euro-dollar intermediation and to consider only dollar positions vis-à-vis nonbanks would underestimate Euro-dollar activity.

Yet another reason for rejecting the volume of nonbank positions as too narrow lies in the fact that the interbank structure of the system is anything but irrelevant. Although the volume of nonbank positions remains the best, if not a perfect, approach to estimating the net size of the system, its interbank structure reflects allocative patterns which are of considerable relevance to the functioning of the market. It is, therefore, desirable to deal in the proper context with positions vis-à-vis both banks and nonbanks.<sup>4</sup>

Geographically, the Euro-dollar market is located in Western Europe and Canada.<sup>5</sup> The United States plays a dominant role through the branches of its commercial banks in Western Europe. The United States *per se* cannot be considered a Euro-dollar center since the principal definitional requirement of a Euro-dollar deposit is that it is held in a bank outside the United States.

In Figure 1 a framework is proposed, which covers the basic structure of the Euro-dollar system. The system is divided into three centers: the United Kingdom, a group of seven Continental European countries (hereafter referred to as the European Group), and Canada. Each of the three centers has four links to the outside world—that is, to the other two centers, to the United States as the most important area which is not a center itself, and to the residual outside area. In addition, each center's position vis-à-vis its own residents is included. Data for the described positions detailed by bank and nonbank positions could be considered satisfactory for an analysis of original sources and final uses as well as the interbank structure of the Euro-dollar system. Tables 1 through 3 represent an attempt to provide data for the positions indicated by letters in Figure 1.<sup>6</sup> Tables 1a, 1b, 2a, 2b, and 2c provide further detail to a number of positions in Figure 1.

The discussion of the data falls naturally into three parts: the positions of the United Kingdom, the European Group, and Canada.

<sup>4</sup> For estimates of the net size of the Euro-dollar market, see *B.I.S., 36th-39th Annual Reports*.

<sup>5</sup> Other areas, such as Japan, Latin America, the Middle East, and other countries of the sterling area, may be important sources and users of funds, but they are generally not intermediaries.

<sup>6</sup> See Appendix.

## The Structure of the Euro-Dollar System

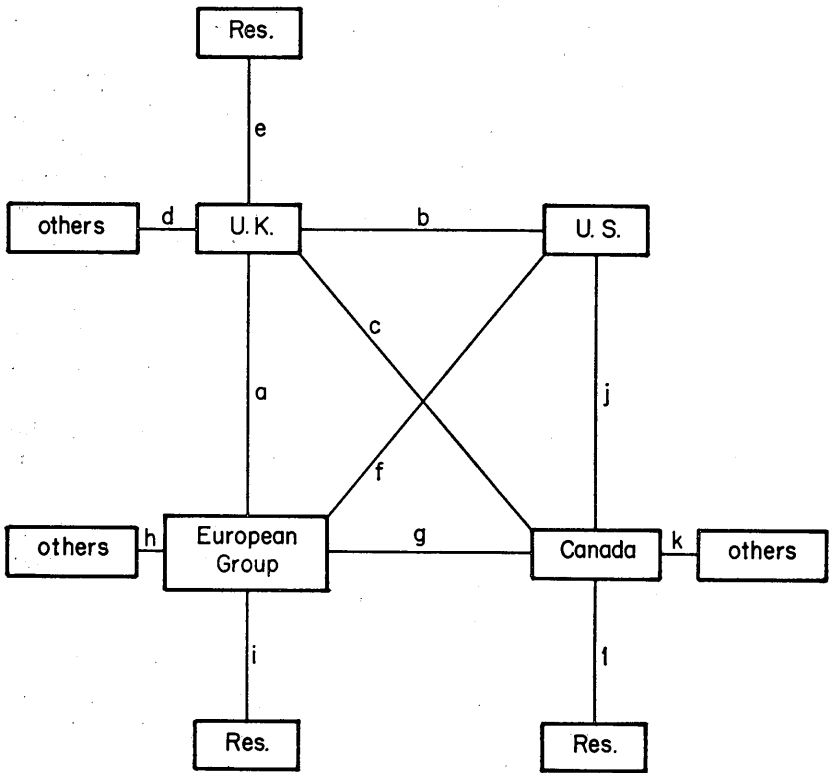


Fig. 1

## II. THE EURO-DOLLAR MARKET IN LONDON

The data for Table 1, covering positions (a)-(d) in Figure 1, are taken from the *Quarterly Bulletin* of the Bank of England (B.o.E.). The reporting banks are all those banks in the United Kingdom known to have such positions, that is, domestic British banks, accepting houses, London offices of British overseas banks and branches of foreign banks in the United Kingdom, notably branches of American banks. Claims are short-term U.S. dollar claims on overseas banks and nonbanks owned by the reporting banks or held on behalf of their British customers. Liabilities include deposits and advances received from overseas banks and nonbanks and some commercial bills drawn in U.S. dollars on residents of the United Kingdom and held by the reporting banks on behalf of their overseas customers.<sup>7</sup> The B.o.E. data give much more geographical detail than is shown in Table 1. Some of this additional detail will be utilized in the discussion below and in Tables 1a, 1b, and 2c.

With regard to the purpose of this study, the B.o.E. data are deficient in three respects. First, a distinction between positions vis-à-vis foreign banks and nonbanks would be desirable. Occasional estimates and comparisons between data of different sources are imperfect substitutes for this information. Secondly, double-counting occurs, to the extent, for example, that overseas funds on deposit in London are advanced to a bank abroad and subsequently redeposited in another bank in London. Thirdly, positions arising from Euro-dollar transactions are not distinguished from conventional U.S. dollar balances, such as correspondent balances, and so forth. Only on the assumption that such conventional balances are fairly constant, can the growth in U.S. dollar positions be linked to Euro-dollar transactions.

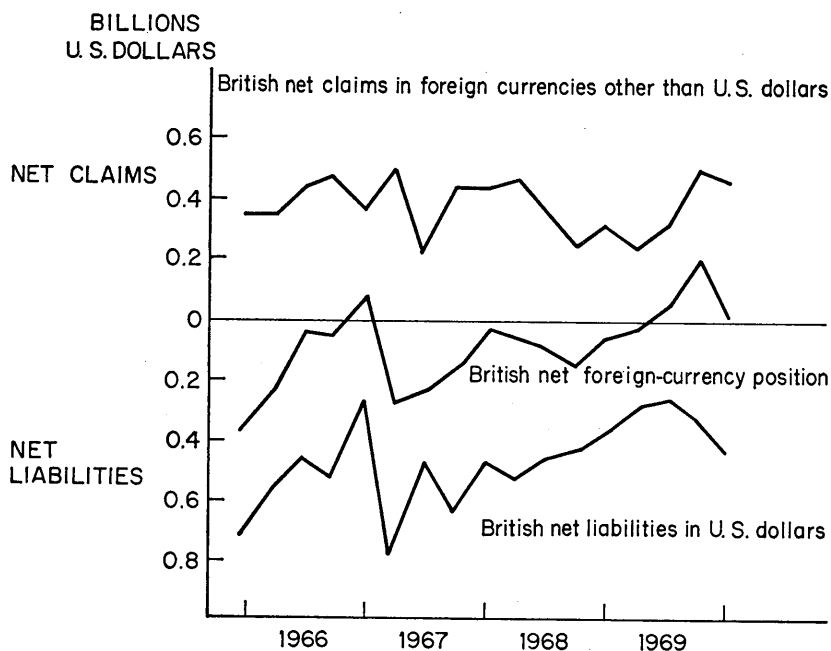
### *The Overall British Position*

Compared with the volume of total gross claims and liabilities, the overall net position of the United Kingdom vis-à-vis nonresidents is very small and shows no apparent relationship to changes in the gross figures. This suggests that London's role in the Euro-dollar market is primarily that of an intermediary that takes funds on deposit from abroad in order to make advances abroad. The reporting banks' net liabilities to foreigners in U.S. dollars cannot be expected to be

<sup>7</sup> A description of these data is given in *The Bank of England Quarterly Bulletin*, Vol. 4 (June 1964), p. 100.

balanced by net claims on nonbank British residents, because of possible conversions into other currencies. British banks, for example, could take dollar deposits from abroad and make equivalent advances to nonresidents in other foreign currencies. The British external foreign-currency position would be balanced and no transactions with residents need have taken place. Figure 2 points toward such an interpretation; it shows that London's intermediary role between non-

### The British Position in Dollars and Other Currencies



SOURCE: BANK OF ENGLAND, *QUARTERLY BULLETIN*, VOL. 6, NO. 4 (DEC. 1966) table 19, pp. 384-385  
 VOL. 8, NO. 1 (MARCH 1968) table 20, pp. 83-84.  
 VOL. 9, NO. 1 (MARCH 1969) table 19, pp. 110-111  
 VOL. 10, NO. 1 (MARCH 1970) table 19, pp. 100-101.

Fig. 2

residents includes some converting of dollar liabilities into claims in other foreign currencies.<sup>8</sup> The net use of Euro-dollar funds by non-bank residents of the United Kingdom is consequently smaller than the British net external position in dollars.<sup>9</sup>

### *London vis-à-vis the European Group*

Data going back to December 1962 show the United Kingdom in a net borrower position vis-à-vis the European Group.<sup>10</sup> The growth of this net liability position from approximately \$0.3 billion in 1963 to \$7.0 billion in September 1969 can be divided into three distinct periods.

During 1963-64 the net position remained relatively constant around an average of \$0.3 billion.<sup>11</sup> In contrast to later periods, the size of the net position relative to gross claims and liabilities remained small. The structure of the European position also remained basically constant during 1963-64: Switzerland was the dominant net lender, while the other countries, notably Italy, were net borrowers, with the exception of Germany whose net position oscillated. London's role vis-à-vis the European Group thus appears to have been largely intermediary between Europeans; it accepted deposits from Switzerland and placed funds amounting to 80 per cent of these deposits in the other Continental European countries.

The second period, 1965-67, saw substantial growth in the net liability position (Table 1) as well as a number of structural changes

<sup>8</sup> An example of this type of intermediation may be found in the British position vis-à-vis Western Germany in September 1969 (when speculation on revaluation of the D-Mark was strong). The United Kingdom had net claims on Germany of \$958 million in currencies other than dollars and sterling (presumably D-Marks), while her net liabilities to Germany in dollars were \$146 million. Figure 2 points to the Euro-dollar market as a source of speculative funds in this example.

<sup>9</sup> One type of transaction involving residents is the swapping of Euro-dollars into sterling for loans to local British authorities and hire-purchase finance houses. Although it contributes to a net external-liability position in dollars, this type of transaction does not affect the dollar position vis-à-vis residents, since the loans are made in sterling. Another type of transaction is foreign-currency loans to non-bank residents. While the banks are free to conduct swaps, nonbank residents' borrowing of foreign-currency funds is subject to Exchange Control regulation.

<sup>10</sup> For reasons of consistency with Table 2, the Western European Continent here includes the following seven countries: Belgium, Netherlands, France, West Germany, Italy, Sweden, and Switzerland.

<sup>11</sup> This period is not covered in Table 1. The data were taken from *Bank of England Quarterly Bulletin*, Vol. 4 (September 1964), p. 242 and Vol. 5 (September 1965), p. 200.

(Table 1a).<sup>12</sup> While the Swiss net creditor position in London remained approximately at its 1964 level through 1965, Italy reduced her gross liabilities to London sharply in early 1965 and increased her gross claims to an extent that by midyear her net position was that of a large lender.<sup>13</sup> France, beginning in December 1964, increased her gross claims on London substantially, while leaving her gross liabilities unchanged. This added France to the group of large net lenders in London. Only Germany, the Netherlands, and Sweden remained net borrowers at the end of 1966, with combined borrowings about equal to the Italian net-creditor position of \$0.2 billion. In early 1967 Germany and Sweden became net lenders, leaving the Netherlands as the only country of the European Group with (very small) net liabilities to the United Kingdom. Swiss net claims, having grown rapidly in 1966, remained at the approximate level of \$1.5 billion during 1967.

During the third period, December 1967 to December 1969, rapid growth occurred in all positions, especially in the first two quarters of both years. There were no further structural changes, with the exception of the Netherlands, which became a net lender in 1968 and increased its position to \$0.7 billion by December 1969. By September 1969, British net liabilities to the European Group were \$7.0 billion. Switzerland accounted for almost 60 per cent, while the shares of Italy, the Netherlands, France, and Belgium were 15, 9, 7, and 6 per cent, respectively.<sup>14</sup>

### *London vis-à-vis the United States*

In terms of the framework given in Figure 1, the United States is the major net borrower of funds in London. A look at Table 1 shows that the overall structure of the London market for Euro-dollar funds has come to be increasingly dominated by American demand. The growth of this demand, as reflected by British claims on the United States, follows a pattern very similar to that described in the previous

<sup>12</sup> Even though the causes of any change are beyond the scope of this study, the American guidelines of early 1965 should be mentioned here. They mark the beginning of American demand as a dominating aspect of the Euro-dollar market. "Guidelines for Banks and Non-Bank Financial Institutions," *Federal Reserve Bulletin*, Vol. 51 (March 1965), p. 371. The Guidelines under the subheading of "Foreign Branches" make specific reference to Euro-dollar deposits as an "independent" source of funds. *Ibid.*, p. 374.

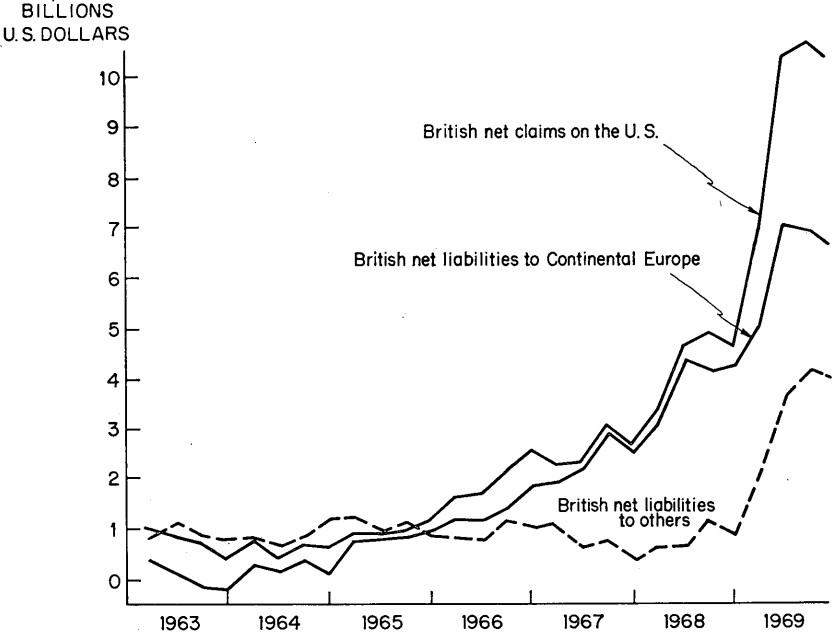
<sup>13</sup> For a detailed description of the important Italian position, see F. Masera, "International Movements of Bank Funds and Monetary Policy in Italy," *Banca Nazionale del Lavoro Quarterly Review*, No. 79 (December 1966), p. 314.

<sup>14</sup> The German position at that time is described in footnote 8 above.

section—that is, no significant growth during 1963-64, followed by considerable expansion in 1965-66; and again a period of slower growth in 1967, followed by extremely rapid increases in the first two quarters of 1968 and 1969.

Figure 3 demonstrates London's intermediation between Continental

The Overall British Position



SOURCES: TABLE 1  
 BANK OF ENGLAND, *QUARTERLY BULLETIN*, VOL. 4, NO. 3 (SEPTEMBER 1964)  
 TABLE 25, p. 242, VOL. 5, NO. 3 (SEPTEMBER 1965), TABLE 22, p. 200.

Fig.3

Europe and the United States. This relationship dominated the Euro-dollar market in London especially during 1966-68. Before 1966, Canada and other areas were relatively large net lenders in London. Similarly, during 1969, London had to rely heavily on non-European sources of funds.

### *American Banks in the United Kingdom*

The B.o.E. data used up to this point are detailed by currencies and geographical distribution but not by types of banks. Another B.o.E. series gives details by types of banks but not by currencies and geographical distribution.<sup>15</sup> It is therefore not possible to continue the preceding discussion of geographical distribution in terms of particular types of banks involved. A number of observations are nevertheless possible concerning the branch offices of American banks in the United Kingdom.

These branches have had an increasing share of total Euro-currency operations in the United Kingdom. Of all British advances to overseas residents in nonsterling currencies, for example, 37 per cent were made by American branches in December 1964. Their share of total Euro-currency liabilities was 34 per cent. By September 1969 these shares had risen to 66 and 63 per cent respectively. The balance sheet of the American banks in London, as shown by the described B.o.E. series, allows the following observations: Their operations were conducted largely in currencies other than sterling.<sup>16</sup> The sources of their deposits and the destination of their advances were, to a large extent, outside the United Kingdom.<sup>17</sup> These external sources and uses in nonsterling currencies were nearly balanced until the second quarter of 1968. When at that time their claims on overseas residents began to exceed their liabilities to overseas residents, their liabilities to other banks in the United Kingdom exceeded their claims on these banks by a comparable amount.<sup>18</sup> By September 1969, their claims on overseas residents were \$18 billion, their liabilities to overseas residents were

<sup>15</sup> This series gives a balance sheet, detailed by type of claims and liabilities, for accepting houses, overseas banks, and other banks in the United Kingdom. Their total external claims and liabilities in "other currencies" are closely correlated with total claims and liabilities in foreign currencies in the series used in Table 1. Compare, for example, *Bank of England Quarterly Bulletin*, Vol. 9 (December 1969), Table 10, p. 491 and Table 19, p. 508.

<sup>16</sup> In December 1966, 18 per cent of their deposits and 14 per cent of their claims were in sterling. By September 1969, these percentages had declined to 6 and 5 respectively. *Ibid.*, p. 494.

<sup>17</sup> In December 1966, 25 per cent of their nonsterling deposits came from British residents and 18 per cent of their nonsterling claims were on British residents. The respective figures for September 1969 were 39 per cent and 22 per cent. *Ibid.*

<sup>18</sup> Net claims on overseas residents and net liabilities to British residents averaged \$0.2 billion during the nine quarters from March 1966 to March 1968. For the remaining six quarters through September 1969, the corresponding average was \$1.5 billion. *Ibid.* and *Bank of England Quarterly Bulletin*, Vol. 8 (March 1968), p. 70.



almost \$16 billion, and their net liabilities to other British banks were slightly in excess of \$2 billion.

This sharply increased borrowing by American banks in London from other banks in the United Kingdom coincided, as may be recalled from Figure 3, with an increasing gap between British net claims on the United States and British net liabilities to the European Group.<sup>19</sup> It therefore appears that the American banks in London primarily intermediated between the European Group and the United States.<sup>20</sup> When European sources no longer sufficed to meet extremely strong American demand in the second half of 1968 and in 1969, the American banks

<sup>19</sup> The excess of British net claims on the United States over British net liabilities to Continental Europe averaged \$0.3 billion during the nine quarters from March 1966 to March 1968. For the remaining six quarters through September 1969, the average was \$1.7 billion. Data from Table 1.

<sup>20</sup> This hypothesis can be supported by regression analysis:

A = claims on overseas residents of American banks in the United Kingdom.

B = claims on the United States of all banks in the United Kingdom.

C = claims on overseas residents of other than American banks in the United Kingdom.

Least squares regression of B on A and C yields:

$$B = 645.45 + 0.91 A - 0.30 C. \quad \text{Corrected } R^2 = 0.998.$$

(309.63) (0.045) (0.120)

The regression coefficients are significant at a 5 per cent level. The regression coefficient of A has the expected sign and indicates that a one dollar increase in A leads to an approximately equivalent increase in B. The regression coefficient of C is negative and indicates that positive changes in C are not typically correlated with changes in B. American banks in the United Kingdom are therefore strongly identified with British claims on the United States.

D = liabilities to overseas residents of American banks in the United Kingdom.

E = liabilities to Continental Europe of all banks in the United Kingdom.

F = liabilities to overseas residents of other than American banks in the United Kingdom.

Least squares regression of E on D and F yields:

$$E = -163.08 + 0.49 D + 0.41 F. \quad \text{Corrected } R^2 = 0.996.$$

(372.61) (0.074) (0.165)

The regression coefficients are significant at a 5 per cent level. Both coefficients are positive, but D accounts for a greater percentage of the observed changes in E than does F. This is indicated by the Beta coefficient of D, which is 0.72, compared with the Beta coefficient of F, which is 0.27 (0.11), (0.11).

Changes in British liabilities to Continental Europe are therefore better explained by the American banks' liabilities than by the liabilities of other banks in the United Kingdom.

The time period covered was December 1965-September 1969 (16 quarterly observations).

Sources of data: For B and E, Table 1.

For A, C, D, and F, *Bank of England Quarterly Bulletin*, Vol. 8 (March 1968), Tables 10-12, pp. 66-71, Vol. 9 (December 1969), Table 10, pp. 491-497.