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INTEREST RATES IN THE U.S. AND EURODOLLAR MARKETS

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This paper treats the Eurodollar market as a segment of the total market for credit denominated in dollars. It asks why interest rates on deposits and loans made in the Eurodollar market differ from rates on apparently equivalent deposits and loans in the domestic money market. In the absence of controls on international capital flows or other factors inhibiting direct competition between the two markets, the paper argues, only jurisdictional risk can account for interest rate differences. Evidence is presented that indicates differences between the markets in their response to events: this supports the hypothesis that limitations on competition cause domestic rates to behave more sluggishly than do Eurodollar rates.

OUTLINE

1. Framework
2. What Gives Rise to Interest Rate Differences?
3. Capital Controls and Eurodollar Rates
4. Risk Differences Between Domestic and External Money Markets
5. Relative Competitiveness of the U.S. and Eurodollar Markets
6. Three Tests of the Effect of Market Imperfections on Interest Rate Relationships
7. Results of the Tests
8. Some Unanswered Questions

Appendix: The Data

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INTEREST RATES IN THE U.S. AND EURODOLLAR MARKETS

1. Framework

Are Eurodollar rates determined independently of interest rates in the U.S. money market? Do interest rates in the Eurocurrency markets differ in their behavior from rates in the corresponding domestic money markets?

In principle the answer is no. The external (Eurocurrency) and internal (domestic) money markets are merely competing segments of the larger markets for financial assets and loans denominated in particular currencies. The Eurodollar market must therefore be treated as a segment of the total dollar credit market.

Conceptual and empirical support for this idea and reasons for the differences that do exist between Eurodollar and corresponding U.S. rates will be provided here. Specifically, we will show that there is little that is special about the Eurodollar market; other things being equal, one would expect arbitrage to ensure equality between bank interest rates in the domestic (U.S.) and Eurodollar markets. However, from the point of view of depositors or borrowers, deposits in or loans from Eurobanks are regarded as riskier because, as we shall demonstrate, Eurobanks are subject to restrictions on funds transfers by one additional jurisdiction. Hence Eurobanks are obliged to offer more attractive deposit and loan rates than are their domestic counterparts. But Eurobanks can afford to operate on narrower margins than can domestic banks because their costs of performing financial intermediation in dollar-denominated credit are lower.

The Eurodollar market thus competes with the domestic U.S. bank market in much the same way that commercial paper competes with bank loans and deposits. Interest rates in any two segments of the credit market do differ, largely because of differing risk characteristics; but both respond similarly to changes in credit conditions, exchange rate expectations, and so forth. Therefore a view of Eurodollar interest rates as peculiarly "international," or as determined in some fashion independently of U.S. rates, ignores the fact that arbitrage between the domestic and external segment of the U.S. money market ensures a near-perfect correspondence in rate levels and movements.[1] Nor is it correct to say that Eurodollar rates are somehow "determined" by U.S. rates,[2] since the Eurodollar market is simply an integral segment of the market for dollar credit, and interest rates in all segments are determined simultaneously.

2. What Gives Rise to Interest Rate Differences?

Despite the extensive arbitrage between the U.S. and Eurodollar markets, interest rate differentials between the two markets persist. How large are they, and how do they fluctuate? Figure 1 traces U.S. and Eurodollar bank deposit and loan rates, or close approximations, from January 1974 through October 1975. Two features are worth noting: First, as we

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[1] See, for example, Victor Argy and Zoran Hodjera, "Financial Integration and Interest Rate Linkages in Industrial Countries, 1958-71," International Monetary Fund Staff Papers (March 1973), 1-73; and Rodney H. Mills, "Structural Change in the Eurodollar Market: Evidence from a Two-Equation Model," Discussion Paper No. 33, Board of Governors of the Federal Reserve System (November 1, 1973).

[2] As, for example, does Patric H. Hendershott, "The Structure of International Interest Rates: The U.S. Treasury Bill Rate and the Eurodollar Deposit Rate." Journal of Finance (September 1967), 455-465.

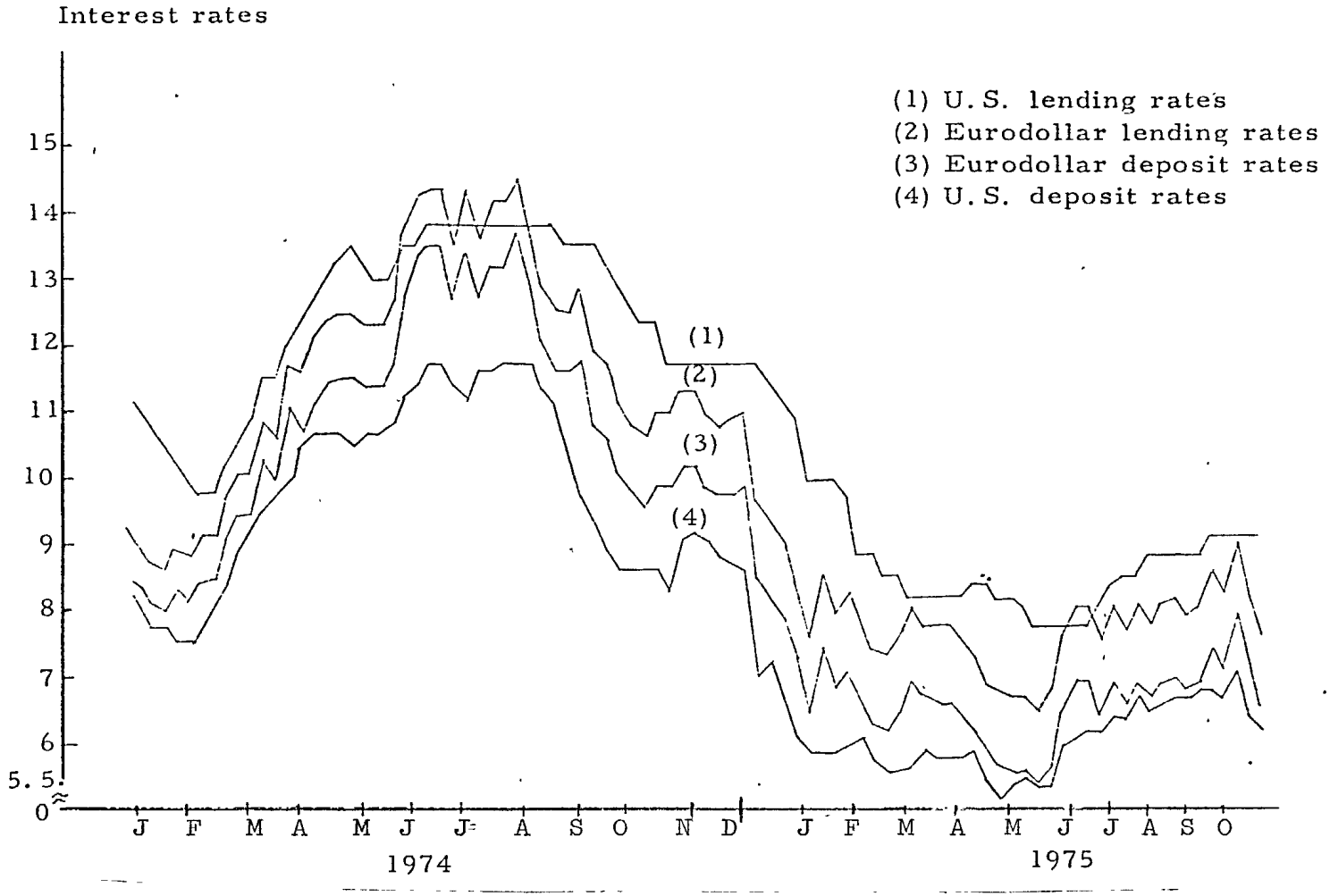

Fig. 1. U.S. and Eurodollar interest rates, 1974-75.

Data: See Appendix.

would expect, Eurodollar rates move in close concordance with U.S. rates; second, with few exceptions, U.S. rates provide upper and lower bounds for the movement of Eurodollar rates.[1] This, too, indicates that the Eurodollar market is a segment of the larger dollar-denominated money market.

Interest rates in the domestic and external money markets are determined by the relative supply of and demand for credit in each market[2] (see Figure 2 below). Because the total market for short-term assets and liabilities in the United States is large and resilient, rates in any smaller competing dollar-denominated market tend to be dominated by U.S. rates on both deposits and loans. If a depositor wants a dollar-denominated time deposit, the natural choice would be a deposit in the United States--perhaps in a New York bank.[3] Previous experience, similar business hours, and political reasons for anonymity may occasionally prompt depositors to turn to financial institutions outside the United States, but a Eurobank could rarely offer lower deposit rates than U.S. banks without losing the deposit. In other words, the supply of deposits to Eurobanks becomes infinitely elastic at the U.S. deposit rate (Figure 2).

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[1]The exceptions that appear are the result either of capital controls (prior to 1974) or market imperfections that prevent U.S. rates from fully adjusting to demand and supply conditions. These effects, and the special circumstances of mid-1974, are discussed below.

[2]This approach is consistent with the more comprehensive model presented in John Hewson and Eisuke Sakakibara, "A General Equilibrium Approach to the Eurodollar Market," Journal of Money, Credit and Banking (August 1976), 297-323.

[3]Covered and uncovered interest arbitrage will tend to ensure equality between effective expected rates of return on short-term assets denominated in different currencies. In this paper we are concerned only with competing credit markets in a single currency.

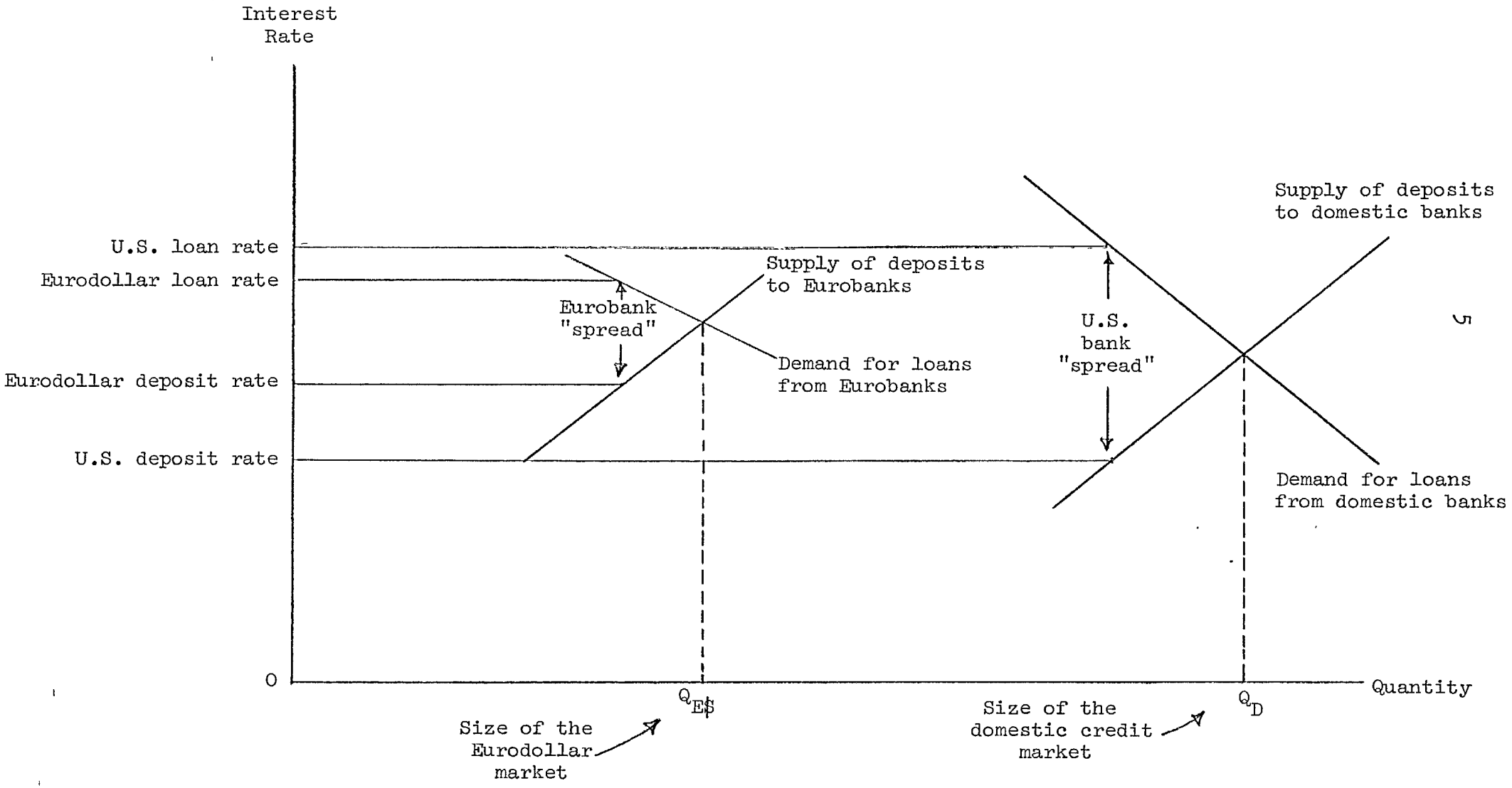

Fig. 2. Demand and supply curves in the domestic and external credit markets.

On the lending side, similar considerations apply. Since borrowers regard a loan from a U.S. bank as at least as good as one from a Eurobank, foreign financial institutions can compete successfully only if their loan rates do not exceed the effective rates charged by U.S. banks. Again, such factors as familiarity, business hours, and communications may play a small role. But because transactions are seldom in units of less than $5 million and the transactors are large banks, public entities, and corporations operating in many countries, the recent advances in communications minimize the effects of these factors. Figure 2 shows how the demand for Eurodollar loans becomes infinitely elastic at the U.S. loan rate, thus serving as an upper boundary for the movement of the Eurodollar loan rate.

With deposit rates higher and effective lending rates normally lower in the Eurodollar market than in the U.S. market, as shown in Figure 2, financial institutions outside the United States that offer dollar deposits and loans must be able to operate on a lower spread. Out of a smaller margin between the deposit and lending rate the Eurobank must cover its various costs and earn a return that justifies such banking business. They can do so largely because of the more competitive and less regulated framework in the Eurodollar market. More specifically, Eurobanks operate profitably on narrower margins than domestic banks because they are free from: (a) the statutory reserve requirements, deposit insurance fees, and official constraints on the allocation of funds that lower effective returns on domestic banks' portfolios, and (b) official restrictions (such as Regulation Q in the United States) and private restraints (such as banking cartels) on interest rates offered.

To see why Eurodollar loan and deposit rates frequently deviate substantially from the corresponding domestic rates, as is shown in Figure 1,

we must first ask why interest rates on different money market instruments differ in general.

Financial theory tells us to expect securities of different maturities, or denominated in different currencies, to differ in a systematic fashion related primarily to expectations regarding interest rates or exchange rates. We limit the problem here by comparing only the domestic and external markets in a given currency and maturity. Interest rates on one instrument in a given money market may be expected to be consistently higher than those on another if the first has less liquidity or greater default risk, if regulations or capital controls prevent arbitrage, or if informational barriers or other market imperfections inhibit arbitrage. How much do these factors affect U.S.-Eurodollar interest rate differentials?

Since the inception of the Eurodollar market in the early 1960's, the liquidity of the external market has steadily approached that of the U.S. money market. Liquidity is related to size, and, as Table 1 shows, the Eurodollar market is now comparable in size to the various U.S. money market aggregates. (Such data must, of course, be interpreted cautiously because none of the markets are exactly alike.) Similarly, barriers to arbitrage have diminished as theoretical, practical, and quantitative knowledge about the Eurodollar market has spread to those interested in the major money markets. Many corporations and governments are now willing to switch their loans or deposits into or out of the Eurodollar market and can do so with impunity.

Both of these trends have almost certainly led to a secular decline in the interest rate required to attract depositors and borrowers from the domestic into the external market. In other words, the interest arbitrage

TABLE 1

RELATIVE SIZE OF THE U.S. AND EURODOLLAR MARKETS

(Billions of U.S. Dollars)

End of Period	Eurodollar Market (Net Size)	U.S. Bank Time Deposits	Large Negotiable U.S. Bank CD's	Commercial Paper and Bankers' Acceptances
1965	12	141	16	12
1970	46	226	26	40
1975	192	435	84	66

Sources: Morgan Guaranty Trust, World Financial Markets; U.S Federal Reserve Bulletin, International Financial Statistics.

schedule has become more elastic. Unfortunately this conclusion cannot be confirmed by the rates themselves, because the U.S. capital control program (1963-74) segmented, with varying degrees of success, the domestic from the external market during most of the latter's early life. What does show up is the quantity (rather than price) adjustment that took place in the Eurodollar market: its rapid growth, evident in Table 1, demonstrates the increasing readiness of borrowers and lenders to switch into the market with the more attractive rates. A large number of bankers and corporate treasurers with whom the authors talked supported this conclusion.

If we assume that the spread of information has largely had its effect, and that differences in liquidity are now unlikely to account for much of the difference between domestic and external interest rates, why do differences still exist? Formerly the barriers to arbitrage imposed by the U.S. capital control program provided an explanation, but since January 31, 1974 there have been no formal controls whatsoever on capital transfers into or out of the United States. Hence U.S.-Eurodollar interest rate differentials and variations in them must derive primarily from the additional risk associated with Eurodollar borrowing and depositing and from imperfections in one or both of the markets.

3. Capital Controls and Eurodollar Rates

The essence of the Eurodollar market is external financial intermediation: financial institutions (Eurobanks) outside the regulatory reach of the United States compete for dollar-denominated deposits and dollar-denominated loans.[1] For U.S. residents as well as other nationals, every

[1] According to some proposals U.S.-based banks could establish "foreign departments" dealing exclusively with nonresident borrowers and depositors and free from U.S. reserve requirements. These foreign departments would still be inferior to branches like those in the Carribbean, because they could not accept deposits from or make loans to U.S. residents.

Eurodollar transaction involves an international credit transaction. When they choose between the domestic U.S. market and the external dollar market, they are choosing the jurisdiction governing the transaction and its attendant obligations. Even when they contract with Eurobanks within their own jurisdiction--for example, when a Swiss corporation obtains a Eurodollar loan from a Swiss bank--an international financial transaction occurs: the borrower receives the money in New York because only the U.S. banking system offers dollars as means of payments. From the perspective of economic analysis, however, not all Eurodollar transactions involve international capital flows: for example, funds deposited in a Eurobank by a U.S. resident may simply be lent to another U.S. resident. This "round trip" of funds through external intermediaries instead of domestic institutions does not involve any of the effects that are germane to international capital flows such as changes in the monetary base, domestic liquidity, and credit conditions.

Legal restrictions on international capital transactions come in many different forms,[1] but they all cut the external (Euro-) market off from its internal (domestic) base and insulate--to the extent that they are effective--the Eurodollar market from the influence of domestic credit conditions, making exchange rate expectations in conjunction with foreign credit conditions the essential determinants of Eurodollar rates.

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[1]For details see David T. Llewellyn, "How to Control Capital Flows?" The Banker (July 1973), pp. 764-68 and Rodney H. Mills, Jr., "Regulations on Short-Term Capital Movements: Recent Techniques in Selected Industrial Countries," Federal Reserve Board Discussion Paper (Washington, D.C.: Nov. 6, 1972).

Without tight controls on international financial transactions, arbitrage in dollar credit will occur between the external and internal segments of the market. Eurodollar lending and deposit rates are thus kept within a margin determined by effective domestic lending rates (the upper limit) and domestic deposit rates (the lower limit). The impact of controls on the relation between U.S. domestic rates and Eurodollar rates has been shown by recent history. Beginning in 1965 the United States imposed a series of restrictions intended to prevent or restrict capital outflows.[1] These measures narrowed the main channels of arbitrage between the external and internal markets, although their effectiveness varied as loopholes were discovered (such as transactions involving Canadian entities, private, non-corporate deposits, and transactions between quarterly reporting periods) and as the programs and their administration underwent modifications. The right-hand column in Table 2 shows that Eurodollar lending rates could, and actually did, move above the theoretical limit set by the effective U.S. lending rate. When the regulations were abolished the rates moved promptly within the expected range. In fact this appears to have happened several months before the controls were removed at the end of January 1974, a sign that the market had correctly anticipated that event.

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[1]The so-called Foreign Direct Investment Regulations, made mandatory in 1965 and abolished in late January of 1974, in effect compelled U.S.-based multinational corporations to finance additional overseas operations with funds raised outside the United States. Partial repatriation of earnings achieved in certain developed countries and strict limitations on working capital positions held abroad complemented these provisions. At the same time, banks and financial institutions in the United States were prevented by the Voluntary Foreign Credit Restraint Program from increasing the level of loans to foreign entities. Finally, the Interest Equalization Tax effectively discouraged most foreign borrowers from raising funds in the United States through the issue of securities.

TABLE 2

U.S. AND EURODOLLAR INTEREST RATES, 1973-74

Day	U.S. Lending Rate (1)	Eurodollar Lending Rate (2)	Difference (1) - (2)
7/4 Wed.	9.41	10.625	-1.215
7/11	9.71	10.25	-0.54
7/18	9.71	11.125	-1.415
7/25	10.00	12.00	-2.00
8/1	10.29	12.063	-1.773
8/8	10.59	12.25	-1.66
8/15	10.88	11.75	-0.87
8/22	11.18	11.875	-0.695
8/29	11.47	12.375	-0.905
9/5	11.47	11.875	-0.405
9/12	11.47	12.438	-0.968
9/19	11.76	11.563	0.197
9/26	11.76	11.313	0.447
10/3	11.76	11.00	0.76
10/10	11.76	10.938	0.822
10/17	11.76	10.50	1.26
10/24	11.47	10.00	1.47
10/31	11.47	9.375	2.095
11/7	11.47	9.625	1.845
11/14	11.47	10.00	1.47
11/21	11.47	10.125	1.345
11/28	11.47	10.875	0.595
12/5	11.47	11.125	0.345
12/12	11.47	10.75	0.72
12/19	11.47	11.25	0.22
12/26	11.47	11.125	0.345
1/2	11.47	10.50	0.97
1/9	11.47	10.00	1.47
1/16	11.47	10.25	1.22
1/23	11.47	10.00	1.47
1/30	11.18	9.625	1.555
2/6	11.18	9.25	1.93
2/13	10.88	9.00	1.88
2/20	10.59	9.25	1.34
2/27	10.29	9.125	1.165
3/6	10.29	9.00	1.29
3/13	10.29	9.25	1.04
3/20	10.29	9.625	0.665
3/27	10.59	10.125	0.465

Sources: Column (1): U.S. prime rate adjusted by compensating balance requirement (15%). U.S. prime rates from Federal Reserve Bulletin.

Column (2): London interbank offer rate (LIBOR) + premium. LIBOR from Financial Times. Premiums from Morgan Guaranty Trust Company, World Financial Markets.

Data are for Wednesday of each week.

Similarly, controls limiting depositor arbitrage may cause rates in the external market to fall below corresponding domestic deposit rates, when effective capital controls prevent an inflow of funds. Germany and Switzerland provide excellent illustrations of such effects. At various times during the 1970's both countries imposed controls on the inflow of foreign funds; as a result the external deposit rate promptly fell below the equivalent domestic deposit rate, which would otherwise represent an effective floor for the Euro-Swiss france or Euro-mark rate. The German example (Figure 3) provides a particularly good illustration because the program, though varying in intensity, was at times very effective, and the extent of controls shows up clearly in the difference between internal and external rates. Indeed, substantial differences between domestic and external interest rates can usually be taken as a measure of the effectiveness of capital controls whenever borrowers or lenders wish to move funds into or out of a country but are prevented from doing so.[1]

4. Risk Differences between Domestic and External Money Markets

Another factor that influences the relation between rates in the domestic and external markets is the degree of risk. Risk differences may explain why, in the absence of controls on international capital flows, Eurodollar lending rates are lower and Eurodollar deposit rates higher than equivalent rates in the United States. We assume here that risk perceptions

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[1] Note that the effectiveness of controls can be measured by internal-external rate differentials only to the extent that rate differentials are not attributable to different degrees of jurisdictional risk. For major developed countries, however, jurisdictional risks tend to have only a minor effect compared to capital controls.

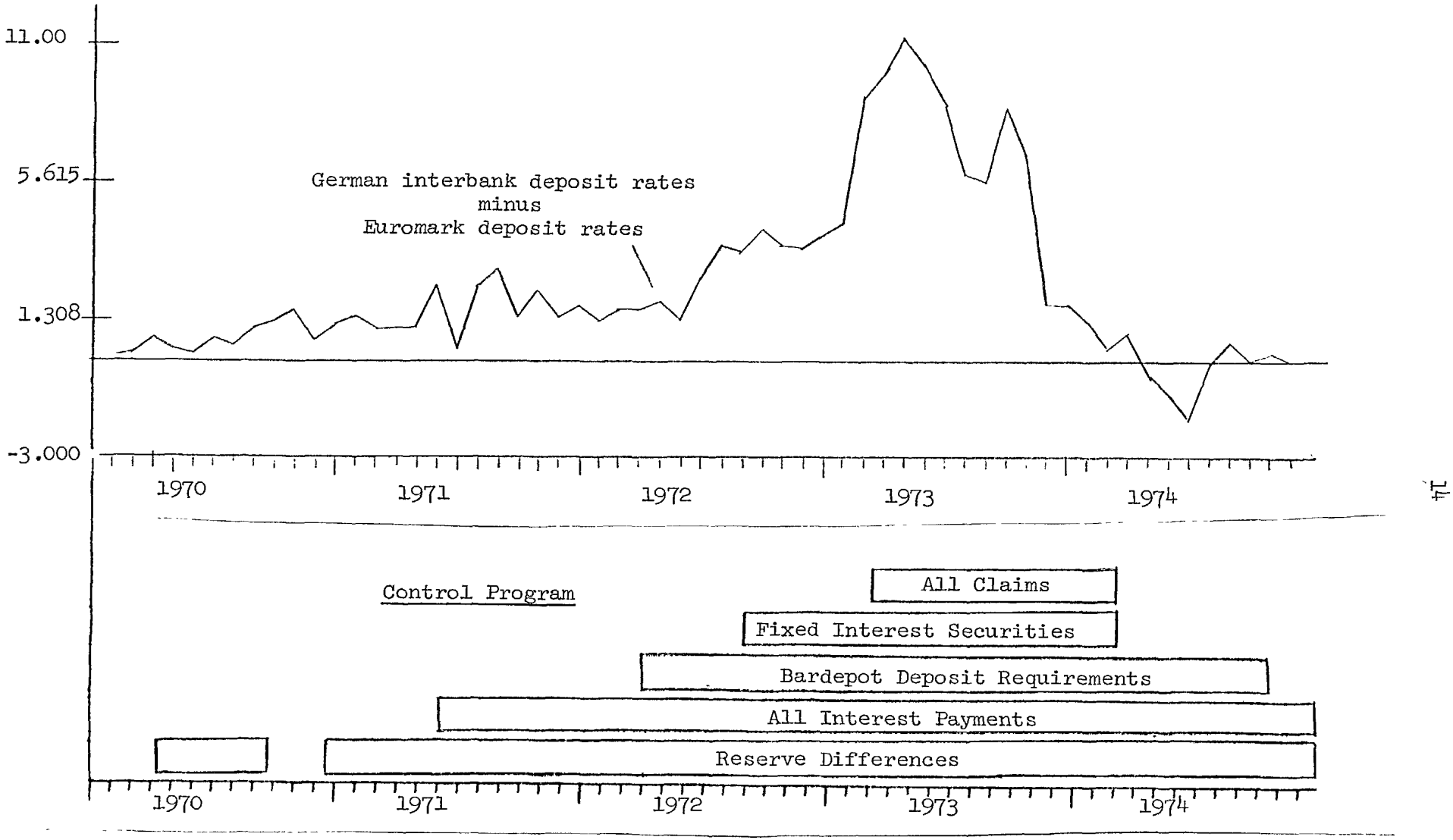

Fig. 3. German capital controls and the domestic-external interest rate gap.

Source: Adapted from Michael P. Dooley, "Note on Interest Parity, Eurocurrencies, and Capital Controls," International Finance Discussion Paper No. 80 (Washington, D.C.: Federal Reserve Board, February 1976), p. 7. Used with permission of author.

are based on the best available information, since those who persistently err and show bias in their decisions are driven out of the market.

Risk in credit markets lies in the probability that an obligation to repay funds at a certain interest rate (in the case of a deposit agreement) or lend funds on certain terms (for loans) will not be honored. In the international financial markets this risk is closely associated with government regulation and control. Since, from a regulatory point of view, all Eurodollar transactions are international transactions, they are all subject to the risk of intervention by at least two governments.

A U.S. depositor in the Eurodollar market, for example, holds a claim in London but receives payment in the United States. He could be deprived of his funds at maturity by an action of either the British or the U.S. government, whereas a domestic deposit would be affected only by actions of the U.S. authorities.[1] For a depositor residing in the United Kingdom the situation is similar whether he owns a dollar-denominated time deposit in a U.S. bank directly, a Luxembourg Eurobank, or a London-based Eurobank. The safety of his funds depends ultimately on whether the United States will refrain from restricting the disposition and transfer of foreign-held dollar funds, that is, whether "nonresident convertibility" will be continued. The British investor will face a greater risk than the American to the extent that the U.S. government may restrict nonresident convertibility more readily than it interrupts domestic bank transfers.[2]

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[1] Nationals who wish to purchase foreign goods and fear new capital outflow controls in their countries may well consider external deposits less risky.

[2] Residents of Eurocurrency banking centers constitute a special case. If the funds are in a London-based Eurobank, the British depositor may perceive more risk because he is subject to the direct control of his own country

Concerning the risk to borrowers of Eurodollars, U.S. borrowers may regard Eurodollar loan commitments as slightly less reliable because a transaction may be blocked by authorities of the country where the external financial intermediary operates, or by the U.S. government (which could restrict the transfer of funds from a nonresident to a resident). Borrowers outside the United States also face the risk of interference by one additional government in the honoring of a loan commitment by a Eurobank than one by a U.S. bank. In both cases, the foreign borrower's government may restrict the transaction, or the U.S. government may intervene in the transfer of funds by nonresidents, depriving the borrower of the use of the loan proceeds. But only in a Euroloan can a third government (that of the Eurobanking center) interfere.

On the other hand, to the extent that the U.S. government may place quantitative restrictions on U.S. banks' lending to foreigners or some other class of borrowers, loans from the unregulated Eurodollar market may

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regarding foreign currency holdings. Generalizations are difficult. Fortunately for our analysis of Euro- versus domestic dollar deposits, such cases are relatively rare because most jurisdictions in which external intermediation takes place have restricted such activities to nonresident depositors and borrowers.

The other special case arises when depositors are from countries whose assets may be subject to interference by particular countries for political reasons. For example, dollar deposits owned by the Soviet Union may be somewhat less subject to risk of government seizure when held in Swiss banks than in banks in the United States. Soviet investors will therefore accept a lower return on dollar-denominated time deposits in banks outside the United States. But these exceptions are minor compared to the bulk of investors whose transactions maintain Eurodollar deposit rates in excess of domestic rates.

appear safer. The fear of capital controls, as well as the controls themselves, could thus allow Eurodollar lending rates to rise above those in the domestic market.[1]

Yet these events are unlikely. The major risks in Eurodollar transactions stem from the possible removal of nonresident convertibility by the United States and the possible seizing of Eurobanks' assets and liabilities by the authorities in countries where they operate. Both of these events are also unlikely. Compared to the gain from blocking the working balances of nonresidents, the damage to a nation's international credit rating would be devastating. Official takeovers appear more probable at first sight but are actually less so. Most transactions by Eurobanks in a given country are with residents of other countries. The government of one Eurocenter might seize the affiliate of an American bank, but it would hardly be able to block a borrower's payments or deposits made through another branch or at the head office. In any case, the location of payment would remain in the United States, where the dollar is legal tender.

The degree of risk associated with different institutions may also account for rate differences. Most Eurobanks are either branches or subsidiaries of banks that are prominent in their national markets. The issue would be the likelihood that the foreign branch would default on its dollar deposit obligations while the bank continued to honor domestic deposit claims. This question became very real in the summer of 1974 with the

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[1]For another view of political risk and Eurocurrency rates see Robert Z. Aliber, "Exchange Risk, Political Risk, and Investor Demand for External Currency Deposits," Journal of Money, Credit, and Banking (May 1975), 162-179.

collapse of the Herstatt Bank.[1] Indeed, confidence in external intermediaries was so damaged that for a while Eurodollar rates exceeded U.S. domestic rates even on the lending side. Growth in the volume of interbank trading also ceased for a while, although the market continued to expand on a net basis.

Interestingly, the failure of the medium-sized German bank did not involve Eurodollar transactions. But the incident suddenly raised doubts about all banks' adherence to established conventions, including their vouching for the obligations of their branches and the guarantee of each central bank that depositors would receive the funds due them.[2] The risks of Eurobanking were more carefully scrutinized and the obligations more explicitly established, and much of the fear was thus dissipated. Most central banks have affirmed their determination to support their national banks, and nothing suggests that they would not give like treatment to domestic liabilities and those of foreign branches and affiliates. In any case, discriminatory policies toward branches would be questionable on legal grounds and politically difficult with foreign subsidiaries. Moreover, a number of incidents show that the principle of parental responsibility is clearly established. Whether all market participants are firmly convinced of it is a different question.

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[1] The Herstatt affair itself, however, was simply the result of excessive foreign exchange speculation that had gone wrong--and also of the German supervisory authorities who closed the bank just when international payments for spot foreign exchange transactions were truncated because of international differences in business hours. The German bank had received payments in Germany but its own delivery of dollars in New York was stopped because the official receiver had taken over.

[2] C. W. McMahon, "Controlling the Euromarkets," The Banker (March, 1976), 267-72.

In summary, dollar external deposits and loans generally entail somewhat greater risk than similar transactions with U.S. domestic banks, although exceptions exist and the risks themselves seem small.

5. Relative Competitiveness of the U.S. and Eurodollar Markets

How much do market imperfections weaken the generally close links between U.S. and Eurodollar interest rates? The view here is that these imperfections derive primarily from the institutional structure of the U.S. banking market.

If no imperfections existed in the domestic or external markets and no imperfections or costs were associated with arbitrage between the two, one would expect arbitrage to ensure a stable relationship between their deposit and loan rates. A change in the supply of dollar-denominated bank deposits, or in the demand for dollar-denominated loans, would ordinarily cause rates in both domestic and external markets to adjust, leaving relative rates unaltered. Similarly one would expect competition between the domestic and external markets for banking services to ensure a stable relation between rates of return to banks in the two markets. If rates of return to U.S. banks, for example, were to narrow relative to those in the Euromarket, banks would shift business into the external market until the rate-of-return relation were restored. Under conditions of perfectly competitive credit markets, the differential between U.S. and Eurodollar bank rates would thus be unaffected by changes in the total demand for or supply of dollar-denominated credit, or by changes in the margins of profitability earned by banks in one or another market.

Yet competitive conditions may well be such that rates will not adjust fully. Although the U.S. and Eurodollar money markets are among the most nearly perfect in the world, differences in their market structures are clearly observable. U.S. rates apparently do not react quickly and directly to changes in credit conditions, and abnormally high or low margins do not seem to adjust very rapidly to market conditions. These imperfections have three causes: regulatory restraints, such as interest rate ceilings; institutional and perceptual factors, like the tendency to adjust the quantity rather than the price of loans when credit conditions change, one reason being the political visibility of the prime rate; and oligopolistic market conditions that result from barriers to entry in the U.S. banking system. Interest rates in the Eurodollar market, on the other hand, are free of governmental or competitive restraints and therefore react promptly to changes in credit conditions.

6. Three Tests of the Effect of Market Imperfections on Interest Rate Relationships

(a) Effects of Changes in U.S. Credit Conditions. Are interest rates in the U.S. and Eurodollar credit markets likely to respond differently to a change in the demand for or supply of domestic credit? Suppose that a business upturn increases the domestic loan demand. If the Federal Reserve System does not inject an appropriate amount of money into the banking system, a temporary imbalance will appear between the supply of loanable funds and loan demand at prevailing interest rates. In theory this imbalance should immediately be eliminated because lending rates will increase, and competition will cause deposit rates to follow. Higher loan rates will reduce demands for loans, and higher deposit rates will increase

the supply of loanable funds; thus the market will return to equilibrium. Eurodollar rates will move accordingly to restore the equilibrium differential between internal and external rates.

Actually U.S. bank rates are not perfectly responsive to changes in loan demand or deposit supply. When loan demand increases without a corresponding increase in the supply of funds, U.S. banks do tend to raise lending and deposit rates, but sluggishly and sometimes too little to restore equilibrium. Political pressures on lending rate increases and ceilings on certain categories of deposit rates often cause banks to adjust quantity rather than price:[1] allocating scarce loanable funds to their best customers, tightening covenants on loan contracts, and making other nonprice adjustments. The oligopolistic nature of prime rate setting reinforces this tendency.

As may be seen in Figure 1, U.S. loan rates tend to be rigid during periods of both rising and declining interest rates. Eurodollar interest rates, on the other hand, are highly responsive to changes in credit conditions and readily absorb unsatisfied supply or demand from the domestic market. When loan demand rises, therefore, lending and deposit rates will increase more in the Eurodollar market than in the U.S. market; the result will be to reduce the lending rate differential and increase the deposit rate differential between the two markets (see Figure 4).

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[1] Lenders' behavior of this type is called credit rationing. Jaffee and Modigliani have demonstrated that if lenders are not price takers, and if exogenous constraints exist on interest rates, then rationing can be optimal for lenders. See Dwight M. Jaffee and Franco Modigliani, "A Theory and Test of Credit Rationing," American Economic Review, Vol. 59, No. 5 (December 1969) 850-72. Also see Marshall Freiner and Myron Gordon, "Why Bankers Ration Credit," Quarterly Journal of Economics, Vol. 79 (August 1965), 397-416.

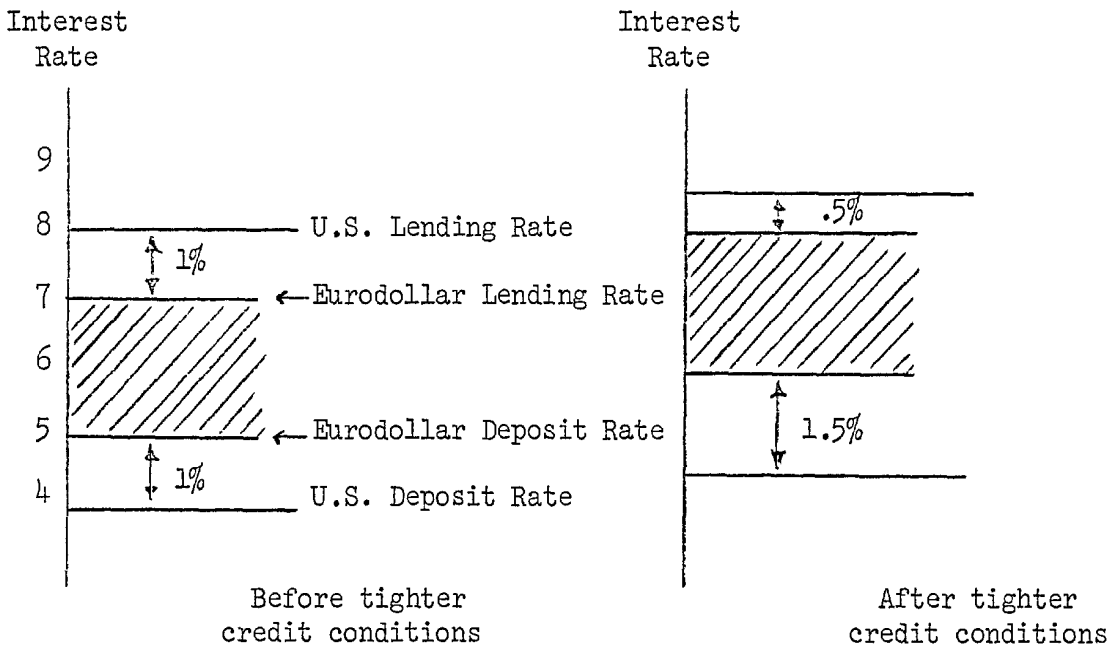

Fig. 4. Hypothetical effect of tighter U.S. credit conditions on U.S. and Eurodollar interest rates.

We define credit conditions simply in terms of the interest rate levels in the United States, where banks use the Federal Funds market to match imbalances between loans and deposits. When loan demand rises in the face of sticky interest rates, the Federal Funds rate is usually among the first to reflect the change in credit conditions. Thus the circumstances that drive the Federal Funds rate higher also tend to reduce the U.S.-Eurodollar lending rate differential and increase the deposit rate differential. The empirical question is therefore whether the lending rate differential is negatively related, and the deposit rate differential positively related, to the Federal Funds rate.

(b) The Effect of Changes in Returns in Foreign-Currency Markets. Since both lenders and borrowers can readily move funds between the world's major money markets in response to cost or return incentives, one would expect a close relation between Eurodollar loan and deposit rates and rates in competing, foreign-currency money markets. This is indeed so, although the relation is complicated by exchange rate expectations and by controls over the movement of funds among foreign money markets.

As is well known, dollar-denominated interest rates are linked to foreign-currency rates and the expected rate of change in the exchange rate. The linkage with foreign interest rates and currency expectations is described by the interest rate parity theorem of the forward exchange rate and the "Fisher effect" for interest rates in two currencies. Both

notions have received empirical support for the period under consideration.[1] According to the former, covered interest arbitrage ensures that the interest rate differential between two currencies equals the forward premium or discount; the latter represents the view that the interest rate differential reflects the expected rate of change in the exchange rate.

This section will argue that both the Eurodollar rate itself and the differential between U.S. and Eurodollar rates are related to foreign interest rates and currency expectations. Since dollar-denominated deposits and loans must compete with foreign-currency deposits and loans, one would expect that a rise in foreign interest rates, domestic or external, or expectations of higher foreign-currency values would normally induce investors to withdraw from, and borrowers to enter, dollar-denominated markets. Upward pressure will be exerted on interest rates in both the U.S. and the Eurodollar credit markets. However, if U.S. bank interest rates exhibit stickiness under changing credit conditions, as this paper contends, Eurodollar lending and deposit rates will rise more than corresponding rates in the United States with a consequent narrowing of the U.S.-Eurodollar loan rate gap and a widening of the deposit rate gap. A drop in foreign interest rates or currency expectations would have the reverse effect.

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[1] Support for a strong form of the interest rate parity theorem is given in Jacob A. Frenkel and Richard M. Levich, "Covered Interest Arbitrage: Unexploited Profits?" Journal of Political Economy (April 1975), 325-38; and Tamir Agmon and Saul Bronfeld, "The International Mobility of Short-Term Covered Arbitrage Capital," Journal of Business Finance and Accounting (Summer 1975).

Evidence on the Fisher effect in this form may be found in Robert Z. Aliber and Clyde P. Stickney, "Accounting Measures of Foreign Exchange Exposure: The Long and Short of It," The Accounting Review (January 1975), 44-47; and Richard M. Levich, "Tests of Foreign Exchange Forecasting Models and Market Efficiency," Graduate School of Business Working Paper No. 75-88 (New York University, November 1975).

How can one measure the combined impact of foreign credit conditions and exchange rate expectations? Some studies have simply employed nominal dollar and foreign interest rates as measures of relative returns in the two sets of markets.[1] Changes in relative rates themselves, however, provide no information about variations in relative expected returns, for any particular interest rate change may be more than, less than, or exactly offset by changes in unobservable exchange rate expectations. Others use foreign interest rates covered in the forward market, in order to segregate the influence of currency expectations.[2] But if the interest rate parity theorem holds, covered interest differentials are zero and the relationship between dollar and foreign interest rates becomes an identity.

A third alternative is to use covered interest differentials insofar as they exist.[3] For this study, however, any apparent covered arbitrage incentive is likely to be illusory, for such incentives as existed would be quickly arbitraged away. Unless a researcher knows of arbitrage opportunities before the market can take advantage of them, he will never observe real covered arbitrage incentives. International arbitrage occurs so rapidly that most deviations from interest rate parity are eliminated before they are recorded. Cases of covered interest differentials discussed in the literature usually result from the use of inappropriate data.[4]

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[1] For example: Sung Kwack, "The Structure of International Interest Rates: An Extension of Hendershott's Tests," Journal of Finance (September 1971), 897-900.

[2] For example: Mills, "Structural Change. . . ."

[3] See, for example, Argy and Hodjera, "Financial Integration. . . ."

[4] Aliber has argued that this need not always be so. He says covered interest differentials could remain if investors believed foreign currency deposits entail a greater risk because of possible capital controls. Again, however, this would imply that apparent covered interest arbitrage opportunities would represent not disequilibria but a risk premium associated with the threat of capital controls. See Robert Z. Aliber, "The IRPT: A Reinterpretation," Journal of Political Economy (November 1973), 1451-59.

Since interest parity between Eurocurrency markets is established so rapidly, how may one identify and measure the influence of foreign-currency credit markets on Eurodollar rates? We approach this question through "revealed preferences," assuming that if incentives to move funds between Eurocurrency markets actually existed, companies and banks would shift their deposits or loans from one currency to another. For example, if German mark interest rates rose or the mark were expected to become stronger, investors would deposit more in marks and borrowers borrow less, causing a capital flow from the United States to Germany, which can be measured after the fact. In other words, since capital flows respond to the incentives we want to identify, capital flows can be used to measure such incentives.

Assume as before that an investor sees that the effective interest rate on DM deposits (nominal rate adjusted for the effect of an expected currency change) is higher than the Eurodollar deposit rate. He would then withdraw his deposit in the Eurodollar market and deposit marks either in the Euromark or the German deposit market.

If he deposits marks in a German bank, Germany's international liabilities increase. The impact of this investor's choice of marks over Eurodollar deposits could be easily detected from German records of short-term capital movements. If he deposits marks in the Euromark market, two effects will follow. Initially the Euromark interest rate will fall. But the stock of Euromark deposits changes only if a change occurs in the relative competitiveness of the Euromark and German deposit markets, and it is therefore not a function of the investor's choice between Eurodollars and Euromarks. Given the stock of Euromarks, the increased demand for them

could be accommodated only by lowering the interest rate on Euromark deposits. Lower Euromark interest rates without corresponding interest changes in the German deposit market, however, will create an interest arbitrage opportunity between Euromark and German deposits. This, in turn, will cause capital to move into Germany until the German deposit rate also drops to restore equilibrium between the two markets. Hence, even though the investor shifted funds from the Eurodollar market into the Euromark instead of the German deposit market, his operation would ultimately be apparent in the German statistics on short-term capital movements if capital flows into Germany were unrestricted.

Stringent capital controls, however, might preclude deposits in the German deposit market. The only alternative would be a deposit of marks in the Euromark market, with a consequent reduction in the Euromark deposit rate. Capital controls, however, would prevent interest arbitrage between Euromark and German deposits. Under such a control program, the investor's choice of marks over Eurodollar deposits would not create any capital movement into Germany, but would only change the interest rate on Euromark deposits, widening the gap between domestic and Euromark deposit rates.

We have therefore selected a period when German capital controls, while not absent, apparently became ineffective.[1] We measure the

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[1]During the period studied (February 1974 to September 1975) the German authorities sought to discourage capital inflows by maintaining a 25 percent withholding tax on interest income, doubling the reserve requirement on deposits made by nonresidents, and requiring Bundesbank approval for interest payments on large nonresident bank deposits.

As Figure 3 shows, however, the domestic-external interest gap narrowed sharply late in 1973 because, as Dooley concludes, "even though the control program was not formally removed until early in 1974 it apparently became ineffective during the last quarter of 1973." See Michael P. Dooley, "Note on Interest Parity. . . ."

attractiveness of marks relative to dollar deposits by the use of net German short-term capital flows,[1] and hypothesize that a rise in the effective return on foreign currency deposits will decrease the demand for Eurodollar deposits and increase that for Eurodollar borrowing. The resulting upward pressure on Eurodollar lending and deposit rates, in turn, will tend to reduce the gap between U.S. and Eurodollar lending rates and increase it between U.S. and Eurodollar deposit rates.

(c) The Effect of Changes in the Spread. Changes in credit conditions and other events in the United States can lead to a widening or narrowing of the gross spread between banks' deposit and loan rates. If an oligopolistic market structure, restraints on interest rates, or other rigidities limit direct and rapid competition between the domestic and Eurodollar markets, a change in the U.S. spread will not necessarily result in an immediate corresponding change in the Eurobank spread. For example, when credit conditions in the United States tighten, U.S. bank spreads may rise or fall as a result of inflexibility in loan rates, in deposit rates, or both. Eurobank spreads, however, will be maintained at a much more constant level because of competition.

Figure 5 illustrates a case where the U.S. lending rate rises by 1.5 percentage points, but the deposit rate by only 0.5 percentage point. As a result the U.S. spread widens by 1 percent but the Eurodollar spread by only 0.25 percent, an increase in both the deposit and the loan rate differentials.

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[1] A better proxy variable, it may be argued, would have been U.S. short-term capital flows. These reflect movements of funds between the U.S. dollar and all other currencies--not just German marks. The U.S. statistics, however, do not segregate interest-sensitive capital movements, as German statistics do. Moreover during the period studied the German mark was tied to several European currencies through the "snake" arrangement.

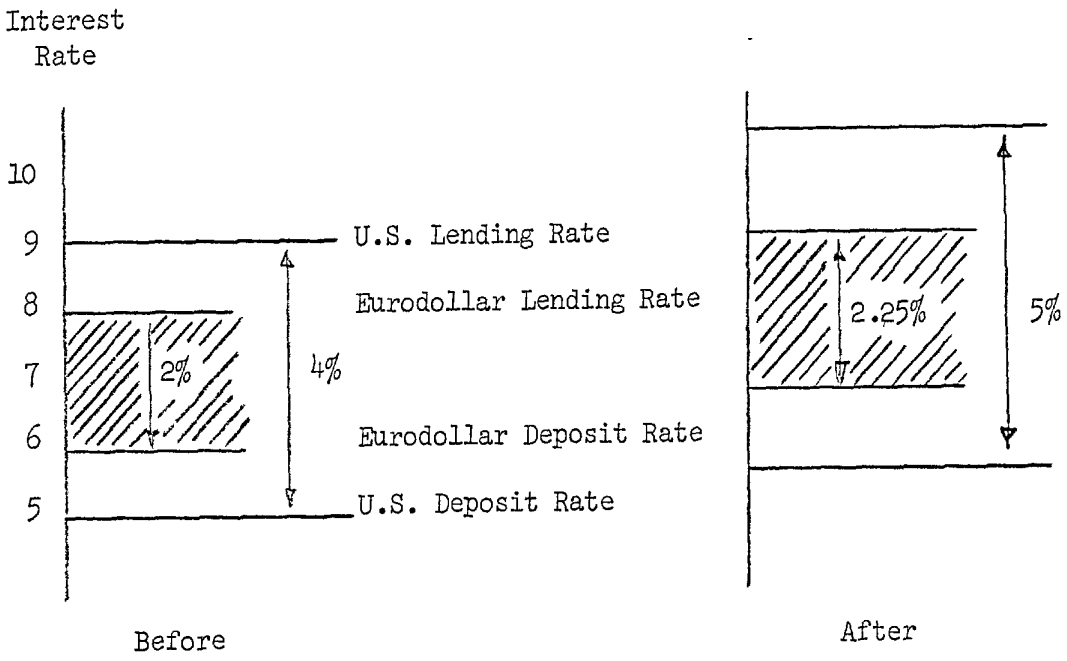


Fig. 5. A change in U.S. and Eurodollar bank spreads.

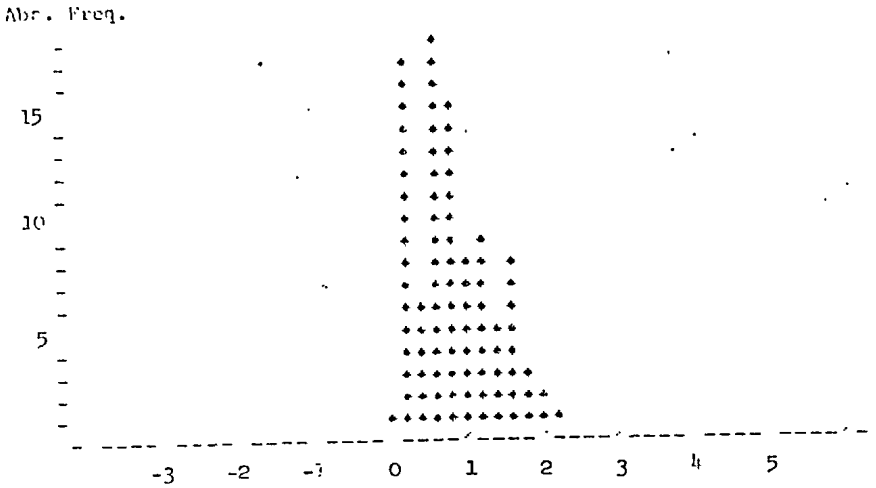
Thus the size of the U.S. spread will be related to the difference between the two lending rates or deposit rates unless a change in the U.S. spread is offset by an exactly equivalent change in the Eurodollar spread. We assume that changes in the U.S. spread will not be wholly absorbed by changes in the Eurodollar spread for three reasons: Competition in the Eurodollar market is relatively more intense; neither regulations nor political pressures prevent or hamper Eurodollar interest adjustments for deposits and loans; and U.S. domestic banks have more diversified sources of funds and loan categories, and so rate adjustments on large deposits and corporate loans may therefore be slower than in the Eurodollar market.

The question we wished to test, then, was whether the differences between the two lending and deposit rates are positively related to the size of the U.S. spread.

7. Results of the Tests

In the following analysis of the test results, the object is to explain how variations in the gap between domestic and external interest rates are caused by interest rate rigidities arising from market imperfections.

Figures 6 and 7 show the distribution of the deposit rate differentials (Eurodollar deposit rate minus U.S. deposit rate) and the lending rate differentials (U.S. lending rate minus Eurodollar lending rate). Weekly bank rates from January 1974 to September 1975 were used (see Appendix). The deposit rate differential ranged from 0.0 percent to 2.19 percent with a mean differential of .83 percent, while the lending rate differential ranged from -.70 percent to 2.94 percent with a mean differential of .95 percent. The lending rate differentials fluctuated more, and were slightly higher, than the deposit rate differentials in this period.

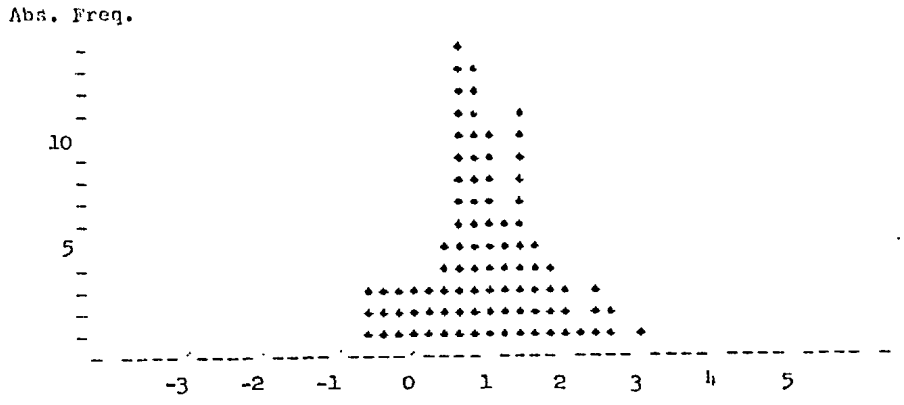


Deposit rate differentials
(Midpoints of class intervals)

Width of each class interval of histogram: .2

Min. Obs. = 0 Max. Obs. = 2.19
Mean = .82742 Std. Dev. = .510935
Sample size = 93

Fig. 6. Distribution of deposit rate differentials (Eurodollar deposit rate minus U.S. deposit rate).



Lending rate differentials
(Midpoints of class intervals)

Width of each class interval of histogram: .2

Min. Obs. = -.698 Max. Obs. = 2.938
Mean = .950803 Std. Dev. = .759445
Sample size = 93

Fig. 7. Distribution of lending rate differentials (U.S. lending rate minus Eurodollar lending rate).

The distributions of the U.S. and Eurodollar loan-deposit rate spreads are summarized in Figures 8 and 9. As predicted, the U.S. spread (ranging from 1.54 to 4.97 percent) is consistently greater than the Eurodollar spread (with a range of from .62 to 1.14 percent). The variability of the Eurodollar apread is only one-fourth of that in the United States, judging from the standard deviations and ranges of the spreads. Both results confirm our contention that U.S. rates are subject to greater rigidities and less competition than Eurodollar rates.

Why do U.S.-Eurodollar interest rate differentials fluctuate? If the cause is imperfections in the way U.S. interest rates are determined, as argued above, we would expect the differentials to be affected by three factors: (1) U.S. credit conditions, as measured by the U.S. Federal Funds rate; (2) relative returns on foreign deposits and loans, as reflected in German short-term capital flows; and (3) gross bank spreads in the U.S. domestic market.

Putting these three together, we may express our arguments in functional form. First, the lending rate differential $(R_L^{US} - R_L^{E\$})$ was hypothesized to be negatively related to the Federal Funds rate (R_{FF}), positively related to net German short-term capital flows, (K)[1], and positively related to the U.S. spread $(R_L^{US} - R_D^{US})$:

$$(1) \qquad R_L^{US} - R_L^{E\$} = f[\underset{-}{R_{FF}}, \underset{+}{K}, (\underset{+}{R_L^{US}} - R_L^{ES})] .$$

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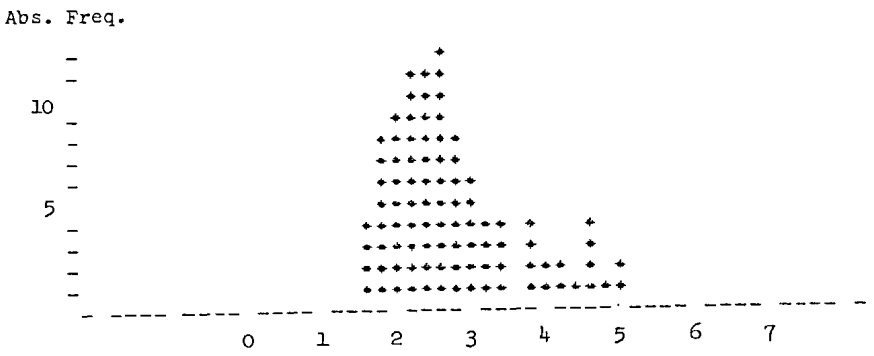
[1] A positive value for K means that the increase in German claims was larger than the increase in German liabilities, which in turn means a capital outflow from Germany. Negative K, on the other hand, means a capital inflow into Germany.

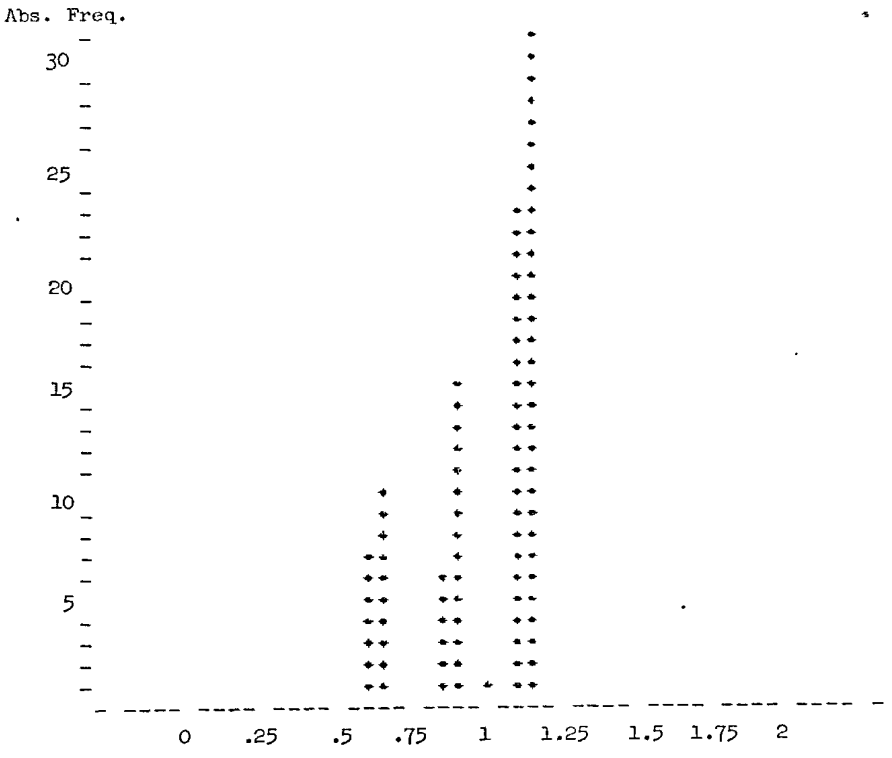


U.S. bank spread
(Midpoints of class intervals)

Width of each class interval of histogram: .1

Min. Obs. = 1.54088 Max. Obs. = 4.968
Mean = 2.755 Std. Dev. = .85396
Sample size = 93

Fig. 8. Distribution of U.S. bank spreads (loan rate minus deposit rate).



Eurodollar spread
(Midpoints of class intervals)

Width of each class interval of histogram: .05

Min. Obs. = .620001 Max. Obs. = 1.14
Mean = .976774 Std. Dev. = .195338
Sample size = 93

Fig. 9. Distribution of Eurodollar bank spreads (loan rate minus deposit rate).

The expected signs of the arguments are shown above each independent variable.

Second, the deposit rate differential $(R_D^{E\$} - R_D^{US})$ was hypothesized to be positively related to the level of the Federal Funds rate (R_{FF}), negatively related to net German short-term capital flows (K), and positively related to the U.S. spread $(R_L^{US} - R_D^{US})$.

$$(2) \qquad R_D^{E\$} - R_D^{US} = f[\overset{+}{R_{FF}}, \overset{-}{K}, (\overset{+}{R_L^{US}} - R_D^{US})] .$$

Least squares multiple regressions of equations (1) and (2) were run on monthly data for the period February 1974 to August 1975 (see Appendix). The regressions yielded the following results:

(a) U.S.-Eurodollar lending rate differentials

$$R_L^{US} - R_L^{E\$} = \underset{(-1.28)}{-0.541} - \underset{(-2.28)^{**}}{0.075R_{FF}} + \underset{(1.33)}{0.224K} + \underset{(6.95)^{**}}{0.726}(R_L^{US} - R_D^{US})$$

$R^2 = 0.78805^{**}$ SE = .36015 DW = 1.6956 n = 19

(b) Eurodollar-U.S. deposit rate differentials

$$R_D^{E\$} - R_D^{US} = \underset{(-1.96)}{-0.646} + \underset{(4.74)^{**}}{0.122R_{FF}} - \underset{(-1.38)}{0.182K} + \underset{(2.46)^{*}}{0.202}(R_L^{US} - R_D^{US})$$

$R^2 = 0.66566^{**}$ SE = .28260 DW = 2.2762 n = 19

The values of the t-statistics are shown in parentheses. Those marked ** are significant at the 1 percent level while those marked * are significant at the 5 percent level. The Durbin-Watson statistics on both

TABLE 3

CORRELATIONS AMONG INDEPENDENT VARIABLES

US spread	1.000		
$\underline{R_{FF}}$	-.0591	1.000	
$\underline{K}$	-.1155	.0145	1.000
	US spread	$\underline{R_{FF}}$	$\underline{K}$

Significance levels: .05 = .4683

.01 = .5897

regressions were not substantially different from 2, implying that the auto-correlations between residuals of successive observations were not significant. There was no evidence of multicollinearity among the independent variables; as Table 3 shows, the correlations between independent variables were not statistically significant.

The signs of all coefficients in both multiple regressions were as expected. Both interest rate differentials--on the lending and deposit sides--were positively related to the spread between U.S. lending and deposit rates (the upper and lower limits on Eurodollar rates). The results suggest that changes in U.S. spreads cause much smaller changes in Eurodollar spreads.

The U.S.-Eurodollar lending rate differentials were negatively related to the relative availability of credit in the United States as measured by the level of the Federal Funds rate; but Eurodollar-U.S. deposit rate differentials were positively related to U.S. monetary conditions. This finding implies that U.S. banks' sluggishness in adjusting their lending and deposit rates to changing monetary conditions provides incentives (or disincentives when U.S. monetary conditions become easier) to go to the Eurodollar market, a situation that in turn affects the interest rate differentials between the two markets. In other words, the Eurodollar market is more sensitive than the U.S. bank market to changes in U.S. credit conditions.

Net German short-term capital movements were positively related to the interest differential between the two lending rates. This fact supports the surmise that an investor's choice of Eurodollar deposits over German deposits tends to put upward pressure on the U.S.-Eurodollar lending rate differentials and downward pressure on the deposit rate differentials.

The coefficients of our measures of the U.S. spread and the relative availability of U.S. dollar funds in the United States were significant at the .05 level. In both multiple regressions, however, net German short-term capital movements were significant only at the .20 level, which means that the chance of a type I error is one in five. A partial explanation may be the inadequacy of these data as a measure of the relative return on foreign currency deposits.

8. Some Unanswered Questions

We have argued that differences between both the loan and the deposit rates in the domestic and Eurocurrency markets arise from capital controls, jurisdictional risk differences, and rigidities affecting rates in domestic markets. Concerning U.S.-Eurodollar interest rate differentials, our results support the view that U.S. rates show greater stickiness than Eurodollar rates, and that the Eurodollar market is in general more competitive and flexible.

The findings also imply that increasing the constraints, regulatory or otherwise, on domestic interest rates will increase the extent of gaps between domestic and external rates. In that event borrowers and lenders alike will tend to shift to the external market. An increase of 1 percentage point in U.S. banks' spread, for example, will probably widen the deposit rate gap by about 20 basis points and the loan rate gap by 73 basis points. How much intermediation business will then shift abroad? And how long do the gaps remain at abnormal levels? More directly, what are the elasticities of demand and supply for Eurodollar loans and deposits? The answers to such questions will help us to know how the relative size of the internal and external markets will be affected by a given change in domestic bank regulation--such as the extension or removal of interest rate ceilings--and to

estimate how greatly the restraints on domestic credit will be offset by a shift to the unregulated external credit market, and hence determine how much monetary restraint is necessary to achieve a given volume of total dollar credit.

APPENDIX: THE DATA

A valid comparison between lending and deposit rates in the U.S. and Eurodollar markets requires special care in selecting comparable securities and comparing effective interest rates.

Lending rates were those charged to the bank's best prime customers. To approximate the effective interest rate (nominal interest plus any hidden costs), however, U.S. loan rates have to be adjusted for compensating balance requirements, while London interbank offer rates (LIBOR) in the Eurodollar market must be adjusted for the premium charged to nonbank borrowers. In this study U.S. prime rates were divided by .85 to adjust for an assumed compensating balance requirement of 15 percent. The premiums on LIBOR were obtained from World Financial Markets, the monthly publication of Morgan Guaranty Trust Company of New York.

As for the deposit rate comparison, previous studies of the relation between U.S. and Eurodollar deposit rates have used U.S. Treasury bill rates as a counterpart of the Eurodollar deposit rates. However Treasury bills are issued by the U.S. government, whose default risk is quite different from that of Eurobanks. U.S. bank certificate of deposit (CD) rates were therefore used as the counterparts of Eurodollar deposit (bid) rates. In this case nominal rates equal effective rates.

Differences in quotation practices in the two markets necessitate care in obtaining directly comparable rates. In the United States the interest rate is effective on the day quoted. But the Eurodollar market employs the two-day delivery convention under which funds deposited or lent on a particular day are delivered only after two full business days. For

example, a Eurodollar deposit arranged on November 10, 1978, a Friday, will not be effective until Tuesday, November 14. A precise comparison would have to be between the Eurodollar rate quoted one day and the U.S. interest rate expected to prevail two business days later, which may be inferred from the term structure of interest rates. Since the interval is short, however, it seems acceptable to compare U.S. and Eurodollar interest rates quoted on the same day.

The U.S. prime rates, London interbank deposit and offer rates, and U.S. certificate of deposit rates were taken from International Reports, a weekly reporting service. Federal Funds rates were obtained from various issues of the United States Federal Reserve Bulletin.

The German capital flow data were obtained from various issues of the Deutsche Bundesbank's Monthly Report, where short-term capital flows are classified into three major types, according to reporting entities--banks, enterprises, and official. The short-term capital transactions of enterprises are further classified into two major categories, financial credits and trade credits.

This study sought to identify flows responding to changes in expected rates of return. Official short-term capital transactions are not necessarily interest-rate sensitive. One may argue that the trade credits are interest sensitive because trade credit is a function of a trading pattern which, in turn, is a function of relative price level and the relative interest rate level in respective countries. Interest cost is generally a small portion of the total price of a traded product, however; and even though the interest cost may be the single most important cost element in a traded product, a lag occurs before the trade pattern and the terms of the trade credit adjust

to interest changes. Only the short-term capital transactions of banks and enterprises (financial credit only) therefore represent an interest-sensitive portion of the German short-term capital movement statistics. The figures presented in the Monthly Report were converted into U.S. dollars using monthly average exchange rates obtained from International Financial Statistics. This conversion was intended to remove changes in valuation arising purely from exchange rate changes, not from capital flows themselves.

TABLE A-1

DATA EMPLOYED IN THE STUDY

(Interest rates in percentages)

Date		U.S.[1] Loan	U.S.[2] CD	Euro-dollar[3] Loan	Euro-dollar[4] Deposit	Federal[5] Funds	German[6] Capital Flows (U.S. $ billions)
1974:	1.4	11.46600	9.00000	10.13000	9.50000		
	1.11	11.46600	8.00000	10.13000	9.50000		
	1.18	11.46600	8.88000	10.25000	9.63000		
	1.25	11.46600	8.88000	9.75000	9.13000		
	2.1	11.46600	8.63000	9.38000	8.75000		
	2.8	11.17200	8.13000	9.00000	8.38000		
	2.15	10.87800	8.13000	8.94000	8.32000		
	2.22	10.58400	7.88000	9.25000	8.63000	9.07	-.23951
	3.1	10.29000	7.88000	9.13000	8.50000		
	3.8	9.99600	8.13000	9.38000	8.75000		
	3.15	9.99600	8.38000	9.44000	8.81000		
	3.22	10.58400	8.75000	10.00000	9.38000		
	3.29	10.87800	9.25000	10.38000	9.75000	9.61	.85845
	4.5	11.46600	9.50000	10.38000	9.75000		
	4.12	11.76000	9.88000	11.19000	10.56000		
	4.19	11.76000	10.00000	10.88000	10.25000		
	4.26	12.34800	10.25000	12.00000	11.38000	10.78	-.17458
	5.3	12.64200	10.75000	11.88000	11.00000		
	5.10	12.93600	11.00000	12.38000	11.50000		
	5.17	13.23000	11.00000	12.63000	11.75000		
	5.24	13.52400	11.00000	12.69000	11.81000		
	5.31	13.81800	10.75000	12.69000	11.81000	11.54	.09072
	6.7	13.52400	11.00000	12.63000	11.75000		
	6.14	13.52400	11.00000	12.63000	11.75000		
	6.21	13.52400	11.13000	12.94000	12.06000		
	6.28	13.81800	11.50000	13.88000	13.00000	11.97	-.16950.
	7.5	14.11200	11.75000	14.50000	13.63000		
	7.12	14.11200	12.00000	14.63000	13.75000		
	7.19	14.11200	12.00000	14.63000	13.75000		
	7.26	14.11200	11.75000	13.81000	12.96000	12.6	.32472
	8.2	14.11200	11.50000	14.56000	13.69000		
	8.9	14.11200	11.88000	13.88000	13.00000		
	8.16	14.11200	11.88000	14.38000	13.50000		
	8.23	14.11200	12.00000	14.44000	13.44000		
	8.30	14.11200	12.00000	14.81000	13.94000	11.84	-.21475
	9.6	14.11200	12.00000	14.19000	13.31000		
	9.13	14.11200	11.63000	13.19000	12.31000		
	9.20	14.11200	11.38000	12.81000	11.94000		
	9.27	13.81800	10.63000	12.75000	11.88000	11.12	-.95680
	10.4	13.81800	10.00000	13.13000	12.00000		
	10.11	13.81800	9.63000	12.25000	11.13000		
	10.18	13.52400	9.25000	12.00000	10.88000		
	10.25	13.23000	8.88000	11.50000	10.38000	9.81	-.11025
	11.1	12.93600	8.88000	11.13000	10.00000		
	11.8	12.64200	8.88000	11.00000	9.88000		
	11.15	12.64200	8.88000	11.31000	10.19000		
	11.22	12.34800	8.63000	11.31000	10.19000		
	11.29	12.34800	9.30000	11.63000	10.50000	9.46	-.46539
	12.6	12.34800	9.45000	11.63000	10.50000		
	12.13	12.34800	9.35000	11.31000	10.19000		
	12.20	12.34800	9.15000	11.13000	10.00000	8.45	-.33808
1975:	1.3	12.34800	8.95000	11.31000	10.19000		
	1.10	12.34800	7.38000	9.94000	8.81000		
	1.17	12.05400	7.55000	9.63000	8.50000		
	1.24	11.76000	7.00000	9.31000	8.19000		
	1.31	11.46600	6.50000	8.81000	7.69000	6.99	.24186
	2.7	10.87800	6.25000	7.94000	6.81000		
	2.14	10.87800	6.25000	8.88000	7.75000		
	2.21	10.87800	6.25000	8.31000	7.19000		
	2.28	10.29000	6.35000	8.56000	7.44000	6.15	-.11335
	3.7	9.70200	6.40000	8.25000	7.13000		
	3.14	9.40800	6.10000	7.75000	6.63000		
	3.21	9.11400	5.88000	7.63000	6.50000		
	3.28	9.11400	5.88000	7.94000	6.81000	5.53	.33549
	4.4	8.82000	6.00000	8.44000	7.31000		
	4.11	8.82000	6.25000	8.13000	7.00000		
	4.18	8.82000	6.15000	8.06000	6.94000		
	4.25	8.82000	6.15000	8.06000	6.94000	5.54	-1.4733
	5.2	8.82000	6.13000	7.88000	6.75000		
	5.9	8.67888	6.20000	7.63000	6.50000		
	5.16	8.67888	5.85000	7.31000	6.19000		
	5.23	8.52600	5.50000	7.13000	6.00000		
	5.30	8.52600	5.70000	7.00000	5.88000	5.14	-.11665
	6.6	8.38488	5.80000	7.06000	5.94000		
	6.13	8.09088	5.75000	6.88000	5.75000		
	6.20	8.09088	5.75000	7.13000	6.00000		
	6.27	8.09088	6.30000	7.94000	6.81000	5.72	-.06877
	7.4	8.09088	6.40000	8.38000	7.25000		
	7.11	8.09088	6.55000	8.38000	7.25000		
	7.18	8.38488	6.55000	7.88000	6.75000		
	7.25	8.67888	6.70000	8.38000	7.25000	6.14	.18775
	8.1	8.82000	6.75000	8.06000	6.94000		
	8.8	8.82000	7.05000	8.44000	7.31000		
	8.15	9.11400	6.85000	8.19000	7.06000		
	8.22	9.11400	6.90000	8.44000	7.31000		
	8.29	9.11400	7.10000	8.50000	7.38000	6.23	.41071
	9.5	9.11400	7.05000	8.31000	7.19000		
	9.12	9.11400	7.15000	8.44000	7.30000		
	9.19	9.40800	7.15000	8.88000	7.75000		
	9.26	9.40800	7.10000	8.56000	7.44000		
	10.3	9.40800	7.50000	9.38000	8.25000		
	10.10	9.40800	6.85000	8.63000	7.50000		
	10.17	9.40800	6.50000	7.94000	6.81000		

[1] Nominal U.S. prime rate adjusted for compensating balance requirement.

[2] U.S. certificate of deposit rate.

[3] London interbank offer rate adjusted by lending premium.

[4] London interbank bid rate.

[5] Federal Funds rate.

[6] Net German short-term capital flow (positive value implies a net capital outflow from Germany).