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EXPLAINING CHANGES IN EURO_DOLLAR POSITIONS; A STUDY OF BANKS IN FOUR EUROPEAN COUNTRIES

by

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EXPLAINING CHANGES IN EURO-DOLLAR POSITIONS: A STUDY OF BANKS IN FOUR EUROPEAN COUNTRIES 1/

International short-term capital flows have proven troublesome for the monetary authorities of nearly every industrial country at one time or another in the past 10 years, and sometimes for protracted periods. In certain countries at certain times, outflows of short-term funds have aggravated balance of payments problems; in other countries at other times, capital inflows have complicated the task of domestic monetary management. The list of measures that monetary authorities have instituted to control short-term capital flows is long. In Europe it includes, inter alia, changes in the overall stance of monetary policy, exchange controls, swap transactions between the central bank and commercial banks, regulations on banks' net positions vis-à-vis nonresidents, discriminatory reserve requirements on banks' foreign liabilities, and prohibition of interest payments on bank accounts of nonresidents. In the wake of the foreign exchange crisis in Europe in May 1971, suggestions were made that some sort of international regulation might be beneficially applied to the Euro-dollar market, which has been the channel for a large portion of the short-term capital flows of recent years.

1/ The author is grateful to several colleagues for helpful comments and suggestions, and especially to Ralph Bryant of the Division of International Finance.

Clearly, the control of short-term capital flows is facilitated by knowledge of the underlying forces that give rise to them. The flows may be divided into three categories: 1) speculative flows set in motion by expectations of exchange rate changes; 2) capital flight, caused by fears of adverse governmental action; 3) flows based on international differences in monetary conditions. The first two categories do not seem susceptible to "control" other than by prohibiting them or by changing people's expectations, but flows of the third type are susceptible to regulation through changes in interest rate relationships, in bank reserves, and in the availability of credit. This study looks into relationships between monetary factors and one type of short-term capital flow, viz., the borrowing and lending of Euro-dollars by commercial banks. Borrowers and lenders of short-term funds include nonbanks (essentially business enterprises) as well as banks, and the markets in which funds are borrowed and loaned include national money markets, and other Euro-currency markets, as well as the Euro-dollar market. But banks' operations in the Euro-dollar market have constituted, in recent years, a very important part of total short-term capital flows between industrial countries.

A word of definition may be appropriate. The Euro-dollar market is a market for dollar funds outside the United States. Looked at from the standpoint of a bank located outside the United

States, Euro-dollar liabilities reflect the receipt of U.S. dollar funds from other banks or from nonbank customers, either residents or nonresidents. These dollars are acquired by accepting a deposit or -- in some interbank transactions -- by obtaining a loan.[2/] On the assets side, Euro-dollars comprise dollar deposits placed with -- or dollar loans made to -- other banks, and dollar loans extended to nonbank customers at home or abroad.[3/]

The maturities of Euro-dollar assets and liabilities tend to be short, interbank transactions being in large part overnight loans, call loans, and deposits of 7 days and 1 month.[4/] Because of short maturities and the efficiency of the market, Euro-dollars compete with domestic money market instruments (and other Euro-currencies) as a source and use of short-term funds. Banks and nonbanks go through the exchange markets to shift funds between the Euro-dollar market and national money markets (or other Euro-currency markets), often in response to very small interest rate differentials.

2/ Some dollar funds that banks outside the United States acquire from banks or other residents of the United States itself are of relatively "traditional" types that antedate the Euro-dollar market. Such liabilities are not considered to be "Euro-dollars."

3/ However, dollar claims on residents of the United States itself of a "traditional" type antedating the Euro-dollar market are not considered to be Euro-dollar assets of those banks.

4/ Bank of England statistics show that, in July 1970, 71 per cent of U.K. banks' dollar liabilities to banks abroad had an original maturity of less than 3 months. The corresponding percentage on the assets side was 74 per cent.

Description and Main Findings of the Study

As is implied by its name, the Euro-dollar market is concentrated in the main financial centers of Western Europe. The banking systems of the larger Western European countries are to a high degree "jobbers" of Euro-dollars, acquiring Euro-dollars abroad and relending the funds to other borrowers outside the particular country. Consequently, as the size of the Euro-dollar market expanded rapidly in the 1960's, these national banking systems tended to increase their Euro-dollar assets and Euro-dollar liabilities in roughly equal proportions. However, over short periods -- from quarter to quarter and from year to year -- their net positions in Euro-dollars frequently showed large fluctuations. Net asset positions shrank, or net liability positions increased, when funds acquired in the Euro-dollar market were not relent in that market; net assets rose, or net liabilities fell, when banks shifted funds from other sources into Euro-dollars. Whenever Euro-dollars acquired abroad were shifted to a domestic use (usually via the exchange market), or whenever funds were shifted out of a domestic use and placed abroad as Euro-dollars, an international capital flow resulted that was recorded in the balance of payments of the country in question, and which increased or decreased the country's official reserves (and banks' liquidity).

This paper discusses problems encountered in trying to explain changes in the net Euro-dollar positions of banks in four

Western European countries. The positions dealt with are banks' Euro-dollar positions vis-à-vis nonresidents only. The omission of positions vis-à-vis residents -- caused by lack of data -- is probably not important. Those positions tend to be much smaller than the positions vis-à-vis nonresidents, and their inclusion would probably not alter significantly the results obtained from the data that are employed.

In trying to generalize about the causes of changes in banks' Euro-dollar positions, it would be desirable to consider banks in as many countries as possible. But because of data problems and the existence of highly restrictive regulations in some countries, this study has had to be limited to banks in four countries: Belgium, the Netherlands, France, and Germany. The positions studied are overall net positions in all maturities, at quarter-end, as published by the Bank for International Settlements. The first observations are for September 1963, and the most recent for dates in late 1968 or early 1969. Note A of the Appendix discusses reasons why more countries were not included and the reasons for the choices of periods covered.

A very simple single-equation model is developed to explain the changes in net Euro-dollar positions. The positions, which constitute the dependent variable in the equation, are not used in their raw form but are adjusted by a scale factor. The purpose of this adjustment is to take account of the growth of banking

activity in general and the Euro-dollar market in particular, and the consequent magnification of the impact of the independent variables on banks' Euro-dollar positions. The model (of which three versions are developed) uses the following independent variables: 1) the average covered differential between the 3-month Euro-dollar deposit rate and a selected domestic money market rate, in the quarter or, for France, in the month preceding the quarter-end; 2) bank loans to private domestic borrowers, in terms of percentage of trend; 3) for Belgium only, a time trend; 4) for Germany only, the simple average of minimum reserve ratios against sight, time, and savings deposits for big banks.

Estimation of the model by multiple regression shows that changes in covered interest differentials were closely associated with changes in banks' net Euro-dollar positions in all four countries. Tests of significance on the estimated coefficients of the interest differentials give t-ratios that are significant at the .001 level -- a severe standard -- for all countries but Belgium, and at virtually the .05 level for the latter. Since only differentials on 3-month funds were used in the model even though the Euro-dollar positions are positions in all maturities, the results suggest that covered differentials relative to other maturities of Euro-dollar deposits are also significant in causing Euro-dollar positions to change.

Fluctuations in bank loans to private domestic borrowers were a significant causative factor affecting net Euro-dollar

positions of banks in the Netherlands and France, but not in Belgium or Germany. In the equation for Germany the reserve ratio variable was significant at the .001 level, and its inclusion raised the $\bar{R}^2$ by no less than 32 points. Concerning the equation for Belgium, the time variable was highly significant; why this is so is hard to establish, but it may well be related to easier monetary conditions in Belgium in the latter part of the period covered. Time was not a significant variable in the equations for the other three countries, when tried in conjunction with the other independent variables chosen.

The particular independent variables selected explain between one-half and three-fourths of the variation in the adjusted Euro-dollar positions in each country, the values of $\bar{R}^2$ (the coefficient of determination corrected for degrees of freedom) ranging from .56 to .76. It seems certain that the $\bar{R}^2$ values would have been higher had it been possible to make use of several other explanatory variables. As already stated, the net positions that the model is intended to explain include deposits with a great range of original maturities, but because of lack of data the only differentials used in the model relate to rates on 3-months funds. Again because of lack of data, the model fails to include any differentials between Euro-dollar rates and interest rates in other Euro-currency markets. Except for the minimum reserve ratios in Germany, there are no variables for monetary policy

actions that might affect banks' Euro-dollar positions directly as well as through induced changes in interest differentials. It also seems probable that a properly-specified model should include a variable to reflect increasing risk (not an exchange risk, however) associated with increases in net Euro-dollar positions.

In this model, the covered interest differentials are not independent of omitted variables comprising the disturbance term, and the estimated coefficients of the differentials are therefore biased.

A General View of Shifts in Net Euro-dollar Positions

A bank has a net position in Euro-dollars vis-à-vis nonresidents whenever its Euro-dollar liabilities to nonresidents exceed its Euro-dollar claims on nonresidents (resulting in a net liability position), or when the claims exceed the liabilities (producing a net asset position).[5/] There are two broad types of circumstances where a bank takes a net Euro-dollar position. In the case of a net liability position, for example, part of the Euro-dollars borrowed abroad might be used domestically, generally

5/ A net position would typically be of this type rather than one in which the bank had only assets and no liabilities, or vice versa. As was mentioned earlier, a large part of European banks' Euro-dollar activities consists of accepting Euro-dollar deposits and relending the funds in the Euro-dollar market to other banks or to nonbank customers.

after conversion into domestic currency on the exchange market (in which case the bank would cover forward). The bank might wish to use the funds to add to its domestic money market assets, to reduce its borrowings in the money market or at the central bank, or to increase its loans or its bond portfolio. In some countries, banks also lend foreign currency directly to domestic borrowers, but Italy is the only Western European country where such a practice is known to be important.

The second type of circumstance in which a bank incurs a net liability position in Euro-dollars vis-à-vis nonresidents is to increase its net foreign assets (or reduce its net foreign liabilities) that are not denominated in U.S. dollars. These other foreign assets and liabilities could be in markets for other Euro-currencies, of which those for Euro-sterling, Euro-Swiss francs, and Euro-DM are the most important, or they could be in national money markets.

If, in the opposite case, a bank has established a net asset position in Euro-dollars vis-à-vis nonresidents, one reason it might have done so is because it wished to shift resources from domestic uses to the Euro-dollar market. In the majority of cases this would involve converting domestic currency into dollars (and obtaining forward cover). In some degree such a shift might also be accomplished by placing abroad dollars received from domestic residents, either in repayment of dollar loans or as

additions to dollar deposits. The other reason for taking a net asset position in Euro-dollars vis-à-vis nonresidents is to shift funds into the Euro-dollar market from other foreign markets, either the other Euro-currency markets or national money markets abroad.

Choosing the Explanatory Variables

A. Covered interest differentials

The foregoing discussion brought out that, in determining what its net Euro-dollar position vis-à-vis nonresidents will be, a bank effectively considers two sets of competing incentives. One pertains to the relative advantage of employing funds in the Euro-dollar market as opposed to some domestic use, such as the local money market; the other set compares the advantage of the Euro-dollar market with other foreign uses. In calculating these advantages, a major consideration will of course be the relative rates of return on invested funds of the same maturity. In specifying an equation to explain net Euro-dollar positions, for some purposes we might ideally want to include covered interest differentials between every Euro-dollar rate and every domestic money market rate of equivalent maturity, and the same for differentials relative to Euro-dollar rates and rates of equivalent maturity in the other principal money markets abroad, in particular the other Euro-currency markets. This might be an ideal procedure if our

sole objective were to explain the highest possible percentage of variation in the dependent variable, and we did not care that we could not make satisfactory tests on the coefficients because of high multicollinearity among the various differentials.

In practice, the only covered interest differentials that can be used in the present study are those relative to 3-month investments. That is because the 3-month forward dollar exchange rate is the only forward exchange rate for which quotations are available, over the period covered by study, in the exchange markets of the four countries considered in the investigation. In calculating covered differentials between the 3-month Euro-dollar rate and domestic money market rates, the 3-month interbank loan rate has been chosen as the most appropriate rate for Germany, and the 3-month local authority rate for the Netherlands. Although there are primary markets for 3-month Treasury bills in both of these countries, it appears that Treasury bills are much less directly competitive with Euro-dollars than are the other instruments referred to above.

For Belgium, the 3-month domestic rate selected for interest differential calculations is the tap rate on 3-month Treasury bills. This rate is adjusted by the authorities with great frequency, in response to changes in money market conditions, and probably competes more directly with 3-month Euro-dollars than any other domestic rate.

A difficulty is encountered with respect to France, where day-to-day loans still dominate activity in the money market. Rates on 1-month and 3-month loans (between financial institutions, mainly banks) are sometimes only nominal, and at other times are not quoted at all. Consequently, in this study the covered interest differential employed for France is that between the 3-month Euro-dollar rate (adjusted for forward cover) and the day-to-day money rate in Paris. Even though unequal maturities are compared, this differential is probably associated with French banks' net Euro-dollar positions about as closely as any differential between comparable maturities, because of the tendency of rates of different maturities in the Paris market to move together.

For each country, then, the model includes only a single covered differential between Euro-dollar rates and domestic rates, rather than a spectrum of differentials for many different maturities. But this may not be an insuperable handicap. A single interest differential may still explain much of the variation in the Euro-dollar positions because of the general tendency for short-term interest rates in the same market to move together.

A possibly serious shortcoming is the enforced absence in the model of any differentials between Euro-dollar rates and other Euro-currency rates. Banks in the four countries covered by this study have been active net borrowers and net lenders in the

nondollar Euro-currency markets. Figures published by the BIS show that, for banks in Belgium and France, shifts from quarter to quarter in quarter-end net positions in these other Euro-currencies, in the years 1963-68, added up to a larger figure than did the shifts in their net Euro-dollar positions; for banks in the Netherlands and Germany, the shifts in the nondollar Euro-currency positions cumulated to more than one-half of the shifts in the Euro-dollar positions. However, interest rates in the major nondollar Euro-currency markets were not available until very recently. The model also does not include differentials between Euro-dollar rates and interest rates in foreign national money markets (e.g., New York and London). This absence reflects the author's belief that, for banks in Belgium, the Netherlands, France, and Germany, interest rates in foreign national money markets have not been a sufficiently important determinant of those banks' operations to justify construction of the differentials.

We now confront a thorny question in specifying our equation. The net Euro-dollar positions we seek to explain are overall net positions determined by assets and liabilities of various original maturities ranging from call or overnight loans to deposits of one year or more. But the only interest differentials at our disposal concern 3-month deposits. And the absence of differentials for other maturities is only one aspect of a broader question. If we had differentials for all the other maturities of funds included

in the outstanding positions, what differentials in point of time should be selected as the determining ones? In short, the positions depend on differentials, but differentials on what dates?

An approach to an answer might be made by considering a hypothetical situation in which a bank's Euro-dollar operations are entirely in 3-month funds. Once the bank borrows or lends in the market on a given day, those particular funds are tied up for the next three months, and to that extent the bank's net position in Euro-dollars is frozen. But over the ensuing 90 days the bank will have a certain amount of flexibility to adjust its net position in 3-month funds. Previously-acquired Euro-dollar assets and liabilities will run off with more or less regularity, allowing gross positions to decrease. Conversely, the bank will presumably be able to run up its gross Euro-dollar liabilities somewhat further, by borrowing new funds faster than old liabilities run off, and it will presumably be able to expand its gross Euro-dollar assets up to some limit, by shifting assets out of other markets faster than existing Euro-dollar assets mature. The speed with which the bank can adjust its net position in response to changing rate differentials will lie somewhere between three months at one extreme and a day or less at the other. Thus, we would expect that on a given date a net position in funds with an original maturity of three months would have been determined more by rate differentials in the relatively recent past than by differentials on more distant dates in the previous three months.

From the foregoing it would seem that, in choosing the differentials to be regressed on the quarter-end positions in our equation, the average differential in the month preceding the quarter-end would be a more appropriate choice than the average differential for the entire quarter.[6/] And there is a second reason for believing so. As noted ~~above, the positions~~ include funds with original maturities other than three months, and from what little we know we should expect that funds with original maturities of less than three months were more heavily represented than funds with original maturities longer than three months.

However, it was felt desirable to try to establish empirically the seeming a priori superiority of using differentials during the month, rather than quarter, preceding the quarter-end.[7/] For each country, the model was estimated twice, using monthly average differentials in one estimation and quarterly averages in the other. For the most part, the results were not in accordance with expectations. For France, the monthly average differentials did indeed yield a much higher value for $\bar{R}^2$. But for Germany, $\bar{R}^2$ was slightly higher using quarterly averages, while for both Belgium and the Netherlands

6/ This is not to say that the only possible speeds of adjustment are three months and one month. But for present purposes the choices are limited to averages for the three months, two months, and one month prior to the quarter-end. In some cases, data used to calculate the differentials are only available in the form of monthly averages. In the other cases, an attempt to calculate averages for periods shorter than a month would run the risk of being inaccurate.

7/ Differentials for the two months preceding the quarter-end were not tested.

the $\bar{R}^2$ values were markedly higher when the quarterly averages were used. In the light of these results, the model discussed in more detail later uses monthly average differentials for France and quarterly averages for Belgium, the Netherlands and Germany. The superior results from using quarterly averages for Belgium and the Netherlands, in contrast with the opposite results for France, could mean that the speed of adjustment of banks in the first two countries to changes in 3-month differentials is relatively long compared with French banks. Or, it may signify that the Euro-dollar assets and liabilities of Belgian and Dutch banks are in general of longer maturities than are those of banks in France.

B. Bank loans to domestic borrowers

A covered interest rate differential may change for several reasons. The forward exchange rate may change, either independently of the uncovered interest differential or because of a shift in the latter. If the uncovered differential changes, this may be because of a change in the Euro-dollar rate (the domestic rate remaining stable), because of a change in the domestic rate, or because of changes in both.

The question arises whether the amount of change in the net Euro-dollar position that is associated with a change of given amount in the covered interest differential is likely to be the same regardless of the reason for the change in the differential. If not, this might well lead to difficulties in estimating the models.

When the differential changes because of a change in the domestic rate, the associated shift in banks' Euro-dollar positions may well be greater than if the differential shifts by the same amount because of a change in the Euro-dollar rate. This seems likely to be true in those cases where the domestic rate changes because banks' overall money market net assets are being increased or decreased, i.e., their net assets in the domestic money market and the Euro-currency markets combined.

A frequent cause of changes in banks' overall money market positions is fluctuations in the domestic demand for bank loans. Consider the case where the demand for bank loans rises. Assuming that bank reserves are not replenished by some other action (including increased borrowing from the central bank or active measures by the authorities), banks can then be expected to try to reduce their overall net money market assets, or increase their net liabilities to the money market, to raise funds for loan expansion. Such behavior would stem from the normal commercial bank preference to employ resources in loans rather than investments (within limits). In response to banks' attempts to shift funds from the money market into loans, two separate and distinct pressures will be brought to bear on their net Euro-dollar positions.

One form of pressure will be exerted through changes in interest rate differentials. As domestic money market rates rise relative to Euro-dollar rates (adjusted for forward cover), incentives

will arise to shift assets from the Euro-dollar market to the domestic money market or to switch liabilities from the domestic money market to the Euro-dollar market. But in addition, to raise funds for loan expansion, banks will be trying to reduce their total net money market assets (or increase their total net money market liabilities). This will constitute an additional pressure for banks to reduce their net Euro-dollar assets (or increase their net Euro-dollar liabilities) over and above that stemming from the shift in interest differentials. Consequently, for a given change in interest differentials, we can expect banks' net Euro-dollar positions to change by a greater amount as a result of fluctuation in domestic loan demand than as a consequence of a change in Euro-dollar rates.

Because of the foregoing, if banks' Euro-dollar positions change over a period of time because of both fluctuations in domestic loan demand and changes in Euro-dollar rates -- and we would expect such a mixture of causes -- then changes in Euro-dollar positions will tend to exhibit inconsistent responses to equal changes in interest differentials. Moreover, in some circumstances, the changes in Euro-dollar positions might be uncorrelated, or even correlated in the "wrong" way, with the changes in the differentials: for example, if banks wished very strongly to liquidate net Euro-dollar assets (increase net liabilities) to expand domestic loans, they might do so even if it happened that Euro-dollar rates rose (for unrelated reasons) as much as or more than domestic money market rates, so that the interest differential shifted in favor of Euro-dollars.

The foregoing paragraphs argue for the addition of a bank loan variable to help explain changes in Euro-dollar positions. The data used for this variable are those shown in International Monetary Fund, International Financial Statistics, for either bank loans to the domestic private sector (France and the Netherlands) or total bank claims on the domestic private sector. These data are not employed in the model in their raw form because of their marked upward trends due to secular growth of banking activity. Rather, log-linear trends have been fitted, and the loan levels expressed as a percentage of trend are used as the bank loan variable in the equations. These observations are for quarter-end dates, and the Euro-dollar positions are regressed on them by corresponding quarter-end. An assumption is made which, for the purposes of the model, amounts to saying that banks adjust their Euro-dollar positions immediately to changes in the volume of loans outstanding. It seems more accurate to say that, because banks can project their loan disbursements with considerable precision, they can plan their Euro-dollar positions accordingly.

C. A monetary policy variable

Actions by monetary authorities are a frequent cause of changes in banks' overall money market net assets (other than changes induced via interest rates). For example, reductions in minimum reserve ratios, or central bank open market purchase of securities, allow an expansion of banks' net assets in money markets. It is

sometimes difficult to quantify such actions in a way suitable for using them as variables in econometric models. In the model in this study only one such action is made use of, and that is the changes in reserve requirements for banks in Germany.[8/] The levels of the minimum reserve ratios in Germany vary not only according to the type of deposit but also according to the size of the bank and its location. The reserve ratios used in the equation for Germany are ratios for the offices of "big banks" located in "Bank places" (towns with a branch of the Deutsche Bundesbank), "big banks" being those most heavily represented among the Euro-dollar positions of the German banking system. The ratios are employed in the form of a simple arithmetic average of the ratios against sight, time, and savings deposits in the last month of each quarter. Over the period 1963-69 the total deposits of the big banks were divided among the three types in roughly equal proportions. A more precise weighting could be made but scarcely seems needed. What is important here is the movement of the ratios through time, not the absolute levels. The ratios underwent important changes only in 1967, when they were reduced in response to a severe slowing of economic activity, and at that time the ratios were changed in about the same proportions for the three types of deposits.

8/ In the cases of Belgium and the Netherlands, it would seem that policy actions affecting banks' money market net assets directly were unimportant in the period covered by the study, and that their omission from the model is of little consequence.

Adjustment by a Scale Factor

The scale on which banks in Western Europe have operated in the Euro-dollar market has increased enormously since the beginnings of the market in the late 1950's, and this was no less true of the period from 1963 to 1969, the period covered by the present study. For example, in the five years from September 1963 to September 1968, Euro-dollar assets and liabilities (combined) of banks in the four countries increased by 4.2 times in Belgium, 3.0 times in the Netherlands, 3.1 times in France, and 2.4 times in Germany. These increases occurred in part because of the growth of bank balance sheets and in part because the Euro-dollar market became relatively more important as a source and use of bank resources.

The spectacular growth of banks' Euro-dollar activities must be taken into account in the model because of its implications for the effect on Euro-dollar positions of changes in the independent variables. For banks in Belgium, for example, we would not expect that a covered interest differential of a given amount would have the same quantitative influence in determining the banks' Euro-dollar positions in 1968 as in 1963. In those five years, Belgian banks' demands for funds, and their capacity to supply funds, increased greatly: the combined balance sheet of the banks grew about 2.1 times. Furthermore, in the same period, there was an intensification of Belgian banks' use of the Euro-dollar market, relative to their banking activities as a whole, as the Euro-dollar market expanded

and as Belgian banks became more accustomed to using that market. From September 1963 to September 1968, Belgian banks' gross Euro-dollar assets vis-à-vis nonresidents increased 5.4 times, and their gross liabilities 3.4 times.

The model needs a scale factor to neutralize the effect of secular growth in banks' Euro-dollar activities on their net Euro-dollar positions. The scale factor that has been chosen is an index of the trend value of the sum of banks' Euro-dollar assets and liabilities vis-à-vis nonresidents over the period covered by the study. The trends are log-linear for all four countries; the base date of the index is that of the first observation. The trend value has been chosen instead of the actual value in order to eliminate irregular (and any seasonal) fluctuations. Using combined Euro-dollar assets and liabilities to construct the scale factor avoids the difficulty that would arise from selecting assets alone or liabilities alone, i.e., that the scale factor might be influenced by the independent variables in the models. Changes in assets separately and in liabilities separately will of course reflect the effects of changes in covered interest differentials, for example, and the trends of assets and liabilities might be influenced thereby. But the combined figure should be largely free of these distortions, because, over a period of years, the effects on assets and the effects on liabilities should largely cancel out.

The index employed as the scale factor could be used either as a multiplicative factor applied to the independent variables, or as a dividing factor applied to the dependent variable.[9/] The latter prodedure has been followed because fewer computations are involved.

Another Omitted Variable

As stated earlier, the model does not include a number of independent variables which we would like to include but cannot. At this point, mention should be made of another consideration that may well constitute an additional omitted variable of importance. There may be a risk factor that holds down the size of banks' net Euro-dollar positions. Suppose that a bank builds up a (covered) net asset position in Euro-dollars. After these net assets reach a certain level, would the bank feel that a further rise in them would increase the risk, because of the bank's increasing exposure to the Euro-dollar market as a market? If so, after a certain point the risk would outweigh the advantage from the favorable interest differential, and there would be no further build-up of the position despite the interest differential (assuming the latter does not change). One factor that determines the degree of risk felt by the bank is the degree to which its claims on other banks or final borrowers in the Euro-dollar market are spread over many borrowers rather than concentrated with a few. But if a bank typically feels that increases in its overall net position entail a rising risk,

9/ The assumption is made that a multiplicative scale factor should also apply to the disturbance term in the equation.

then such behavior will be an additional independent variable determining the size of net Euro-dollar positions. But inability to quantify such a variable precludes its inclusion in the model.

Estimating the Equations

The three versions of the model developed in this study are as follows:

for Belgium,

$$Y = B_1 + B_2X_2 + B_3X_3 + B_4X_4$$

for the Netherlands and France,

$$Y = B_1 + B_2X_2 + B_3X_3$$

and for Germany,

$$Y = B_1 + B_2X_2 + B_3X_3 + B_5X_5$$

Y is banks' quarter-end net Euro-dollar position vis-à-vis nonresidents, in millions of dollars, adjusted by the scale factor described above. A net asset position is given a positive value and a net liability position a negative value.

X_2 is the quarterly or monthly average covered differential, in basis points, between the 3-month Euro-dollar deposit rate and the particular domestic money market rate. A positive sign is assigned to this variable when the differential favors the Euro-dollar deposit, a negative sign when the differential favors the domestic instrument. The coefficient of this variable should be positive. As earlier noted, quarterly average differentials are used for

Belgium, the Netherlands, and Germany and monthly averages for France, depending on which differentials give the higher $\bar{R}^2$. The $\bar{R}^2$ values using first quarterly and then monthly average differentials are, respectively, .56 and .47 for Belgium; .61 and .50 for the Netherlands; .76 and .74 for Germany; and .42 and .67 for France.

X_3 is the level, expressed as a percentage of trend, of bank loans to private domestic borrowers. For Belgium and Germany, the data include bank claims on the private domestic sector other than loans. The coefficient of this variable should have a negative sign.

X_4 is a time trend, measured in the number of calendar quarters elapsed since September 30, 1963.

X_5 is the unweighted average (in percentage points) of the minimum reserve ratios on sight, time, and savings deposits for big banks in Germany, in the last month of each quarter. The coefficient of this variable should be negative.

Appendix table A shows both the unadjusted Euro-dollar positions and the positions after adjustment by the scale factor. There are gaps in the series, for December 31, 1963 and for June 30, 1964, which reflect nonpublication of the figures. The choice of dates for the termination of the different series is explained in Appendix note A.

Appendix table B gives the average covered interest differentials, of which the details of calculation are described in Appendix

note B. Appendix table C shows bank loans as a percentage of trend, and Appendix table D the minimum reserve ratios in Germany.

Results of estimating the model by ordinary least squares are shown in the table on the next page. The F-test shows all the $\bar{R}^2$ values to be significant at levels of significance above the .001 level. The t-ratios show the estimated coefficients of X_2, the interest differential variable, also to be significant at levels well above .001, a very severe standard, for the Netherlands, France, and Germany. The 95 per cent confidence intervals of the coefficients of X_2 are: Netherlands, $1.16 \pm .43$; France, $1.35 \pm .55$; Germany, $1.49 \pm .74$. For Belgium, the B_1 coefficient is significant at marginally below the .05 level, with a confidence interval of $.27 \pm .28$. It is well to stress that these and the other estimated coefficients derive from data for certain periods only, and that for other periods the estimates might be different because the true values of the coefficients were different.

The estimated coefficients of the bank loan variable, X_3, are of the correct sign for the Netherlands and France -- an increase in loans being associated with a decrease in net Euro-dollar assets -- and are significant at almost the .025 level for the Netherlands and at above the .001 level for France. But for Belgium and Germany the estimated B_3 coefficients are not significant at any acceptable level.

Estimation of the Model

Belgium

	B1	B2	B3	B4
Coefficient	-122	.27	.49	2.93
t-ratio	-0.44	2.07	.17	3.42

$\bar{R}^2$: .56. F-test (3, 17): 9.54
Standard error of estimate: 22
Durbin-Watson "d" statistic: 2.14

Netherlands

	B1	B2	B3
Coefficient	553	1.16	-5.73
t-ratio	2.30	5.61	-2.39

$\bar{R}^2$: .61. F-test (2, 19): 17.34
Standard error of estimate: 29
Durbin-Watson "d" statistic: 1.09

France

	B1	B2	B3
Coefficient	1,217	1.35	-12.57
t-ratio	4.04	5.19	-4.11

$\bar{R}^2$: .67. F-test (2, 16): 19.51
Standard error of estimate: 40
Durbin-Watson "d" statistic: 1.69

Germany

	B1	B2	B3	B5
Coefficient	-83	1.49	6.19	-49.79
t-ratio	-0.11	4.24	.80	5.01

$\bar{R}^2$: .76. F-test (3, 17): 22.29
Standard error of estimate: 56
Durbin-Watson "d" statistic: 2.43

For Germany the estimated coefficient of the reserve ratio variable, X_5, is significant at a level above .001. This estimate says that a rise of one point in the reserve ratio variable is associated with a decrease of approximately $50 million in the banks' net Euro-dollar assets. The 95 per cent confidence limits are 49.79 ± 20.53. For Belgium the estimated coefficient of X_4, the time trend, is significant at a level higher than .005. The addition of this variable to the other independent variables raised the $\bar{R}^2$ for Belgium from .31 to .56. But the linear trend given by the coefficient of this variable does not really describe well the irregular upward movement of the predicted Euro-dollar positions in the regression that leaves the trend variable out. The economic forces behind this ill-defined upward trend are elusive; the trend may have been shaped by factors (other than interest rates) associated with easier monetary conditions in Belgium beginning in the summer of 1967.

Banks' Euro-dollar positions are subject to seasonal influences. For the countries and periodscovered by this study, the seasonal patterns appear to have been entirely the result of seasonality in the independent variables included in the equations, rather than the result of other influences. When equations were estimated in which seasonal dummy variables were added to the other independent variables, the estimated coefficients of the seasonal dummies proved to be not significant by even the most generous standards.

The Durbin-Watson test indicates no autocorrelation of residuals as concerns Belgium and France, the absence implying that we need not worry about inefficiency or downward bias in the sampling variance of the estimates of the coefficients. The Durbin-Watson test is inconclusive as applied to the Netherlands and Germany.

It should be pointed out, however, that the estimated values of the coefficients of the independent variables are subject to a bias from another source. This results from the fact that the covered interest differentials are not independent of at least some of the omitted variables that go to make up the disturbance term responsible for the unexplained variation in Euro-dollar positions. Changes in omitted interest differentials, such as the uncovered differential between Euro-dollar rates and other Euro-currency rates, are likely to affect the forward dollar exchange rate and thereby the covered differential between the Euro-dollar rate and the domestic money market rate. Speculative forces are sometimes an element of the disturbance in models where they are not themselves an independent variable, and by influencing the forward dollar exchange rate they can affect covered interest differentials. However, for the countries and periods covered by this study, it is doubtful that speculation on exchange rate changes -- or the unwinding of such speculation -- was present except as regards Germany in the final two quarters of 1968.

APPENDIX

Note A: Countries and Periods Covered

In addition to Belgium, the Netherlands, France, and Germany, the Bank for International Settlements has published the Euro-dollar positions (vis-à-vis nonresidents) of banks in four other European countries -- Switzerland, Sweden, the United Kingdom, and Italy. The latter four are not included in this study for either of two basic reasons. Intractable data problems are present as regards Switzerland and Sweden. In the Swiss case, the published positions of the banks include those of the BIS itself, and these are important. The BIS' large-scale operations in Euro-dollars being motivated by special considerations, such as the alleviation of pressures on central bank reserves, the data for Switzerland could not be adequately explained in terms of market forces.

As concerns the United Kingdom and Italy, banking regulations have seriously interfered with the impact of market forces on banks' operations in foreign currencies. In Britain, banks have been prohibited since the mid-1960's from holding net asset positions in foreign currency, in order to protect the official reserves. British banks have been permitted to "switch into sterling," i.e., to incur net liabilities in foreign currency. And they have been allowed to eliminate any such liabilities by increasing their net foreign currency assets, but "switching out of sterling" after reaching an even balance in foreign currency has been prohibited.

In Italy, banks have been subject most of the time since 1960 to regulations that have limited their positions in foreign currencies; these regulations have sometimes been directed at limiting the banks' net foreign liabilities, and at other times at their net foreign assets. In addition, there have been other regulations that have limited the extent to which the banks could shift out of lire into foreign currencies through swaps, either in the exchange market or within the framework of facilities provided by the Bank of Italy.

Banks' Euro-dollar positions (vis-à-vis nonresidents) have not been published by the BIS (or, to the author's knowledge, by others) for dates earlier than September 1963, the first observation date in the present study. And although the BIS has published the figures for later dates, the final observation dates in this investigation are September 30, 1968, for France; March 31, 1969, for Belgium and Germany; and June 30, 1969, for the Netherlands. In three of the four cases, dates later than these have not been included because of the introduction of new regulations on banks' positions that seriously interfered with market forces.

In France, the balance of payments crisis of November 1968 prompted a series of measures that forced banks to turn over dollar assets to the Bank of France. To protect their reserves against the pull of soaring interest rates in the Euro-dollar market, the central banks of Belgium and the Netherlands introduced new regula-

tions beginning in the second quarter (Belgium) or third quarter (Netherlands) of 1969 that limited the amount of foreign assets the banks could hold. In Germany, speculation on a revaluation of the mark led to massive inflows of funds in April-May and again in August-September of 1969, which were followed by an enormous exodus after the October 1969 revaluation. These flows left their imprint on the German banks' Euro-dollar positions at the end of the second, third, and fourth quarters. These dates have been excluded because the model does not include an independent variable representative of speculative forces.

Note B: Calculation of Covered Interest Differentials

For Belgium, the Netherlands, and France, the 3-month Euro-dollar rate used in calculating the quarterly average covered interest differentials is a daily bid rate for new deposits, offered by banks in London, and obtained from market sources by the Federal Reserve Bank of New York.

For the Netherlands, the domestic money market rate is a monthly average, published by the Netherlands Bank, of daily rates on 3-month local authority loans. For France, the domestic money market rate is a monthly average, published by INSEE (National Statistical Institute), of daily rates on day-to-day loans against private paper. For Belgium, the domestic money market rate is an estimated monthly average based on end-of-month rates on 3-month Treasury bills published by the National Bank of Belgium. The

estimated monthly averages are obtained by averaging the end-of-month rate with the preceding end-of-month rate; these monthly estimates are then averaged in turn to obtain quarterly averages.

For Belgium, the Netherlands, and France, the quarterly or monthly averages of premiums and discounts on the 3-month forward dollar are estimated by averaging the data for each Friday in the quarter or month (or the nearest preceding day when Friday was a holiday). The premiums and discounts are calculated from the daily spot and forward rates published by the International Monetary Fund.

For Germany, monthly average covered interest differentials are estimated from Friday data on the 3-month Euro-dollar rate, exchange rates, and the Frankfurt 3-month interbank loan rate, as obtained from various sources. When applicable, the discount on the 3-month forward dollar is that for dollar/DM swaps between the Bundesbank and German commercial banks, rather than the market discount.

Table A. Banks' Net Euro-Dollar Positions
(end of quarter; in millions of dollars; no sign indicates net assets)

End of Quarter	Actual				Adjusted by Scale Factor			
	Belgium	Nether-lands	France	Germany	Belgium	Nether-lands	France	Germany
1963 - III	-90	20	-50	80	-90	20	-50	80
1964 - I	-70	-10	-50	100	-60	-9	-44	90
III	10	-80	-60	-70	7	-61	-46	-56
IV	-70	-20	-70	-230	-48	-14	-50	-175
1965 - I	-40	40	0	-30	-25	27	0	-22
II	-40	-60	-30	-10	-23	-37	-19	-7
III	-140	-100	-20	-30	-76	-58	-12	-19
IV	-110	-130	140	-80	-55	-71	77	-49
1966 - I	-40	-200	230	50	-19	-102	119	29
II	-50	-220	370	50	-22	-105	179	27
III	-40	-250	210	180	-16	-111	95	94
IV	0	-250	40	0	0	-103	17	0
1967 - I	-100	-240	120	430	-34	-93	48	201
II	-100	-260	280	440	-32	-94	104	195
III	-70	-190	220	470	-21	-64	77	197
IV	-30	-220	-120	440	-8	-70	-39	175
1968 - I	-50	-140	-150	720	-13	-41	-46	270
II	140	-100	260	240	33	-28	74	85
III	70	-60	250	490	15	-16	67	165
IV	0	-20	1/	510	0	-5	1/	163
1969 - I	230	170	1/	750	43	38	1/	227
II	1/	50	1/	1/	1/	11	1/	1/

1/ Not covered by study.
Source: Actual data were taken from annual reports of the Bank for International Settlements. The figures are for banks' net dollar positions vis-à-vis nonresidents, excluding residents of the United States.

Table B. Covered Interest Differentials
(in basis points;
no sign means differential favors 3-month Euro-dollar rate)

Period	Belgium	Nether-lands	Germany	Period	France
1963 - III	49	62	12	1963 - Sept.	10
1964 - I	36	18	- 1	1964 - Mar.	3
III	93	- 27	- 24	Sept.	37
IV	88	- 34	-102	Dec.	59
1965 - I	9	- 1	- 8	1965 - Mar.	5
II	54	- 24	- 32	June	39
III	9	- 42	- 90	Sept.	26
IV	75	- 27	-100	Dec.	75
1966 - I	50	- 18	0	1966 - Mar.	84
II	76	- 61	- 29	June	89
III	66	- 62	- 21	Sept.	19
IV	59	- 37	- 13	Dec.	59
1967 - I	16	- 21	39	1967 - Mar.	5
II	26	- 48	51	June	72
III	7	- 49	19	Sept.	31
IV	83	- 43	17	Dec.	0
1968 - I	56	- 54	- 7	1968 - Mar.	- 9
II	83	- 20	- 3	June	122
III	100	- 28	- 13	Sept.	63
IV	151	28	- 53	Dec.	1/
1969 - I	157	12	- 12	1969 - Mar.	1/
II	1/	5	1/	June	1/

1/ Not covered by study.
Source: See Appendix note B.

Table C. Bank Loans to Private Domestic Borrowers
(end of quarter; in percentage of trend)

	Belgium[2]	Nether-lands	France	Germany[2]
1963 - III	100.25	100.93	103.08	97.07
1964 - I	101.27	101.54	102.13	97.36
III	101.07	100.16	99.21	99.38
IV	101.85	96.40	104.61	100.35
1965 - I	98.71	98.57	97.68	100.29
II	98.66	95.85	98.21	102.16
III	99.45	94.88	95.67	102.30
IV	96.91	104.39	101.17	103.02
1966 - I	97.10	107.09	95.07	102.95
II	96.31	102.76	94.77	103.94
III	97.71	100.55	94.95	103.12
IV	98.78	98.11	99.13	102.05
1967 - I	100.66	98.59	94.79	99.51
II	100.28	98.94	99.80	99.08
III	100.47	99.54	97.04	98.21
IV	101.96	100.97	100.95	98.74
1968 - I	102.26	100.34	97.42	97.32
II	102.30	99.76	102.13	98.18
III	100.06	99.92	102.01	98.44
IV	99.94	101.18	1/	99.58
1969 - I	100.22	98.66	1/	99.97
II	1/	100.07	1/	1/

1/ Not covered by study.
2/ Total claims on the private domestic sector.
Source: Raw data were taken from International Monetary Fund, International Financial Statistics.

Table D. Minimum Reserve Ratios for Big Banks in Germany[1/]
(in per cent)

Month	Sight Deposits	Time Deposits	Savings Deposits	Simple Average
1963 - Sept.	14.3	9.9	6.3	10.17
1964 - Mar.	13.0	9.0	6.0	9.33
Sept.	14.3	9.9	6.6	10.27
Dec.	"	"	"	"
1965 - Mar.	"	"	"	"
June	"	"	"	"
Sept.	"	"	"	"
Dec.	13.0	9.0	"	9.53
1966 - Mar.	14.3	9.9	"	10.27
June	"	"	"	"
Sept.	"	"	"	"
Dec.	13.0	9.0	"	9.53
1967 - Mar.	11.7	8.1	5.94	8.58
June	11.05	7.65	5.61	8.10
Sept.	9.25	6.4	4.25	6.63
Dec.	"	"	"	"
1968 - Mar.	"	"	"	"
June	"	"	"	"
Sept.	"	"	"	"
Dec.	"	"	"	"
1969 - Mar.	"	"	4.7	6.78

1/ For offices in "Bank places" (towns with a branch of the Deutsche Bundesbank).

Source: Deutsche Bundesbank, Monthly Report.