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A Brazilian-Type Debt Crisis: Simple Analytics

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This paper develops a model that captures important features of debt crises of the Brazilian type. Its applicability to Brazil lies in the facts that (1) macroeconomic fundamentals were relatively sound in the wake of the crisis (e.g., a nonnegligible primary surplus, a relatively low debt-GDP ratio, and low inflation); and (2) the trigger for the crisis—forthcoming elections with an expected regime change—appears to be extraneous. We rationalize the sort of circularity involved in a country's credit rating. In particular, we show how country credit ratings could bring about unstable macroeconomic behavior, and explore the implications of such behavior for fiscal policy. [JEL F21, F34, G15]

Brazil's public finances appeared to have been in a shambles prior to the election in October 2002. The September 2002 stand-by credit gave Brazil a critical boost, providing the central bank with an additional $16 billion in international reserves to defend its weak currency and thereby to contain the explosion of dollar-linked public debt service.[1] The package also included a promise to increase the available funds to $30 billion, if the primary surplus had increased. Because three-fourths of Brazil's debt is in domestic currency, and about one-third of this debt is

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[1]Although only $6 billion of the new arrangement with the IMF was available in 2002, Brazil's central bank was also given more flexibility under the program, which cut to $5 billion (from $15 billion) the minimum level of reserves the central bank promises to hold. Thus, in effect, the central bank had an additional $16 billion to defend its currency.

indexed to the dollar, the policy challenge was not only to defend the strength of Brazil's currency, but also to reduce the level and volatility of domestic interest rates. However, because most of Brazil's local currency debt is short term, and thus effectively indexed to the rate of interest, Brazil seems to have been vulnerable to self-fulfilling-expectations reversals in capital flows, with the country-risk ratings at the center of the expectations-coordination failure. But, since the presidential elections in October 2002 that brought to power the leftist Workers' Party, which had a history of anti-market sloganeering, the new government has worked to reassure the markets that Brazil would pay its debts, curb its budget deficits, and reduce inflation. By March 2003, Brazil's currency had appreciated and the risk premium that investors demand for holding Brazilian debt had dropped significantly (from more than 20 percentage points in October 2002 to 10 percentage points by March 2003). Did credit rating institutions contribute to an overreaction by the markets in the run-up for Brazil's 2002 election? The *Economist* (2003), though in a domestic regulation context, describes the potential circularity associated with ratings as follows:

> As ratings have been more widely used in regulation, they have begun to affect the market, in a version of Goodhart's law (that any variable chosen as a monetary-policy target immediately starts to behave differently). Because regulators and banks use ratings to assess credit risk, a rating downgrade can itself become a trigger requiring higher interest payments from a borrower or even driving it into bankruptcy. Similarly, rather as teachers often teach to the test, financial instruments are increasingly designed solely to carry a particular rating, not the other way round.

In this paper we rationalize the sort of circularity involved in country credit ratings. Our main purpose is to develop a simple, textbook-like exposition of how country credit ratings could bring about unstable macroeconomic behavior, and to explore its implications for fiscal policy. We have previously dealt with this subject in Razin and Sadka (2001). The main differences between this paper and our earlier paper are as follows. (1) Investment behavior in this paper is neoclassical, to assure the reader that no other credit frictions are crucial to the argument. In contrast, in our earlier paper investors are subject to a costly state verification to accommodate for potential defaults (as in Townsend, 1979). (2) This paper deals with fiscal policy implications, while in the earlier work we glossed over such implications. (3) The main insight to be obtained from this paper comes from a simple diagrammatic analysis. Thus, our main argument is not clouded by algebra. This paper is also related to Velasco (1996). That paper's model, however, deals with a different macroeconomic mechanism that could lead to coordination failure. Consequently, the fiscal policy implications are also quite different.

I. Textbook Model

Consider a small open economy that borrows in the world capital markets at a rate r, which includes a country-specific risk premium. Suppose that the initial stock of capital of a representative firm is $(1 - \delta)K_0$, where δ is the rate of depreciation and

K_0 is previous period capital. With this stock at hand, the firm invests at present so as to adjust its capital stock to K to maximize its value. This gives rise to a Bellman equation as follows:

$$V[(1-\delta)K_0] = \text{Max}_K\left\{\frac{1-t}{1+r}F(K) - [K-(1-\delta)K_0] + \frac{1}{1+r}\alpha V[(1-\delta)K]\right\}, \quad (1)$$

where $F(.)$ is a production function, $V(.)$ is a value function, t is a current (distortionary) tax, and α is a parameter that captures expected future corporate taxes. Naturally, higher future taxes should reduce α. Thus, the derivative of the function $V'(.)$ must always be equal to one.[2] The first-order condition is given by

$$(1-t)F'(K) = r + \delta + (1-\alpha)(1-\delta). \quad (2)$$

Because investment is irreversible no new investment occurs when

$$(1-t)F'((1-\delta)K_0) < r + \delta + (1-\alpha)(1-\delta). \quad (3)$$

Naturally, the country's credit rating is *external* to our (identical) competitive firms, and depends on some aggregate (macro) economic variables that characterize the macroeconomic state of the country. Suppose that these macro variables are two. The first variable is the growth prospect of the economy as measured by the private stock of capital (K); the second variable denotes the fiscal stance of the government, as measured by the primary surplus of the government. The higher the surplus, the less likely that the government will have to increase taxes in the future (that is, the higher also is α). Accordingly, we assume that the country-specific interest rate is a decreasing function of both (K) and α:

$$r = r(K, \alpha). \quad (4)$$

Equation (4) captures plausibly country risk rating based on aggregate macroeconomic variables, which yields a macroeconomic externality. It is admittedly ad hoc. But this reduced-form relationship is of a more general validity. It seems that this macroeconomic externality can also be rationalized in a more micro-founded relationship of this sort.

Given the current fiscal stance of the government, and the implied future taxation as captured by α; equations (2) (or condition (3)) and (4) equations (1) and

[2]Why should $V'(.) = 1$, as implied by equation (2)? The derivative of the maximand in equation (1) with respect to K yields

$$\frac{(1-t)}{(1+r)}F'(K) - 1 + \frac{(1-\delta)}{(1+r)}\alpha V'[(1-\delta)K] = 0.$$

Differentiating equation (1) totally, using the first-order condition (the Envelope Theorem) yields

$$(1-\delta)V'[(1-\delta)K_0]dK_0 = \left\{\frac{1-t}{l+r}F'(K) - 1 + \frac{(1-\delta)}{(l+r)}\alpha V'[(1-\delta)K]\right\}dK + (1-\delta)dK_0 \rightarrow V'[(1-\delta)K_0] = 1.$$

(2) jointly determine r and K. This is illustrated in Figure 1. Equation (2) is depicted by the curve AB (recall that F is concave in K). Equation (4) is depicted by the curve $E_1E_2E_3H$.

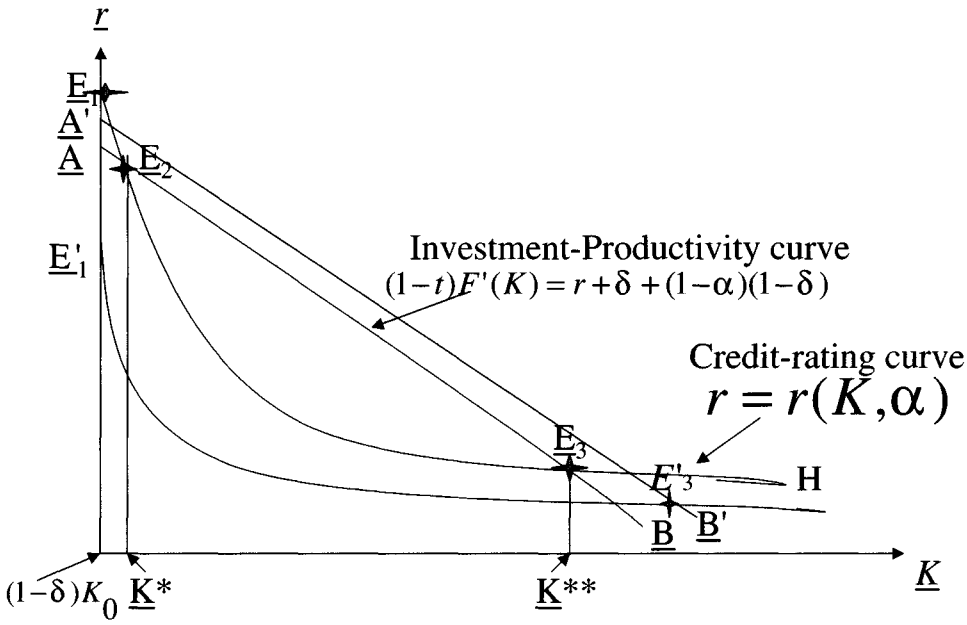
There are potentially three equilibrium points—at E_1, E_2, and E_3. We can ignore the equilibrium at E_2, as it is not Walras-stable: If the stock of private capital rises above K^*, then $r = r(K, \alpha)$ falls, and each firm will tend to further increase its capital stock, moving further away from the equilibrium; a similar divergent out-of-equilibrium process occurs if K falls below K^*.

We refer to the equilibrium point at E_1 as the "bad" equilibrium. At this equilibrium the interest rate $r[(1 - \delta)K_0, \alpha]$ is "high," above $(1 - t)F'(K_0) - \delta - (1 - \alpha)(1 - \delta)$, so that no firm will choose to invest at all, as indicated by condition (3). We refer to the equilibrium at the point E_3 as the "good" equilibrium, in which $(1 - t)F'(K^{**}, \alpha) = r + \delta + (1 - \alpha)(1 - \delta)$ and firms have incentives to increase their capital stock to K^{**} from $(1 - \delta)K_0$.

II. Self-Fulfilling Credit Ratings

Our textbook model can now be used to highlight the problem of self-fulfilling credit ratings. Suppose that the economy is initially at the "good" equilibrium: private domestic investment is relatively high and the country-specific risk premium is relatively low. However, triggered by extraneous shocks, the country may switch abruptly from this "good" equilibrium to the "bad" equilibrium. Such expectations-coordination failure may happen if some political factor serves to

Figure 1. The Stock of Private Capital and the Country-Specific Interest Rate



redirect market expectations and move the entire equilibrium point. An example of such a political factor is the emergence of a rookie candidate for presidency whose future policies are uncertain in the eyes of international investors. Creditors would then shift their beliefs about the country's creditworthiness, which in turn would shift the market. These beliefs (that the country is at high credit risk) then become self-fulfilling and, indeed, the country's investments dry out.[3]

III. Corrective Policies

A possible remedy is to raise the primary surplus. This would reduce future taxes, increase α, and shift the curve $E_1E_2E_3H$ downward to $E_1^1E_3^1$. The primary surplus increases by cutting spending, rather than by raising current taxes (in this case, t does not change). Therefore, the increase in α also shifts out the curve AB to $A'B'$. In this case, the "bad" equilibrium (and also the unstable equilibrium) may altogether disappear. Despite the initial decline in the country's credit rating that made the country land on the bad equilibrium point E_1, the country moves to a new "good" equilibrium with an even better credit rating and more investment. If, however, the primary surplus is raised by increasing current taxes and not by cutting spending (that is, by increasing t,) then the curve AB need not shift out at all. In this case, all three equilibria may remain, and the country is still vulnerable to self-fulfilling credit-rating crunches.

Thus, raising the primary surplus as such is not necessarily a cure for a Brazilian-type debt crisis. It is effective when the policy is a government spending cut, but not necessarily when taxes are raised.

IV. Conclusion

Our simple credit-rating model captures key features of the Brazil-type debt crisis. Its applicability to Brazil lies in two common features.

(1) Both in the model and in the case of Brazil, macro fundamentals are not shaky (e.g., the primary surplus in Brazil in the wake of the crisis was about 2.25 percent of the GNP).

(2) Both in the model and in the Brazilian case, the "coordinator" of market expectations that shift the market outcome is extraneous to the market economy. In Brazil the expectations coordinator appears to have been forthcoming elections with a possibility of regime change.

Recently, to tackle the crisis Brazil raised its primary surplus target to 3.75–4.25 percent of GDP; as in our model, in the preceding section. Whether Brazil can return to robust growth seems to depend crucially on whether lower interest rates can be restored, as in our model.

[3]See our earlier paper (Razin and Sadka, 2001) for a similar mechanism that creates boom-bust cycles. A related treatment is Calvo (1988), which is concerned about the debt-service issue.

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