A Note on Brazil and Debt Dynamics

Econ 434

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Brazil has a new President. He faces tough choics. Net public sector debt is large (see figure 1) and a lot of it is linked to the dollar. So as the real has weakened the share of debt to gdp has risen. The question is whether Brazil can continue to service the debt or whether it will default, and if so, on foreign or domestic debt. At the end of June 2002, net public debt equaled
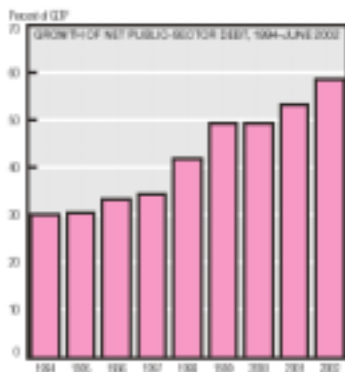

Figure 1: Growth of Net Debt

58.6% of the country's GDP or roughly $265 billion (equivalent), of which foreign investors held approximately 21%. About 42% of Brazil's net public-sector debt is linked to the U.S. dollar, so that movements in the dollar's exchange rate against the Brazilian real directly affect the real value of the debt.

It could be that Brazil will just default. After all, Lula has been sympathetic to this in the past. Moreover, if Argentina was forced into default

when everyone in the country tried so hard to avoid it, then should we be shocked if a sympathetic (to default) President examines his options and chooses this?
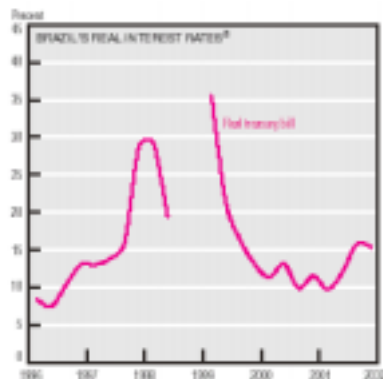

Figure 2: The Lula Premium?

On the other hand, one might note that interest rates and exchange rates have been suffering from a Lula premium for a long time. The chance that a President sympathetic to default caused a premium to be attached to the price. Now that he is President, if he does not default, and takes convincing action – some painful steps that nobody would choose if they were going to default – then the premium could go away. Then the Lula premium might fall significantly.

If the cost of servicing its debt outpaces its ability to raise revenue for that purpose, Brazil's debt-to- GDP ratio will continue to rise. Economists typically measure the costs of servicing debt by a real (or inflation-adjusted) interest rate and use the nation's real GDP growth as a proxy for its ability to service debt. We do not know how real interest rates and Brazil's economic growth will evolve over the coming years, but we can measure the prospects for its debt-to-GDP ratio under a range of possibilities. In the calculations, these values represent 10-year averages, so the exercise permits some variation, provided that any deviations from these values are eventually offset.

How do we figure out debt dynamics. Let the $b = \frac{B}{PY}$ be the ratio of public debt to GDP. Our interest is whether this ratio is stable or not; that is what

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happens to $\frac{\Delta b}{b}$? Public debt is stable if this growth rate is not positive. Now

$$\frac{\Delta b}{b} = \frac{\Delta B}{B} - \frac{\Delta(PY)}{PY} \tag{1}$$

since if the debt grows faster (slower) than gdp the debt-dgp ratio must rise (fall). Now what is ΔB equal to? The debt grows for two reasons, a primary deficit (PD) and interest on past debt, and GDP grows at the rate of real growth (x) plus inflation (π), so we can write:

$$\begin{aligned}
\frac{\Delta b}{b} &= \frac{PD + iB}{B} - (x + \pi) \\
&= \frac{PD}{B} + i - (x + \pi) \\
&= \frac{PD}{B} + r - x
\end{aligned} \tag{2}$$

where the last line follows from the Fisher effect. It is sometimes convenient to re-write expression (2) as:

$$\begin{aligned}
\Delta b &= b \left[\frac{PD}{B} + r - x \right] \\
&= \frac{PD}{PY} + (r - x)b \equiv pd + (r - x)b
\end{aligned} \tag{3}$$

If the real interest rate exceeds the growth rate then the debt ratio goes up even if there is no primary deficit.

Notice that a stable debt ratio implies that $\frac{\Delta b}{b} = 0$. This implies, using (3) that

$$-pd = (r - x)b \tag{4}$$

in other words, the primary surplus (negative deficit) as a share of gdp needed to stabilize the debt increases with $r - x$. Higher growth or lower real interest rates accomodate a lower primary surplus.

We can make some rough calculations using actual data: $b = 58.6$, $ps = 3.75$. In figure 3 we plot what happens to b with different values for x and r. What is evident from these rough calculations is how sensitive debt dynamics are to these values. Notice that as the interest rate rises from 9.1% to 10% we go from stable debt ratios to rising, and to explosive when $r = 11\%$. Note further that Brazil's GDP has grown only 2.7% per year on
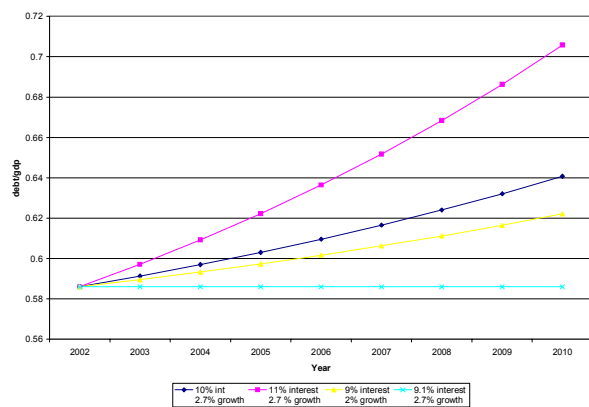
Figure 3: Debt Dynamics to 2010 under different scenarios

average since 1986, with a range of –0.5% in 1992 to 7.0% in 1986. Similarly, between 1996:IQ and 2001:IVQ, the average annual real interest rate on Brazil's treasury bills equaled 15%, with a median value of 13%.

Notice that an improvement in the primary surplus can have a dramatic effect. This is evident if we ask what happens if the primary surplus moves from 3.75% to 5% of GDP. In figure 4 we can see that in the alarming scenario of 11% real interest rates and 2.7% growth, an increase in the primary surplus to 5% causes debt dynamics to shift from very unstable to quite stable.

Our simple calculations suggest that Brazil must maintain a rate of economic growth consistent with that achieved in its relatively prosperous years. The key uncertainty is real interest rates. Interest rates in large part mirror investors' confidence, which depends partially on developments that Brazil can affect and partially on world events beyond Brazil's control. The recent $30 billion IMF loan package may assuage investors' fears in the short run. But a lot of it is conditional on policy – it remains to be disbursed. So until uncertainty is reduced, rates remain high.

Notice that Brazil is primarily a victim of fear. Interest rates are extremely high by historical standards. Why? Because investors are scared of default. This has raised the cost of servicing the debt and made default a reality. It is a bad equilibrium. It is not the only equilibrium. Clearly if the risk premium were lower then the debt is sustainable on current performance, and hence there is no reason for default. Indeed, looking at what happened to interest rates (figure 2) and exchange rates (figure 5) in Brazil because
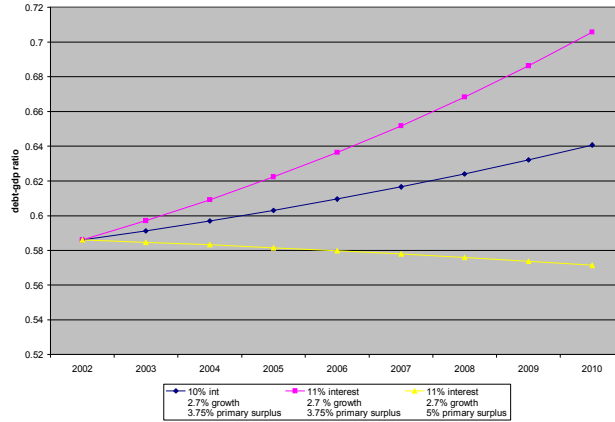
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Figure 4: Debt Dynamics with alternative values for primary surplus

of the panic suggests that there could be profit opportunities if only values returned to normal levels. Investors could hold long positions in the real and if it returns to the 1999 levels they make a killing. But this will only work if enough investors shift sides to defeat panic. In other words the equilibrium must switch. But no investor will want to switch on his/her own.

The problem here is coordination failure. To see this suppose we analyze it as a 2×2 game, with the two agents being foreign investors (FI) and the government. Of course foreign investors are not one player, but many – this is what makes coordination hard. Let the two actions for the FI be to panic or not panic. And for the government it is to default or not. Then we have:

		Government	
		Default (D)	No default (ND)
FI	Panic (P)	$-x, -x$	$-x, -2x$
	No panic (NP)	$-2x, -x$	x, x

$$(5)$$

where the payoffs to the FI are listed first.[1] What is evident from these illustrative payoffs in this payoff matrix (5) is that if the government chooses

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[1]Notice that it would be more likely that the payoffs resemble:

		Government	
		Default	No default
FI	Panic	$-x, -x$	$-.75x, -2x$
	No panic	$-2x, -.75x$	x, x

D, then the payoff to the FI from panicking (write this as $\theta^{FI}(P, D) = -x$) is greater than if they do not panic ($\theta^{FI}(NP, D) = -2x$) Similarly, the payoff to the government of defaulting is greater than that of not defaulting when investors panic, since $\theta^{G}(P, D) = -x > \theta^{G}(P, ND) = -2x$. So the outcome of $[P, D]$ is an equilibrium. Given that foreign investors panic government wants to default, and given that government wants to default investors want to panic. So there are two equilibria: $[P, D]$ and $[NP, ND]$. Of course the latter dominates for everybody. The question is how to get there.

The problem for policy is how to get out of the bad equilibrium and into the good one. This requires government to do something to coordinate investors expectations.

One adjustment that Brazil can undertake to avoid default is increasing its budget surplus by selling state-owned assets, raising taxes, or cutting public spending. Brazil currently has a primary surplus, consisting of its budget balance less interest payments, equal to 3.75% of its GDP. A higher primary surplus expands the range of real interest rates and economic growth that is consistent with a lower debt ratio. This is a hard task, but the alternative may be harder.
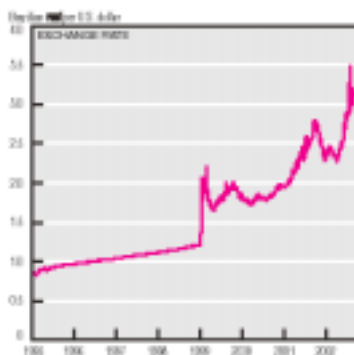

Figure 5: The Lula Premium in the Real

If the FI do not panic the government is better off in the default case than if there is panic. They were able to borrow more before repudiating debt. Not clear, however about the outcome of panic plus no default. Given that there is no default the foreign investors who panicked have lost some extra returns. So one could argue that they are worse off now than if there had been a default.