DM/86/58

INTERNATIONAL MONETARY FUND

Fiscal Affairs Department

Fiscal Rigidities, Public Debt, and Capital Flight

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August 22, 1986

Abstract

This paper associates the occurrence of exchange rate crisis and capital flight with the possibility of default on public debt, resulting from fiscal weaknesses and rigidities. The basic triggering mechanism is similar to the one explored in the speculative attacks literature. However, the fiscal underpinnings are more clearly specified here, as the model is built around the budget restriction of the public sector, rather than the monetary balance of the Central Bank. By doing so, insolvency and default risk appear as the basic underlying variables behind exchange rate crisis. Since solvency requirements apply to all government debt, the model can explain why the existence of domestic interest bearing assets, even when perfectly indexed, is not sufficient to eliminate the possibility of a crisis. By including both foreign and domestic debt into the analysis, it generates endogenous ceilings to the amount of public debt which can be acquired by domestic or foreign creditors, instead of relying on an exogenously determined level of foreign reserves, as in the usual speculative attacks literature. An explanation is thus found to justify the simultaneous occurrence of foreign lending and capital flight, as recently observed in several Latin American countries. Finally, the addition of a price rigidity assumption provides a natural way to explain the large jumps in real exchange rates which are often the product of balance of payments crisis. The recent experience of Mexico is taken as a particularly fitting illustration for this set of issues.

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*/ A previous version of this paper was presented at a seminar in Maale Hamamisha, Israel, in July 1985. The views presented here are the authors' and do not necessarily reflect those of the International Monetary Fund. Useful comments by Mario I. Blejer and Masahiro Kawai are gratefully acknowledged.

I. Introduction

When analyzing the debt problem, economists have generally focused exclusively on external debt. Yet, most developing countries' public sectors with large external debts have also incurred sizable internal debts. On the other hand, debt-servicing difficulties are often caused and compounded by weak fiscal performances and a limited ability to adjust taxes and expenditures in the face of external shocks. Under these circumstances, countries have become vulnerable to capital flight and exchange rate adjustments in the event of an emerging financial gap, as the public shifts away from taxable domestic assets in anticipation of debt-service problems. Paradoxically, a country committed to honoring its external obligations may be more prone to capital flight, as domestic creditors suspect that the government may be able to maintain external debt service only at the expense of taxing domestic assets. This may explain the coexistence of the inverse capital flows observed in Latin American countries during the recent crisis: public external borrowing flowing in, private capital flowing out. 1/

The notion that investors shift away from domestic assets to avoid inflation taxes brought about by fiscal disequilibrium underlies the whole literature on speculative attacks. 2/ However, the origins and implications of the weak fiscal stance of the government have not been explored, since analysis has been limited to the consideration of an "excessive" rate of credit creation, and money is the only asset explicitly considered. It is particularly difficult to understand why the government does not implement timely corrective measures to prevent a balance of payments crisis. Nor is it clear why the public does not acquire domestic bonds, which could serve as well as foreign bonds as an inflation hedge, and which may be closer substitutes for domestic money. Ex ante, exchange risk is not a satisfactory explanation since the interest premium on domestic bonds could fully adjust to discount expected movements in the exchange rate. Moreover, in many countries, domestic banks have been offering dollar-denominated deposits. To justify capital flight and the preference for foreign over domestic instruments, it seems more appropriate, then, to extend and generalize to all domestic public debt--not only to money--the risk factor associated with the overall financial solvency of the public sector. The

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1/ This phenomenon has puzzled many observers of the Latin American scene. See, in particular, Díaz Alejandro (1984), Sachs (1984a), and Khan and Ul Haque (1985).

2/ See the seminal contribution in Salant and Henderson (1978) and in Krugman (1979). More recent contributions include Flood and Garber (1984), Obstfeld (1984 a and b), Connolly and Taylor (1984), and, in the case of Mexico, Blanco and Garber (1983). Van Wijnbergen (1985) independently developed a model relating fiscal rigidities to asset taxes and capital flows, somewhat similar to ours.

government's weak fiscal stance, which may force it to impose an inflation tax, could also induce it to reduce domestic debt servicing on bonds.

If prices are not perfectly flexible, an explanation can also be found for the exchange rate overshooting that is often the product of balance of payments crises, such as the one experienced by Mexico in 1982. With price inertia, domestic debt servicing cannot be instantaneously reduced through a devaluation-induced jump in the price level. It can, however, be reduced through a fall in the domestic real interest rate, which is possible, even with interest rate parity, if, following an initial depreciation, the real exchange rate gradually appreciates over time, reducing the return of foreign bonds in terms of domestic currency. An expectational equilibrium is thus generated as the public's fear of lower returns on domestic assets leads to a shift into foreign instruments, provoking an overshooting that enables the authorities to lower domestic interest rates without violating interest rate parity.

In this paper we develop simple models to clarify these issues, using the recent experience of Mexico as an illustration. Section II relates the occurrence of speculative attacks to the solvency of the public sector in an economy with interest-bearing debt, and perfect price flexibility but imperfect asset substitution. Unlike in the usual speculative attacks literature, endogenous lending ceilings are derived, which are fully consistent with the behavior of both domestic and foreign creditors. Section III explores exchange rate dynamics and overshooting phenomena in the opposite case of price inertia and perfect asset substitution. Section IV illustrates the results of the analysis of Mexico's recent experience, and the final section offers concluding comments.

II. Public Indebtedness and Capital Flight

Consider an economy in which prices are flexible and purchasing-power parity (PPP) holds continuously, so that the real exchange rate equals one. The government finances its deficit through domestic and foreign indebtedness. For greater simplicity, domestic debt is taken as a single aggregate with an average real interest cost r^h. Since b^h is a composite of money and bonds and r^h is the real average interest rate, r^h can take negative values even when the real rate on the bond component is positive, provided that the inflation tax on money balances outweighs the real interest rate paid on bonds. With the domestic price index as a deflator, except for the real foreign debt and interest rate, b^w and r^f, which are expressed in terms of foreign prices--the real budget restriction of the public sector can be written as:

$$g + r^h b^h + r^f b^w = t + \dot{b}^h + \dot{b}^w, \qquad (1)$$

where g and t, real expenditures and taxes, are assumed to be fixed, reflecting fiscal weaknesses; b^h is real domestic debt. Residents hold both domestic and foreign assets, but foreigners do not hold domestic assets. Consider the portfolio equilibrium condition:

$$b^h = \lambda\, b^f \exp \sigma\, [r^h - r^f], \tag{2}$$

where b^f represents privately held foreign bonds and σ the semi-elasticity of substitution between home and foreign assets. Define

$$W = b^h + b^f, \tag{3}$$

as private financial wealth. Using equations (2) and (3), we can express the total interest bill on public sector debt for a given level of private wealth expressed as:

$$R = r^f b^W + \left[r^f + \frac{1}{\sigma} \operatorname{Log} \frac{b^h}{\lambda\, [W - b^h]} \right] b^h \tag{4}$$

Define $\phi(b^h, \sigma)$ as the net asset tax revenue that can be obtained by the government, before paying the world interest rate on its debt:

$$\phi(b^h, \sigma) = r^f(b^W + b^h) - R. \tag{5}$$

Then, from equations (4) and (5):

$$\phi(b^h, \sigma) = - \frac{b^h}{\sigma} \operatorname{Log} \frac{b^h}{\lambda[W - b^h]}. \tag{6}$$

The ϕ contours have the usual inflation tax shape, as shown in Figure 1. $\phi(o, \sigma) = 0$, ϕ then rises with b^h, reaches a maximum for $b^h = \bar{b}^h$, and then falls gradually toward $-\infty$ as $b^h \to W$. As σ rises, the maximum obtainable tax revenue falls, and ϕ becomes null when $\sigma \to +\infty$, the perfect asset substitution case.

The shape of the iso-interest contours, $R(\sigma)$, is then easy to visualize in Figure 2. For $b^h = 0$, all contours corresponding to the same R intersect the vertical axis at the same point, independently of σ. For a given σ, the contours rise, as b^h becomes positive, reach

FIGURE 1

THE ASSET TAX REVENUE

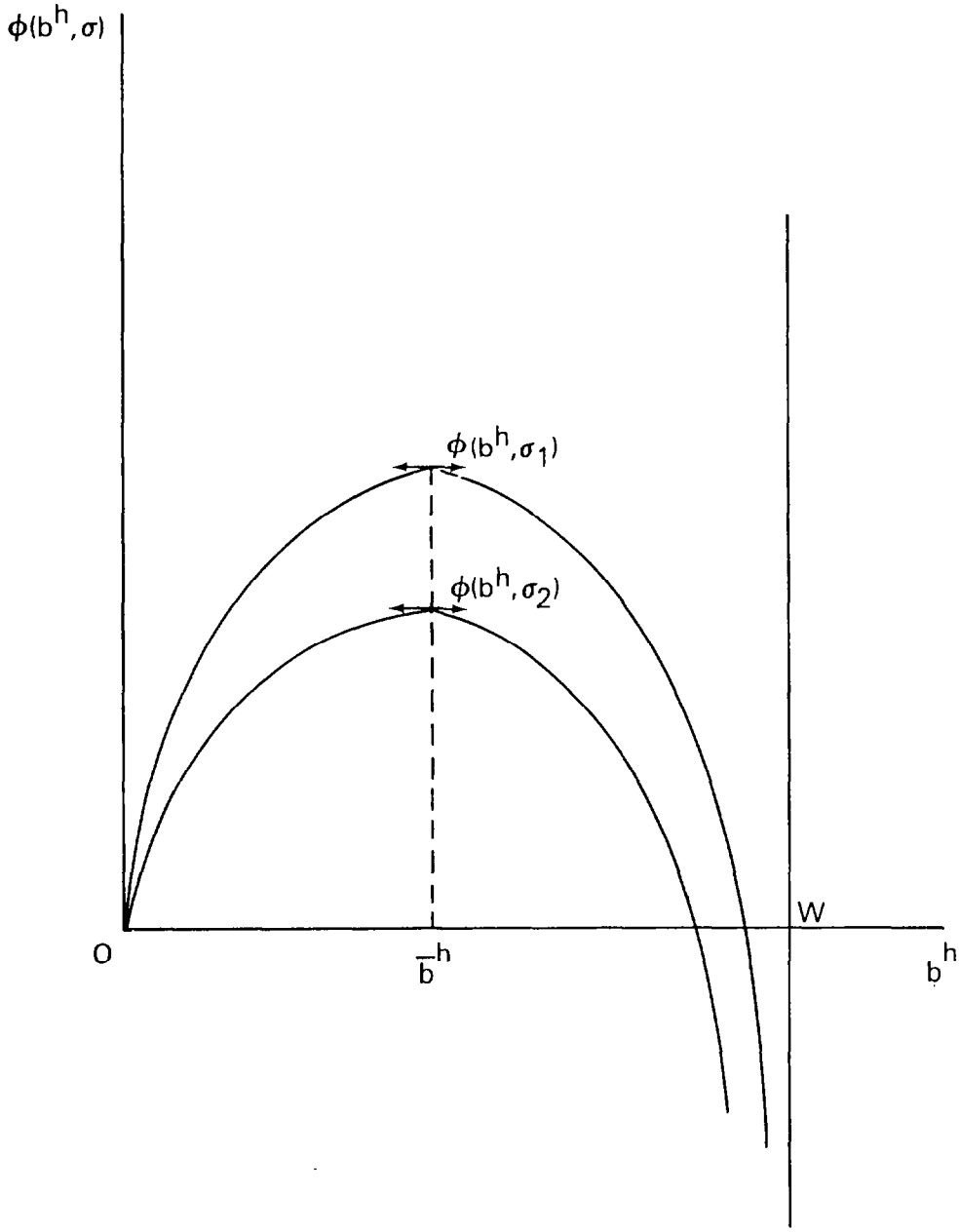
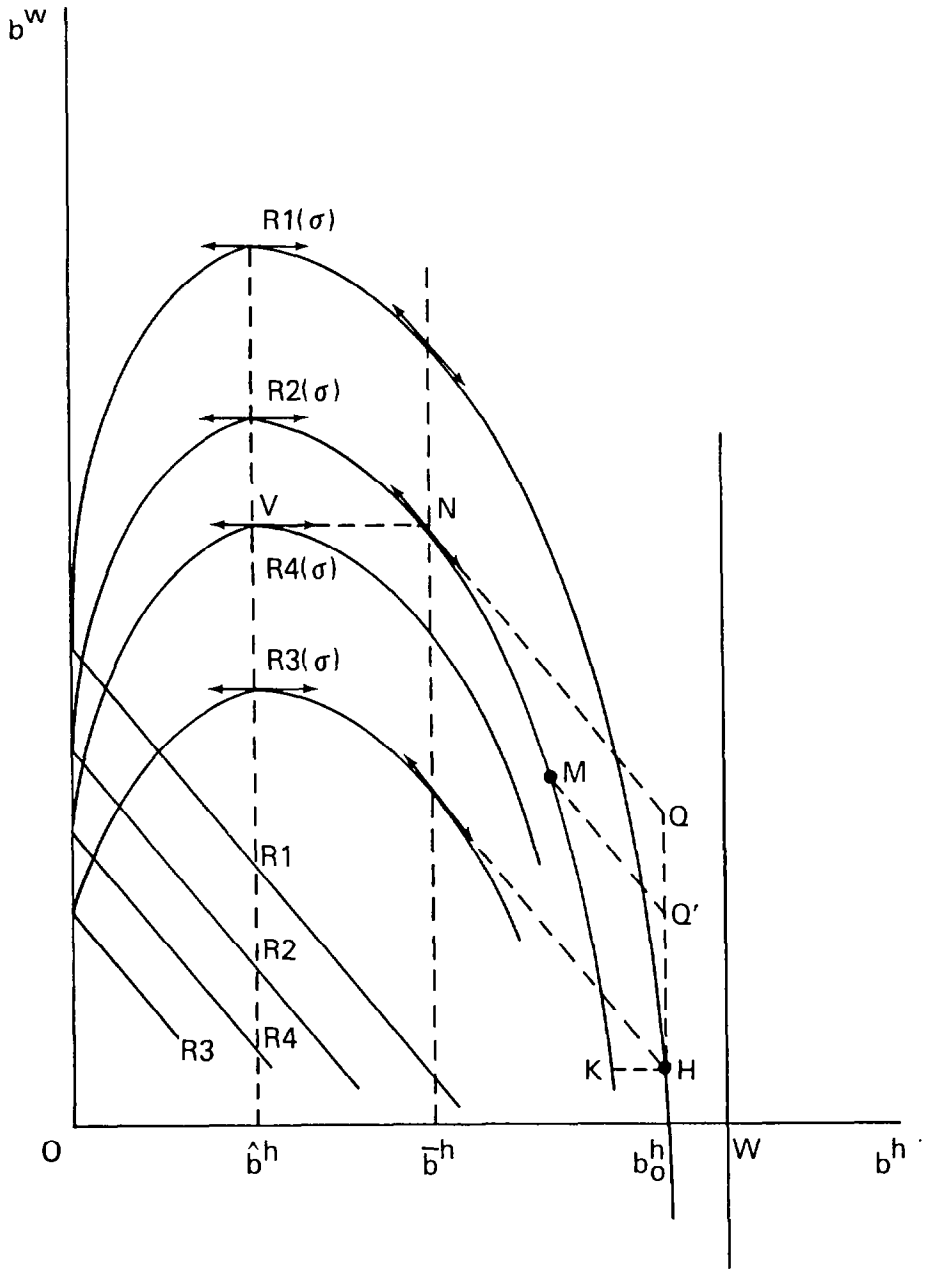


FIGURE 2

ISO-INTEREST CONTOURS



a maximum for $b^h = \hat{b}^h$, a point at which $r^h b^h$ is minimized, 1/ then start falling, have a slope of minus one for $b^h = \bar{b}^h$, and go toward $-\infty$ as b^h reaches W. As σ rises, their curvature decreases; when $\sigma \to +\infty$, they become straight lines of slope minus one, defined as R* in Figure 2.

The government can intervene by borrowing abroad and using the proceeds to reduce domestic debt. In Figure 2, this operation moves the economy leftward on a line of slope equal to minus one. For $\sigma \to +\infty$, the total interest bill remains invariant, and the economy moves on the same R* contour. When σ is finite, a marginal intervention leaves the interest bill unchanged when $b^h = \bar{b}^h$, since the slope to the R contour at that point equals minus one. Elsewhere, a change in debt composition alters R.

Consider now the following experiment: suppose that a permanent negative fiscal shock, $\Delta (t-g) < 0$, hits the economy, while the budget is initially in equilibrium, so that $\dot{b}^h = \dot{b}^w = 0$. If assets are perfect substitutes, an immediate default is unavoidable, since the total interest bill cannot be altered by intervention. A default on domestic debt is more likely to occur than a default on foreign debt, because the former is much simpler to achieve. With perfect price flexibility, all it takes is a discrete devaluation, which, by instantaneously raising the price level, reduces b^h and moves the economy horizontally to the left in Figure 2, until an R* contour is reached that is low enough to close the fiscal gap.

However, if assets are imperfect substitutes, default can be avoided if a change in debt composition can by itself reduce R sufficiently. Suppose that the economy is initially on the $R_1(\sigma)$ contour at a point such as H in Figure 2, where $b^h = b_o^h > \bar{b}^h$. Let $R_3(\sigma)$ be the minimum iso-interest contour that can be reached by intervention from H. Then if $\Delta (g-t) < R_1 - R_3$, the government remains solvent, and rational creditors, domestic or external, should be willing to finance the emerging fiscal gap through the acquisition of new debt. Assume that the government prefers to postpone defaulting on its debt as long as possible. To the extent that default on domestic debt occurs first, through a discrete devaluation, this is equivalent to having a government committed to a fixed exchange rate rule. The authorities could then, for example, increase foreign borrowing along a vertical trajectory, from H up to Q, the point from which the minimum iso-interest contour that can be reached is $R_2(\sigma)$, such that $\Delta (g-t) = R_1 - R_2$. Additional

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1/ To see this, note that $dR = r^f db^w + d(r^h b^h) = 0$ on an iso-interest contour. The slope is horizontal when $db^w = 0$, which corresponds to the point where $d(r^h b^h) = 0$, which maximizes the asset tax.

foreign borrowing beyond Q would eventually require a partial default on domestic debt, so as to maintain foreign debt servicing. Domestic creditors should at that point shift from domestic into foreign assets, forcing the government to intervene. Capital flight, financed by a large burst of foreign borrowing, would occur as a result, moving the economy from Q to N. 1/

N is the new steady state equilibrium, and the fixed exchange rate rule should be abandoned at that point. To see this, let $R_4(\sigma)$ be the iso-interest contour whose tangent to the point of maximum domestic asset taxation, V in Figure 2, goes through N. Since $R_2 - R_4 > 0$, a margin is still available to service additional borrowing, and foreign lending can, in principle, continue. However, if the government is committed to honoring its foreign obligations, any further external borrowing will require a default on domestic obligations, since the total interest bill can no longer be reduced through the reshuffling of debt created by intervention (see Figure 2). Even with a one-to-one conversion of new foreign borrowing into capital flight, the total interest bill rises and a jump devaluation remains unavoidable. Thus, any additional external borrowing should give rise to an increase of a larger magnitude in the private demand for foreign assets, as domestic creditors try to protect themselves from a certain capital loss. Since no net additional financing can therefore be obtained, 2/ a rational government should, at that point, abandon the fixed exchange rate rule and finance the deficit by a higher tax on domestic assets, made possible by a sudden increase in the rate of depreciation, as documented in the usual speculative attacks literature. 3/ Here, however, the timing of the attack is determined within the model, instead of by an exogenous stock of foreign reserves.

1/ Similar dynamics would be obtained if the deficit had initially been financed by internal borrowing. In that case, domestic borrowing first rises, and then collapses, as the economy moves back to N following a burst of capital flight.

2/ This can explain the reluctance of countries with already heavy levels of asset taxation to engage in further international borrowing, since the additional foreign debt may be immediately exchanged for domestic debt and converted into deposits abroad.

3/ Notice that, in principle, a higher inflation (and, hence, a higher rate of crawl) could be avoided if the nominal interest rate on bonds fell sufficiently to fill up the fiscal gap. In practice, however, the margin for imposing a pure interest tax on bonds without additional inflation is likely to be limited. First, because nominal rates must be positive and this constraint becomes rapidly binding unless the initial inflation rate is already high. Second, because the degree of substitutability between foreign and domestic bonds may be high. Hence, a higher inflation can be expected to be the main vehicle of asset taxation, both because it directly erodes money balances and because it allows for negative real interest rates on bonds.

Point N will only be reached by a government that is willing to postpone an exchange rate adjustment, and to keep servicing its foreign debt, whatever the final cost of taxing its domestic obligations. The associated level of inflation or of financial repression can be so high, however, that it may force the government to abandon its exchange rate policy earlier, or to contemplate a partial default on its foreign obligations as a less costly way to close its financing gap. If this is anticipated by investors, capital flight will occur earlier on the HQ segment, say at Q', such that all the desired portfolio substitution from domestic into foreign assets can be carried out before intervention ceases or foreign lending is cut off. The new ending point on the R_2 contour, M, is associated with a lower level of asset taxation. Depending, therefore, upon the perceived comparative willingness of the government to accept earlier exchange rate adjustments or higher eventual asset taxes, the economy may end up at any point of the KN segment. If the government's intentions are not known, capital flight should gradually accelerate as foreign borrowing increases, since the rising level of asset taxation that will eventually be needed makes a collapse of a pegged exchange rate more and more likely over time, either because the government may stop intervening or because foreign creditors may decide on their own to stop lending. 1/ Furthermore, since in the context of uncertainty the collapse of the exchange rate regime cannot be perfectly anticipated, a jump devaluation will necessarily occur at the time of the collapse, as documented in the speculative attacks literature. 2/

III. Price Inertia and Overshooting

In the previous model, an immediate adjustment in the debt-servicing burden following a devaluation could be obtained as a result of an instantaneous adjustment of the price level, which reduced the real value of domestic debt. However, if prices are not perfectly flexible, adjustment can only be achieved through a reduction of the real interest rate. In this section, we will show that real interest rates can be substantially reduced even when a large share of domestic debt is composed of interest-bearing instruments that are close substitutes for foreign bonds, so that interest rate parity holds. Real interest rates will fall if a large overshooting of the real exchange rate is engineered at the time of the collapse of the nominal exchange rate.

1/ The default risk on foreign loans that is implied here could be assimilated to the sovereign risk analyzed in the debt repudiation literature (see Sachs (1984b)). The defaulting benefits emphasized here are less inflation and less financial repression, which are not usually considered in the literature.

2/ See, in particular, Lizondo (1983), and Flood and Garber (1984).

Let P^{h*} be the equilibrium domestic price level obtained when PPP holds. Setting the foreign price equal to one, $P^{h*} = E$, where E is the nominal exchange rate. Suppose that P^h adjusts with some inertia toward its PPP equilibrium level: 1/

$$\frac{\dot{p}^h}{p^h} = \frac{\dot{p}^{h*}}{p^{h*}} + \nu \left(\frac{p^{h*} - p^h}{p^h}\right) \tag{7}$$

With p^h as a deflator, equation (7) may be expressed in real terms:

$$\frac{\dot{e}}{e} = \nu (1-e) \tag{8}$$

where e is the real exchange rate. Since e can differ from 1, the budget restriction needs to be rewritten:

$$g + r^h b^h + r^f e b^w = t + \dot{b}^h + e\dot{b}^w \tag{9}$$

Suppose, finally, that interest rate parity is verified, so that:

$$r^h = r^f + \dot{e}/e \tag{10}$$

then, replacing r^h from equation (10) and $\dot{e}/e$ from equation (8), and equation (9) becomes:

$$\dot{b}^h = [r^f + \nu (1 - e)]b^h + (r^f b^w - \dot{b}^w)e + g - t \tag{11}$$

equations (8) and (11) form a differential system in e and b.

We will assume that price adjustment is fast enough to allow us to neglect the impact of additional external borrowing on the stock of foreign debt. In the phase diagram of Figure 3, equation (8) is

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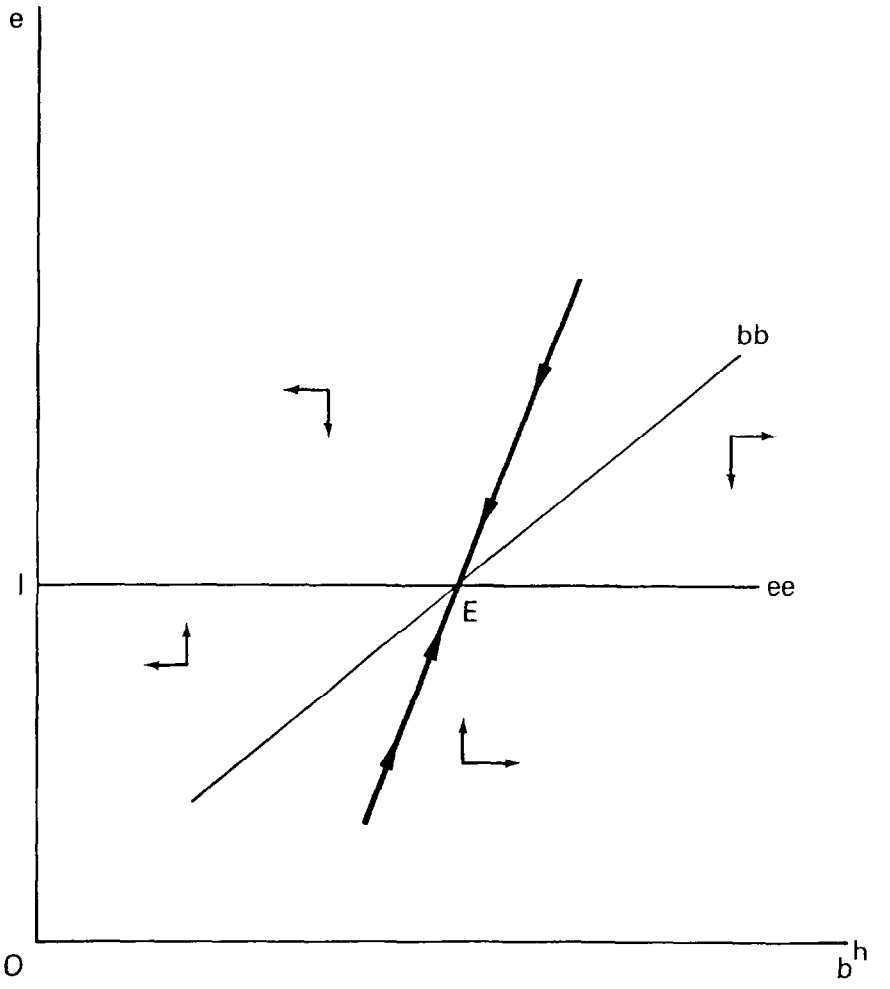
1/ A more usual adjustment equation would be of the type:

$\dot{p}^h = \dot{p}^{h*} + \nu (p^{h*} - p^h)$. However, when converted in real terms, the inflation rate becomes a determinant of the speed of adjustment. Although this would not alter in any significant way the nature of the analysis, we opted to retain a simpler formulation in real terms.

FIGURE 3

DYNAMICS OF ADJUSTMENT IN THE PRICE INERTIA CASE



simply an inertial adjustment that gives rise to a horizontal equilibrium schedule, ee. On the other hand, the bond equilibrium schedule corresponding to equation (11), bb, is positively sloped around the equilibrium exchange rate if the following condition is satisfied:

$$\nu\, b^h + (\dot{b}^w - r^f b^w) > 0 \qquad (12)$$

In this case, a higher b^h requires a compensating increase in e so as to maintain the budget in equilibrium. This is because a higher b^h implies a higher domestic debt servicing, which can be neutralized in one of two ways: by the increase in the value of net public capital inflows that is caused by a devaluation when $\dot{b}^w - r^f b^w$ is positive; or, by a reduction in r^h, which is only possible, with interest rate parity, if the exchange rate gradually appreciates after an initial devaluation. The latter effect is validated through price adjustment and applies to the value of domestic debt, hence, the first term in equation (12). Suppose then that equation (12) is verified, in particular because price inertia is not too strong, so that the first term in equation (12) outweighs the second in the case in which there are net public capital outflows. Then it is easy to check that the dynamics of adjustment have the saddle-path property (see Figure 3).

Suppose now that an unanticipated negative public finance shock, for example, a reduction in the flow of external lending, hits the budget. The bb schedule shifts leftward (see Figure 4) and the real exchange rate overshoots before converging slowly back to equilibrium. The interpretation is straightforward: the shock reduces the ability of the government to service its domestic debt. The public then shifts toward foreign bonds and the nominal exchange rate depreciates, in turn inducing a depreciation of the real exchange rate, since the price level does not jump owing to inertia. The ensuing gradual appreciation of the exchange rate toward equilibrium reduces the return of foreign bonds in domestic currency and--through interest rate parity--the interest rate on home bonds, thus allowing for the collection of an interest tax and the adjustment of public finances. As the price level starts rising, real home bond balances fall and the domestic interest rate recovers gradually, until bond balances have been reduced to a level that can be serviced at the world interest rate.

Several remarks can be made. First, the overshooting mechanism depicted in Figure 4 is the same as the one in Dornbusch's well-known 1976 paper. However, while in Dornbusch's model interest rate movements are caused by changes in monetary policy, in our model they respond to pure fiscal shocks. Second, it is interesting to note here a direct relationship between the magnitude of the overshooting and the amount of foreign public debt. As the real exchange rate jumps, following a

fiscal shock, the burden of servicing foreign obligations rises. A larger foreign debt requires a larger interest tax on domestic bonds, which in turn requires a stronger exchange rate adjustment. Third, the adjustment of domestic bond balances to the level that can be serviced by the state at the world interest rate provides a simple theory of private bond portfolio composition, if extended to a longer-term horizon that includes current account adjustments. In particular, if a certain level of real financial wealth is desired, the public will have to acquire abroad those bonds that cannot be serviced internally. Fiscally weaker countries can thus be expected to have higher shares of foreign bonds in private portfolios. Finally, given that short-term fiscal adjustment requires real exchange rate overshooting if prices are not fully flexible, and given that the more dollarized an economy the smaller its taxable base, it is clear that the existence of dollar-denominated domestic bonds tends to be destabilizing because it raises the size of the overshooting. Since the government may elect to default on its domestic dollar debt in order to avoid an excessive jump in the real exchange rate, investors may eventually lose confidence in this type of bond if their share in total domestic debt becomes substantial. This can explain why foreign dollar bonds may be preferred to their domestic counterparts.

IV. The Mexican Experience

Let us now turn to the recent Mexican experience and see to what extent it fits the story depicted in our models. Table 1 displays the budget restriction of the public sector for 1978-84, expressed in real terms (billions of 1978 pesos). 1/ The top part of the table shows the public deficit before oil income and interest payments on dollar-denominated debts, both domestic and foreign. The middle section gives income sources, oil tax income, the inflation tax on money balances, the interest tax on peso bond balances, net proceeds from increases in real money balances, real peso and dollar domestic bonds 2/, and, finally, proceeds from foreign debt. The bottom part includes a statistical discrepancy term (Δ) and, as memorandum items, capital flight and the real (yearly average) free exchange rate.

The first obvious observation is that public deficits grew steadily from 1978 to 1982, the combined result of runaway public spending and lagging non-oil revenues, the latter mostly stemming from falling real prices of goods and services produced by state enterprises. Up to 1981, the deficit was financed by rapidly growing oil revenues derived

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1/ Details on the elaboration of this table can be found in the Appendix.

2/ For an explanation of how the Mexdollar system worked, see Ortiz (1983).

FIGURE 4

OVERSHOOTING DYNAMICS

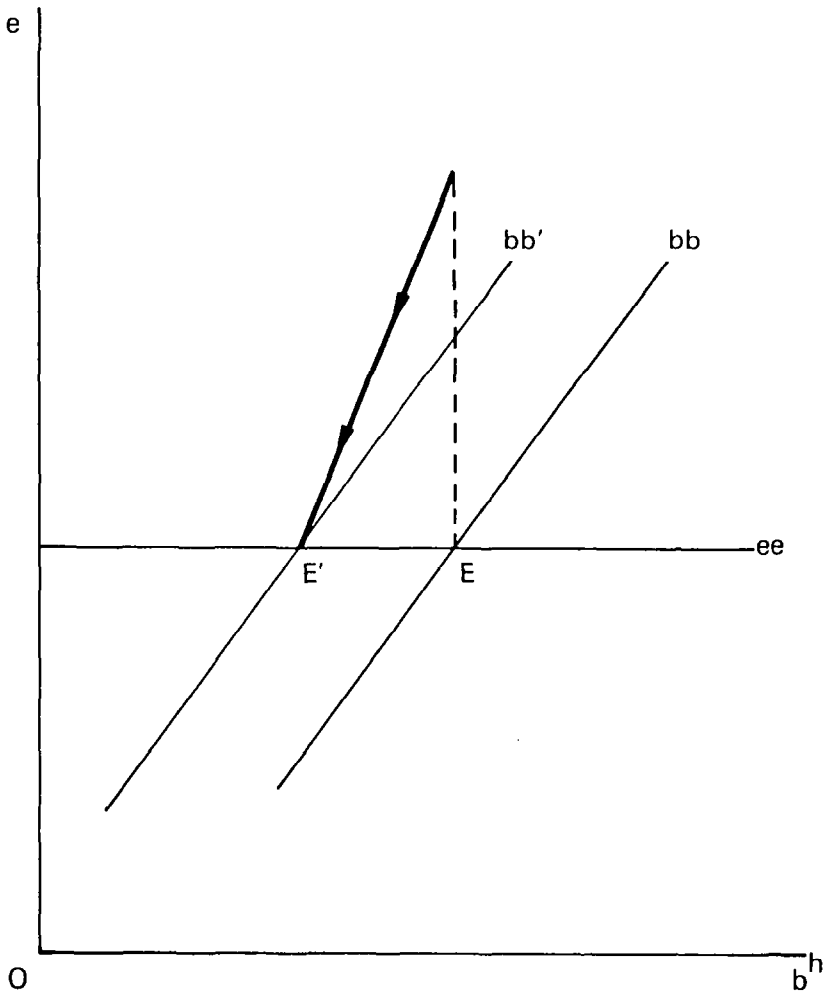

Table 1. The Budget Restriction of the Mexican Public Sector

(In billions of 1978 pesos)

	1978	1979	1980	1981	1982	1983	1984
Pre-oil deficit	109	142	236	416	429	83	78
Foreign debt interest	46	56	61	70	158	143	141
Dollar bonds interest	1	1	3	10	15	8	3
Oil income	27	38	110	122	150	190	171
Inflation tax	17	24	36	36	95	64	42
Interest tax	12	13	36	3	200	43	33
Changes in real money balances	8	18	1	2	-15	-33	-5
Changes in real peso bond balances	18	36	38	51	105	-60	-30
Changes in real dollar bond balances	--	8	20	73	-45	-31	-62
External borrowing	58	65	64	229	132	83	44
Δ	16	-3	-5	-20	-20	-22	29
Capital flight	14	21	68	160	179	105	48
Real exchange rate	22.8	19.3	15.4	12.8	24.0	24.4	18.5

from expanding exports and favorable world prices; by a steady increase in domestic credit, made possible by rapid economic growth; and by a significant tax on both money and bond balances, the latter facilitated by the continuous real appreciation of the peso. Foreign lending to the public sector from 1978 to 1980 was largely utilized to cover interest payments and did not, therefore, constitute a significant financing source over that period.

In 1980, signs of a lack of confidence in the path followed by the Government began to appear. Devaluation expectations, induced by a rapidly appreciating exchange rate, led to a growing dollarization of the economy, as reflected in the expansion of dollar-denominated domestic debt, which became the main source of domestic finance in 1981. Together with the increasing dollarization, capital flight accelerated sharply from 1980 on, reflecting growing doubts about the public sector's ability to honor its domestic debt commitments, both in pesos and in dollars.

The year 1981 marked the turning point on the path leading to the crisis. The budget deficit continued on its exploding path while oil revenues reached a plateau, mainly because of falling oil prices and the continued appreciation of the peso. Despite the fact that domestic credit still grew substantially in real terms, owing to the Mexdollar system, a huge financing gap had to be covered by foreign borrowing, which, in that single year, rose in dollar terms by as much as it had grown in the previous five years. Simultaneously, capital outflows may have reached about $8 billion, most of it in the second half of 1981, when the lack of fiscal adjustment, in the face of adverse external shocks, became quite evident. 1/

1/ An account of the economic events of this period is contained in Ortiz (1985). Apart from the lack of control over the deficit, another costly mistake of the López Portillo administration was maintaining the nominal value of the peso. In the context of our model, devaluing earlier would have been greatly desirable because it would have increased the peso revenues obtained from foreign borrowing and oil earnings. A real 50 percent devaluation, for example, would have raised oil income by 61 (1978) billion pesos and reduced the need for foreign debt by about $7 billion, even considering that the burden of servicing that debt would have risen, as a result of the higher exchange rate. By improving government finance, the reduction in foreign indebtedness would, in turn, have helped stabilize the exchange market, as seen earlier in the model.

In 1982, the peak of the crisis, the budget deficit grew even larger, a clear indication again of fiscal rigidities. 1/ The other dominant events were, of course, the interruption of foreign borrowing, following a last burst of intense borrowing to sustain the peso in the face of the large capital outflow observed from March to August; and the final collapse of the Mexdollar system in August, after investors massively lost confidence in that instrument. Mexdollars were converted into pesos at 70 pesos a dollar, while days afterward the free exchange rate shot up to 130 pesos. This clearly amounted to a partial default by the state on its domestic dollar creditors.

The ongoing fiscal deficit and the foreign debt crisis created an enormous financial gap, which could not be financed by an increase in real domestic credit, given the exhaustion of the Mexdollar system and the massive capital outflows. 2/ A portion of the deficit was financed by higher oil revenues associated with the depreciation of the peso. But even after accounting for oil income, there was still in 1982 a shortfall of 295 billion pesos which had to come, in effect, from taxes on domestic assets. As seen in Table 1, 32 percent of this shortfall was covered by an inflation tax; the rest by a huge interest tax.

The years 1983 and 1984 marked the aftermath of the crisis. The pre-oil deficit finally fell from its 430 billion pesos peak in 1982 to around 80 billion pesos, a quite impressive achievement. But, despite higher oil revenues associated with the devaluation, this reduction failed to absorb both the continued deterioration of net foreign capital inflows (-60 billion pesos in 1983 and -97 billion pesos in 1984, down from -26 billion pesos in 1982 and 159 billion pesos in 1981) and the fall in real domestic credit associated with higher inflation, negative or low growth, and the portfolio reallocation resulting from the public's preference for foreign bonds. Thus, high inflation and interest taxes were still needed; 106 billion pesos was obtained from money and 76 billion pesos from bonds.

1/ Public spending grew, although the Government had announced spending cuts on at least three occasions, in July 1981 and in February and April 1982. Its credibility was understandably damaged by those repeated failed attempts. Besides the downward rigidity of expenditures, two other factors help to explain the increase in the deficit: a fall in non-oil tax income owing to the recession, and exchange losses suffered when the Government converted Mexdollar deposits into pesos at a rate of 70 pesos a dollar. The loss was compounded by the fact that the Government nationalized a banking system that had been forced to convert dollar loans at 50 pesos a dollar only.

2/ Although real peso bond balances grew by twice as much as in the previous year, this was essentially the result of the forced conversion of dollar bonds into pesos. Altogether, money and domestic bonds grew by only 45 billion of 1978 pesos, versus 126 billion pesos for 1981.

To better appreciate how these tax revenues were collected, we need to examine the dynamics of the free exchange rate that appears in Figure 5, using the monthly closing date of the peso spot price at the New York Stock Exchange. The figure shows that overshooting reached its peak in August 1982. The free exchange rate then appreciated fairly smoothly until the end of 1984. 1/ This gradual appreciation allowed domestic real interest rates to fall below the world rate, at very negative levels in late 1982 and early 1983 and 1984, as shown in Figure 6, which compares domestic and foreign bond rates over that period, in domestic currency terms. 2/

V. Conclusions

This paper analyzes the linkages between fiscal rigidities, public debt, and exchange market adjustments. It is based on the concept that asset demand shifts between domestic and foreign bonds respond to the perceived ability of the state to service its domestic debt. In this context, internal or external shocks with an adverse public finance impact create fiscal gaps that have to be filled, in the absence of fiscal adjustment, by taxing domestic holders of public debt. Asset substitution is then likely to give rise to capital flight or to sharp exchange rate movements. We demonstrated that, with imperfect asset substitutability, capital flight could be financed by foreign borrowing. This was a rational outcome if foreign creditors expected the state to tax its domestic creditors as a means of maintaining foreign debt servicing. In turn, it was rational for domestic creditors to attack the local currency and massively convert their domestic assets into foreign bonds so as to avoid a devaluation-induced default on these assets. In contrast to methods used in the usual speculative attacks literature, debt ceilings fully consistent with rational behavior on the part of both domestic and foreign creditors of the public sector were derived endogenously.

We also showed that exchange rate overshootings are likely to occur in response to unanticipated public finance shocks if prices are not fully flexible. Price inflexibility implies that the real value of domestic debt cannot fall instantaneously, so that domestic debt

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1/ September and October 1982 are out of line owing to an expectational error motivated by a wrong setting for the controlled exchange rate during those months, at an unrealistically low level, given the rates of inflation that had prevailed since January. On the other hand, a small speculative bubble occurred in mid-1984 provoked by a combination of "bad news" concerning the inertia of inflation and the behavior of oil prices and external interest rates.

2/ The high rate of appreciation, in fact, allowed for strong premiums on pesos in all periods, except for late 1982.

FIGURE 5

REAL EXCHANGE RATES

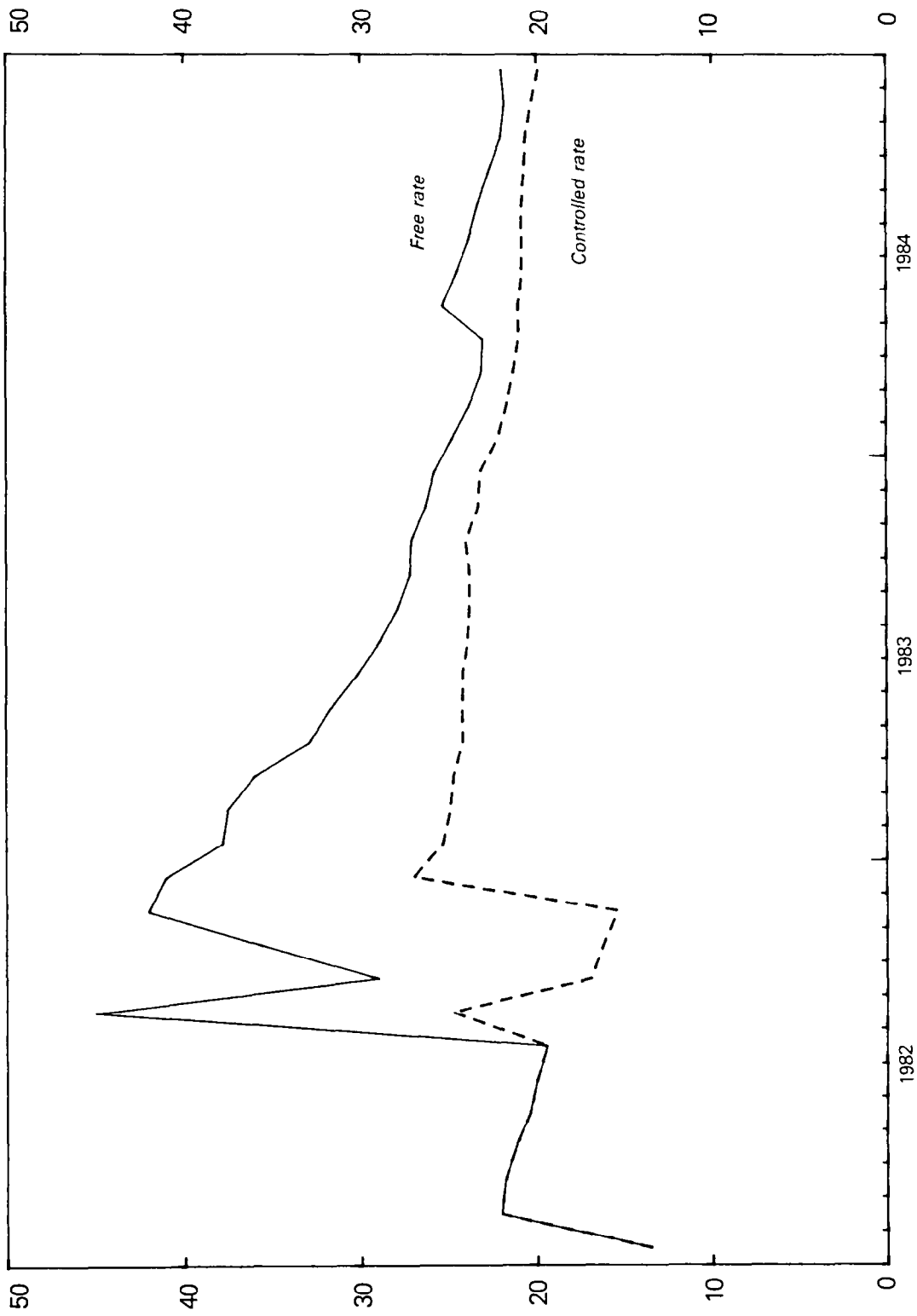
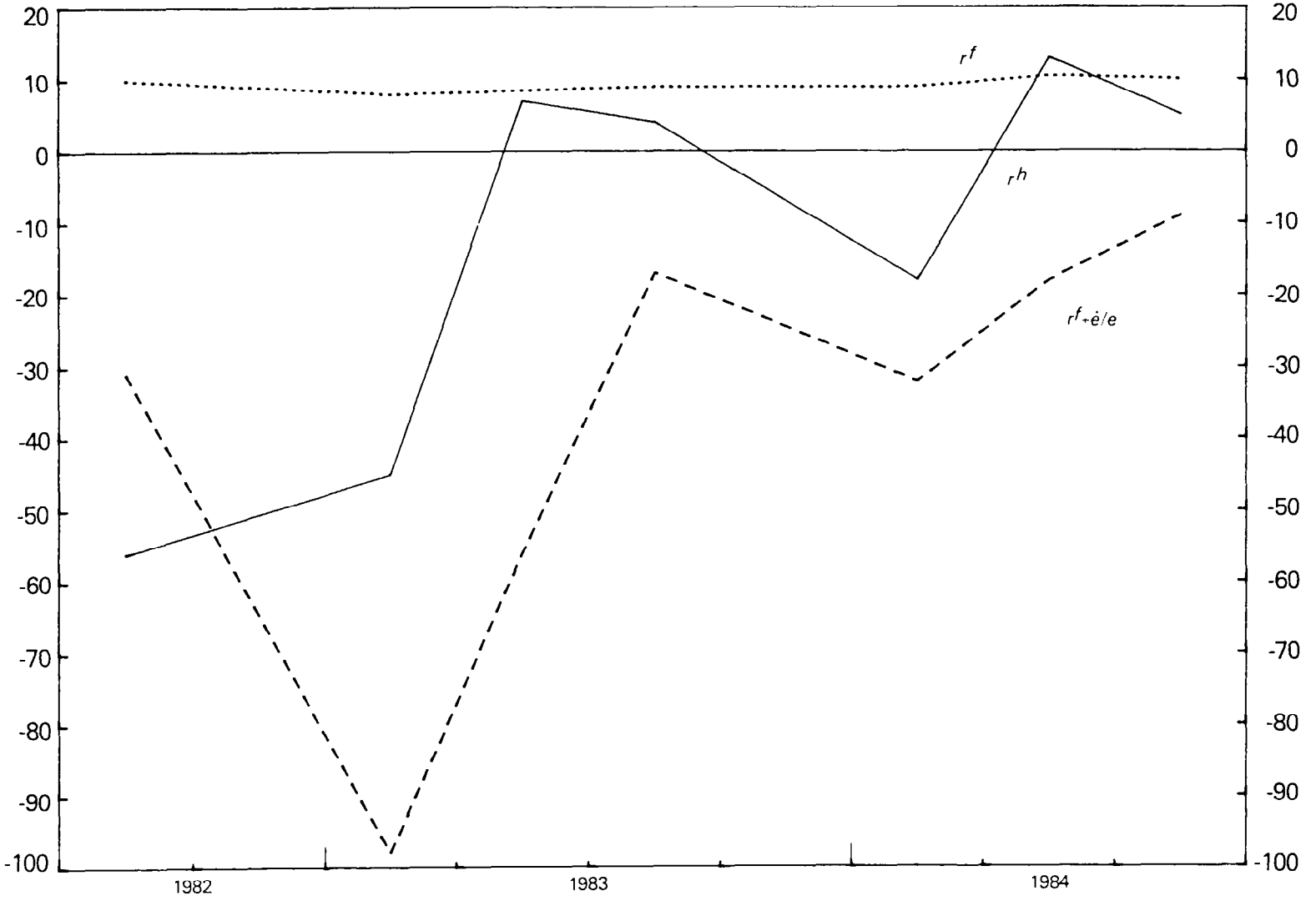


FIGURE 6

REAL DOMESTIC AND FOREIGN RETURNS

(3 month deposits, ex-port)



servicing must be reduced through a fall in domestic real interest rates. In turn, with interest rate parity, this reduction can only result from an expected real exchange rate appreciation following an initial discrete devaluation.

Although claims of rational behavior based on underlying fundamentals cannot be pushed too far, our models suggest ways in which to interpret the recent Mexican experience, that do not rely on sheer speculation and disequilibrium dynamics. Available evidence from the Mexican crisis seem to provide reasonable support for our analysis.

This approach can be extended in a number of directions. Among them, two lines of analysis in particular merit investigation: the introduction of a fully stochastic framework such as that used by Flood and Garber (1981) for their monetary model; and the analysis of fiscal rigidities and asset substitution in a richer intertemporal framework, which could integrate issues of credibility and temporal inconsistencies. 1/

1/ The concept of fiscal weaknesses or fiscal rigidities could perhaps be endogenized. In Ize and Ortiz (1983) and Ize (1985), spending rigidities are related to the set of political pressures that the government faces.

APPENDIX

Table 1: The Budget Restriction of the Mexican Public Sector

The data for the elaboration of Table 1 was obtained from "Indicadores Económicos" from the Bank of Mexico. The public sector deficit figures correspond to the concept of "financial deficit," less oil tax income and interest payments. Peso bonds were obtained as the sum of total domestic credit given by the financial sector to the public sector, plus bonds sold directly to the public. Foreign credit was obtained from balance of payments data. 1/ Finally, the figure for domestic dollar credit was computed as the flow of dollar credit granted by the financial sector, less foreign credit obtained by development banks, since this portion is already accounted for as external credit. From the comparison of the nominal figures, a statistical discrepancy term, Δ, was obtained for each year. A further separation between money and bonds was obtained by dividing domestic peso credit from banks to the public sector, into interest and non-interest bearing assets, according to the proportion of M1 into peso liabilities of the financial system.

Figures were then deflated by the yearly average consumer price index. In the case of peso credit flows, real increases were obtained by deflating end-of-period nominal balances by the end-of-period price index. The inflation tax on money balances was then computed to be consistent with this deflation procedure, and the peso bonds tax was obtained as residual.

1/ Average yearly controlled rates were used to convert balance of payments figures since it was at that rate that the state sold its foreign currency surplus to the private sector.

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