

#80

February, 1976

NOTE ON INTEREST PARITY, EUROCURRENCIES AND CAPITAL CONTROLS

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In a recent article Robert Aliber [1973] suggested a reinterpretation of the interest parity theory. Aliber's reinterpretation rests on the distinction between political risk and exchange risk as determinants of forward exchange rates.^{1/} Several studies (Aliber, 1973; Dooley, 1974; Marston, 1974) have shown that interest rates paid on Eurocurrency deposits, which are identical in terms of political risk, are offset by forward exchange premia or discounts so that covered differentials among Eurocurrency deposits are essentially zero. The objective of this paper is to analyze a corollary of this finding. That is, if interest rates paid on Eurocurrency deposits are different from deposit rates paid by banks located in the country of issue, then covered differentials do exist between deposit rates in national money markets. These covered differentials are of interest because under certain assumptions they provide a measure of private speculative expectations. In this paper the well known argument that speculation influences forward exchange premia is recast in terms that are consistent both with Aliber's reinterpretation of the interest parity theory and with current institutional arrangements in international credit and foreign exchange markets. We

*/ The views expressed herein are solely those of the author and do not necessarily represent the views of the Federal Reserve System. I am indebted to Peter Clark and Frank McCormick for helpful suggestions.

^{1/} Political risk is defined by Aliber [1973] as "the probability that the authority of the state will be interposed between investors in one country and investment opportunities in other countries."

then test the usefulness of this formulation in evaluating private speculative expectations for the German mark relative to the U.S. dollar during the time period January 1970-December 1975.

I. Covered Interest Rate Differentials as Indicators of Private Speculative Expectations.

The hypothesized relationship between private speculative expectations and covered interest rate differentials is well known and is only briefly recapitulated here.^{2/} Those who wish to speculate on exchange rate changes can avoid the political risk of holding claims or liabilities of residents of a particular country and can specialize in bearing the risk of exchange rate changes by dealing in the forward exchange market. The other speculator on a net basis, the central bank, typically chooses to take positions only in the spot foreign exchange market, possibly because it is less concerned about political risk. The spot and forward exchange markets are linked by covered interest arbitrage. If private speculators have expectations concerning future spot exchange rates different from those held by central banks, the spot and forward rate will be bid toward different expected values. The resulting tendency for spot and forward exchange rates to be bid apart induces arbitragers to take increasingly large arbitrage positions.^{3/}

The effect of these changes on the stock of arbitrage positions on forward premia depends on the elasticity of the arbitrage schedule.

^{2/} See for example: Tsaing [1959], Stein [1962], Kesselman [1971].

^{3/} This analysis is equally valid under floating exchange rates if central banks continue to intervene primarily in the spot market. The stock of arbitrage positions still depends on the divergence of central bank and private expectations.

If the arbitrage schedule is not perfectly elastic with respect to covered interest differentials because of political risk associated with securities issued in a given country then changes in the stock of arbitrage positions are associated with changes in the equilibrium levels of covered interest differentials. It would seem that, if covered interest differentials are observed, it follows that the arbitrage schedule is not perfectly elastic, and that the nature of private expectations can be inferred from the divergences of the forward exchange rate from interest parity. Since private expectations cannot be directly measured it is important to know whether or not easily measurable departures from interest parity are reliable indicators of market expectations, or, more precisely, of the differences in expectations between private and official market participants.

II. Arbitrage Among National Money Markets and Within the Eurocurrency Markets.

The starting point for an empirical study of arbitrage is the identification of the yield on similar financial assets denominated in various currencies. We will concentrate on interbank time deposits and interbank loans at "name" commercial banks. These particular financial assets are useful for a study of the arbitrage function since the "name" commercial banks which issue such deposits are nearly homogeneous, except for country of residence, and because such interbank deposits and loans are known to be actively traded internationally.

In the case study presented in the next section we consider the relationship among Eurodollar deposits in Zurich, Euromark deposits in Zurich and interbank loans in Frankfurt.^{4/} We know that forward exchange premia conform closely to the Eurocurrency deposit yield differentials and much less closely to yield differentials among financial assets such as Treasury bills or bank deposits which are denominated in the currency of the country in which the issuer is located.

The absence of covered differentials among Euro-currency deposit rates is not difficult to understand. It does not seem likely that a depositor would hold a Eurodollar deposit at a Swiss bank when he could hold a Euromark deposit at that bank, sell the marks forward for dollars (perhaps to the same bank), and receive a higher yield on what is essentially a dollar-denominated position. It seems clear that this would cause at least the forward rates quoted by a given bank to be consistent with Eurocurrency rates quoted by that bank.^{5/}

The fact that interest arbitrage is nearly perfect among Euro-currency deposits does not imply that interest arbitrage among national financial markets is nearly perfect. As shown in our case study below there have been times when there have been significant differences between yields on deposits at banks located within the country of issue as compared to deposits denominated in the same currency at Eurobanks. These

^{4/} The linkages between the Eurodollar market and U.S. money markets are not crucial for this exercise.

^{5/} A full specification of a stock equilibrium model is not necessary for the very simple hypothesis presented in this paper. The description of equilibrium conditions is not meant to imply causal relationships.

differentials are equivalent to departures from interest parity since they directly measure different yields on assets with the same exchange rate risk but different political risks. Why, for example, have depositors accepted a significantly lower yield on Euromark deposits as compared with mark denominated deposits of German banks?

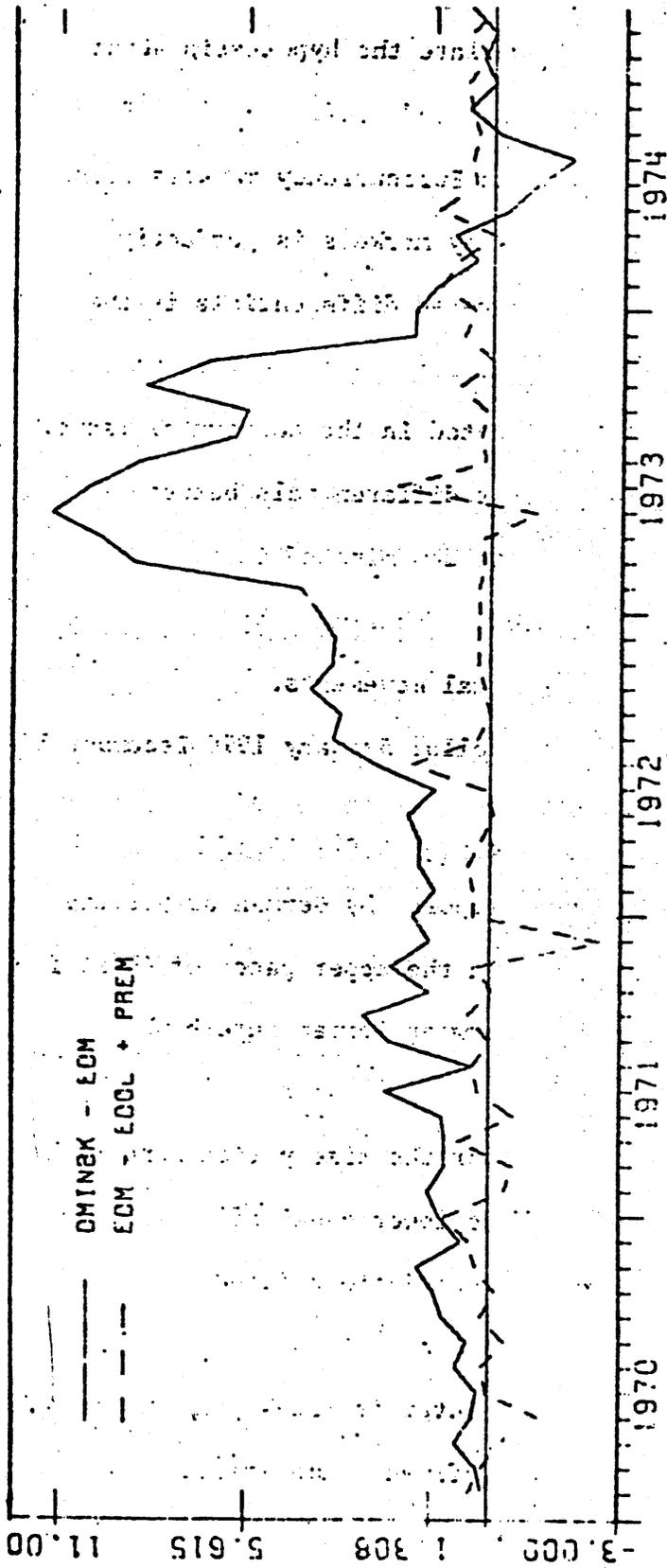
One possible answer can be couched in terms of the traditional model of interest arbitrage. That is, speculative bids for forward marks, coupled by central bank sales of spot marks, tended to open a covered differential in favor of mark-denominated deposits at German banks. Arbitragers purchased marks spot (from the Bundesbank), invested the mark balances in German bank deposits, and sold the marks forward (to private speculators). As the stock of these arbitrage positions grew, arbitragers might have become increasingly uneasy since a larger share of their portfolios was subject to political risk peculiar to claims on German residents. An arbitrager could diversify his political risk by purchasing mark-denominated claims on non-German banks, i.e., Euromark deposits. But while this serves to diversify the arbitrager's political risk, Eurobanks face the same risks that arbitragers are trying to avoid. Upon issuing a Euromark deposit, the Eurobank must cover its mark liability to the depositor. To avoid taking an uncovered position in marks, the Eurobanks, as a group, then must do the same thing that arbitragers are attempting to avoid, namely purchase claims on German residents in order to cover their Euromark deposit liabilities. At some point the Eurobanks themselves might have become uneasy about the political

risk accompanying their stock of claims on German residents. Eurobanks can discourage arbitragers from further shifting of this political risk to Eurobanks by offering a lower yield on Euromark deposits. The difference between Euromark rates and the interest rates available on claims on German residents then might have been due to the reluctance of arbitragers, including Eurobanks, to acquire a larger stock of covered claims on German residents.

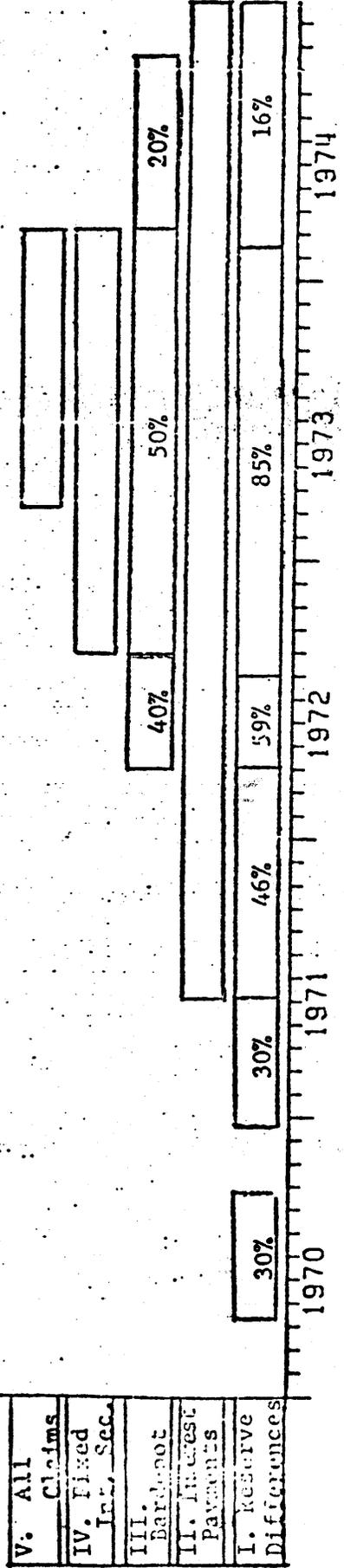
An alternative, and simpler, explanation of the differences in yield between Euromark deposits and similar deposits in German resident banks is that legal restrictions designed to inhibit capital inflows placed a tariff on the export of financial claims on German residents.^{6/} This control program drove a variable wedge between the price (interest rate) at which such claims were traded inside and outside Germany and was itself a response to private speculative demand for mark denominated claims. Once in place, exchange controls did not affect the political risk faced by arbitragers but rather the certain effective yield on arbitrage positions. Interest rates available to German residents then were not effective rates for arbitragers, and their use in computing an interest differential introduces errors in variables.

^{6/} The importance of controls has been suggested but not tested in almost all treatments of the interest parity theory. See Officer and Willet [1970, p. 251].

ANNEX I



Control Program



With this in mind, we can reformulate the hypothesis about the relationship between speculation and covered differentials. First, the absence of covered differentials within Eurocurrency markets does not imply that arbitrage among national money markets is perfectly elastic. Second, the proper measure of covered differentials is the difference between Eurocurrency deposit interest rates and interest rates available on similar deposits at banks located in the country of issue. Finally, we can ask whether or not interest differentials between Eurocurrency deposits and domestic deposits denominated in the same currency are caused by changes in the stock of claims subject to political risk or to legal restrictions on capital movements.

III. Case Study of German mark and U.S. dollar January 1970-December 1975

In this section an attempt is made to empirically assess the importance of various legal restrictions imposed by German authorities between January 1970 and December 1974. In the upper panel of Chart I the end of period interest differential between German interbank deposit rates and Euromark deposit rates and the covered differential between Eurodollar and Euro DM deposits for the time period January 1970 through January 1974 are presented. In the lower panel of Chart I an attempt has been made to chart the legal restrictions faced by non-resident arbitragers in acquiring claims on German residents. The effect of this program was to drive a wedge between interest rates paid to residents and non-residents and, thus, directly to influence the effective yield

that non-resident arbitragers could earn on additional claims on German residents. It is impossible to exactly quantify the effectiveness of this program but two qualitative measures of effectiveness of controls are suggested here. First, at various times, a given type of control was made more stringent. For example, the differential reserve requirements on bank liabilities to non-residents, as well as reserve free bases of such liabilities, were adjusted several times during the time period. Second, controls on different financial intermediation channels were imposed. For example, when controls on German banks became less effective, short-term borrowing by German non-financial corporations was penalized by the Bardepot which placed reserve requirements on nonfinancial corporations' liabilities to non-residents. As the effectiveness of this program eroded, non-residents were prohibited from acquiring fixed interest securities. Finally, in February 1973 acquisition by non-residents of virtually all claims on German residents was prohibited.

The capital controls considered here applied only to changes in claims on German residents during the time period studied. In this case the control program was effective only when desired positions exceeded some initial base level plus changes not covered by the control program. After substantial capital inflows through the 3rd quarter of 1973, in October and November 1973 capital outflows from Germany totaled about DM 3.3 billion and DM 3.8 billion respectively. Therefore, even

though the control program was not formally removed until early in 1974 it apparently became ineffective during the last quarter of 1973. A detailed explanation of the controls imposed during the period is given in the notes to Chart I.

The relationship between these measures and the observed interest differentials is certainly striking, if not conclusive. This relationship suggests that the observed covered interest differentials were not produced primarily by movements along a less than perfectly elastic arbitrage schedule but rather were due in large part to shifts in the schedule caused by the program designed to change the effective interest rate that could be earned on additional claims on German residents. Capital control measures themselves may have been correlated with the intensity of private speculative activity, and one might suspect that the correlation, if any, between private speculation and covered interest differentials at other times for other currencies is due to this same factor.

Unfortunately, since it is not possible to precisely quantify the control program, it is simply not possible to differentiate the effect of private speculation per se and the effect of the German control program on forward exchange premia during this time period. We cannot, therefore, reject the hypothesis that the covered differentials observed were due to movements along a less than perfectly elastic arbitrage schedule. But we can warn that any inferences drawn from covered interest differentials for the specification and estimation of theoretical models, are valid only if the dual nature of covered

interest differentials is considered.

In summary, there seems to be no escape from the conclusion that detailed examination of capital control programs is a necessary, if unattractive, aspect of our understanding of interest rate and exchange rate determination. We have shown that control programs do not simply introduce random errors into calculations of interest parity but are instead correlated with an important variable in all models of international financial markets, i.e., differences in exchange rate expectations between private and official market participants.

Chart I -- Notes and Sources

Upper Panel

DMINT = 3-month Frankfurt interbank loan rate at or near
end of month WFM

EDM = 3-month Euro DM Deposit, at or near end of month
LFT, SBC

EDOL = 3-month Eurodollar deposit, at or near end of
month, LFT

Prem = 3-month forward premium, at or near end of month,
LFT.

Sources LFT = London Financial Times

SBC = Swiss Bank Corporation, internal records

WFM = World Financial Markets, Morgan Guarantee Trust
Company New York

Lower Panel

I. On April 1, 1970 the Bundesbank reintroduced a special reserve ratio on the growth of banks' liabilities to non-residents. With the exception of a four month period, September through December 1971, when liabilities of both residents and non-residents carried equal special reserve ratios, some differential reserve ratios were imposed on bank liabilities to non-residents throughout the time period. This program served two purposes. First, it induced German banks to pay lower deposit rates to non-residents as compared to residents. This effect of the program probably was less important after May 1971 when payment of interest on deposits held by non-residents was made subject to prior approval by the Bundesbank

although they still served to discourage implicit payments for deposits. Secondly, the reserve requirement absorbed reserves and thereby "sterilized" the increase in the monetary base resulting from bank reported capital inflows. The percentages shown in Chart I are the approximate percentage differences between average plus marginal reserve ratios on liabilities to residents and non-residents.

II. On May 10, 1971 interest payments on non-resident bank deposits exceeding DM 50,000 were made subject to prior approval by the Bundesbank.

III. On March 1, 1972 the Federal Government introduced a cash deposit requirement (Bardepot) of 40% on most types of credits of non-residents to German non-banks in excess of DM 2 million per individual. The cash deposit was a non-interest bearing deposit at the Bundesbank. The cash deposit was increased to 50% on July 29, 1972 and the exempt amount was reduced to DM 0.5 million. On January 30, 1974 the cash deposit requirement was reduced to 20% and the exemption raised to DM 2 million. On September 11, 1974 the cash requirement was eliminated.

IV. On June 29, 1972 the Federal Government decreed that the purchase of fixed-interest securities by non-residents was subject to prior authorization. Fixed-interest securities included all maturities of bonds including, for example, all bank bonds, mortgage bonds, communal bonds, industrial bonds, and public authority bonds. The authorization requirement was, in practice, equivalent to prohibition of such purchases. The authorization requirement for all but short term securities (less than four years to maturity) was terminated on January 30, 1974.

V. On February 5, 1973 the Federal Government made acquisition of domestic shares and mutual funds by non-residents and the raising of loans abroad by residents, including trade credits, subject to authorization. This measure was designed to prohibit essentially all capital transactions with non-residents. All of these additional measures were terminated on January 30, 1974.

Source: Various issues of Monthly Report of the Deutsche Bundesbank.

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