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Introduction and Overview

In his reinterpretation of the interest-rate parity theorem, Robert Aliber (1973) distinguishes between exchange risk and political risk as determinants of disparities between interest rates on different money-market assets. Interest disparities reflect exchange risk when assets are denominated in different currencies and/or political risk when assets are issued in different countries (i.e., under different legal jurisdictions).

It is now well established that assets differing essentially in only their currencies of denomination, such as Eurocurrency deposits in a particular financial center, exhibit interest differentials equal to the forward exchange premiums that must be paid to insure against exchange risk.^{1/} (See Aliber, 1973; Dooley, 1974; or Herring and Marston, 1976.) In contrast, it is not well understood to what extent political

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

^{1/} It is also well recognized that forward exchange "insurance" premiums are simultaneously determined with interest differentials as functions of policy instruments and/or other exogenous variables.

risk has contributed to disparities between interest rates on assets denominated in the same currency but issued in different political jurisdictions. Aliber defines the concept of political risk as "the probability that the authority of the state will be interposed between investors in one country and investment opportunities in other countries" -- i.e., the probability that controls will be imposed on capital inflows or outflows. By the nature of risk, this concept has nothing to do with existing capital controls *per se*, but rather relates to the uncertainty of future capital controls. Thus, interest differentials due to the political risk of future capital controls must be distinguished from disparities due to the effective tax that existing controls place on interest earnings.

The purpose of this note is to clarify that the interest differential due to political risk depends not only on the probability of capital controls but also on supplies of outside (government) debt and the distribution of world wealth. A simple model of portfolio behavior is used to explain the interest differential between Euromark deposits in Zurich (EDM) and interbank mark-denominated loans in Frankfurt (GDM) for 3-month maturities between January 1970 and December 1974.

During this period Germany placed a series of controls on capital inflows (see the appendix for a chronology) and the interest differential (GDM - EDM) fluctuated from near zero at the start of 1970 to an annual rate of more than 10 per cent in April 1973, and then back to near zero after the controls were effectively removed. Our reading of the empirical evidence suggests that most of the swing was due to shifts in the tax that controls effectively imposed on nonresident earnings from assets held in Germany. At its peak we estimate that this tax accounted for an interest differential of about 6 per cent per annum between February and October 1973. An additional differential of up to almost 2 per cent was apparently required, in the context of political risk, to induce nonresidents to hold the excess supply of German outside debt.

Theoretical Underpinnings

Within the framework of the traditional theory of interest arbitrage, the interest differential between mark deposits in Germany and Euromark deposits outside Germany can be attributed to efforts by the German Bundesbank to hold the mark below the level to which private speculators expected it to appreciate. In this context speculative bids for forward marks, coupled with 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 (or other claims on German residents), and sold the marks forward (to private speculators). As the stock of these arbitrage positions grew arbitragers became increasingly averse to increasing the share of their portfolios that was subject to political risk peculiar to nonresident claims on German residents. Individual arbitragers could have diversified and reduced their political risk by purchasing mark-denominated claims on non-German banks (i.e., Euromark deposits) instead of German bank deposits. But this would have forced Eurobanks either to hold uncovered mark liabilities subject to exchange risk, or to pay a premium to purchase marks forward, or themselves to purchase claims on German residents and accept the associated political risk. Consequently, Eurobanks would have discouraged mark depositors by offering lower yields. Thus the difference between Euromark rates and the interest rates available on claims against German residents can be attributed to the reluctance of nonresident arbitragers, including Eurobanks, to acquire a larger stock of claims on German residents.

A graphical representation of this story would show markets equilibrating on the finitely-elastic portion of the arbitrage schedule. There is an alternative story, however, which assumes that markets equilibrated on the infinitely-elastic (or risk-neutral) portion of the arbitrage schedule in the context of capital controls already in place. This alternative story attributes interest disparities entirely (apart from random noise) to the effective tax that existing controls placed on nonresident interest earnings in Germany.

These conflicting stories suggest that estimation of the arbitrage schedule is the key to separating the interest disparity due to capital controls already in place from the interest disparity due to political risk associated with the prospect of additional (or tighter) controls. A problem with this approach, however, is that the arbitrage schedule has traditionally been viewed to describe the flow of arbitrage funds, which does not square well with the currently-accepted stock-equilibrium model of portfolio behavior. Our alternative approach is to consider the behavior of both the German private sector and nonresidents in choosing their portfolio stocks, implicitly taking account of arbitrage possibilities.

The Model

Consider a world divided into the German private sector, which demands a net stock of B_G^d mark-denominated claims against German residents (including the German government); nonresidents, who demand a net stock B_{NR}^d of mark-denominated claims against

German residents; and the German government, against which there exists a stock of B mark-denominated claims. Market-clearing in this world requires

$$(1) \quad B_G^d + B_{NR}^d = B$$

Let W_G and W_{NR} denote the "wealth" of the German private sector and of nonresidents; and let GDM, EDM and EDOL respectively denote the interest rates on mark-denominated claims against German residents and on Euromark and Eurodollar deposits held outside Germany. Interpret Eurodollar deposits as a composite of all assets not denominated in marks, and assume that capital controls apply only to nonresidents' claims against German residents.^{2/} Let $E\%X$ denote the expected rate of appreciation of the mark against the dollar.

Portfolio demands of the German private sector are viewed to depend on relative expected yields and wealth -- ignoring exchange risk for the moment -- so that

$$(2) \quad B_G^d = f(GDM-EDM, GDM-EDOL+E\%X, W_G)$$

Portfolio demands of nonresidents are viewed to depend on similar variables, and in addition on the level of capital controls CC, so that

$$(3) \quad B_{NR}^d = g(GDM+E\%X-EDOL, EDM+E\%X-EDOL, W_{NR}, CC)$$

^{2/} The analysis is not affected by the simplifying assumption that all claims against German residents are denominated in marks. More precisely, our regression specification would not be affected by extending the model to include dollar-denominated claims against German residents, paying an interest rate GDOL, provided the differential between GDOL and GDM was identical -- as it should be -- to the differential between EDOL and EDM.

When it is further assumed that the expected rate of appreciation of the mark equals the forward premium on the mark, which in turn is known to equal the excess of the Eurodollar rate over the Euromark rate, we have

$$(4) \quad E\%X = EDOL - EDM$$

and therefore

$$(2a) \quad B_G^d = f(GDM - EDM, W_G)$$

$$(3a) \quad B_{NR}^d = g(GDM - EDM, W_{NR}, CC)$$

For purposes of avoiding a nonlinear specification hypothesis, we assume that (2a) and (3a) have the linear forms

$$(2b) \quad B_G^d = a_0 + a_1(GDM - EDM) + a_2 W_G$$

$$(3b) \quad B_{NR}^d = b_0 + b_1(GDM - EDM) + b_2 W_{NR} + b_3 CC$$

with a_1 , a_2 , b_1 and b_2 all positive.^{3/}

Together, conditions (1), (2b) and (3b) imply

$$(5) \quad GDM - EDM = c_0 + c_1 B - c_2 W_G - c_3 W_{NR} + c_4 CC$$

with c_1 , c_2 and c_3 all positive. Since we measure our wealth variables exclusive of claims on real assets, we impose the identity that the global net worth of paper assets is zero, or that

$$(6) \quad B = W_G + W_{NR} \quad 4/$$

Thus, condition (5) reduces to

$$(7) \quad GDM - EDM = c_0 + (c_1 - c_3)B - (c_2 - c_3)W_G + c_4 CC$$

^{3/} Implicitly we assume that a_1 and b_1 are finite, reflecting aversion to political risk.

^{4/} We assume that B represents the total net liabilities of the German government and that B , W_G and W_{NR} are measured in the same currency unit.

Note that nonresidents include official as well as private nonresidents, so the combined portfolio of nonresidents and the German private sector includes no outside dollar-denominated assets. Hence, conditions (1) and (6) are consistent.

Condition (7) is our estimating equation. A more general development of the model would assume that exchange risk affects both German and non-resident portfolio demands, which would add another argument to equations (2) and (3), and hence another regressor in equation (7). Insofar as exchange risk increases private German demand for mark-denominated claims on German residents and reduces nonresident demand for mark-denominated claims on German residents, the sign of the net effect on global demand for claims on German residents (i.e., the global demand for outside German debt) is ambiguous. Thus, exchange risk can either increase or reduce the interest differential GDM-EDM.

Data Sources and the Representation of Capital Controls

Our measure of GDM is the 3-month Frankfurt interbank loan rate at or near the end of the month, as published by Morgan Guarantee Trust Company in World Financial Markets. EDM is the 3-month Euro-DM deposit rate in Zurich, at or near the end of the month, from the London Financial Times and internal records of the Swiss Bank Corporation. B is the cumulative sum, from an estimated end-of-1969 initial value, of the change in the German Federal Government's indebtedness plus the change in German official holdings of gold and external assets (from various issues of the Monthly Report of the Bundesbank, Tables VII.8 and IX.6a). W_G is the cumulative sum, from an estimated end-of-1969 initial value, of the change in the German Federal Government's indebtedness plus the German current-account surplus (same source, Tables VII.8 and IX.1). The initial values of B and W_G are not important to the regression results, since errors in these initial values affect only the estimated intercept parameter.

We experimented with two different representations of the capital controls variable CC. As described in the appendix, controls on capital inflows were imposed or tightened in 5 major doses and a number of subsequent modifications.^{5/} Accordingly, one of our representations of CC is a step function constructed with five zero-one dummy variables.

Our other representation of CC assumes that the effective tax imposed by controls increased continuously

^{5/} Not all of the doses were directed at bank deposits, but interest rates on bank deposits clearly responded to controls that directly affected interest rates payable on alternative assets.

between the first dose of controls in April 1970 and the last dose in February 1973. Here we follow Wilton's (1975) technique for representing structural shifts, as modified by Reid (1977), which allows us to specify CC as a polynomial of any degree m . We have chosen $m=3$ as the minimum value that allows for an inflection point. Given that the capital controls applied only to increases in nonresident claims on Germans, we assumed in both representations that the effective tax imposed by controls dropped to zero when capital began to flow strongly out of Germany in the fourth quarter of 1973.

Empirical Results

Table 1 presents our regression results. Both specifications of CC yield good fits. The estimated coefficients of B and W_G have correct signs (as will be discussed below); and the coefficients on the capital control variables are appropriate, with the exception of the insignificant negative coefficient on the first step (April 1970 through April 1971) in equation 2. Critical single-tail t -values are 1.3 for 90 per cent confidence tests and 2.4 for 99 per cent confidence tests.

The two equations respectively attribute interest differentials of 5.7 ($=10.1-33.0+28.6$) and 6.16 per cent per annum to capital controls in place during their tightest interval between February and October 1973. On average during this period the two equations respectively estimate that capital controls in place explained 74 and 81 per cent of the interest differential.

Table 1: Regression Results ^{a/}

$$1.) \text{ GDM-EDM} = 4.66 + .0353B - .0547W_G + 10.1Z - 33.0Z^2 + 28.6Z^3$$

(1.01) (1.88) (-1.77) (1.56) (-2.13) (2.93)

$$\bar{R}^2 = .895$$

D.W. = 1.88

$$\text{RHO} = .488$$

(4.30)

where Z increases linearly (by 1/35 per month) from 0 in March 1970 to 1 in Feb. 1973, remains at 1 between Feb. and Oct. 1973, and is 0 prior to March 1970 and beginning in Nov. 1973.

$$2.) \text{ GDM-EDM} = 7.28 + .0131B - .0429W_G$$

(1.72) (0.732) (-1.61)

$$\bar{R}^2 = .913 \quad \text{RHO} = .444$$

D.W. = 1.97 \quad (3.80)

$$\left\{ \begin{array}{l} -.369 \text{ from April 1970 through April 1971} \\ (-.492) \\ + .411 \text{ from May 1971 through Feb. 1972} \\ (.554) \\ + .425 \text{ from Mar. 1972 through May 1972} \\ (.498) \\ + 2.12 \text{ from June 1972 through Jan. 1973} \\ (2.78) \\ + 6.16 \text{ from Feb. 1973 through Oct. 1973} \\ (8.64) \end{array} \right.$$

^{a/} The dependent variable is measured in per cent per annum. B and W_G are in billions of DM. The Cochrane-Orcutt procedure was used to correct for first-order serial correlation. Numbers in parenthesis are t-values. The sample period consists of 60 monthly observations from January 1970 through December 1974.

The remainder of the interest differential can be attributed to political risk, under the assumption that the probability of additional capital controls was uncorrelated with the level of capital controls in place during our sample period.^{6/} The equation specifications emphasize that the interest differential attributed to political risk depends not only on the probability of additional controls on capital inflows, but also on the stock of German government liabilities (B) and on the distribution of the counterpart net assets (here labeled "wealth") between the German private sector and non-residents (i.e., that size of W_G relative to B). As B increases holding W_G constant, additional German debt is pushed into non-resident portfolios and the interest differential due to non-resident exposure to political risk increases. And as W_G increases holding B constant, thereby reflecting a shift in wealth from non-residents to the German private sector, the interest differential due to non-resident exposure to political risk is reduced. Thus, the signs of the estimated coefficients on B and W_G are appropriate when the

^{6/} This latter assumption allows us to avoid attributing any of the interest differential to the covariance between existing controls and the probability of additional controls. This is consistent with the fact that we do not treat the probability of additional controls as a variable in our model, and thus we implicitly assume it to be constant throughout the sample period, independent of the level of existing controls. Even if we could measure variations in the probability of additional controls, however, it would be difficult to separate the anticipatory encouragement to capital inflows from the ultimate discouragement that would follow an increase in the probability of additional (nonretroactive) controls.

political risk concerns future interest payments to non-residents (i.e., capital inflows).

The two equations provide slightly different estimates of the time path of the interest differential attributable to political risk. Evaluated at the initial values of B and W_G , the first three terms of equations 1 and 2 respectively attribute interest differentials of -0.1 and 1.1 per cent per annum to political risk at the beginning of the sample period. Between January 1970 and the end of April 1973, when the interest differential reached its peak of slightly more than 10 per cent per annum, Germany's stock of international reserves increased rapidly and B increased four times as much as W_G . This pushed claims on Germany into non-resident portfolios and increased the interest differential due to political risk. Equation 1 estimates that the interest differential due to political risk peaked at 1.8 per cent per annum at the end of July 1973; equation 2 puts the peak at 1.6 per cent at the end of September 1972. In both equations the direction of political risk changed during the last quarter of 1974, and equations 1 and 2 respectively attribute interest differentials of -0.6 and -0.4 per cent per annum to political risk at the end of December 1974.

Appendix: A Chronology of German Capital Controls ^{7/}

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, bank liabilities to non-residents were subject to higher reserve requirements than bank liabilities to residents. This program served two purposes. First, it induced German banks to pay lower deposit rates to non-residents than to residents. (This effect of the program probably was less important after May 1971 when controls were tightened to make payment of interest on deposits held by non-residents subject to prior approval by the Bundesbank.) Second, it absorbed reserves and thereby "sterilized" the increase in the monetary base resulting from bank-reported capital inflows.

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, which was not normally granted.

III. On March 1, 1972 the Federal Government introduced a cash deposit requirement (Bardepot) of 40% on most types of new credits of non-residents to German non-banks in excess of DM 2 million per

^{7/} Based on various issues of the Monthly Report of the German Bundesbank.

individual. The cash deposit, held by the Bundesbank, did not pay interest. The deposit was increased to 50% effective on July 1, 1972, and the exempt amount was simultaneously reduced to DM 0.5 million. The exemption was further reduced to DM .05 million on January 1, 1973. On January 30, 1974 the cash deposit requirement was reduced to 20% and the exemption raised to DM .1 million. In mid-September 1974 the cash requirement was eliminated retroactively from August 1, 1974.

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: 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 extended its prior authorization requirement to the acquisition of domestic shares and mutual funds by non-residents, and to the raising of loans abroad by residents, including trade credits. Controls now applied to almost all capital transactions with non-residents, and no longer just to transactions in fixed-interest securities. These additional measures were terminated on January 30, 1974.

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