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Determinants of the Spread in a Two-Tier Foreign Exchange Market

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Abstract

The literature on two-tier foreign exchange markets has concentrated on relating various shocks to the spread between the exchange rates relevant to the two tiers of the exchange market. In some earlier work we found that none of the typical predictions of theory held up empirically as BLEU spread explanations. In particular we could not find any domestic policy variables that significantly explained the BLEU spread. Our finding led us to reformulate two-tier market theory. We find that if domestic agents are risk neutral then no domestic policy variables are predicted to influence the spread.

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Table of Contents

Summary

The theoretical literature on two-tier foreign exchange markets has grown much faster than has the applied literature on the topic. The theoretical literature has largely concentrated on predicting how foreign and domestic shocks influence the spread between the exchange rates in the commercial and financial tiers of the exchange market. The present paper had its beginnings in an empirical study of the two-tier market in the Belgium-Luxembourg Economic Union (BLEU). It finds that none of the typical theoretical predictions held up as explanations of the spread. In particular, it discerns no domestic policy variables that significantly explain the spread.

This finding led to a reformulation of the two-tier market theory to make it consistent with the results. The paper reports some of the preliminary results of the reformulation and suggests that if domestic agents are risk neutral, no domestic policy variables are predicted to influence the spread.

The two-tier market spread is an asset-market distortion that induces domestic asset-market participants to avoid net international asset purchases. With risk-averse (as opposed to risk-neutral) market participants, the required distortion can in principle depend on market participants' planned consumption streams. These planned streams can, in turn, depend on domestic policies. It is through this intertemporal profile of consumption that most of the literature obtains its predictions about the effects of policy on the spread.

The assumption of risk neutrality removes the planned consumption stream from the asset-pricing decision and therefore removes the consumption profile as a channel through which domestic policy might influence the spread. The results are consistent because the consumption profile is policy's only channel of influence on the spread.

Even if the paper is not exactly correct about risk neutrality, its results have wide applicability since per capita consumption profiles are notoriously insensitive to macroeconomic policies.

I. Introduction

Many countries have experimented with separate exchange markets for current and capital transactions as a way of dealing with capital flows, especially during periods of exchange-rate uncertainty. Dual (or two-tier) exchange markets have been in effect for almost thirty years in the Belgium-Luxembourg Economic Union (BLEU), they were adopted by France and Italy during the breakdown of the Bretton Woods system, and they have been used by many developing countries in recent years.

For countries experiencing high inflation and capital flight, a dual exchange market has been advocated as a way to stem capital outflow through a change in the financial exchange rate while delaying a depreciation in the commercial exchange rate that would worsen inflation. Of course, the prerequisite for "successful" dual exchange market is that the two markets are in fact kept separate. Given this criterion, the spread between the commercial and financial exchange rates is often taken as an indicator of the degree of separation and hence of the effectiveness of the arrangement. For the three OECD countries, Belgium, France, and Italy, spreads have tended to be under 5 percent. For Belgium, the spreads have generally been much less, usually under 2 percent. For Mexico, however, the spreads have been considerably larger and more variable. The IMF's Report on Exchange Arrangements and Exchange Restrictions (1985, page 37) concludes that, overall, dual markets have played only a limited buffering role against capital movements since "spreads have been fairly constant."

The purpose of this note is to study theoretically the determinants of the spread. This is now a well-worn topic in international finance. Recent contributions include those of Obstfeld (1986), Greenwood and Adams (1985), Kaminsky (1986), and Frenkel and Razin (1986) all of whom use an explicit optimizing framework to show that a number of domestic and foreign variables influence the spread. The variables of interest in these papers generally exert their influence on the spread by altering the risk averse household's intertemporal consumption profile.

Another branch of the literature develops spread explanations based on reduced-form macroeconomic models (see Flood and Marion (1982), Dornbusch (1986), Lizondo (1984), Lanyi (1975), Bhandari (1982), Bhandari and Decaluwe (1985), and Gros (1988)). In these models, movements in the spread between the commercial and financial exchange rates have been attributed to domestic monetary and fiscal policies as well as to changes in the foreign environment and other factors.

Our model offers a different view on the determinants of the spread. We use a utility maximizing model but we concentrate of a special case of the model where we find:

a. If domestic agents are risk neutral, the spread between the commercial and financial exchange rate is equal to a constant plus apart influenced only by foreign factors. Domestic policy and nonpolicy variables cannot influence the spread.

b. If foreign agents as well as domestic agents are risk neutral, the spread is a constant that depends only on the two rates of time preference.

c. If domestic and foreign agents have the same rates of time preference, no spread between the commercial and financial exchange rates will exist.

d. When there are cross-market leakages, the spread still depends on foreign factors alone as long as leakages are constant or themselves depend only on the spread.

II. The Model

Consider the choices of a representative consumer who has an infinite horizon. He must decide on an plan for his consumption and his portfolio over time. The consumer maximizes an intertemporal expected utility function defined over consumption of a single composite traded good in all periods subject to a sequence of budget constraints. His problem is to:

$$\text{Max} \quad E_t \sum_{j=0}^{\infty} U(c_{t+j})\rho^j$$

Subject to

$$P_{t+j}c_{t+j} + [\theta x_{t+j} + (1-\theta)s_{t+j}]B^{*H}_{t+j} = P_{t+j}y_{t+j} +$$

$$[\lambda x_{t+j} + (1-\lambda)s_{t+j}]i^{*}_{t+j-1}B^{*H}_{t+j-1} + [\alpha x_{t+j} + (1-\alpha)s_{t+j}]B^{*H}_{t+j-1},$$

for $j = 0,1,2,\ldots$

where B^{*H} denotes domestic holdings of one-period debt denominated in terms of foreign exchange, c is the rate of consumption of the composite good, ρ is the subjective discount factor with $\rho = 1/(1+\delta)$, where δ is the constant rate of time preference.

As explained elsewhere (see Flood and Marion (1982)), the market is two-tiered in the sense that two different exchange rates are relevant to different types of transactions. The rates x and s are the exchange rates for capital and current-account transactions respectively (domestic currency/foreign currency), y is the domestic output of traded goods, P is the domestic price level, and i* is the nominal interest rate on foreign-currency denominated bonds.

In addition, θ is the fraction of foreign currency denominated bond purchases (a capital-account item) transacted at the financial exchange rate, λ is the fraction of interest payments (a current-account item) repatriated at the financial exchange rate, and α is the fraction of principal repatriated at the financial rate. The budget constraints indicate that in each period the agent's expenditures on goods and bonds cannot exceed his income from production plus the repatriated interest and principal from last period's bond holdings. Each period the consumer must choose (among other things) his consumption for the period and his foreign currency-denominated bond holding for the period.

The home country is small, so that it takes the foreign price level and interest rate as exogenous. There is no a priori assumption about whether the commercial rate is pegged or not.

In each period, the agent purchases an amount of bonds that will maximize his utility. The first-order condition relating time t to time (t+1) is:

$$U'(c_t)[\theta x_t + (1-\theta)s_t]/P_t = \rho E_t\{U'(c_{t+1})[(\lambda x_{t+1} + (1-\lambda)s_{t+1})i_t^* + (\alpha x_{t+1} + (1-\alpha)s_{t+1})]/P_{t+1}\} \quad (1)$$

The representative foreign agent faces a similar optimization problem:

$$\text{Max } E_t \sum_{j=0}^{\infty} U^*(c^*_{t+j})\rho^{*j}$$

subject to budget constraints of the form:

$$P^*_{t+j}c^*_{t+j} + B^*_{t+j} = P^*_{t+j}y^*_{t+j} + (1 + i^*_{t+j-1})B^*_{t+j-1}, \quad j=0,1,2\ldots$$

The one-period first order condition for a foreign agent at time t is:

$$(2) \quad U'^{*}(c_t)/P^{*}_t = \rho^{*}E_t\{U'^{*}(c_{t+1})(1+i^{*}_t)/P^{*}_{t+1}\}.$$

Now we make four simplifying assumptions, the last three of which we will later discuss relaxing:

a. Domestic agents are risk neutral, so that $U'(c_t) = \beta$ for all t.

b. There are no leakages, so that all current-account transactions take place at the commercial exchange rate and all capital-account transactions take place at the financial rate, i.e., $\theta = 1$, $\lambda = 0$, and $\alpha = 1$.

c. The two-tier regime is expected to be permanent.

d. Purchasing power parity (PPP) holds at the commercial exchange rate, so that the domestic price of traded goods equals the domestic-currency value of the foreign price of traded goods. Thus, $P_t = s_t P^*_t$ for all t. 1/

Given the four assumptions listed above, the domestic first-order condition becomes

$$(3) \quad z_t(1 - L^{-1}\rho) = \rho E_t(i^{*}_t / P^{*}_t),$$

where $z = x/P$ and L^{-1} is the forward operator, i.e., $L^{-1}K_t = K_{t+1}$ for any K in the model. Equation (3) is a first-order linear difference equation whose solution is:

$$z_t = \rho \sum_{j=0}^{\infty} [i^{*}_{t+j}/P^{*}_{t+j}] \rho^{j}.$$

The above solution gives us our expression for the spread between the two exchange rates:

$$(x - s)/s = P^{*}z - 1$$

1/ We relax the purchasing power parity assumption in Flood and Marion (1988).

We observe that the spread is a constant (negative one) plus a part influenced only by foreign factors. No domestic policy or nonpolicy variables matter for the spread.

This result is really quite surprising (to us). The general view has been that domestic policy changes influence the spread because they trigger an attempted portfolio reallocation among private agents which alters the financial exchange rate and hence the spread, given a pegged commercial rate. In our framework, domestic policies cannot alter the effective opportunity cost of holding money because they cannot affect the domestic rate of time preference or current and expected future values of foreign interest rates. Hence, no portfolio reallocation takes place which would affect the spread.

So far we have made no assumptions about foreign behavior. Let us now assume that foreign agents are also risk neutral. Then the foreign first-order conditions in (2) become:

$$(4) \quad (1/P^*_t)(1 - L^{-1}\rho^*) = \rho^* E_t(i^*_t/P^*_{t+1}).$$

Dividing (3) by (4) and rearranging terms gives us a new expression for the discount in the financial exchange rate:

$$(5) \quad (x - s)/s = (\rho - \rho^*)/\rho^*(1 - \rho)$$

Note that if domestic and foreign agents are risk neutral, the discount in the financial exchange rate will be a constant which depends only on the two rates of time preference. For example, if the home country has a smaller rate of time preference, then the financial rate will be at some constant discount. Should domestic and foreign agents have the same rates of time preference, there will be no spread between the financial and commercial exchange rates.

One important implication of our result is worth noting. Contrary to popular belief, a narrow spread between the commercial and financial exchange rate doesn't necessarily imply that the authorities have been unsuccessful in partitioning the foreign exchange market. Indeed, a narrow or zero spread can persist even when there are no leakages across markets.

III. Leakages

In the actual operation of a two-tier exchange market, there are always leakages between the two exchange markets. Some of these leakages are fraudulent, others are officially sanctioned. Let us now consider how our results concerning the determinants of the spread might be modified when we allow explicitly for leakages.

With leakages, the first-order conditions for the home country are given by equation (1). Assuming risk-neutral domestic agents and PPP, we can rewrite equation (1) as:

$$(6)\quad \theta z_t + (1-\theta)(1/P^*_t) = \rho E_t\{z_{t+1}(\lambda i^*_t + \alpha) + [(1-\lambda)i^*_t + (1-\alpha)]/P^*_{t+1}\},$$

where symbols retain their earlier definitions.

Equation (6) is a nonlinear difference equation. Note that its solution indicates that the spread now depends on the degree of leakages as well as on current and expected future foreign variables. As long as leakages are constant or depend solely on the spread, which we think is a plausible story, our result still holds: the spread is explained entirely by foreign variables. If, however, leakages depend on the domestic policy variables, then the spread will depend on the these variables as well as on foreign factors.

IV. Conclusions

In this paper we have tried to isolate the determinants of the spread between the commercial and financial exchange rates for a country operating a two-tier exchange market. Our main result was that the spread is influenced only by foreign factors; no domestic policy or nonpolicy variables affect the spread. This result holds even when the authorities are unable to keep the two foreign exchange markets completely separate, as long as leakages are a constant or depend solely on the spread.

How then might domestic variables influence the spread? Domestic disturbances might alter the spread if they affect the degree of leakage. Alternatively, they might alter the spread if they affect agents' views about the possible demise of the two-tier exchange market. We have assumed that agents expect the two-tier arrangement to be permanent. This is a reasonable assumption for the BLEU, at least during the 1960s and

1970s, which has operated a two-tier exchange market for about 30 years, but not for countries that institute two-tier exchange markets as an explicitly temporary device. If the probability of a regime switch depends on the domestic state, domestic policies can affect the spread. In addition, since the evidence indicates that purchasing power parity does not hold, domestic disturbances might influence the spread by altering the terms of trade. Finally another channel through which domestic variables could influence the spread would be through their influence on the intertemporary consumption profile. By assuming risk neutrality, we have ignored this channel.

The next step is to subject our results on the determinants of the spread to empirical tests. Preliminary work using approximately 30 years of monthly Belgian data have been encouraging. For the Belgian data, none of the Belgian variables hypothesized by others to be important for the spread are significant, but U.S. interest rates seem to have significant explanatory power.

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