

Bevilaqua, Afonso S.; Werneck, Rogério L. F.

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Public-sector debt dynamics in Brazil

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DEPARTAMENTO DE ECONOMIA

PUC-RIO

TEXTO PARA DISCUSSÃO
Nº 376

PUBLIC-SECTOR DEBT DYNAMICS IN BRAZIL

Afonso S. Bevilaqua e Rogério L. F. Werneck
asb@econ.puc-rio.br rwerneck@econ.puc-rio.br

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1. INTRODUCTION¹

The understanding of the determinants of public-sector debt dynamics is a key step towards a fuller assessment of fiscal sustainability in the Brazilian economy. After a brief analysis of the recent rapid increase in public-sector indebtedness and a discussion of the consequences of the current macroeconomic policy mix, this paper calls attention to specificities of the Brazilian debt dynamics process and resorts to a simulation model to envisage the implications of different fiscal policy scenarios.

2. POLICY MIX AND THE PUBLIC-SECTOR NET DEBT

For many years, macroeconomic policy in Brazil has been marked by a combination of lax fiscal policy and high interest rates.² During the long high-inflation experience of the eighties and early nineties, extremely high interest rates were used to curb currency substitution and to keep outright hyperinflation at bay.³ But not even the successful stabilization plan of 1994 managed to reduce the asymmetry of the macroeconomic policy mix. As shown in Figure 2.1 below, the demand boom that followed the launching of the stabilization plan in mid-1994 could only be choked, in the aftermath of the Mexican crisis, by soaring interest rates, given the sharp fiscal deterioration of 1995. Though interest rates have been brought down steadily since the last quarter of 1995, the basic rate was still above 20 per cent by the end of 1996. The medium- to long-run consequences of that kind of asymmetrical policy mix are very well known. Given the scope of the present paper, the important ones are those related to the perverse implications for the dynamics of the public sector debt. As shown in Table 2.1, the public-sector net debt has increased from 28.5 percent of GDP in December 1994 to 34.4 per cent in December 1996. More than two thirds of that increase

¹ The authors acknowledge the very competent research assistance of Fernando Blanco, Joana Meyer and Álvaro Motta, as well as helpful comments from Carlos Vegh, Ernesto Talvi, Dionísio Dias Carneiro Netto and Marina Figueira de Mello.

² See Bevilaqua and Werneck (1997b) for an analysis of the behavior of fiscal-policy indicators since the mid-eighties.

³ See Carneiro and Garcia (1994).

Figure 2.1
Annualized Basic Real Interest Rate (Monthly Average)
August 94 - December 96

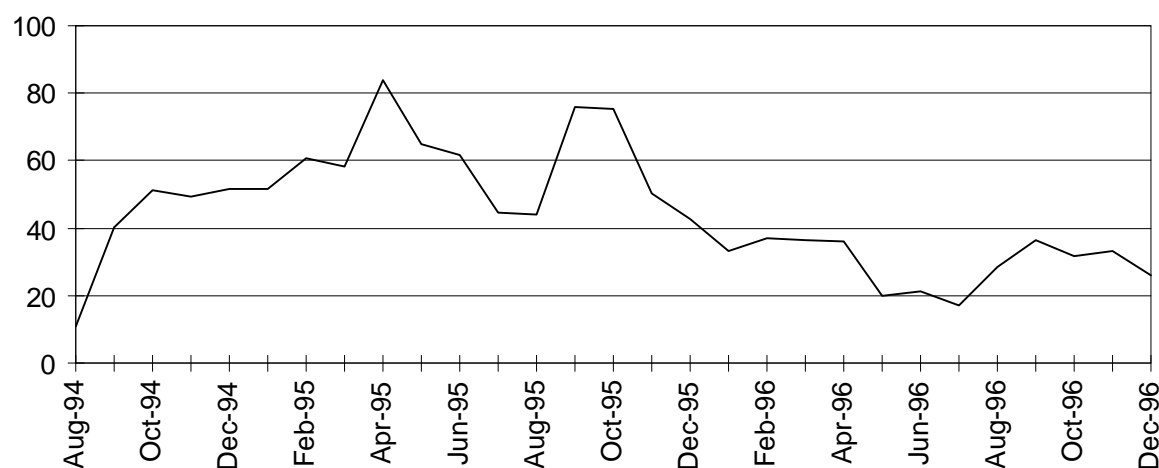


Table 2.1
Brazil, Non-Financial Public-Sector Net Debt, 1994-1996
(in percent of GDP)

	December 1994 (A)	December 1995 (B)	December 1996 (C)	Change 94-96 (C) - (A)
<i>(1) Federal Government & Central Bank Net Debt</i>	12.3	13.0	16.4	4.1
<i>Gross Debt</i>	31.4	32.8	39.1	7.7
<i>Domestic Debt</i>	18.1	22.0	29.8	11.7
<i>Foreign Debt</i>	13.3	10.8	9.3	-4.0
<i>(-) Foreign Reserves</i>	7.2	7.4	7.7	0.5
<i>(-) Other Assets</i>	11.9	12.4	15.1	3.2
<i>(2) State and Municipal Governments Net Debt</i>	9.5	10.4	11.9	2.4
<i>Domestic Net Debt</i>	9.2	10.1	11.6	2.4
<i>Foreign Net Debt</i>	0.3	0.3	0.4	0.1
<i>(3) Public Enterprises Net Debt</i>	6.7	6.5	6.1	-0.6
<i>Domestic Net Debt</i>	4.8	4.8	4.0	-0.8
<i>Foreign Net Debt</i>	1.9	1.7	2.0	-0.1
<i>Public-Sector Net Debt [(1) + (2) + (3)]</i>	28.5	29.9	34.4	5.9

Source: Banco Central do Brasil

stemmed from the net debt of the federal government and the Central Bank, as may be observed in the last column of the table. The evolution of federal net-debt figures should be seen with a grain of salt. Though the federal net debt has really increased much less dramatically than the federal gross debt since 1994, the slower increase conceals a deterioration of the quality of the net-debt that deserves some attention.

High interest rates have had a severe impact on the accounts of state and municipal governments. And the combination of high interest rates and the sudden end of the high-inflation regime precipitated the already expected going under of the most fragile part of the banking system, largely constituted by banks controlled by the states. In order to avoid a major banking crisis, the Central Bank launched in late 1995 a program to bail out large banks which were facing problems. Three big private institutions were rescued over the next two years, roughly in the same way: the Central Bank assuming the bad part of the insolvent bank's balance sheet and forcing the sale of the remaining part to a sounder institution, properly persuaded to participate in the operation by the access to a low-interest credit line. Something similar is now being done with the insolvent state banks, after a long political battle with governors that insisted in keeping control over their banks after the bail out operation.

But, having lost that battle, state governors won a much more important one, as they managed to extract from the federal government a generous restructuring of the states' sizable outstanding debt. As high-interest state bonds are being swapped for lower-interest federal bonds, the states' debt is being largely converted into debt to the federal government and, therefore, being subtracted from the federal gross debt in the net-debt figures. Analogously, non-performing assets of the insolvent banks transferred to the Central Bank, as well as low-interest loans extended to the institutions that absorbed those banks, are also being deducted from the federal gross debt. As the importance of those various assets has been growing very rapidly there is every reason to believe that the quality of the federal net-debt figures is being negatively affected.

In fact, the last column of Table 2.1 shows an increment corresponding to 11.7 per cent of GDP in the gross domestic debt of the federal government and the Central Bank, partly compensated by a reduction in their foreign debt equivalent to 4 per cent of GDP. The resulting gross-debt increment of 7.7 per cent of GDP, though still impressive, led to a much smaller increase in the federal net debt, largely because it was offset by an accumulation of “other assets” amounting to 3.2 per cent of GDP.

3. “SKELETONS IN THE CLOSET”, PRIVATIZATION PROCEEDS AND SEIGNIORAGE

Besides the macroeconomic policy mix, at least three other factors are bound to be important determinants of the public-sector debt dynamics. The first has to do with the existence of contingent and hidden liabilities that are either expected in some sense or simply pop up unexpectedly. When liabilities of that sort appear, as skeletons taken out of the closet, they become normal registered debt.

In Brazil, the most important of those liabilities stems from the federal guarantee granted to the Mortgage Assistance Fund (*Fundo de Compensação de Variações Salariais, FCVS*), administered by the Federal Savings Bank (*Caixa Econômica Federal, CEF*).⁴ The FCVS was originally designed to stimulate the housing industry by providing insurance to the financial institutions against loss of income by borrowers. Preliminary estimates point to an accumulated deficit of US\$ 40 billion for the FCVS, which eventually will have to be assumed by the federal government.⁵

Another liability of that kind stems from the inability of the federal government to collect certain debts that are being considered as assets in its balance sheet. It is highly probable that, in the future, part of the assets which are being subtracted from the federal gross public debt, as just discussed above, may prove to be partially or totally worthless. The states may not fully honor part of their debts to the federal government,

⁴ See Furuguem et alii (1996).

or some of the assets transferred to the Central Bank when failing banks were bailed out may prove to be worthless. If and when that happens, the federal net-debt figures will have to be adjusted upwards. Therefore, the writing off of those assets in the federal government balance sheet may well be treated as equivalent to a contingent liability. The still hidden costs of the bailing out of the failing banks and the restructuring of the states' debt are bound to comprise an important part of the "skeletons in the closet".

Another important determinant of the public-sector debt dynamics is the flow of privatization proceeds. Though there have been many important public assets sales, particularly since 1991, only very recently cash payments have become relevant. The first wave of privatization involved auctions in which various kinds of public debt were accepted as payment. Also, most of the enterprises transferred to the private sector belonged to manufacturing industries, with a large part of the assets sales concentrated in the steel and chemical industries. Since 1994, however, the privatization program has reached a new stage. As the divestiture in the manufacturing industries advanced, the federal government prepared public enterprises in other sectors to be privatized, and started to require cash payments. A first group of electricity supply companies and CVRD, the big mining concern, have already been privatized. The bulk of the state-owned electricity supply industry and the whole telecommunications industry are now in line to be privatized over the next few years. A sizable part of the privatization of the electricity industry will also involve the sale of assets that belong to the states. Privatization proceeds are expected to reach a peak in 1998 and as much as US\$ 80 billion over the period 1997-2002.

The effect of privatization on public-sector debt dynamics will depend, not so much on the flow of privatization proceeds, but on the part of that flow effectively channeled into debt redemption. Though the present government appeared for quite a long time

⁵ One could also include among such liabilities those that are being accumulated in the wake of new entitlements generated by the social security system, though they could also be treated in a different way, as part of the expected future expenditure flows of the public sector.

totally committed to using all funds generated by the privatization program to redeem public debt, the commitment seems to have been mollified since the assets sales operations started to involve cash payments. The President has been strongly pressed to spend the new resources in various ways. In early 1997, after some strife within the government over how the proceeds generated by the sale of CVRD should be used, the President “solomonically” decided that half would be used to redeem debt and the other half to fund low-interest long-term loans to the private sector. However, in July 1997, in the wake of the growing concern with the consequences of the crisis that swept across Southeast Asian economies, the Government decided that it was time to show a stronger commitment to fiscal rectitude and announced that the proceeds would be “obsessively allocated” to the redemption of public debt.

Finally, a third important determinant of the public-sector debt dynamics is the extent of the financing that could stem from seigniorage. The Brazilian economy emerged from its very long high-inflation experience with an extremely low monetization ratio. As the *monthly* inflation rate was sharply brought down in mid-1994, from 50 per cent to something around one per cent, a strong remonetization movement was expected. However, the response of the demand for money has been much less intense than anticipated. Three years after the launching of the stabilization program, the monetary base is still limited to about 2.8 per cent of GDP. If the monetization ratio remains at such a low mark in the future, the contribution of seigniorage to public-deficit financing is bound to be extremely limited.⁶

4. SIMULATING DEBT DYNAMICS

An analysis of the dynamics of the public sector debt may be separated into two parts. The first one involves the determinants of the evolution of the primary balance. Given the path of the primary balance over time, one may then examine how the debt stock

⁶ See Pastore and Pinotti (1997).

variables are bound to evolve. The simulation analysis below will be confined to exercises based on exogenous scenarios for the primary balance path.

A detailed description of the simulation model may be found in the Appendix. The main features of the model may be described as follows. Given the rapid advancement of the privatization process and the extensive ongoing restructuring of state and municipal debts -- which are being transformed into obligations to the federal government, as just seen above --, the aggregate public-sector debt is actually in a state of flux. It was therefore considered unwise to break it down into the traditional three debt stocks: federal, state & municipal and public enterprises'. Instead, the aggregate public-sector net-debt was separated in the model into local-currency denominated registered net-debt (BR), foreign-currency denominated registered net-debt (BRD) and external net-debt (D). Interest rates on the various debt-stocks are all referred to an exogenous external rate. The highest spread (s) is paid on BR . Given the covered exchange-rate risk, a smaller spread is paid on BRD . A fixed spread is paid on D , since the current cost of the external net-debt is highly dominated by the cost of Brady bonds and the return on the stock of foreign reserves.

The base year is 1996 and the simulation period extends to 2002, the final year of the next presidential term. Given an exogenous path for the primary balance of the public sector (d_p), the model determines the volume of interest payments (INT) and the operational balance (d_{op}) for the first year. The debt stocks in the first year are then determined, taking into account the operational balance as well as three other factors: the expected volume of public assets sales from privatization (AS), the possible emergence of contingent and hidden liabilities (HD) and the importance of seigniorage. The resulting change in indebtedness is distributed in fixed proportions between BR and BRD . Having obtained the value of the debt stocks for the first year, the model repeats the exercise for the second year and so forth.

As the dynamics of the public-sector debt depends to a great extent upon the evolution of interest rates over time, special care was dedicated to the determination of the interest spread variable (s). The idea was to assure that, in each scenario, the evolution of the interest spread would be fairly consistent with the primary balance path. Though its reasonable to assume that a sounder fiscal stance, as measured by the primary balance, should allow lower interest rates, the actual extent of the response of interest rates to an improvement in the fiscal accounts is certainly open to dispute. But that is no reason to avoid a systematic treatment of the problem. So, just in order to impose consistency between the primary balance and the interest spread, the model simply determines the interest spread (s) as an isoelastic function of the primary balance. The sensitiveness of the simulation results to different views on the probable response of interest rates to an improvement in fiscal stance may therefore be explored by simply changing the value of a parameter.

Three different scenarios were considered, their differences being the assumptions about the evolution of the primary balance over the simulation period. In the first scenario, there is no fiscal adjustment whatsoever. The zero primary balance observed in 1996 is repeated year after year till 2002. The second scenario has the primary balance improving slowly, though steadily, over the simulation period, reaching 2 percent of GDP in 2002. Finally, in the third scenario, the primary balance jumps to 1.5 per cent of GDP in 1997 and stays at this level till the end of the period under consideration. As shown in Table 4.1, the same set of assumptions about the evolution of public assets sales, emergence of contingent and hidden liabilities and external interest rate was adopted in all three scenarios. Also invariant were the assumptions about inflation, exchange-rate policy and growth performance during the period. Though this uniformity may certainly have made some of the scenarios less consistent than they could have been, it assured a clearer interpretation of the simulation results. Besides, these simulations can be easily complemented by other exercises to check the sensitivity of the obtained conclusions to refinements in some of the assumptions.

Simulation results are presented in a set of graphs in Figure 4.1. The first graph, on the top left, serves as a reminder of the basic differences among the three scenarios: the assumptions about the evolution of the primary balance over the period. In Scenario 1, in which a no-improvement path is envisaged, the public-sector net debt, shown on the lower right graph, jumps from 34.4 percent of GDP in 1996 to 50 percent in 2002. Scenario 3, that assumes an effort that leads to a primary surplus of 1.5 percent of GDP in 1997, which is maintained over the rest of the period, tells a totally different story. The public-sector net debt as a proportion of GDP would rise in 1997 and start to fall from 1998 on, reaching 32.2 percent of GDP in 2002, somewhat below the base year mark. Scenario 2, represents a halfway case, in which the primary balance describes a slow, though steady, upward movement over the period, reaching 2 percent of GDP in 2002. The net debt would be rising till 2001 but would fall back slightly to 36.2 percent of GDP in 2002.

Table 4.1
Main Assumptions Common to the Three Scenarios

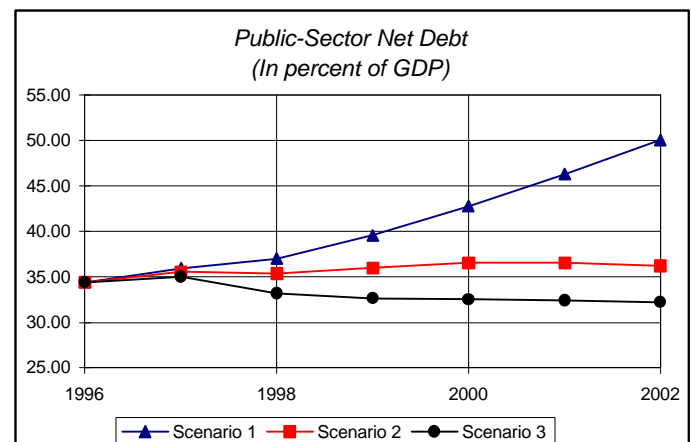
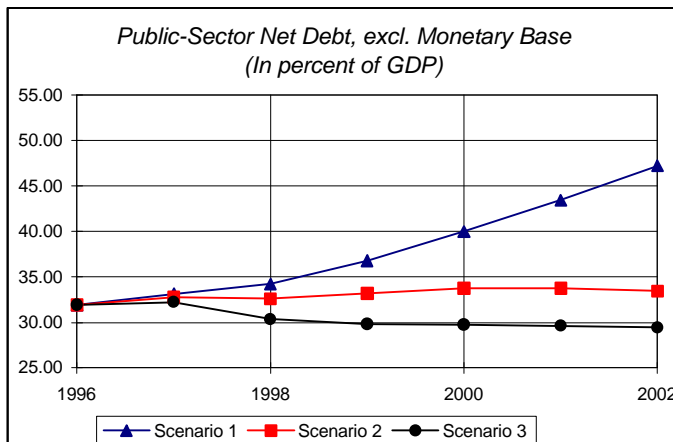
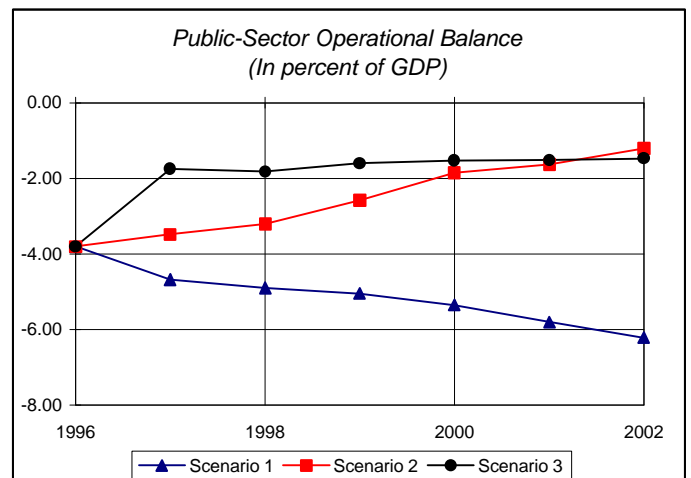
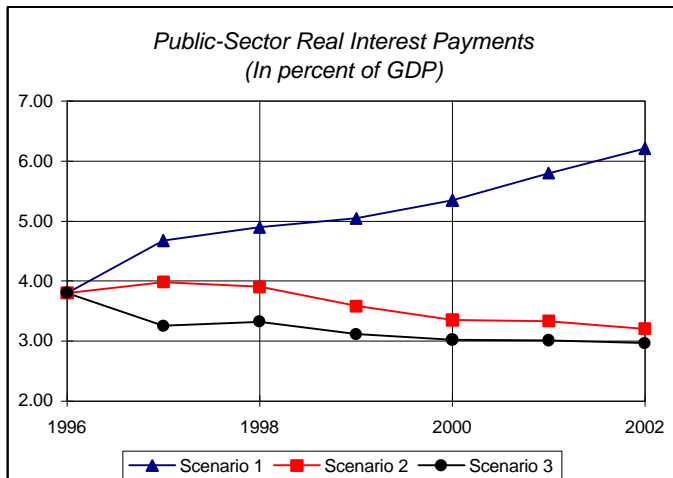
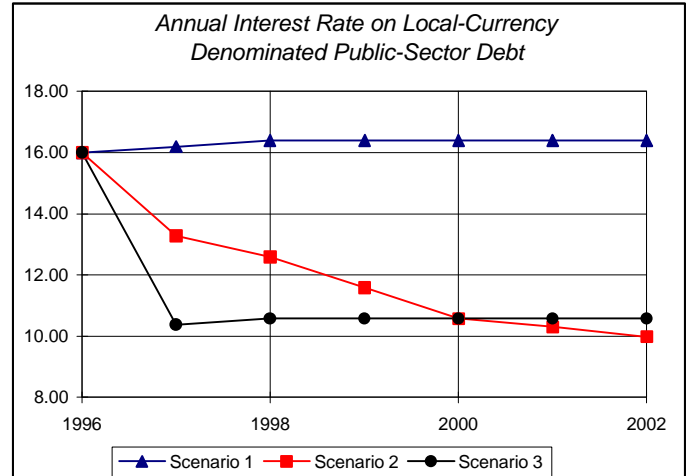
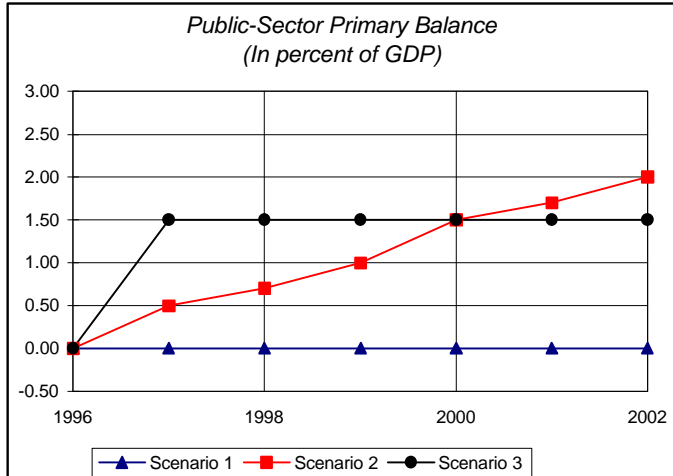
<i>Year</i>	<i>Public Assets Sales (% of GDP)</i>	<i>Emergence of Contingent and Hidden Liabilities (% of GDP)</i>	<i>GDP Growth Rate (%)</i>	<i>Inflation Rate (%)</i>	<i>Foreign- exchange Depreciation Rate (%)</i>	<i>External Interest Rate (%)</i>
1997	2.0	1.0	4.0	6.0	8.0	5.9
1998	2.5	1.0	4.5	5.5	8.0	6.1
1999	1.5	1.0	4.5	5.0	7.5	6.1
2000	1.0	1.0	4.5	4.5	6.5	6.1
2001	1.0	1.0	4.5	4.0	6.0	6.1
2002	1.0	1.0	4.5	4.0	5.5	6.1

It should be noticed that the zero primary-balance path assumed in Scenario 1 leads to a such a strong increase in the net-debt as a proportion of GDP -- despite the vigorous flow of privatization proceeds --, partly because the precarious fiscal situation prevents the interest rate from falling, in contrast to what happens in the other two scenarios, as may be seen in the top right graph of Figure 4.1. The widely different consequences

Figure 4.1

Brazil, 1997-2002

Results of the Simulation Exercises: Three Scenarios



for the evolution of both the volume of real interest payments and the operational balance are shown in the two graphs in the mid-row of the figure.

5. SENSITIVITY ANALYSIS

The debt dynamics depicted in Scenario 1, worrying as it certainly is, may actually be underestimating the rise of indebtedness that would result from a zero primary-balance path over the period. In fact, as stressed above, the invariant set of assumptions described in Table 4.1 and adopted in the three scenarios, helped to provide a controlled experiment, but at the cost of compromising the consistency and plausibility of some of the scenarios. It is highly implausible that the macroeconomic policy mix of Scenario 1 could be consistent with the common assumption adopted for GDP growth over the period. More likely, such a policy mix would at best be consistent with a much lower average GDP growth rate from 1997 to 2002. And that would mean an even faster increase in the public-sector net debt as a proportion of GDP.

If, for example, one assumes -- optimistically, under the circumstances of Scenario 1 -- that the GDP growth rate will remain at 3 per cent per year during the whole period, the public-sector net debt in 2002 jumps, not to 50 percent of GDP, as seen above, but to 54.2 percent of GDP.

Another important point to be noticed is that the simulations assume in all three scenarios that $\frac{3}{4}$ of the total proceeds from privatization are used to redeem debt. The underlying assumptions are that federal assets-sales proceeds -- comprising 75 percent of the total expected privatization proceeds -- will be entirely set aside for debt redemption, but that, in contrast, the remaining 25 percent, that should accrue to state governments, will be wholly used to fund additional expenditures. What would happen if, instead, only half of the federal proceeds could be set aside for debt redemption, in line with the policy the Government was tempted to adopt till mid-1997. That would

bring down the fraction of total privatization proceeds used to redeem debt from $\frac{3}{4}$ to $\frac{3}{8}$. In Scenario 1, for example, that change would make the public-sector net debt to reach 54.2 percent of GDP in 2002, under the GDP growth assumptions of Table 4.1, and to 58.6 percent of GDP, under the more realistic growth assumptions adopted in the last paragraph.

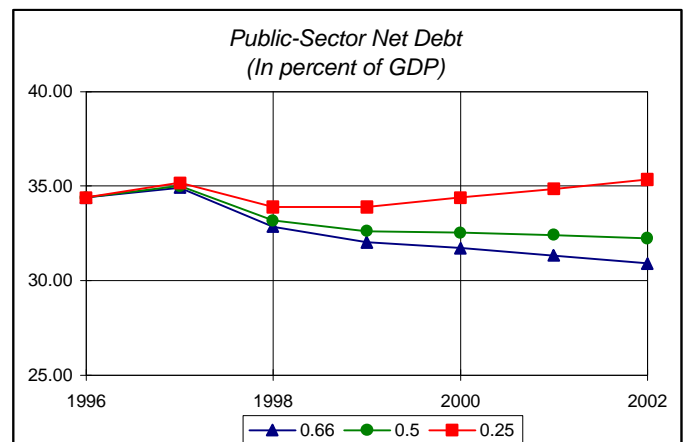
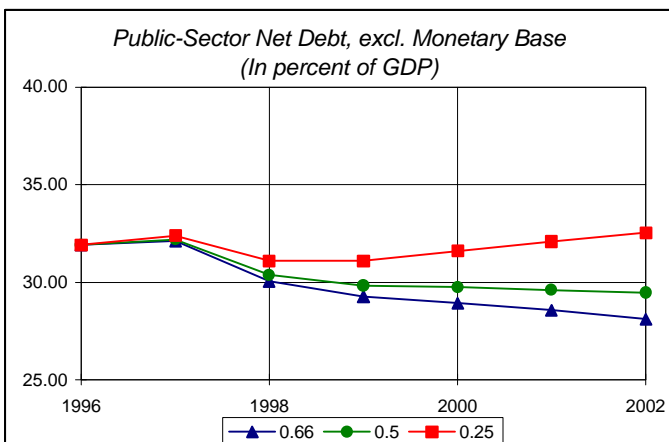
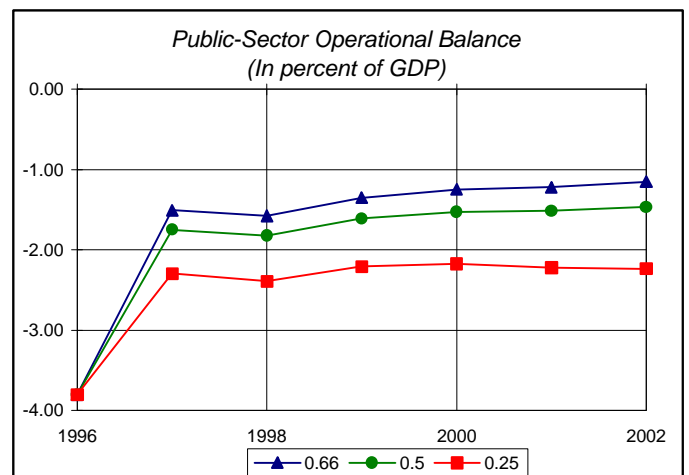
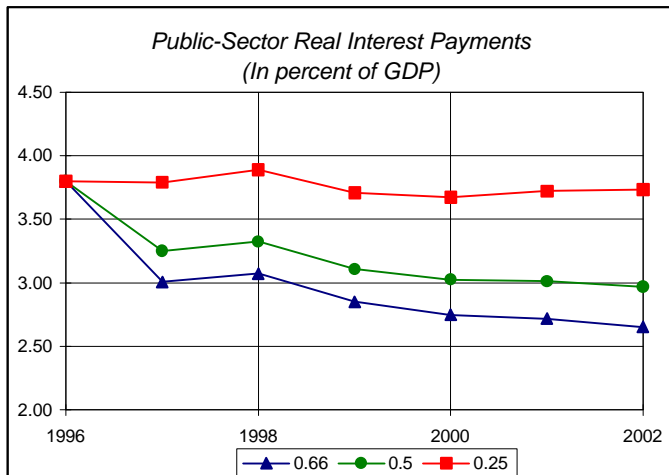
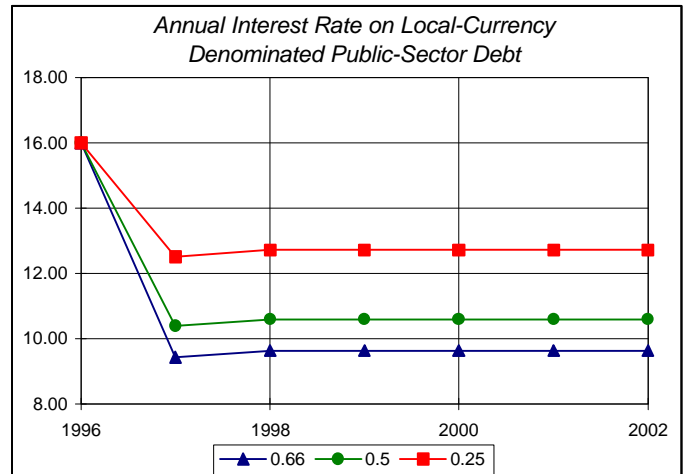
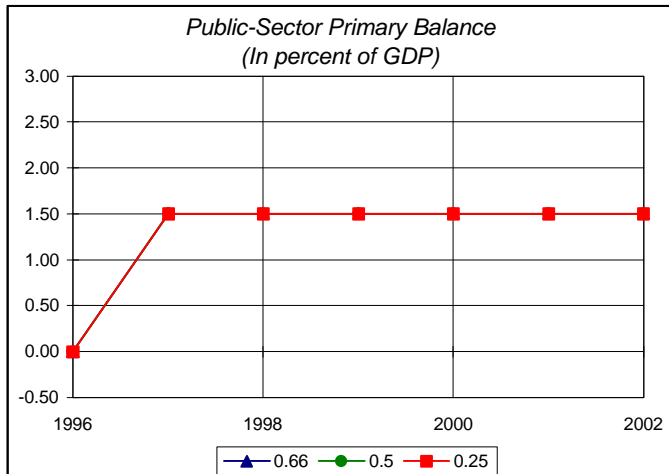
The possible evolution of the interest rate over the period deserves a closer look. As was seen above, in order to impose consistency between the primary balance and the interest rate, the simulation model assumes the interest spread (s) to be an isoelastic function of the primary balance. In all simulations considered so far the elasticity (α) of that function was presumed to be equal to $\frac{1}{2}$. What would be the sensitivity of the simulation results to changes in the value of that parameter? Figure 5.1 presents results of simulations for Scenario 3 -- which assumes the most favorable primary-balance path -- for different values of α . Besides $\frac{1}{2}$, two other values, $\frac{1}{4}$ and $\frac{2}{3}$, are also considered. The faster fall in interest rates implied by the latter value would lead to a public-sector net debt in 2002 of 30.9 percent of GDP, instead of 32.2 percent, obtained when the value attributed to α was $\frac{1}{2}$. If, on the other hand, the parameter is set equal to $\frac{2}{3}$, the end-year net debt would reach 35.3 percent of GDP.

A final observation concerns the sensitivity of the results to the assumption on the evolution of the external interest rate. If the rates assumed in Table 4.2 are adjusted upward by one percentage point, the public-sector net debt of 2002 increases by 2.1 percent GDP in Scenario 1 and between 1.8 and 1.9 percent of GDP in the other two scenarios. That might serve as a rough proxy of the degree of vulnerability of the fiscal accounts to a rise in external interest rates.

Figure 5.1

Brazil, 1997-2002

Results of the Simulation Exercises for Different Values of α (Scenario C)



6. CONCLUDING REMARKS

What conclusions about fiscal sustainability in Brazil can be drawn from the previous sections? If a sustainable fiscal policy is defined as a policy such that the public debt to GDP ratio eventually converges back to some determined level⁷, the answer is clear: the present fiscal stance (near-zero primary balance) is not sustainable. If the current tax rules and spending programs are maintained, the debt to GDP ratio will grow rapidly in the near future.

Under reasonable sets of assumptions, the simulation exercises of section 5 and 6 have shown that a sharp increase in the public sector net debt, as a proportion of GDP, will be unavoidable if there is no improvement in the primary balance in coming years. But even with a significant improvement in the primary balance during the period, the net-debt to GDP ratio would still show an upward trend and public sector real interest payments would not fall, unless extremely optimistic assumptions on GDP growth are made.

Given the obstacles currently faced by fiscal-adjustment efforts, there is a widespread temptation in Brazil to believe that the country may simply grow out of its fiscal problems. If fiscal repression could produce a slowly increasing primary surplus in the near future, one could cross one's fingers and hope that economic growth will save the day and naturally lead to a significant improvement in fiscal indicators. Much as an overfed boy that dreams about getting rid of his obesity problems by simply maintaining his present weight while growing taller.

There are many reasons to believe that growing out of fiscal problems in Brazil will not be so easy. A slow improvement in the fiscal-stance will mean that for a long time interest rates will have to remain much higher than would be compatible with a growth-conducive economic environment. In addition, long-lasting fiscal repression

⁷ Blanchard et al. (1990)

means public investment deficiencies that will also hamper fast economic growth. Finally, the recent evolution of the Brazilian external accounts, marked by a large and rapidly widening current account deficit, suggests that a faster growth rate will probably be unfeasible. And also that the convergence of domestic interest rates to international levels may end up being much slower than assumed in the most optimistic scenarios of the paper.

It seems, therefore, that there is no easy way out. In order to interrupt the vicious circle of bad fiscal stance, high interest rates, slow growth and even worse fiscal stance (and greater external vulnerability), there seems to be no other alternative than a decisive effort to improve the primary balance.

It is highly unrealistic to expect that the country's already high tax burden can be further increased. Improvements in the primary balance will have to come, therefore, from expenditure reduction. Given the rigidities in the public sector payroll, the fiscal pressure coming from the social security system and the expected expansion in expenditures with health assistance programs, it is unlikely that the necessary expenditure cuts will be viable without a major fiscal reform. There seems to be no way to circumvent a deep change in the very nature of the fiscal regime, that only constitutional amendments will make feasible.

APPENDIX: THE SIMULATION MODEL⁸

In the model used for the debt-dynamics simulations, the public sector net-debt is separated into three components: local-currency denominated registered net-debt (BR), foreign-currency denominated registered net-debt (BRD) and external net-debt (D).⁹ All debt-stock variables are defined as a proportion of GDP. As r^* is the external interest rate paid on D , the real interest rate on that debt can be written as $r^*(1 + e) +$

⁸ All parameters and variables involved in the model are defined in Table A.1.

$(e - p)$, where e is the rate of depreciation of the domestic currency and p is the inflation rate.¹⁰ Accordingly, as the local-currency denominated net-debt pays an interest r above the monetary correction of the debt, the relevant real interest is given by $r(1 + p)$.¹¹ All interest rates are referred to a basic exogenous external rate re . The highest spread s is paid on BR . Given the covered exchange-rate risk, a smaller spread Ws is paid on BRD , where $0 < W < 1$. A fixed spread se is paid on D , since the current cost of the external net-debt is highly dominated by the cost of Brady bonds and the returns on the stock of foreign reserves.

The public sector operational balance, as a proportion of GDP, may therefore be written as

$$\begin{aligned}
 [1] \quad dop_{t+1} = & d_{t+1} - \frac{(re_{t+1} + se)(1 + e_{t+1}) + (e_{t+1} - p_{t+1})}{(1 + p_{t+1})(1 + g_{t+1})} D_t - \\
 & - \frac{(re_{t+1} + \Omega_{t+1} \cdot s_{t+1})(1 + e_{t+1}) + (e_{t+1} - p_{t+1})}{(1 + p_{t+1})(1 + g_{t+1})} BRD_t - \frac{re_{t+1} + s_{t+1}}{1 + g_{t+1}} BR_t
 \end{aligned}$$

where d is the primary balance, the other three terms in the right hand side are the public sector interest payments, and g is the real GDP growth rate.

As argued in Section 4, it is reasonable to suppose that a sounder fiscal stance, as measured by the primary balance, should open room for lower interest rates. The model therefore simply determines the interest spread s as an isoelastic decreasing function of the primary balance. The sensitiveness of the simulation results to different views on the likely response of interest rates to an improvement in fiscal stance may be easily explored by simply changing the value of the elasticity a in

⁹ The reasons for avoiding the traditional disaggregation into federal, state & municipal and public enterprises' debt have already been discussed in Section 4 above.

¹⁰ From $(1 + r^*)(1 + e) - (1 + p)$.

¹¹ From $(1 + r)(1 + p) - (1 + p)$.

$$[2] \quad s_t = s(\mathbf{d}_t, \mathbf{a})$$

The debt stocks are determined in the next three equations. The change in the total net-debt depends on the operational balance \mathbf{d}_{op} as well as on three other factors: the expected value of public assets sales AS , the expected emergence of contingent and hidden liabilities BH and seigniorage. The resulting change in indebtedness is assumed to be distributed in fixed proportions, \mathbf{f} and $(1 - \mathbf{f})$, between BR and BRD . The local-currency denominated registered net-debt in period $t+1$ is therefore written as

$$[3] \quad BR_{t+1} = \frac{BR_t}{1 + g_{t+1}} + \mathbf{f} \cdot [BH_{t+1} - \mathbf{d}_{op_{t+1}} - (\mathbf{m} + \mathbf{g})AS_{t+1} - \frac{(1 + \mathbf{p}_{t+1})(1 + g_{t+1}) - 1}{(1 + g_{t+1})(1 + \mathbf{p}_{t+1})} M_t]$$

where \mathbf{m} is the part of the privatization proceeds that is effectively set aside for debt redemption, M is the monetary base and seigniorage is given by the last term on right-hand side bracket. The impact of public-assets sales on the net-debt is amplified by the “debt reclassification” parameter \mathbf{g} .¹² In turn, the foreign-currency denominated registered net-debt evolves according to

$$[4] \quad BRD_{t+1} = \frac{1 + \mathbf{e}_{t+1}}{(1 + \mathbf{p}_{t+1})(1 + g_{t+1})} BRD_t + (1 - \mathbf{f}) \cdot [BH_{t+1} - \mathbf{d}_{op_{t+1}} - (\mathbf{m} + \mathbf{g}) \cdot AS_{t+1} - \frac{(1 + \mathbf{p}_{t+1})(1 + g_{t+1}) - 1}{(1 + \mathbf{p}_{t+1})(1 + g_{t+1})} M_t]$$

As to the external net-debt, it is simply governed by

$$[5] \quad D_{t+1} = \frac{1 + \mathbf{e}_{t+1}}{(1 + \mathbf{p}_{t+1})(1 + g_{t+1})} D_t$$

¹² Given the peculiarities of public-debt accounting in Brazil, when a public enterprise is privatized its whole debt is reclassified and written off from the the public sector net-debt statistics. Therefore, each billion of privatization proceeds may end up reducing the net debt by more than \mathbf{m} times one billion. The intensity of this additional “reclassification effect” on the net debt is measured by \mathbf{g} . It may be easily shown that $\mathbf{g} = \mathbf{r} / [\mathbf{L} \cdot (1 - \mathbf{r})]$, where \mathbf{r} is the leverage ratio of the privatized enterprise (debt/assets) and \mathbf{L} is the part of its equity that is being transferred to the private sector. See Werneck (1997).

Table A.1
List of Variables and Parameters of the Simulation Model

<i>Symbol</i>	<i>Endogenous Variables</i>
dop	<i>Public sector operational balance</i>
s	<i>Interest spread on registered local-currency denominated public sector debt</i>
r	<i>Interest rate on local-currency denominated public-sector debt</i>
BR	<i>Registered local-currency denominated public sector debt</i>
BRD	<i>Registered foreign-currency denominated public sector debt</i>
D	<i>Public sector net external debt</i>
	<i>Exogenous Variables</i>
d	<i>Public sector primary balance</i>
re	<i>External interest rate</i>
e	<i>Nominal depreciation rate</i>
p	<i>Inflation rate</i>
g	<i>GDP growth rate</i>
BH	<i>Hidden domestic debt</i>
AS	<i>Asset sales</i>
M	<i>Monetary base</i>
	<i>Parameters</i>
se	<i>Interest spread paid on external debt</i>
W	<i>Ratio between interest spreads paid on foreign-currency and local-currency denominated debts</i>
a	<i>Elasticity of the spread function</i>
f	<i>Fraction of borrowing requirements financed by issuing BRD</i>
m	<i>Fraction of privatization proceeds used for debt redemption</i>
g	<i>“Debt-reclassification” effect parameter</i>

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