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Brazil is walking on a fence between sustainable and unsustainable public-debt dynamics. How it treads could affect not only its own economic prosperity but that of its neighbors, emerging markets in general, and U.S. financial institutions in particular. Relatively small improvements in Brazilian economic conditions and a continuation of that country's recent fiscal improvements could push Brazil in the right direction, particularly if the dollar continues to depreciate.

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Introduction

Since the adoption of its Fiscal Stabilization Program in 1998, Brazil has substantially improved in fiscal position. Even as economic activity stagnated last year, that country managed to maintain the momentum of its fiscal reforms. Its primary budget surplus—receipts minus non-interest expenditures—rose, and its debt-to-GDP ratio ticked down. Risk spreads on Brazilian debt narrowed.

Nevertheless, the Achilles' heel of sustained economic prosperity in Brazil remains that country's public-debt burden. High and growing levels of debt increase the chances that Brazil might default on its obligations, either through an outright repudiation of its contractual commitments to lenders or through inflation and currency depreciation. These prospects cause investors to demand a risk premium, which raises real interest rates in Brazil and reduces investment, employment, and growth in that country.

Since Brazil is Latin America's biggest economy and the world's twelfth largest, default there could have serious consequences for the region, for emerging markets in general, and for U.S. financial institutions in particular. Debt problems in one emerging market often spill over into others, particularly those shouldering large debt burdens, as lenders grow increasingly cautious and attempt to reduce their exposures. With the emerging-market debt situation growing somewhat more precarious in recent years, so have the prospects for debt contagion.

According to the IMF (2003, p. 115), the public debt burdens of a broad range of emerging-market economies increased sharply in the last half of the 1990s after declining during the first part of that decade. The gross public-debt burden among emerging markets now averages approximately 72 percent of GDP and exceeds that of developed economies (65 percent). This pattern has raised concern about the debt's viability because emerging markets generally have not been able to sustain the same levels of debt as developed countries. The IMF (2003, p. 118) reports that in 55 percent of all defaults, the gross debt burden was less than 60 percent of GDP in the year before the default, and in 35 percent of the cases, the debt burden was less than 40 percent. Brazil's gross debt burden approached 80 percent of GDP in September 2003.

Serious debt problems currently affect Argentina, Ecuador, and Uruguay. Bolivia, Paraguay, and Venezuela face budget problems. A Brazilian default would almost certainly shake investors' confidence and have serious spillover effects on these Latin American countries, if not the entire region. The broader the contagion, the more problematic it becomes for the United States.

U.S. banking organizations hold approximately \$97.5 billion in total claims on emerging-market economies.¹ Approximately 58 percent of this lending (\$56.8 billion) is to Latin American countries. Next to Mexico, Brazil is our largest Latin American borrowing country. Brazil accounts for nearly one-third (\$18.2 billion) of all U.S. bank claims against Latin America. A default in Brazil, especially one that rippled through other emerging markets, would affect U.S. banking organizations and complicate monetary policy.

Since the International Monetary Fund's extension of a \$30 billion loan facility in August 2002, concerns about Brazil's debt have waned somewhat, but the situation remains tenuous. The prospects largely depend on the contours of Brazil's near-term economic development. In this paper, we assess the sensitivity of Brazil's public-debt burden to alternative scenarios for that country's economic growth and real interest rates. Under certain combinations of these variables, Brazil's public-sector

1. These data are from the Federal Financial Institutions Examination Council (2003) and pertain to the survey responses of 72 U.S. banking organizations.

debt could become unsustainable; that is, the costs of servicing its public debt would outpace the country's ability to generate revenues for that purpose. Investors would flee, and Brazil could only hope to avoid default by undertaking severe austerity measures.

The results of our analysis are cautiously optimistic. Brazil's past performance indicates that the necessary economic conditions are attainable, but it also suggests that they may prove difficult to sustain in a world buffeted by economic shocks. Brazil can, however, improve its chances for debt sustainability by continuing its recent fiscal reforms, especially by maintaining a primary budget surplus near the current 5.10 percent of GDP. These findings update and echo similar conclusions found in Goldfajn (2002), Goldfajn and Guardia (2003), and Williamson (2002).²

Brazil's Public Debt

In September 2003, Brazil's consolidated net public-sector debt equaled \$304.3 billion (equivalent) or 57.7 percent of that country's GDP (see table 1).³ This consolidated amount includes the net debt of the general government—that is the federal, state, and local government sectors (including social security)—plus the net debt of government-owned enterprises and Brazil's central bank.

This figure, however, may be a somewhat imprecise measure of the overall debt burden. For one thing, it subtracts from Brazil's gross debts certain assets held by the government, government-owned enterprises, and the central bank. Such assets should be subtracted only if Brazil can readily use them to service its debts. According to Banco Central do Brasil (2003, table 37), approximately \$124.2 billion (equivalent) of general government assets—an amount equal to 23.6 percent of Brazil's GDP—was available to offset debts in September 2003. The Bank considered slightly more than one-half of these assets to be liquid, which makes them particularly well suited for redeeming debt on short notice (see Goldfajn, 2002, p.13). The 23.6 percent figure, however, also includes investments in several constitutional funds, resources in the Labor Assistance Fund, and credits to public enterprises that are considerably less liquid. They are

2. See also Favero and Giavazzi (2002) and Goldstein (2003).

3. Throughout this paper, we convert Brazil's public debt to dollar equivalents at 2.928 reais per dollar, the exchange rate at the end of September 2003. Original data are from the Banco Central do Brasil (2003).

TABLE 1 | BRAZIL'S PUBLIC-SECTOR DEBT

	R\$ (billions)	% GDP	US\$ (billions)
Gross public-sector debt	1230.4	79.7	420.2
Assets	363.6	23.6	124.2
Net public-sector debt	891.1	57.7	304.3
General government	866.9	56.2	296.1
Central bank	2.0	0.1	0.7
Government-owned enterprises	22.2	1.4	7.6
Net public-sector debt	891.1	57.7	304.3
Domestic	702.7	45.5	240.0
External	188.4	12.2	64.3
Gross public-sector debt			
Domestic	793.3	62.0	270.9
External	227.2	17.8	77.6

NOTE: GDP = R\$1543.6 billion, September 2003; Reais per \$ = 2.928, September 30, 2003.

SOURCES: Banco Central do Brasil, September 2003; and Board of Governors of the Federal Reserve System.

potentially available over a longer-term horizon. Other illiquid governmental assets, such as state-owned enterprises and land, are not included in this 23.6 percent, but conceivably Brazil could also use these assets to meet debt obligations (see Favero and Giavazzi, 2002, and Goldstein, 2003). In the calculations that follow, we stick with the official estimates of net consolidated debt listed in table 1, as Goldfajn (2002) and Goldfajn and Guardia (2003) do in their debt-sustainability analysis, but adjustments in our analysis could be made to reflect alternative assumptions about the liquidity of some assets and the ability to use them for debt service.

In addition to the difficulty of ascertaining which assets are potentially available to help service Brazil's gross debts, the official, publicly announced level of overall debt may understate that country's true total. As part of its fiscal reforms, Brazil began adding some heretofore hidden liabilities—euphemistically called skeletons (as in “skeletons in the closet”)—to the consolidated public-debt totals in 1996. Goldfajn and Guardia (2003, p. 14) calculate that roughly half of the increase in the debt-to-GDP ratio from 1994 to 2002 (30 percent to 56.5 percent) was due to the recognition of these skeletons. They also suggest that additional hidden liabilities could come to light in the future, and they augment their debt calculations by 0.65 percent of GDP in 2003 and 0.75 percent of GDP per year between 2004 and 2007. Again, we stick with the official data and do not make adjustments for additional skeletons.

Brazil's net public-debt burden has burgeoned since 1995, despite substantial fiscal reforms, because of high real interest rates, currency depreciation, slow economic growth, and the inclusion of the skeletons. Brazil's net public debt is generally short-term in nature, and sensitive to interest rate changes. Williamson (2002, p. 5) estimated that roughly 37 percent is linked to Brazil's overnight interest rate (SELIC), but this percentage is now probably higher because of changes in the portion of the debt that is linked to the dollar (see below). In addition, a small portion is tied either to the inflation rate or to other indexes that help protect nominal returns from economic shocks.

Foreigners hold only 21 percent of Brazil's net public debt, but approximately 26.5 percent of the total debt is linked to the U.S. dollar and is therefore directly responsive to changes in the exchange value of the Brazilian *real* relative to the U.S. dollar. Goldfajn and Guardia (2003, p.14), for example, estimate that had the Brazilian *real* not depreciated between 1994 and 2002, the debt burden would have risen only to 42.5 percent of GDP instead of 56.0 percent.⁴

The remainder of this paper explores the sensitivity of Brazil's debt-to-GDP ratio—officially put at 57.7 percent in September 2003—to changes in real interest rates, economic growth rates, fiscal policy, and exchange rates. The calculations are clearly back-of-envelope in nature. We do not posit a particular type of underlying economic shock, nor do we allow for the intricate real-world interactions that would take place among these variables. The results, nevertheless, set out a range of alternative economic and budgetary assumptions that indicate when Brazil's debt burden will fall or rise, and therefore, suggest the chances for debt sustainability in Brazil.

4. Over the past year, Brazil reduced the dollar-linked proportion of its public debt from 40.7 percent to 26.5 percent. Goldfajn and Guardia (2003) use the older percentage.

Debt Dynamics

Brazil's net public-sector debt is sustainable if that country can meet its obligations without a major policy change (see International Monetary Fund, 2002a). This implies that the level of debt does not exceed the country's ability to routinely service it. Since a country's capacity to generate revenue for fulfilling its debt obligations ultimately depends on its economic growth rate, economists typically assess sustainability in terms of a debt-to-GDP ratio.⁵ Brazil's debt-to-GDP ratio—its debt burden—cannot rise indefinitely and remain sustainable.

Whether Brazil's debt burden rises or falls depends largely on how that country's economic growth rate compares with its real interest rate. The year-to-year change in Brazil's net public debt is equal to the interest cost of its outstanding debts from the previous year less any additional surplus revenues available to reduce that debt; that is:

$$1) \quad D_t - D_{t-1} = r_t \cdot D_{t-1} - S_t^p,$$

where D_t is the outstanding government debt in period t , r is the real interest rate on government debt, and S^p is the primary budget surplus (see Carlson and Stevens 1985). The primary budget surplus equals public-sector receipts less non-interest expenditures.

Expressing the arguments of equation 1 as ratios to GDP provides an equation for the debt burden, d_t :

$$2) \quad d_t = \left(\frac{1 + r_t}{1 + g_t} \right) d_{t-1} - s_t^p.$$

5. To the extent that Brazil's debt is denominated in dollars, measuring the ability to service these debts in terms of GDP may be somewhat misleading. To service dollar-denominated debt, Brazil must earn dollars through its exports. Using GDP, instead of exports, implicitly assumes that Brazil can potentially direct all of its GDP into exports. In a later section we look at the effects of currency revaluation on Brazil's budget situation.

TABLE 2 | BRAZIL'S ECONOMIC PERFORMANCE

	Real GDP (% change)	Inflation (%)	Treasury bill rates	
			Nominal (%)	Real (%)
Average 1984–1993	2.8	614.2	NA	NA
1994	5.8	2074.7	NA	NA
1995	4.2	66.0	49.9	-16.1
1996	2.7	15.8	25.7	10.0
1997	3.3	6.9	24.8	17.9
1998	0.1	3.2	28.6	25.4
1999	0.8	4.9	26.4	21.5
2000	4.4	7.1	18.5	11.4
2001	1.3	6.8	20.1	13.2
2002	1.9	8.4	19.4	11.0
2003	0.6	13.6	24.6	11
2004	3.5	6.2	NA	NA

NOTES: GDP for 2003 and 2004 and inflation in 2004 are IMF projections. Interest rate and inflation for 2003 are averages of the first eight months. Real interest rates equal the nominal interest rate less the inflation rate.

SOURCES: IMF World Economic Outlook, September 2003, Tables 6 and 12; and IMF International Financial Statistics, IMF Press Release #03/217.

In equation 2, the lowercase letters designate ratios to GDP for the corresponding uppercase letters from equation 1, and \dot{g}_t is the real growth rate of output in period t .⁶ As equation 2 indicates, for any given primary surplus and initial debt burden, the debt will continue to rise relative to GDP if the average real interest rate on that debt exceeds the growth rate of the economy.

Consistent with equation 2, the real rate on Brazil's Treasury bills, which we use as a proxy for the average interest rate on Brazilian public debt, has almost always exceeded that country's real growth rate since 1995, and Brazil's debt ratio has risen (see table 2). An increase in Brazil's primary budget balance from an average deficit of 0.4 percent of GDP between 1996 and 1998 to a primary surplus of 5.1 percent of GDP in September 2003 helped limited the rise in Brazil's debt ratio.

Table 3 shows the change in Brazil's debt-to-GDP ratio over the next 10 years under a range of assumptions about real GDP growth and the average real interest rate on this debt. The calculations start with the September 2003 debt-to-GDP ratio—57.7 percent—and assume that Brazil's primary budget surplus as a percent of GDP remains at its current target of 4.25 percent on average over the next 10 years.

If recent patterns serve as a reliable guide to the future, Brazil is not likely to sustain a rate of economic growth over the next decade at the high end of our assumptions in table 3. Between 1984 and 2002, Brazil's economy expanded at a relatively low 2.8 percent average annual rate. Since 1994, year-to-year growth has ranged from 0.1 percent in 1998 to 5.8 percent in 1994.⁷ The International Monetary Fund (2003a) believes that Brazil only grew 0.6 percent in 2003 but anticipates a 3.5 percent growth rate in 2004. This is substantially below Brazil's potential growth, which Banco Central do Brasil estimates at 4.5 percent, an estimate that equals the high end of our assumptions.

The range of Brazil's real interest rates since 1995 is so large as to make the average (11.7 percent) a rather unsure forecast of the future. Nevertheless, it falls in the upper half of our assumptions. Based on the data in table 2, a range of 10 percent to 13 percent seems conceivable, and 8 percent to 10 percent seems optimistic.

The combinations of economic growth and real interest rates that could achieve a decline in Brazil's consolidated net public-debt ratio over the next decade seem to be within that country's reach, but lie on the more optimistic end of the assumptions. A 3.5 percent average rate of GDP growth and a 9 percent real interest rate, which underlie Goldfajn's and Guardia's (2003) projections, would lower the net public-debt ratio from 57.7 percent to 42.6 percent by 2013 according to our estimates. This

6. Although the mathematics suggests that equation 2 should include nominal interest rates and nominal growth rates, economists typically employ real variables. Implicitly, they are holding inflation constant.

7. In 1994, Brazil instituted a new currency, the real, and a crawling peg exchange rate mechanism. These changes "proved a turning point for macroeconomic policies" (International Monetary Fund, 2002, Box 1.4).

TABLE 3 THE CHANGE IN BRAZIL'S DEBT-TO-GDP RATIO UNDER ALTERNATIVE ECONOMIC ASSUMPTIONS (percentage point change over 10 years)

Interest rate	GDP Growth				
	2.0%	3.0%	3.5%	4.0%	4.5%
8.0%	-11.2	-18.1	-21.2	-24.2	-27.0
9.0%	-4.0	-11.6	-15.1	-18.4	-21.5
10.0%	4.0	-4.5	-8.4	-12.0	-15.4
11.0%	12.7	3.3	-1.0	-5.0	-8.8
12.0%	22.2	11.9	7.2	2.7	-1.5
13.0%	32.6	21.2	16.0	11.1	6.5

NOTE: The initial debt-to-GDP ratio is 57.7 percent, and the initial primary budget surplus is 4.25 percent of GDP.
SOURCE: Authors' calculations.

scenario clearly implies a sustainable debt burden. Brazil has achieved this rate of economic growth and has come close to this real interest rate on occasion since 1994, but has not managed to maintain either rate for very long. A 3.0 percent real economic growth rate and a 12 percent real rate of interest, which corresponds more closely to Brazil's recent average performance, would push the debt ratio to 69.6 percent by 2013. All else equal, the debt would ultimately be unsustainable in this case.

Primary Budget Surplus

Brazil's budget situation has improved substantially since the announcement of the Fiscal Stabilization Program in 1998 and the Fiscal Responsibility Law of 2000 (see Goldfajn and Guardia, 2003). These laws introduced far-reaching institutional reforms, which seem to focus on eliminating the moral hazard problems created when the central government assumes the debts of the state and local governments. In addition, Brazil now adopts targets—currently 4.25 percent—for its primary surplus.

The projections of Brazil's debt burden in table 3 assume that the primary budget surplus remains constant at its current target, 4.25 percent of GDP. But if Brazil can continue to exceed this target, as it did in 2003 (through September), it could improve its chances for stabilizing its debt ratio. We can calculate from equation 2 the primary surplus that would keep the debt burden constant under alternative assumptions for the real interest rate and the real growth rate. To do so, we assume a constant debt ratio (that is, $d_t = d_{t-1} = d^*$) and solve for the primary surplus:

$$3) s_t^p = \left(\frac{r_t - \dot{g}_t}{1 + \dot{g}} \right) \cdot d^*.$$

Table 4 shows the percentage point amount that the primary budget surplus would need to increase relative to GDP in order to prevent a rise in Brazil's net public-debt ratio under alternative economic scenarios. The calculations also assume that Brazil implements the increase immediately and sustains it over the next 10 years.

As we saw, the previous estimates (table 3) suggested that the debt ratio would increase by 11.9 percentage points (from 57.7 percent to 69.6 percent) over the next 10 years if the average rate of economic growth is 3.0 percent and the average real interest rate is 12 percent. This 10-year increase in the debt burden, however, could be offset by an immediate, and sustained, 0.8 percentage point increase in the primary budget surplus from 4.25 percent to 5.04 percent. In fact, Brazil exceeded this

TABLE 4 CHANGE IN BRAZIL'S PRIMARY DEFICIT NEEDED TO STABILIZE THE DEBT-TO-GDP RATIO (percentage point change over 10 years)

Interest rate	GDP growth				
	2.0%	3.0%	3.5%	4.0%	4.5%
8.0%	-0.9	-1.4	-1.7	-2.0	-2.3
9.0%	-0.3	-0.9	-1.2	-1.5	-1.8
10.0%	0.3	-0.3	-0.6	-0.9	-1.2
11.0%	0.8	0.2	-0.1	-0.4	-0.7
12.0%	1.4	0.8	0.5	0.2	-0.1
13.0%	2.0	1.4	1.0	0.7	0.4

NOTE: The initial debt-to-GDP ratio is 57.7 percent, and the initial primary budget surplus is 4.25 percent of GDP.
SOURCE: Authors' calculations.

target in September 2003, when its primary budget surplus reached 5.11 percent. If Brazil were to maintain a primary budget surplus of roughly 5 percent over the next 10 years, the country could lower its debt burden, even if its economic growth and real interest rates were no better than their past averages.

Exchange Rates

As Goldfajn (2002) and Goldfajn and Guardia (2003) show, movements in the *real*-dollar exchange rate have had a major impact on Brazil's debt burden. During 2002, the U.S. dollar appreciated more than 50 percent against the Brazilian *real*. Since then, the dollar has depreciated almost 20 percent. Over the past year, Brazil lessened the exchange rate impact on its debt burden by reducing the proportion of its net public debt that is linked to the dollar, from 40.7 percent to 26.5 percent.

Table 5 presents rough guesses for the direct effect of a dollar appreciation or depreciation on the debt burden, given that 26.5 percent of Brazil's debt remains linked to the dollar. An immediate 20 percent dollar appreciation, for example, would increase the debt ratio almost to 61 percent. Of course, like all of the calculations presented here, this estimate does not allow for the complicated interactions that could take place between the exchange rate, real interest rates, and real economic growth. We assume no other changes.

Goldfajn (2002) and Williamson (2002) correctly anticipated an appreciation in the *real*, contending that the recent depreciation has left the real—or inflation adjusted—*real*-dollar exchange rate too low relative to its average level. An immediate 20 percent depreciation of the dollar would lower

TABLE 5 THE CHANGE IN BRAZIL'S DEBT BURDEN UNDER ALTERNATIVE EXCHANGE RATE ASSUMPTIONS

	Sept. 30, 2003	Dollar appreciation		
		10%	20%	30%
Exchange rate	2.928	3.221	3.515	3.806
Net public-sector debt	891.1	914.8	938.4	962.0
Dollar-indexed	236.1	259.8	283.4	307.0
Other	655.0	655.0	655.0	655.0
Net public-sector debt	891.1	914.8	938.4	962.0
Percent of GDP	57.7	59.3	60.8	62.3
	Sept. 30, 2003	Dollar depreciation		
		10%	20%	30%
Exchange rate	2.928	2.635	2.342	2.050
Net public-sector debt	891.1	867.5	843.9	820.3
Dollar-indexed	236.1	212.5	188.9	165.3
Other	655.0	655.0	655.0	655.0
Net public-sector debt	891.1	867.5	843.9	820.3
Percent of GDP	57.7	56.2	54.7	53.1

NOTE: Exchange rates are in reais per dollar.

SOURCE: Authors' calculations, assuming that 26.5 percent of Brazilian debt is indexed to the dollar.

Brazil's debt burden to 54.7 percent. A continuing dollar depreciation against the Brazilian *real* should help Brazil stabilize and reduce its debt burden.

Cautious Optimism

Our simple calculations—like those found in Goldfajn (2002), Goldfajn and Guardia (2003), and Williamson (2002)—suggest that Brazil is walking on a fence between sustainable and unsustainable public-debt dynamics. Relatively small improvements in economic conditions and a continuation of that country's recent fiscal improvements could push Brazil in the right direction, particularly if the U.S. dollar's recent depreciation continues.

Merely banking on past economic patterns may not be sufficient to produce a sustained decline in Brazil's debt-to-GDP ratio. Although Brazil can attain the economic conditions necessary to sustain its debt burden without further fiscal consolidation, maintaining them against future economic shocks seems highly problematic. The key uncertainty is real interest rates. A continuation of recent patterns, that is, real rates in the 11 percent to 13 percent range, will not lower the debt ratio unless economic growth is fairly robust. Real interest rates reflect investor confidence, so any step that Brazil can take to assuage investors' fears could be particularly helpful in securing debt sustainability. While the recent IMF loan packages fall into this category, a more fundamental and persistent change in Brazil's primary budget deficit could do even more. Brazil's ability to achieve a 5.11 percent primary budget surplus this year is especially heartening in that respect. It exceeds the level necessary to prevent a rise in that country's debt burden given Brazil's historical averages for growth and real interest rates. The U.S. dollar's recent 20 percent depreciation against the *real* has also helped stabilize Brazil's debt ratio; a further dollar depreciation, which many analysts anticipate, should provide Brazil an added respite in which to expand its fiscal and economic reforms.

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