View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Research Papers in Economics

Inter-American Development Bank
Banco Interamericano de Desarrollo
Latin American Research Network
Red de Centros de Investigación
Research Network Working paper #R-424

The Structure of Public Sector Debt in Brazil

Afonso Sant'anna Bevilaqua*

DIONÍSIO DIAS CARNEIRO*

MÁRCIO GOMES PINTO GARCIA (PROJECT COORDINATOR)*

ROGÉRIO FURQUIM LADEIRA WERNECK*

FERNANDO BLANCO (RESEARCH ASSISTANT)*

PATRICIA PIEROTTI (RESEARCH ASSISTANT)*

MARCELO REZENDE (RESEARCH ASSISTANT)*

TATIANA DIDIER (RESEARCH ASSISTANT)*

***Department of Economics, PUC-Rio**

April 2001

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

The structure of public sector debt in Brazil / Afonso Sant'anna Bevilaqua … [et al.].
p. cm. (Research Network working paper ; R-424)
Includes bibliographical references.

1. Debts, Public--Brazil. 2. Brazil--Economic conditions--1964-1985. 3.Brazil--Economic conditions--1985-. I. Bevilaqua, Afonso S. II. Inter-American Development Bank. Research Dept. III. Latin American Research Network. IV. Series.

336.34 S844--dc21

©2001
Inter-American Development Bank
1300 New York Avenue, N.W.
Washington, D.C. 20577

The views and interpretations in this document are those of the authors and should not be attributed to the Inter-American Development Bank, or to any individual acting on its behalf.

The Research Department (RES) produces the *Latin American Economic Policies Newsletter*, as well as working papers and books, on diverse economic issues. To obtain a complete list of RES publications, and read or download them please visit our web site at: http://www.iadb.org/res/32.htm

TABLE OF CONTENTS

1. Introduction

The literature on the end of remarkable inflationary processes (Bresciani-Turroni, 1937; Sargent, 1986) calls our attention to one of the favorable aspects of hyperinflations: the fact that high inflation destroys old debts. Because of the central role fiscal deficits play in chronic inflation, the alleviation of the debt burden helps stabilization, and the fact that a large portion of government debt may disappear without the undesirable reputation costs of explicit debt repudiation is even better. In the Brazilian inflationary experience, most of this potentially favorable effect of high inflation on debt has been neutralized by indexation. In December 1994, officially recognized total federal domestic debt was 19.9% of GDP. The fast growth of public debt in the first four years of stabilization has offset the benefits of the inflation acceleration, which occurred shortly before the onset of monetary reform in July, 1994. By December 1998, this figure was 44.8% of GDP.

Part of this debt growth process may be due to foreign reserves accumulation, but it has certainly been aggravated by delays in fiscal reforms and the absorption of bad debts which had been carried by private and public banks, as well as the long process of political negotiation surrounding the need to extend fiscal adjustment, which has been taking place at the federal level, to local and state governments. As a result of this process, the public sector net debt has increased from 28.5 percent of GDP in December 1994 to 42.6 percent in December 1998. More than two-thirds of that increase stemmed from the net debt of the federal government and the Central Bank. There was an increment of 24.9 percent of GDP in the gross domestic debt of the federal government and the Central Bank. The resulting federal gross debt increment of 23.3 percent of GDP led to a much smaller, though still impressive, increase in the federal net debt, largely because it was offset by an accumulation of “other assets” amounting to 15.9 per cent of GDP. The recent evolution of federal net debt figures should, however, be taken 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, which deserves close examination.

High interest rates have had a severe impact on state and municipal government accounts. Thus, 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 made up of state-controlled banks. In order to avoid a major banking crisis, the Central Bank launched in late 1995 a program to bail out large banks that were facing problems. Three big private institutions had been rescued during the Real Plan, roughly in the same way: the Central Bank assumed the bad part of the insolvent bank's balance sheet and forced the sale of the remaining part to a sounder institution, properly persuaded to participate in the operation by access to a low-interest credit line. Something similar is now being done with insolvent state banks after a long political battle with governors who insisted on maintaining control over their banks after the bailout 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. The total ongoing state debt swap operation is estimated to reach R$107 billion (December 1998) or roughly 12 percent of GDP. Similarly, non-performing assets of 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.

It is highly likely that, in the future, part of the assets that are being subtracted from the federal gross public debt may prove to be partially or totally worthless. Some of the assets transferred to the Central Bank when failing banks were bailed out may prove to be worthless, or the states may not fully honor the service of their debts to the federal government. If and when that happens, the federal net debt figures will have to be adjusted upwards. The still unknown costs of bailing out the failing banks and restructuring the states' debt are bound to comprise an important determinant of the effective net debt burden.

At the same time as these events are affecting the supply side of the debt, the stabilization process is significantly shifting the debt demand curve outward and in the direction of longer debt. Maturities of nominal securities, which prior to the stabilization reached no more than a couple of months, increased to as much as three years prior to the Asian crisis of October, 1997.

The spectacular growth of some financial services—e.g., insurance and private pension funds—has the potential of creating a steady demand for public debt of longer maturity. Foreign funds also represent a growing demand for government securities denominated in foreign currency. However, this process has not been monotonic, since it has been partially reversed by the international currency crises that began with the 1997 Asian crisis.

In Brazil, the demand for public debt has traditionally been associated with high liquidity. Banks or money-market funds managed by banks used to hold the public debt and provide depositors with a combination of a highly liquid interest-bearing account and a demand deposit account (see Carneiro and Garcia, 1994 and Garcia, 1996a). This process increased the *moneyness* of the debt, and provided the conditions for agents to bear the megainflation that ended with the Real Plan of July, 1994. The economic role of the public debt might now be changing, as pointed above, and it is very important to try to determine if that is indeed the case, because this process will also affect the demand for different types of debt. The structure of the debt—denomination, indexation, and maturity—is, therefore, a point of utmost importance. At the same time, as recent research has demonstrated (see Calvo, 1995), the debt profile is in itself an important fundamental of the stabilization process. That is, the success of the stabilization process is a fundamental determinant of the public debt structure, and the structure of the public debt is, in turn, a major factor in the success of the stabilization process.

In addition to this introduction, this paper has four sections. Section 2, Public Debt in Brazil, 1970-98: Causes and Evolution, reviews the public debt growth process in the Brazilian economy, with special emphasis on the post-1990 period. We decompose recent public debt growth into its main components, namely, the fiscal deficit, recognition of old debts, and debt issue related to sterilization of monetary effects of foreign reserves accumulation. This section also presents a detailed description of the structure—denomination, indexation and maturity—of the federal debt. We show how these characteristics evolved in accordance to domestic macroeconomic conditions—the rise in both the inflation level and volatility—and to external conditions—the debt crisis, the agreements and the revival of capital inflows in the 1990s.

Section 3, Debt Management in Brazil during the Real Plan, provides several important insights into the very important question of what had determined the debt structure in Brazil during the period after the Real Plan. There have been many recent contributions in the literature

regarding the question of what should determine the debt structure; these have included, among others, Barro (1995), Blanchard and Missale (1991), and Goldfajn (1996). In this paper, we provide a classification of the different periods regarding debt management after the Real Plan. We describe the government's risk vs. return tradeoff that determined the issuance of more or less of a given type of security, and how the market reacted to the different tactics. To study in detail debt management in Brazil we use, besides the standard data on debt stocks and yields, data on debt redemption and placements, through the Treasury and Central Bank auctions. The study of the auctions'data provides insights on debt management not found in the more widely used data on total debt size and structure. We see our analysis as a necessary first step in a broader and more ambitious project of estimating the supply and demand schedules for different types of debts.

Section 4, The Public Sector Net Debt, carries out an in-depth analysis of the net debt figures. After identifying their main shortcomings, an effort is made to improve such figures in three important aspects. The first involves the credit risk of the failed banks assets that were given as collateral to the loans made by the PROER, the banks' bailout program carried out by the federal government. The second mainly involves the treatment of the liabilities of state and municipal governments that are being rapidly converted from debts to the private sector into debts to the federal government. In an effort to analyze the risk that may be involved in low quality assets that are being subtracted from the federal gross debt—in order to have a clearer assessment of the real extension of the debt burden—part of Section 4 involves a risk analysis of those assets using Monte Carlo simulation methods. Finally, the section addresses the improper treatment of public enterprises' debt in the official public sector net debt statistics.

Finally, in Section 5, the conclusion, we summarize the main conclusions of the paper, offer a few scenarios of the evolution of the debt, and draw a few policy implications for debt management in Brazil.

2. Public Debt in Brazil, 1970-1998: Causes and Evolution

2.1 Public Debt in Brazil: 1970-1998—An Overview

The introduction of a formal market for public securities in Brazil was an important outcome of the mid-1960s financial reforms. The lack of marketable public securities as a possible option for

financing fiscal deficits was part of the diagnosis of the causes behind the increase in inflation from 15% to 80% between 1955 to 1964, as stated in the first military government's Economic Plan, the PAEG. Although the 1964 revolutionary government had stern goals for fiscal improvement, the view that fiscal deficits would be the rule rather than exception in the following years led to the creation of a market for government debt based on the institutionalization of monetary correction. This would be one of the three pillars of the 1964-1965 financial reforms. The other two were the creation of the Central Bank and the adoption of a banking system based on a clear-cut separation between commercial banks and non-bank institutions.[1]

The broad evolution of the total federal government debt in constant reais may be read in Figure 1, where Central Bank holdings of government debt, measured by the vertical difference between the two lines, is distinguished from the outstanding debt held by the private sector. The years of high inflation, from the early 1980s to the mid-1990s, witnessed a widening of the fraction of the public debt held by the Central Bank. Under high inflation, cash management activities tended to predominate in the banking sector, and the Central Bank backing of such activities required the automatic provision of liquidity to banks' holdings of public debt.[2]

This phenomenon is a far cry from the situation prevailing in the second half of the 1960s and the end of the 1970s. The objective of institutional development of a market for government debt, which had been stated in the mid-1960s reforms, had been fully attained. Indexed bonds (the so-called ORTNs—Obrigações Reajustáveis do Tesouro Nacional)[3] were seen by asset holders as offering genuine protection against inflation erosion of financial wealth despite the fact that, until 1974, monetary correction was arbitrarily defined each month by an act of the Ministry of Finance, without official commitment to any particular price index.

The existence of indexed public debt, held by private savers on a voluntary basis, laid a foundation for the development of financial markets in Brazil in the following years, in spite of increasing annual inflation rates from 1973 to 1994. In the earlier years (between 1966 and at least 1971), the demand for public debt was growing faster than the government's financial

[1] For a historical analysis of the reforms in the context of Brazilian financial history, see Sochaczewski (1980).
[2] See Carneiro *et al*. (1993), who describe the mechanism of substitution of public debt for money in Brazil. Indexed deposits replaced cash and nominal demand deposits as transaction balances.

needs. The existence of an extensive stock of public securities was, however, seen as rather convenient for the purposes of regulating the short-run liquidity of the banking system by means of final sales and purchases of public debt in the open market. This "institution building" goal actually opened room for the creation, in the Central Bank, of a widespread range of credit programs designed to fund agricultural projects and regional development, and it has fostered the establishment of regional development banks at the state level. Excess demand for public bonds led the Central Bank to assume the role of a financing agent.

Federal government overfinancing thus led to the institutionalization of mechanisms that increased the spending capacity of local governments, a phenomenon taking years to reverse. In what became known as the years of the Economic Miracle (the early 1970s), annual GDP growth rates in excess of 10% led to the optimistic view that the Brazilian State had created a wholesome mechanism for capturing private savings and channeling them to public investment, thereby compensating for the underdevelopment of long-term financial markets. The idea of complementarity between public and private investments reinforced the view that public debt was a key element in channeling funds for more investment, whether public or private. When the first oil crisis of 1973 challenged the feasibility of the high growth path, during the Geisel years (1974-79) the Brazilian government kept its long-run strategy of growing its way out of the first oil crisis, even if it had to rely on further deepening of public indebtedness supported by the growth of external liquidity.

This strategy was successful for the first few years, as the accumulation of public debt was compatible with the maintenance of economic growth at high rates. The continuation of this process of growing indebtedness, however, relied on factors behind demand: the growth of private wealth, wealth holders' confidence in the prospects of the public sector's ability to service the debt and the use that was ultimately being made of the savings captured by the government. The growth of private wealth ran out of steam in the second half of the 1970s and virtually ceased during the stagnation of the 1980s. High and unstable inflation led to a considerable increase in the volatility of expected returns from government debt due both to a deterioration in the use of public savings and to the frequent change in monetary correction rules

[3] Treasury indexed bonds.

related to the growing risk of default. Finally, the decade of high inflation in the 1980s was also a decade of economic stagnation and a decline in public as well as private investment, witnessing a visible deterioration in the use of resources. There thus seems to be no shortage of explanations for the end of public debt accumulation. Both the reduction of public investment (as illustrated, for example, by the decline of profitability of public enterprises) and the difficulties in accumulating further debt were part of a major crisis in which the shrinking of public savings played a dominant role.[4] This evolution will be analyzed in more detail in the following sub-sections. However, before we proceed to the analysis of the evolution of the debt during the last three decades, we should explain the idiosyncrasies of Brazilian public bonds, which were issued with many different forms of indexation.

2.2 Denomination, Indexation and Maturity

Brazilian Federal Domestic Debt securities have been issued in various formats. Nevertheless, only the external debt is denominated in foreign currency (mostly in US$); clauses indexing the domestic debt to the US$ have always prescribed the settlement in domestic currency. Besides the exchange rate, several other indices have been used to index the debt: price level indices, official monetary correction, and interest rates (both *ex ante* and *ex post*). As far as floating bonds denominated in domestic currency are concerned, Brazil has developed in the highly volatile inflation environment of the late 1980s an idiosyncratic form of debt indexation, which we refer to as "zero-duration bonds."

When inflation became very high and very volatile in the mid-1980, interest rates were managed so that a positive real interest rate was provided on top of inflation, in a Fisher-effect-like way; it would have been foolish for the Central Bank to take advantage of short-run gains while risking the loss of its long-run customers. Given the high inflation volatility, nominal interest rates also became very volatile and risky. Therefore, when inflation rose unexpectedly, large losses were caused to bond holders, most of them financial institutions holding interest-bearing deposits against the government bonds. More than once, the Central Bank bailed out the financial institutions that would otherwise have failed in the face of a large interest rate increase. Therefore, the situation turned out to be unfair, since the government had to pay a risk premium

[4] See Carneiro and Werneck (1993).

on its debt because of the high interest rate volatility, but when the interest rate was raised, bond holders' losses were limited by the bailouts.

In order to provide a less expensive solution to this problem, the LBC (Central Bank Bill) was created in 1985 (after the second Collor Plan, in February 1991; the LFT, or Treasury Financial Bill, replaced it with the same kind of indexation). The LBC was a security sold at a discount which had its face value corrected daily by the average daily interest rates during its term. It is a floating interest rate, adapted to the high frequency required by high inflation and daily indexation. It is equivalent to a bond whose nominal value is compounded daily by the daily accrual of the Brazilian equivalent of the FED Funds rate. We may call these securities "zero-duration bonds," because this is the closest one can get to perfect indexation in fixed income markets. It corresponds to a bond of duration zero, since it suffers practically no loss in its price when interest rates go up. These bonds were widely used in times of high uncertainty, such as the crossover to the Cruzado Plan in 1986 and to the Real Plan in 1994. On the other hand, as a consequence of zero-duration bonds, monetary policy has a very limited or nil wealth effect, since increases in interest rates do not affect the value of the private financial wealth in these fixed-income securities. Thus, the introduction of these bonds in 1985 implicitly acknowledged that monetary policy had already lost its power because of widespread indexation.

A wide variety of bonds and bills existed in the 1970-1998 period. Nominal securities (discount bills) were the LTN (Letra do Tesouro Nacional) and the BBC (Bônus do Banco Central). The LTN, issued since August 1970 by the Treasury, has a minimum maturity of 28 days. The BBC, issued since January 1991 by the Central Bank, also has a minimum maturity of 28 days, being used chiefly for monetary policy purposes.

The first index used in Brazil was the so-called "monetary correction." According to Simonsen (1995), the newly empowered military government created in July 1964 indexed bonds, the ORTNs (Obrigações do Tesouro Nacional). The ORTNs were bonds whose nominal values were periodically adjusted upwards (initially, every quarter; later, every month) according to coefficients computed by the Ministry of Finance, with terms from one to twenty years, and a (real) yearly interest rate of 6%. The coefficients were set in many different ways in the following two decades, but the overall result was a vast underestimation of inflation, making "monetary correction" a very poor inflation hedge. Figure 2 displays the evolution of the real value of the

ORTN index, showing unequivocally that there has been a vast underestimation of inflation by the official index.

Many different indices were tried in the Brazilian public debt market during the last thirty years. Appendix 1 lists all the bonds that were in the market during 1999. The analysis of the federal bonded debt evolution presented next illustrates the different restrictions faced by the Brazilian government in finding uninflationary finance for its excess of expenditure over tax collection.

2.3 1970 to 1979: The Hopeful Years

The stock of government bonds was multiplied by a factor of five in the 1970s.[5] As seen in Table 1, there is a clear break between the annual figures before and after the oil crisis. GDP growth declined sharply in the second half of the decade compared to the first half, as inflation doubled and there were increasing difficulties in controlling the growth of public sector financial needs.[6] Average maturity reached its peak in 1975, but the share of fixed interest bonds kept growing until the end of the decade, as interest rates began to rise in 1976 following the abandonment of the interest rate ceilings, which had prevailed until September 1976.

Figure 3 shows the evolution of federal bond debt and debt held by the private sector. Total bond debt went from 1.2% of GDP to 3.7% of GDP between 1970 and 1979. But in the second half of the 1970s, as external debt was accumulated, a gradual process of absorption of private external debt by the public sector financed part of the public deficit. In order to prevent their total foreign liabilities, in face of higher exchange rate risk, from aggravating balance of payments problems, private debtors were allowed to decrease their net liabilities by depositing unwanted foreign debt at the Central Bank. This process transferred available finance of foreign origin which had been previously used by the private sector to fulfill the increasing requirements due to the wave of public investment associated with the Second National Development Plan (PND). Dollar-denominated deposits from the private sector at the Central Bank went from less

[5] In constant reais of December 1997, the stock grows from 8.6 billion to 40.5 billion**.** The exchange rate on December 31 was R$1.1164 R$/US$1.
[6] See Table 4 in Carneiro (1987).

than 0.1% of GDP in the first half of the seventies to 3.2% of GDP in 1979.[7] The peak was attained in the last quarter of 1978, the last year of President Geisel's government. The first year of General Figueiredo's term started with a reduction in the real value of public bond debt due to two effects: the decline in nominal interest rates promoted by Delfim Neto in an attempt to stimulate the level of economic activity and the increase in exchange rate uncertainty related to the second oil crisis. Both factors have reduced the attractiveness of public debt in private portfolios.

Public debt denomination has thus changed in response to changes in demand. From 1971 onwards, fixed interest Treasury Bills (LTNs) were issued side by side with the old Indexed Treasury Bonds (ORTNs) as a result of the success of the reforms. In contrast with the ORTNs, which were held both by financial and non-financial institutions, LTNs were the typical assets used as reserves by financial institutions. They were auctioned at a discount only in large denominations, with maturity ranging from 30 to 720 days. Central Bank daily operations to regulate short-term liquidity were then conducted through sales and purchases in the LTN market, whereas ORTNs were considered adequate to provide steady finance for the Federal Government's structural fiscal deficit. The Central Bank portfolio was therefore largely concentrated in LTNs.

Figures 4A and 4B show the composition of bond debt held by the private sector in the two kinds of instruments. The real value of indexed debt reached a plateau and stabilized in the middle of the decade, so that further finance for the public deficit came from the steady increase in the stock of LTNs between January 1975 and October 1978. The share of ORTNs held by the private sector declined to one half at the end of the decade as the duration of the debt shrank in the face of higher inflation and unstable interest rates. Figure 5 shows the decline in the average maturity of public debt from 20 to 14 months between 1977 and 1979, when the widespread practice of repurchase agreements by the Central Bank makes it harder to ascertain the actual demand for longer term debt.[8]

[7] See *Boletim do Banco Central do Brasil* (several issues).
[8] Data that discriminate the average maturity of the indexed debt from that of the nominal debt are not available for the earlier period.

2.3 1980 to 1989: High Inflation

The 1980s witnessed the rise of the inflation plateau from the 30% annual rate to the three-digit level through inflationary bursts, which had two dominant effects on the accumulation of public debt. The first was the loss of credibility of monetary correction rules. The second was the growing fear that anti-inflationary policies would have to involve some sort of explicit default of the stock of public debt.

The stock of public debt was again multiplied by a factor of 4.8 in real terms between January 1980 and December 1989.[9] But the pace of debt accumulation in the 1980s exhibited symptoms of an unhealthy process: the average maturity declined, despite the fall in the share of nominal bonds, and the share of private holdings of public debt also decreased. We take this latter movement as an indication that public debt was working more as "indexed money" than public debt.[10] Figure 6 shows the evolution of Federal bond debt in the 1980s.

In 1980, a major blow to the institution of monetary correction as a basis for debt indexation was struck by the prefixing of monetary correction for the twelve months following the maxi-devaluation of December 1979, in an attempt at controlling inflation expectations. After the external debt crisis of 1982-83, the dynamics of domestic debt growth experienced different regimes. A new source of uncertainty (moral hazard due to government behavior) was introduced, namely the possibility of changes in indexation rules as an instrument for defaulting on debt. Following the failure of the Cruzado stabilization plan of 1986, a swarm of indices and rules for indexation were introduced in private contracts, as well as in public liabilities, as markets reacted to changes in the rules of the game by requiring extra protection. Figure 2 shows the evolution of the real value of the ORTN index. That picture clearly explains agents' distrust of official indexation.

Figures 7A and 7B show the evolution of the federal public bond debt held by the private sector, distinguished by type of index used for monetary correction. Minister Delfim Neto's first effort to control inflation by means of manipulating expectations resulted in doubling the rate of

[9] In constant reais of December 1997, the stock grows from 39.1 billion to 186.6 billion. The exchange rate in December, 31 was 1.1164 R$/US$.

[10] For a discussion on the "moneyness" of Brazilian public debt in the megainflation years, see Carneiro (1994), Carneiro and Garcia (1994) and Garcia (1996a).

inflation to a three-digit annual pace, when another maxi-devaluation was followed. Figure 5 shows the decline in the average maturity of public debt, which fell from 31 months in May 1983 to 4.5 months in August 1989. With inflation rates going from 100 to 200% a month, debt management was mainly concentrated in the short-run needs of the banking system, as indexed public debt became the essential backing for overnight indexed demand deposits offered by banks as a domestic money substitute.[11]

From the viewpoint of establishing a reputation to create the demand for public debt, indexation was seen at first as a guarantee. More inflation could not be used as a means of reducing debt. Discount bills were issued when inflation expectations were declining. The return of high inflation in the 1980s revived old fears.

Debt management in high inflation thus required thus a good deal of creativity, as revealed in denominations, maturities and forms of indexation. As emphasized before, in contrast with other inflationary economies, in Brazil, only the external debt is denominated in foreign currency (US$); the domestic debt indexed to the US$ is, and has always been, redeemable in local currency. Several indices have been used to index the debt, e.g., the exchange rate against the US$, different price-level indices, different formulas for monetary correction, and several interest rates, culminating with the zero-duration bond, which withdraws almost all interest rate risk from bond holders at the same time that it weakens one of the transmission channels of monetary policy, namely the wealth effect.

As Figures 7A and 7B make clear, the decade ended with almost 100% of the federal bond debt being rolled over in the form of zero-duration bonds. This state of affairs reflected not only the extremely high uncertainty regarding the inflation and interest rates, but also the fear of an explicit debt default by the incoming administration (President Collor de Mello). At the time, there was a widespread suspicion regarding the credit risk of public securities, which were indeed validated by the new administration's actions, summarized in the next section.

2.4 The Roaring 1990s

[11] The issue of the provision of a domestic currency substitute as a means to prevent the dollarization of the economy is studied in Carneiro (1994), Carneiro and Garcia (1994) and Garcia (1996a).

The successful replacement of demand deposits by indexed deposits at the banks (backed by government securities in the banks' portfolios) during the period of high inflation avoided dollarization but created an obstacle to any stabilization strategy that required a sudden fall in the rate of inflation. Two reasons may explain this difficulty: a) Since the demand for money was partially satisfied by the indirect holding of indexed public debt through overnight indexed deposits, the sudden fall in nominal interest rates that would result from a successful stabilization plan would, simultaneously, induce the monetization of government debt. This could be erroneously read as lack of monetary control and thus jeopardize the continuity of low inflation; b) the change in fiscal regime that was needed to guarantee the survival of low inflation would take some time, so that in the transition to a fiscal regime compatible with low inflation extra finance for the deficit would be required.

Two ways out of this dilemma were then proposed: the first was a tax on financial assets in order to provide government financing for the transition. A political evaluation, made on the eve of Collor's inauguration, concluded that the Congress would not pass a law imposing an effective capital levy immediately, as was needed in order to give the new government some time to work on the fundamentals. A second alternative was adopted in the Collor stabilization plan: a moratorium on virtually all public debt for a period of 18 months by denying holders access to their financial assets and transforming these assets into deposits at the Central Bank, referred to as VOBs. The "hijacked" assets would be returned to owners with monetary correction plus 6% interest (the same interest rate offered by popular savings accounts) in twelve installments beginning in September 1991, except when decided by the Central Bank on a case- by-case basis.

The 1990s thus began with the most extraordinary of government interventions in the public debt market, which was announced on the inaugural day of the Collor Presidency (March 15, 1990). For the first time in Brazil since markets for public debt were overhauled in 1964, default was explicitly introduced into the market.

The long-run response was extremely surprising. The stock of public debt grew significantly, especially after July, 1995, as shown in Figure 8, which displays the evolution of the total federal bond debt during this decade. Table 3, which includes the VOB, shows that the proportion of the debt held by the public has been increasing since 1992. This proportion was

approximately 33% in 1993, reached 60% in 1994 and finally peaked at 90% in 1997, having decreased since then.

The effect of the moratorium may be seen in Figure 9A, which displays the evolution of the debt held by the private sector, by type of indexation, during the 1990s. Figure 9B clearly shows the fall of the real value of the total debt in March 1990, when the liquidity of the existing debt was suspended.

The evolution of the composition of the bond debt in regard to the different types of securities may also be observed in Figure 9B, which shows the evolution of the debt held by the private sector by type of indexation, in percent since 1990. The rich structure of the portfolio during the period reflects the larger diversity of available bonds, especially after February 1991.[12] The ever-changing composition of the public debt was also made possible by the extremely short maturity of the debt. When debt maturity is short, it is constantly being rolled over. The constant replacement of maturing short-term bonds with new bonds opens space to much faster changes in debt composition than observed in countries with longer-maturity debt, where the debt manager would have to repurchase debt in order to speed a change in composition.

At the time of the debt freeze in 1990, debt held by the public consisted of three different types of bonds: non-indexed securities sold at discount, indexed bonds linked to the overnight short-run interest rate (zero-duration bonds), and dollar-indexed bonds with a fixed coupon. Until April 1990, the stock of debt can be divided into zero-duration bonds (over 95% of the total) and bonds indexed to the exchange rate. After April, the share of non-indexed debt grew for a short period, reflecting the short-lived success of the de-indexation. But it then decreased drastically with the strong acceleration of the inflation in the end of 1990. After March 1991, the proportion of non-indexed debt increased once again, remaining around 10% until the end of 1991, when it reached the lowest average of the decade. The share of dollar-linked debt increased in the April-December period compared to the previous period, reflecting the mounting uncertainty surrounding the President's impeachment, but it remained around 7% of the total debt. The

[12] Note that the total stock of debt presented in figures 9A and 9B does not include the so-called VOBs (deposits at the Central Bank) representing claims against the Central Bank which were the outcome of the moratorium between March 1990 and July 1992. At the onset of the Collor Plan, it represented 68% of the debt held by the public in March 1990.

remainder of the bond debt held by the public corresponds to the bonds linked to the overnight interest rates.

Only at the beginning of 1992, when expectations of accelerated inflation did not materialize, did the effects of recovering investor confidence start to show up in public debt markets. Such expectations had been based on the combination of price liberalization, public tariffs corrections and the devaluation which followed the floating of the exchange rate in October 1991, in face of the strong monetization of the hijacked assets during the first Collor Plan. The recovery of the stock of public debt in the portfolio of the private sector (Figure 8) was a clear demonstration that asset-holders were willing to return to business as usual in spite of the violence of repeated interventions in the rules of indexation and liquidity of public securities in the previous twelve years. One should bear in mind that the majority of economic analysts at the time were forecasting that never again would the government be able to place new debt. The Brazilian experience, therefore, contradicts reputational models that withdraw the government's ability to place new debt after a capital levy on the public debt.

The return of investor confidence is also confirmed by the recovery of foreign exchange reserves after 1992, which can be seen in Figure 10. Following the high political turbulence that characterized the months before the impeachment of President Collor de Mello, the beginning of the Itamar Franco presidency was once again marked by high uncertainty concerning economic policy. Proposals of another moratorium and even repudiation of the public debt were in the press daily, and it was only after the President nominated his fourth Minister of Finance in less than six months that the recovered confidence materialized in higher external reserves.

Between April 1992 and July 1993, non-indexed debt grew, reaching more than 50% of the total. Zero-duration debt was reduced to less than 10%, and two new types of bonds appeared: those indexed to IGP-M, a price-index calculated by the Vargas Foundation, believed to be free of government intervention, which accounted for more than 30% of the debt in July 1993, and those indexed to the TR (Referential Rate, average of private CDs rates) which accounted for around 5% of the debt. Dollar indexed debt accounted for 5% of the total debt in July 1993.

From July 1993 to June 1994, on the eve of the Real Plan, the share of debt in dollars linked either to the dollar or to the TR grew, each to around 10% of the total debt. The share of

IGP-M indexed bonds remained initially around 35%, falling to 25% in June 1994. The fraction held in non-indexed discount bonds fell gradually until May 1994 (to 42%), and then abruptly to 7% in June 1994. The debt was "rolled over" into the Real Plan mainly in the form of bonds indexed to the overnight interest rate, which were considered to be the least risky bonds (46% of the total debt in June 1994).

From April 1993 to July 1997, foreign capital inflows resumed as Brazil's relations with the international financial community were back to normal, putting an end to a long process of foreign debt rescheduling under the Brady Plan. The inflows were a main factor in expanding both the monetary base and interest-bearing public debt. Central Bank sales of debt to sterilize monetary expansion avoided the explosion of the monetary base.[13]

In July 1994, the Real monetary reform promoted a general de-indexation of the economy by adopting the real as the monetary unit, made equal to the value on June 30, 1997 of the URV, a unit of value equal to the official value of the dollar exchange rate, which had been an official index for monetary correction of nominal values and contracts since March 1994.

Both the dynamics and the composition of the process of debt accumulation experience important changes after the reform. The proportion of non-indexed debt remained around 30% between July 1994 and November 1995, when it started to grow, reaching 50% after January 1996. The share of bonds indexed to the IGP-M decreased continuously between July 1994 and December 1995. After March 1996, this share did not exceed 3% of the total debt, reflecting a policy decision to decrease the share of inflation-indexed debt, which was believed to hamper the process of de-indexation of the economy. Dollar-linked bonds remained around 10% between July 1994 and August 1995, falling slightly to around 7% of the total debt between September 1995 and February 1996. With the aggravation of the economic situation in Asia, the share of

[13] As analyzed elsewhere (Carneiro and Garcia, 1995), capital inflows responded to a large spread between external and internal rates of returns. Financial instruments such high interest rates were government securities. Therefore, *strictu sensu*, capital inflows were not sterilized once they entered the country; actually they entered the country in order to purchase government securities and profit from the large spread. The government was purchasing foreign reserves in order to prevent oscillations in the economy's cash flow from jeopardizing the stabilization effort under construction . The word "sterilization," though, gives the wrong timing idea; it suggests that after the funds entered the country, and have been converted into domestic currency, government securities were sold to mop up liquidity and avoid the inflationary consequences of monetary expansion. That was not the case in Brazil. The word sterilization also suggests that the government has to raise interest rates in order to sell its securities. That is also false for the Brazilian case. Had the Central Bank not intervened by selling securities at low prices (high yields), the domestic interest rate would have fallen and the capital inflows would have been smaller.

dollar-linked bonds increases once again to reach 15% at the end of 1997. The share of bonds indexed to the short-run interest rate corresponds to around 25% of the total debt between July 1994 and July 1995, 35% between August 1995 and February 1996, falling to approximately 20% at the end of 1997. The share of bonds indexed to the TR increased after July 1994, reaching 22% in May 1995. Between October 1995 and July 1996, this fraction is reduced to 10% and 8% from August 1995 to August 1997; at the end of 1997 this proportion is 11% of the total debt. Apart from short-run variations, demand for such bonds is determined essentially by the need of the banking system to avoid mismatches, since TR is the basic factor of correction for saving accounts and mortgages. Another type of bond appears between November 1994 and July 1995, the NTN-T, indexed to the long-run interest rate applying to loans from the BNDES and corresponding to around 5% of the debt, but reducing its participation to 1% of the total debt between January 1996 and December 1997.

The decline in the average debt maturity in the 1990s may be observed again in Figure 5. From March 1990 to July1992, the high average maturity reflects the existence of the well-known VOBs. After the devolution of the hijacked assets, the average maturity of the debt falls from 33 months in August 1992 to 6 months in December 1996.

The issue of debt sustainability in Brazil, not addressed in this paper, should consider measures of the net total debt, not only the federal bond debt. The subject of measurement of the public-sector net debt is taken up in Section 4. First, however, we analyze a cruder measure of the net debt in order to assess symptoms of explosive behavior. The issue of whether this behavior can be attributed to worsening of the fiscal situation after the Real plan, when inflation control eroded both the seignorage revenue and the fiscal gain from postponing non-indexed government outlays, will become clear only after Section 4 probes into the debt-generating process.

Figure 10 shows the growth in the domestic net effective federal bond debt.[14] From January 1991 to July 1995, all debt growth may be fully explained by two factors: the unfreezing of the blocked bank accounts which occurred in the Collor administration,[15] and the accumulation of foreign reserves. This causality changes dramatically after July 1995. Until December, 1997, a

[14] This is the "Dívida Mobiliária Federal" minus the securities traded with the states and municipalities (LBC-Es).

gap of almost US$70 billion opened up between the net federal debt and the sum of the other two series. This is the outcome of the deterioration of the fiscal accounts, although some outlays may not show up immediately in the fiscal accounts as loans to troubled financial institutions. The next section will examine these issues.

3. Recent Developments in Debt Management in Brazil

The recent literature on debt management is very rich. Several models have been developed trying to explain the debt structure, among others Alesina *et al*. (1990), Barro (1995), Blanchard and Missale (1991), Bohn (1988), and Goldfajn (1997). This literature points to at least six different arguments that should be considered when the policymaker decides the debt structure in a country such as Brazil (see Goldfajn and Paula, 1999): budget risk, credibility, signaling, rollover risk, liquidity, and reindexation risk.

The budget risk encourages the government to use the debt structure to smooth budgetary shocks. In Brazil, the budgetary shocks are such (see Goldfajn and Paula, 1999) that in order to use the debt to smooth their effect, the government would have to issue long nominal bonds, without any indexation clause. Contrarily to that argument, the credibility and signaling motives encourage the government to issue short nominal debt or indexed debt. With either of those two alternatives the government would eliminate the possibility of inflating away the debt, thereby signaling its "good" type to the private sector. Therefore, there is a trade-off between indexing and not indexing.

The rollover risk encourages the lengthening of the debt maturity in order to avoid that too high a volume must be rolled over at any given moment, as emphasized in the Italian case by Alesina *et al*. (1990). If that happens when the debt market lacks liquidity, the government may either have to pay too high a premium to roll over the maturing debt, or even default. On the other hand, to enhance the liquidity of the debt market, thereby performing the function of completing the financial markets and improving their risk sharing properties, the government is encouraged to concentrate the maturity dates.

[15] That is, compulsory savings were transformed into voluntary savings.

Finally, a Brazilian idiosyncrasy is the extreme fear of indexation, inherited from the megainflation years. However, there is no clear reason why issuing inflation-linked debt should lead to wage or exchange-rate indexation (crawling peg). Furthermore, as Price (1997) emphasizes: *the academic literature suggests no necessary connection between indexed bonds (or indexation in general) and inflation. The emergence of inflation depends on other circumstances and policies that are independent of indexation. Recent government issuers of indexed bonds in fact point to credibility enhancements that may result from issuing indexed bonds, by neutralizing the inflation tax*.[16] According to Price, *in newly developing or transition markets, they* [indexed bonds] *could be envisaged as part of a concomitant package of fiscal and monetary reforms to foster longer term capital formation, along with strong commitments to price stability*.[17]

Here, we challenge the so-called "pedestrian" explanation of the debt structure, i.e., that the government tries to save on debt service by playing the yield curve and fiddling with composition and denomination. We will argue that the arguments mentioned above had different weights in different situations, especially during the reaction to international financial crises. We deem this to be an unavoidable first step in assessing possible explanations for the Brazilian debt structure.[18]

The relevant decisions concerning debt size and structure are how much and what kind (denomination, indexation and maturity) of bonds to place at the auctions, given, among other pieces of information, the amount of debt that is being redeemed.[19] The redemption of old maturing debt and placement of new debt constitute the marginal changes in size and structure of the total debt. The size and structure of the total debt are, of course, the average that corresponds to those marginal changes. Therefore, to properly study debt management, besides analyzing the stocks (i.e., total debt size and structure), we must analyze what happens at the auctions, (i.e., the flows and prices).[20] After all, if conditions change and it becomes optimal to issue only one type of debt that was not being issued before, the structure of the total debt can only be gradually

[16] Page 53.
[17] Page 55.
[18] For econometric tests of the more sophisticated models using Brazilian data, see Goldfajn (1997), and the recent M.Sc. thesis of one of the participants in this project (Pierotti, 1998).
[19] Appendix 1 presents a description of the public bonds available in the market in 1999.

changed. Here, we study in detail debt management in Brazil during the period of the international financial crises, with special emphasis on auction data (flows and prices). This period is very rich concerning the debt structure, because the government changed its debt management strategy after the Asian crisis (October, 1997), and again after the Russian crisis (May, 1998).

In June 1997, on the verge of Thailand's first difficulties, the debt market was following a process of increasing the maturity of the bonds, with the interest rate leveling out at an annual rate of a little over 20%. Figure 11 shows several interest rates. The TBC (Taxa do Banco Central) is the short-term discount rate, at which banks may get bank reserves at the Central Bank. The other marks refer to average rates at non-indexed (nominal) bonds primary auctions conducted by the Treasury and/or the Central Bank (Andima, 1997 and 1998). Until late October 1997, when the Asian crisis erupted completely with the fall of the Hong Kong market, we may observe a normal yield curve (positively sloped) built on top of the TBC, which was kept by the Central Bank at 20.70% p.y. for several months. Note that in the weeks previous to the crisis' eruption, two auctions of two-year bonds were successfully conducted, the last one with an average rate close to 25% p.y. In that week (the week of September 30, 1997) auctions of bonds with maturities of six months, one and two years were held, and the auction average interest rates show a positively sloped yield curve, with a maturity premium of almost four percentage points for the two-year bonds.

When Brazil began to suffer the contagion effect of the Asian crisis in the form of a speculative attack during the week of October 27, 1997, the Central Bank quickly reacted by increasing the basic interest rate, the TBC, from 20.70% to 43.41%. After two weeks without auctions, the rolling over continued with three-month-maturity bonds, at rates little below the TBC. The negative maturity premium, i.e., the fact that the three-month bonds' yield was lower than the TBC, implied an inverted yield curve (negatively sloped). That meant that the market was expecting the interest rates to fall (including the TBC) in the next three months.

In that environment, it is likely that the Treasury and the Central Bank did not want to place long maturity debt. An interest rate of 43% p.y. (with the inflation rate well below 5% p.y.

[20] Unfortunately, there is no available data for the secondary market of government debt.

and an exchange-rate devaluation of 7.5% p.y.) is clearly unsustainable in the long run, being admissible only during a short period to counteract a speculative attack. Therefore, if the Treasury and the Central Bank decided to place one or two year bonds at such high rates, they could conceivably spark a panic because of the informational content of such a move. Placing debt at 43% for a short while may be admissible, but paying such high rates for long periods puts the government budget on a clearly unsustainable path. That could then trigger expectations of default on the part of the government. In other words, in such a situation, an equilibrium may not exist with that high an interest rate and longer maturities.[21] The only equilibrium may be the one with very short maturity bonds. The alternative explanation is that the maturity premium asked by the market for longer maturity bonds was beyond the maximum premium implied by the auction managers' reservation prices.[22]

Until the end of 1997, only three-month maturity bonds were placed, all with negative maturity premia. Figure 12 shows the overall monthly balance of government auctions and debt redemption, and its composition.[23] Note that in the last quarter of 1997, the debt redemptions were much higher than the new placements through the auctions. In that environment, there may be excess liquidity in the market, in the sense that the banks have an undesired amount of excess free reserves in their reserve accounts at the Central Bank. When that happens, the Central Bank is said to be undersold. In those situations, the Central Bank usually places bonds every day with repurchase agreements to avoid the fall in interest rates.[24] However, given that the previous situation was a large oversold position on the part of the Central Bank, the net redemption of the last quarter of 1997 only reduced the oversold position, without reversing it into an undersold

[21] The argument here follows the lines of the credit rationing model of Stiglitz and Weiss (1981).

[22] We asked a Central Bank staff member what had happened in those auctions. He answered that the Central Bank and the Treasury offered longer term bonds, but the bids were all refused, because they were deemed insufficient in quantity, and the yields asked were both too high and too volatile.

[23] Figure 13 shows the size and composition of total redemptions, and Figure 14 shows the size and composition of total new placements at the auctions.

[24] Note the apparent paradox of this situation. If the Central Bank has to act to avoid a fall in the interest rate, why does it not let the interest rate fall from such a high level? The answer is that the market indeed required such high rates to bear the new level of Brazil risk after the Asian crisis. Nevertheless, short-term movements in the interbank market could let the short term interest rate temporarily fall much below such a high rate. In order to avoid sending false signals as to its targeted rate, the Central Bank acted to prevent the temporary fall in the short-term interbank interest rate.

position.[25] This description shows how debt management in Brazil is still very much intertwined with the daily operation of monetary policy.

Another aspect that should not be overlooked is the positive net placements of US dollar-linked debt during the last four months of 1997 (see Figures 12 and 14). That status continued in the first semester of 1998, and responded for the increase in the US$-linked debt share in total debt (see Figure 9A), which, nevertheless, did not cross the 20% level until very near the devaluation of January 1999. We interpret such movement as a combination of the agents' desire to hedge the exchange-rate risk, and the government's double objective to provide such a hedge without compromising foreign reserves[26] and to place higher priced (lower yield) debt.[27]

Figure 15 shows the auctions of non-indexed (nominal) bonds since the beginning of 1998 and until the onset of the Russian crisis. The pattern is extremely interesting. Note that the reduction in the basic short term rate set by the Central Bank (TBC) sets the pace for the reduction of the other interest rates at the auctions. The pattern is clearly one of a steady reduction of the TBC (set at six-week intervals). The auction rates tend to be lower than the TBC, signaling the market expectation of a future interest rate fall. At first, only one and three-month bonds are being placed. After the third reduction in the TBC since the Asian crisis, in February 1998, the market for six-month bonds reappeared. After the fourth reduction in the TBC since the Asian crisis, in March 1998, the market for one-year bonds also reappeared.

The yield curve is inverted (downward sloped) for the one-month, three-month and six-month maturities, and normal (positively sloped) for the one-year maturity, when such a market reappears. This is compatible with a market expectation of falling interest rates in the near future (up to six months), but with a large uncertainty of events "much further in the future" (one year, in this case). In late April 1998, after the fifth reduction in the TBC since the Asian crisis, the

[25] The undersold or oversold position of the Central Bank is not a public datum. This qualitative piece of information was given to us by a Central Bank staff member.

[26] Remember that the US$-linked bonds were redeemable in R$. Under a fixed (or semi-fixed) exchange-rate regime, this detail is irrelevant. However, Brazil still keeps a dual exchange-rate system and, furthermore, the reintroduction of foreign exchange restrictions is always regarded as a possibility (see Garcia and Barcinski, 1998). This leads to the so-called "convertibility" risk, which is traded in international financial markets. That is, one may get a quote on how much would it cost in R$ to have a certain amount of US$ delivered in a US bank account at a certain future date. From the point of view of the government accounts, in the event of a devaluation, US$-linked debt does not compromise the amount of foreign reserves, but only the fiscal situation.

[27] Given the increased fear of a devaluation, the yields on US$-linked debt were much lower than those on nominal bonds.

yield curve became normal (positively sloped), and, as the spreads opened up, much more steep, signaling increasing maturity premia. By mid-May, the time of the Russian crisis eruption, the yield curve was very steep.

At that point, the government decided to double its bet on falling interest rates, undertaking a sixth successive reduction in the TBC. This time, however, market's expectations did not agree with such move. To demonstrate that, we resort to other interest rates, those of interest rate swaps.[28] The rates for those swaps are comparable to those of the public bonds.[29]

Figures 16-19 show the interest swap rates, together with the auction rates, and the TBC, for three-month, six-month and one-year maturities, respectively. What we want to demonstrate with these figures is that the swap rates served as *lower bounds* for the respective auction rates, and, as such, served as (downwardly biased) measures of the bids offered at the auctions of government bonds. What we observe in Figures 16, 17 and 18, especially in the latter two, is that the swap rates were declining accordingly to the TBC until April 1998. After that, the swap rates increased, while the TBC was once more reduced by the Central Bank. That is, a gap opened up between the interest rate the government was trying to signal and the interest rate the market was requiring under the new epidemic given the Russian contagion. Not surprisingly, the market for three-month, six-month and one-year bonds vanished, and the only nominal bond placed in the auctions after mid-May were one-month BBCs. In June and July, the Central Bank resorted to its last resource, the LBCs, short term (one month) bills indexed to the daily interest rate (zero-duration bonds).

This decision was prompted essentially by the increase of rollover risk, and it had an immediate impact on the amounts that were rolled over in each auction. When debt maturity decreases, the debt must be rolled over more often. That is exactly what we observe in the last months of Figures 12, 13 and 14. The amounts of monthly redeemed and issued debt tripled. This, of course, significantly increased the rollover risk, i.e., the risk of not being able to roll over the debt in the event of a crisis, with likely negative impacts in the exchange-rate anchor of the stabilization program that was in place at the time.

[28] These swaps are like forward contracts, with only one final payment.
[29] Strictly speaking, the rates differ for a minor dating convention, which has no importance for our purposes here.

This one-year period, therefore, is indeed very rich, because in it we were able to see markets opening up before the Asian crisis (two-year nominal bonds), then markets disappearing when the crisis erupted, markets reappearing as interest rates were reduced, and markets once more disappearing when a new crisis erupted and the Central Bank did not want to validate the market's expectation of higher interest rates.

After May, due to the strategy of placing only indexed bonds (mostly zero-duration and dollar-linked), average maturity resumed its upward trend, and the rollover risk decreased.[30] However, this happened at a cost: if interest rates had to be lifted in the future, the fiscal budget would be badly hit. The same was valid regarding a devaluation. With the benefit of hindsight, we know now that both strategies caused massive losses to the fiscal budget.

Even with zero-duration debt, average maturity fell again in the last quarter of 1998, due to the contagion effect of the Russian default. Since the devaluation of January 1999, maturity has been increasing (see Figure 9B).

We conclude from all those observations that the "pedestrian" explanation is a reasonable description of what has happened. The government has indeed tried on one hand to save on the interest rate expenditures, playing with different kind of indexes and the term structure, and on the other hand to lengthen the debt to avoid the rollover risk. It also allowed the share of US$-linked debt to increase, but not as much as in the case of the Mexican Tesobonos of December 1994. This strategy was able to prevent a confidence crisis but was not able to prevent the devaluation that eventually came. We now turn to the issue of the net debt, which will allow us to tackle the fiscal side and its impact on the bonded debt.

4. Net Debt

Three major stylized facts mark the evolution of the public-sector debt during the 1990s. The first is the substantial reduction in the importance of foreign debt in the total public-sector debt.[31]

[30] It is very important to note that the issuance of indexed debt reduces the rollover risk (because it increases debt maturity) without proportionately increasing debt duration. Indexation separates maturity and duration; i.e., it allows the debt manager to reduce the rollover risk while keeping the price (market) risk. Figure 9B shows how, after May 1998, the average remaining life of the stock of debt placed through public offers became higher than the average duration of the same debt stock.

[31] The public-sector foreign gross debt was reduced to from almost 28% of GDP in 1991 to less than 13% of GDP in 1998.

The second important fact is that from January 1991 until mid-1995 domestic federal debt growth can be entirely explained by two elements: the conversion of compulsory savings to voluntary savings by the Collor administration, and the substantial accumulation of foreign reserves. The third major stylized fact is that from 1995 on the growth in the domestic federal debt is in large part explained by fiscal developments.

With the sizable accumulation of foreign reserves after 1991, the net public-sector debt acquired increasing importance as an indicator of public indebtedness. As in many other countries, it became routine to refer to the gross indebtedness figures net of the value of major assets in the public sector balance sheet. In addition to foreign exchange reserves, however, the net debt figures in Brazil include many other lower-quality assets that have been growing very rapidly in the last few years. This paper discusses the implications of this fact for the interpretation of the public-sector net debt statistics.

4.1 Recent Evolution of the Public-Sector Net Debt

As the bottom line of Table 4 shows, the public-sector net debt has increased from 28.5% of GDP in December 1994 to 42.6% of GDP in 1998. This increase is totally explained by very rapid growth in the domestic net debt, which increased from 20.3% of GDP in 1994 to 36% of GDP in 1998, and more than compensated the reduction in the foreign net debt from 8.2% of GDP to 6.7% of GDP in 1998. Given that the domestic net debt of public sector enterprises was substantially reduced during the period, the increase in the public-sector net debt during 1994-1998 can be entirely explained by the growth in the domestic net debt of the federal government and Central Bank, and state and municipal governments. In fact, the figures in Table 4 imply that about 3/4 of this growth can be attributed to the federal government and Central Bank.

This evolution of the federal net-debt figures during 1994-1998 should be interpreted with caution. Though the federal net debt has increased much less dramatically than the federal gross debt, there are reasons to believe that the quality of the net debt has deteriorated substantially during the period.

4.2 The Quality of the Federal Net Debt

There are two important sources of deterioration in the quality of the public-sector net debt after 1994. The first is the recent restructuring of the Brazilian financial system. The combination of

high interest rates and the sudden end of the high inflation regime, following the launching of the stabilization plan in mid-1994, considerably increased the vulnerability of the banking system.

After the Central Bank intervention in *Banco Econômico* in August 1995, the financial health of important private banks became increasingly questioned and there was a growing concern that a major banking crisis could develop. In response to those concerns, the Central Bank decided to promote the restructuring of the private banking system, introducing in early November 1995 a series of measures, including the creation of the Program to Promote the Restructuring of the Financial System (PROER). Three big private institutions have been rescued since then, following basically the same procedure, with 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, persuaded to participate in the transaction by access to a low-interest credit line.

From its launching in November 1995 to March 1997, PROER operations amounted to R$15.1 billion. With the acquisition of *Banco Bamerindus* by the Hong Kong & Shanghai Banking Corporation in May 1997, this amount increased to R$20.8 billion. By August 1998, a total of R$23.0 billion had been released. Some R$1.6 billion havealready been paid off by the banks[32] and R$13.2 billion,[33] corresponding to the resources used to finance the purchase of *Banco Econômico* and *Banco Nacional*, have been transferred to the Central Bank department in charge of liquidating financial institutions. Those resources will be paid back only when the Central Bank manages to sell assets of the former *Econômico* and *Nacional* or when it liquidates the guarantees of the PROER loans.

A similar program, denominated PROES, was launched in mid-1996 to deal with insolvent state-owned banks. So far, the most important transaction in the context of this program has been the R$8 billion capitalization of *Banco do Brasil* by the Treasury in 1996.

A second important source of deterioration in the quality of the federal net debt has been the generous restructuring by the federal government of the states' sizable outstanding debt during 1997. In the third major state-debt restructuring operation in a period of ten years, the federal government has issued bonds with high interest rates and relatively short maturities to extend credit to the states at low interest rates and maturities that in most cases reach 30 years. In

[32] See "Bancos só pagaram 7% dos recursos do PROER," *O Estado de São Paulo*, August 28, 1998.

the end, some R$87 billion of states' debt was restructured.[34] It is estimated that the final amount of resources spent on the states, including the resources used to reform the state banks through the PROES, could be as high as R$103 billion.

The 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, have been deducted as assets from the federal gross debt. Similarly, as high-interest state bonds have been swapped for lower-interest federal bonds, the states' debt has been largely converted into debt to the federal government and, therefore, also been subtracted from the federal gross debt in net-debt figures. 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 4 shows an increase of 24.9% of GDP in the gross domestic debt of the federal government and the Central Bank between 1994 and 1998, partly compensated by a reduction in their foreign debt equivalent to 1.6% of GDP. The resulting gross-debt increment of 23.3% of GDP led to a smaller, though still impressive, increase in the federal net debt largely because it was offset by an accumulation of "other assets" amounting to 10.1% of GDP. The evolution of those assets has been dominated by developments related to the restructuring of the financial system and the states' debt.

It is highly likely that, in the future, part of the assets which are being subtracted from the federal gross public debt may prove to be partially or totally worthless. Some of the assets transferred to the Central Bank when failing banks were bailed out may prove to be worthless, or the states may not fully honor the service of their debts to the federal government. If and when that happens, the federal net-debt figures will have to be adjusted upwards.

4.3 Reassessing the Federal Net Debt: A Simple Model

The contingent liabilities that stemmed from the financial-system restructuring program, as well as the sizeable stock of states' debt included in the assets considered in the federal net-debt figures, may be properly taken into account in a simple model that allows a more careful

[33] See Mendonça de Barros *et al*. (1998).
[34] See Bevilaqua (1999).

assessment of the importance of the federal net debt. As the model is developed, the two problems will be dealt with separately at first and jointly afterwards.

The contingent liabilities beneath the financial-system-restructuring program may be treated in a very straightforward way. Let *Z* be the non-performing assets of bailed-out banks that were absorbed by the Central Bank and let *h* be the proportion of those assets that the Central Bank will be able to recover after they are liquidated. As those assets are currently being entirely subtracted from the gross federal debt, the federal net-debt *ND* should be transformed into the corrected measure ND_Z according to the following equation

$$ND_Z = ND + (1 - h)\, Z \qquad (1)$$

Of course the value of *h* is not known yet. But one may deal with the pending uncertainty about its value assuming a plausible probability distribution for *h*. Preliminary data on the costs of the financial-system restructuring program show that in the case of *Banco Nacional*, one of the three big private institutions that have been bailed out, the Central Bank will be able to recover as much as 25 percent of the absorbed assets.[35] Just to illustrate the point, it was somewhat optimistically assumed that *h* has a truncated exponential distribution with mean equal to 0.4 and minimum and maximum values 0.25 and 1.0 respectively.

In 1998, the federal net debt *ND* corresponded to roughly 25 percent of the GDP. The total value of the assets of *private* bailed-out banks that were transferred to the Central Bank has been estimated at 1.6 percent of GDP. If nothing could be recovered *(h = 0)*, the value of the corrected federal net debt stock ND_Z would be equivalent to 26.6 percent of GDP. Such an extreme case was just assumed away when the distribution for *h* presupposed that its value would be at least 0.25, as shown in Figure 20, obtained from Monte Carlo simulations. Using the above-mentioned values for *ND* and *Z*, simulations based on equation 1 generated the distribution for ND_Z presented in Figure 21.[36] According to this distribution, the mean value of the corrected federal net-debt measure ND_Z would be around 26 percent of GDP.

Putting aside for a moment the problem stemming from the existence of contingent liabilities related to the financial-system restructuring program, one may now turn to the problem

[35] See "BC recupera só 1,1 bilhão do Nacional," *Gazeta Mercantil*, February 2, 1998.
[36] In fact the utilized sampling method was the Latin Hypercube, a variant of the Monte Carlo method.

posed by the importance of the states' debts among the assets considered in the federal net-debt calculation.

Assuming that *A*, the total stock of states' debts to the Union, is the only relevant federal asset, the federal net debt may be written as

$$ND = D - A \qquad (2)$$

Where *D* is the gross debt, on which an average interest rate *r* is paid. The states are supposed to pay an interest rate ρ on their debt to the Union. The federal net interest payments therefore are

$$J = rD - \rho A.$$

This may be rewritten as

$$J = (r - \rho\alpha)\, D \qquad (3)$$

where

$$\alpha = A/D \qquad (4).$$

Dividing both sides of expression (3) by *ND*, and taking (2) and (4) into account, one may get

$$v = (r - \rho\alpha)/(1 - \alpha) \qquad (5)$$

where $v = J/ND$ is the implicit interest rate paid on the federal net debt. Naturally, if $r > \rho$ and $a < 1$, an increase in α leads to a higher *v*, as the derivative of *v* with respect to *a* may be written as

$$(r - \rho)/(1 - \alpha^2) \qquad (6)$$

In other words, if the interest rate ρ on states' debt to the Union is lower than the interest rate paid by the federal government on its own debt, the implicit interest rate *v* paid on the federal

net debt will be higher the higher, the importance of the state's debt to the Union vis-à-vis the gross federal debt.[37]

In Figure 22, which was drawn assuming plausible values for the interest rates in equation (6)—r = 12 percent and ρ = 6 percent—one may have a clearer idea of how an increase in a affects the implicit interest rate v. Since the current value of a is around 0.27, the implicit rate consistent with those values would be around 14.2 percent.

In fact, the implicit interest rate v on the federal net debt should depend not on the contractual interest rate ρ on the states' debt to the Union but upon the *effective* interest payments that the federal government is finally able to receive from the states. As past experience has shown that such debt service has been subjected to all kinds of difficulties, one may take this fact into account in the model, treating ρ as a random variable, and running simulations in order to detect the effect of the uncertainty about ρ on the implicit interest rate on the federal net debt.

The maximum interest rate the Union may expect to receive from the states is, of course, the contractual rate, i.e., 6 percent. In the worst case the states could even stop paying interest on their debts to the federal government. It was assumed that ρ has a truncated normal distribution with mean 4 percent, standard deviation 0.75 percent, maximum 6 percent and minimum 2 percent.[38] Figure 23 shows the distribution for ρ generated by the simulations. Keeping r = 12 percent and assuming α = 0.27, simulations run with the model generated the distribution for v presented in Figure 24.

As may be seen in the figure, the implicit interest rate v on the federal net debt may vary from 14.2 to 15.7 percent, as a result of the uncertainty about ρ. The average interest rate is around 15 percent.

Looking from a different angle, one might notice that although taking federal assets into account may undoubtedly lead to what seems to be more comfortable federal debt figures, as long as $r > \rho$, the implicit interest rate on the net debt tends to be higher than the rate paid on the gross debt. And that could be seen as an indicator of a less comfortable situation. The interest bill that

[37] In fact, the second derivative of v with respect to a, which may be written as $2(r - \rho)/(1 - \alpha)^3$, is also positive if $r > \rho$ and $\alpha < 1$. The higher α, the higher the sensitivity of net interest paid on the federal net debt to an increase in α..

stems from paying an annual implicit interest rate of v on a net federal debt D - A is equivalent to the bill that would result from paying the lower interest rate r on a much higher debt stock, which would be a measure more appropriate for comparisons involving debt accumulated before the restructuring of the states' debt. Labeling such a virtual debt stock ND_A one may write

$$v\,(D - A) = r\,ND_A \qquad (7)$$

and get

$$ND_A = (D - A)\,v/r \qquad (8)$$

An expression that, when (2) and (5) are used, may be rewritten as

$$ND_A = [ND/r][(r - \rho\alpha)/(1 - \alpha)] \qquad (9)$$

That expression provides a corrected measure of the federal net debt that takes into account the relatively low interest paid by the states on their debts to the Union. For a given level of ND, ND_A will be higher the higher the value of α, as illustrated in Figure 25, for r = 12 percent *and* ρ = 6 percent.

As the current value of α is 0.27, what Figure 25 shows is that even if the states duly pay the contractual 6 percent interest rate on their debt to the Union, the interest bill on the 25 percent of GDP federal net debt would be equivalent to the bill that would result from paying a 12 percent interest on a debt corresponding to 29.6 percent of GDP. Of course, ND_A could be much higher if the effective interest rate on the states' debt to the Union proves to be well below 6 percent. Again, simulations may be helpful at this point. Using the distribution for ρ from above, one may generate the distribution ND_A presented in Figure 26, which has a mean value of 31.2 percent.

Up to now the problem posed by the existence of contingent liabilities related to the financial-system restructuring program, on one side, and the problem stemming from the importance of the states' debt to the Union, on the other, were treated separately. It is now time to consider both problems together.

The first problem was dealt with above by equation (1),

[38] However, no credit risk was assumed. The optimistically underlying hypothesis is that the states will eventually pay their debts to the Union.

$$ND_Z = ND + (1 - h)\, Z \qquad (1)$$

which provided a correction of the federal net debt that allowed for the existence of the contingent liabilities. Using (2), that equation may be rewritten as

$$ND_Z = D - A + (1 - h)\, Z \qquad (10).$$

Repeating the same reasoning used above when equation (7) was discussed, one may say that the interest bill brought about by paying an implicit interest rate v on $D - A + (1 - h)\, Z$ is equivalent to the bill that would result from paying the lower interest rate r on a higher debt stock. Labeling now such a virtual debt stock ND_{AZ} one may write

$$v\,[D - A + (1 - h)\, Z] = r\, ND_{AZ} \qquad (11)$$

and get

$$ND_{AZ} = [D - A + (1 - h)\, Z]\, v/r \qquad (12)$$

Using (2) and (5), one may write

$$ND_{AZ} = [ND + (1 - h)\, Z]\, [(r - \rho\alpha)/(1 - \alpha)r] \qquad (13).$$

This provides a corrected measure of the federal net debt that *jointly* takes into account the problem posed by the existence of contingent liabilities related to the financial-system restructuring program and the problem stemming from the importance of the states' debt to the Union.

The uncertainty about both h and ρ may now be jointly considered. Taking the distributions assumed for h and ρ above, one may use equation (13) to simulate the distribution for ND_{AZ}, as shown in Figure 27. The corrected measure ND_{AZ} could reach as much as 34.2 percent, with a mean value of roughly 32.4 percent.

Taking into account the combined uncertainty entailed in two of the main assets that have been deducted from the gross federal debt leads, therefore, to a corrected measure of the federal net debt that could easily involve increasing the official net debt measure by a third.

5. Conclusion

Given Brazilian inflationary history, the domestic bonded debt market was recreated in the mid-1960s with the introduction of indexed bonds (ORTNs), which were then conceived as an anti-inflationary tool. The idea was that only the money financing of the fiscal deficits was inflationary. In the period of more than thirty years since its creation, the Brazilian open market has evolved into a very sophisticated one. The gross bond debt held by the private sector is currently around one fourth of a trillion US dollars; the megainflation of the 1980s and early 1990s did *not* inflate away the Brazilian debt.

As shown in Section 2, the Brazilian public debt and inflation grew together from the second half of the 1970s. This imposed a very peculiar structure on the debt. Except in very short periods, most of the debt has some form of inflation protection through indexation. Despite indexation, the debt maturity has been and still is quite short. After all, during the megainflation, monetary correction has traditionally been a very poor inflation hedge in Brazil. On more than one occasion, the government has tampered with the indexation clauses of the debt. Moreover, in 1990, the Collor administration started by hijacking most of the public debt to avoid massive capital flight.

During the megainflation, most of the debt was placed with banks (and later, with mutual funds managed by the banks) which used the bonds as the asset counterpart of inflation protected deposits (the indexed money, or domestic currency substitute). With the Real Plan this situation is gradually changing. The debt maturity has been lengthened (with a few setbacks, as the recent Asian and Russian crises), and more agents interested in becoming final holders of long debt—as insurance companies and pension funds—are becoming more important in the financial arena.

As Brazilian short-term interest rates converge to a lower level, we shall see these agents holding much longer debt. Until then, the high level of short-term debt, which is many times higher than foreign reserves, will be a menace to the stabilization program. This is even more concerning because Brazil's dismal fiscal performance since the Real Plan both negatively affects investors' confidence in the country's macroeconomic stability and adds to the already high level of debt. Since early 1999, however, fiscal accounts have improved considerably in the context of the IMF-supported adjustment program.

The increase in public-sector net debt in recent years is totally explained by the very rapid growth in the domestic net debt, which increased from 20.3% of GDP in 1994 to 35.9% in 1998.

More than two-thirds of this growth can be attributed to the expansion of the domestic net debt of the federal government and Central Bank. Though federal net debt has increased much less dramatically than federal gross debt, there are reasons to believe that the quality of the net debt has deteriorated substantially during the period.

There are two important sources of deterioration in the quality of the public-sector net debt after 1994. The first is the recent restructuring of the Brazilian financial system, which led the Central Bank to assume the bad part of the balance sheet of insolvent institutions. The second important source of deterioration in the quality of the federal net debt has been the restructuring by the federal government of the states' sizable outstanding debt during 1997, which led to the conversion of states' debt into debt to the federal government.

The non-performing assets of the insolvent banks transferred to the Central Bank have been deducted as assets from the federal gross debt. Similarly, as states' debt has been largely converted into debt to the federal government, it has also been subtracted from the federal gross debt in the net-debt figures. 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.

It is highly likely that, in the future, part of the assets which are being subtracted from the federal gross public debt may prove to be partially or totally worthless. Some of the assets transferred to the Central Bank when failing banks were bailed out may prove to be worthless, or the states may not fully honor the service of their debts to the federal government. If that happens, the federal net-debt figures will have to be adjusted upwards, with possible budgetary impacts which will probably increase the size of the bond debt.

The contingent liabilities that stemmed from the financial-system restructuring program, as well as the sizable stock of states' debt included in the assets considered in the federal net-debt figures, may be properly taken into account in a simple model that allows a more careful assessment of the importance of the federal net debt.

When the proportion of those assets that the Central Bank will be able to recover after the bailed-out banks are liquidated is treated is a random variable, with a plausible probability distribution, one finds that the federal net debt figures should be corrected upwards. This is also the case when it is taken into consideration that the interest rate on states' debt to the Union not

only is lower than the interest rate paid by the federal government on its own debt, but uncertain. Taking into account the combined uncertainty entailed in these two assets that have been deducted from the gross federal debt leads to a corrected measure of the federal net debt that could increase the official net debt measure by a third.

As shown in Section 3, the strategy to roll over the old debt and issue new debt as required by the fiscal deficits has conformed quite well to the "pedestrian" explanation. That is, the government has indeed tried on one hand to save on the interest rate expenditures, playing with different kind of indexes and the term structure, and on the other hand to lengthen the debt to avoid the "rolling over" risk. It also allowed the share of US$-linked debt to increase, but not as much as to turn a possible devaluation into a "poison pill" as in the case of the Mexican Tesobonos in December 1994. However, this strategy has become a very risky one, as the fiscal results eroded since the start of the stabilization plan.

Therefore, unless a major improvement in the fiscal accounts is undertaken by the new administration in 1999, we foresee difficult problems in debt management. Interest rates will have to remain at high levels, with deleterious impacts on the budget, on economic growth, and on social welfare. Furthermore, the short average maturity and large size of the bond debt will represent a constant threat to the exchange-rate anchor that is fundamental to the stabilization process. As of November 1999, the Central Bank unveiled a package of measures aimed at decreasing the number of bonds, thereby promoting more liquidity for the remaining bonds. According to the *The Economist* (11/11/1999), *... among the main features of the central bank's planned reforms are: to hold fewer, bigger auctions of debt, with dates announced further in advance; to reduce drastically the types of bonds on the market (there are currently more than 200, many of them small, illiquid issues relating to former state firms); to allow banks to have "short" positions on the bond market (i.e., to sell bonds they do not own), plus other rule-changes to promote liquidity and to be more open in publishing details of the debt*.

References

Abreu, M.P., Carneiro, D. and Werneck, R.L.F. 1994. “Government and Economic Growth: A Three-Gap View of the Long-Run Prospects of the Brazilian Economy.” Texto para Discussão 327. Rio de Janeiro, Brazil: PUC-Rio, Departamento de Economia.

Abreu, M.P. and Werneck, R.L.F. 1994. “Privatization and Regulation in Brazil: The 1990-92 Policies and the Challenges Ahead.” *Quarterly Review of Economics and Finance*. 33 (special issue): 21-41.

Alesina, A., Pratti, A. and Tabellini, G. 1990. “Public Confidence and Debt Management: A Model and a Case Study of Italy.” In: R. Dornbusch. and M. Draghi, editors. *Public Debt Management: Theory and History*. Cambridg, United Kingdom: Cambridge University Press.

Andima 1993. Séries Históricas – Dívida Pública, Rio de Janeiro, Andima.

Andima. 1997. Retrospectiva 1997. Rio de Janeiro, Andima.

Andima. 1998. Retrospectiva 1998. Rio de Janeiro, Andima.

Andima, Sinopse (various issues). several issues. Rio de Janeiro, Andima.

Bacha, E. 1990. “A Three-Gap Model of Foreign Transfers and the GDP Growth Rate in Developing Countries.” *Journal of Development Economics*. 32 (2): 279-96..

----. 1996. “Plano Real: Uma Segunda Avaliação.” Paper presented at the seminar The First Two Years of the Real Plan, jointly sponsored by IPEA and ECLAC, Brasília, Brazil.

Barro, R. 1996. “Optimal Debt Management.” NBER Working Paper 5327. Cambridge, United States: National Bureau of Economic Research.

Bevilaqua, A.S. 1995a. “Dual Resource Transfers and the Secondary Market Price of Developing Countries Debt.” Texto para Discussão 344. Rio de Janeiro, Brazil: PUC-Rio, Departamento de Economia.

----. 1995b. “Dual Resource Transfers and Interruptions in External Debt Services.” Texto para Discussão 346. Rio de Janeiro, Brazil: PUC-Rio, Departamento de Economia.

----. 1996. “Public External Debt and Dual Resource Transfers.” Texto para Discussão 352. Rio de Janeiro, Brazil: PUC-Rio, Departamento de Economia.

----. 1999. “State-Government Bailouts in Brazil.” Rio de Janeiro, Brazil: PUC-Rio, Departamento de Economia. Mimeographed document.

Bevilaqua, A.S., and R.L.F. Werneck. 1997. “Fiscal Policy Sustainability in Brazil.” Rio de Janeiro, Brazil: PUC-Rio, Department of Economics. Mimeographed document.

Blanchard, O. and Missale, A. 1991. “The Debt Burden and the Debt Maturity.” *American Economic Review* 84(3): 309-319.

Bohn, H. 1988. “Why Do We Have Nominal Debt?” NBER Working Paper 5327. Cambridge, United States: National Bureau of Economic Research.

Bresciani-Turroni, C. 1937. *The Economics of Inflation.* London, United Kingdom: George Allen & Unwin.

Buiter, W.H. 1983. “Measurement of the Public Sector Deficit and its Implication for Policy Evaluation and Design.” *International Monetary Fund Staff Papers*. 30 (2): 306-49.

Calvo, G. 1995. “Varieties of Capital-Market Crises.” Research Department Working Paper 306. Washington, DC, United States: Inter-American Development Bank, Research Department.

Carneiro, D. 1987. “Passivo do Governo e Déficit Público: A Experiência da Economia Brasileira no Período, 1970-84.” In: E. Lozardo, editor. *Déficit Público Brasileiro: Política Econômica e Ajuste Estrutural***.** São Paulo, Brazil: Paz e Terra.

----. 1994. “Adaptação Inflacionária, Política Monetária e Inflação.” In: J.P. Velloso, editor. *Inflação, Moeda e Indexação*. Rio de Janeiro, Brazil: Nobel.

----. 1995. “Política monetária e a remonetização Pós Real.” Discussion Paper 351. Rio de Janeiro, Brazil: PUC-Rio.

Carneiro, D. and Garcia, M. 1994. “Capital Flows and Monetary Control under a Domestic Currency Substitution Regime: The Recent Brazilian Experience.” In: R. Steiner, editor. *Afluencia de Capitales y Estabilización em America Latina*. Bogota, Colombia: Fedesarollo.

----. 1995. “Private International Capital Flows to Brazil.” Serie Financiamento del Desarrolo No. 33. Santiago, Chile: ECLAC / UNPD.

----. 1996. “Flujos de Capital y Control Monetario Bajo Sustitución Doméstica de Dinero: La Reciente Experiencia Brasileña.” In: R. Steiner, editor. *Afluencia de Capitales y Estabilización en América Latina*. Bogota, Colombia: Fedesarollo.

Carneiro, D. and R.L.F. Werneck. 1990. “Dívida Externa, Crescimento Econômico e Ajustamento Fiscal.” *Pesquisa e Planejamento Econômico* 20 (1).

----. 1993a. “Obstacles to Investment Resumption in Brazil.” In: E. Bacha, editor. *Savings and Investment Requirements for the Resumption of Growth in Latin America*. Washington, DC, United States: Inter-American Development Bank/Johns Hopkins University Press.

----.1993b. “Strengthening the Financial Sector in the Brazilian Economy.” IDB Working Paper 142. Washington, DC, United States: Inter-American Development Bank.

Franco, G.H.B. 1990. “Fiscal Reforms and the End of Four Hyperinflations.” *Economic Journal* 100(399): 176-187.

Frankel, J.A. 1991. “Quantifying International Capital Mobility in the 1980s.” In: B.D. Bernheim and J.B. Shoven, editors. *National Saving and Economic Performance.* Chicago, United States: University of Chicago Press

Furugem, A.S., L.P. Pessôa and S. Abe. 1996. “Dívida Pública Líquida: Evolução 1982-95 e Perspectivas de Curto Prazo.” Sao Paulo, Brazil: Banco de Investimento Garantia. Unpublished research paper.

Garcia, M. 1993. “The Fisher Effect in a Signal Extraction Framework: The Recent Brazilian Experience.” *Journal of Development Economics* 41(1): 71-93.

----. 1994a. “The Formation of Inflation Expectations in Brazil: A Study of the Futures Market for the Price Level.” *Revista Brasileira de Economia* 48(4): 47-70.

----. 1994b. “The Role of Capital Markets in Economic Growth.” Chicago, United States: Catalyst Institute.

----. 1995a. “Política Monetaria y formación de expectativas de inflación. ¿Quién acertó más, el gobierno o el mercado a futuro?” *El Trimestre Economico* 62(245): 97-128.

----. 1995b. “Política Monetária, Depósitos Compulsórios e Inflação.” *Revista de Economia Política* 15(2): 112-124.

----. 1995c. “Política Monetária e Cambial: Algumas Lições do Período Recente para o Real.” In: IPEA and ECLAC, editors. *Transformação Produtiva com Eqüidade: o Debate no Brasil; Condicionantes Macroeconômicos*. Brasilia, Brazil: IPEA/ECLAC.

----. 1996a. “Avoiding Some Costs of Inflation and Crawling toward Hyperinflation: The Case of the Brazilian Domestic Currency Substitute.” *Journal of Development Economics* 51(1).

----. 1996b. “Política Monetária e Cambial: Algumas Lições do Período 1991-1994.” *Estudos Econômicos* 25(3): 327-353.

----. 1996c. “O Financiamento à Infra-Estrutura e a Retomada do Crescimento Econômico Sustentado.” *Revista de Economia Política* 63(2): 153-165.

Garcia, M., and A. Barcinski. 1998. “Capital Flows to Brazil in the Nineties: Macroeconomic Aspects and the Effectiveness of Capital Controls.” *Quarterly Review of Economics and Finance* 38(3): 319-358.

Garcia, M., G. Bekaert and C. Harvey. 1994. “The Contribution of Speculators to Effective Financial Markets in Brazil.” Chicago, United States: Catalyst Institute.

Garcia, M., and E. de la Rocque. 1996. “Um Estudo sobre a Volatilidade do Mercado Futuro de Taxa de Juros no Brasil.” *Pesquisa e Planejamento Econômico* 26(2): 203-30.

Garcia, M. and Fernandes, E. 1993. “Regulacion y Supervision de los Bancos Comerciales en Brasil.” In: G. Held and R. Szalachman, editors. *Regulacion y Supervision de la Banca: Experiencias en América Latina y el Caribe*. Santiago, Chile: ECLAC.

Garcia, M., P. Perron and R. Cati, R. 1999. “Unit Roots in the Presence of Abrupt Governmental Interventions with an Application to Brazilian Data.” *Journal of Applied Econometrics* 14(1): 27-56.

Garcia, M., and L. Rezende. 1996. “Leilões de Títulos da Dívida Pública pelo Banco Central do Brasil: Um Estudo dos Fatores Condicionantes da Dispersão das Propostas para os BBCs.” Discussion Paper 360. Rio de Janeiro, Brazil: PUC.

Goldfajn, I. 1996. “On Public Debt Indexation and Denomination.” Waltham, United States: Brandeis University. Discussion paper.

----. 1998. “Public Debt Indexation and Denomination: The Case of Brasil.” IMF Working Paper 18. Washington, DC, United States: International Monetary Fund.

Goldfajn, I., and A. Paula. 1999. “Uma nota sobre a composição ótima da dívida pública: Reflexões para o caso brasileiro.” Rio de Janeiro, Brazil: PUC-Rio. Mimeographed document.

Mello, M.A.R.F. 1994. “Privatização e Ajuste Fiscal no Brasil.” *Pesquisa e Planejamento Econômico* 24(3): 445-518.

Mendonça de Barros, J.R., G.J.L. Loyola and J. Bogdanski. 1998. “Reestruturação do Setor Financeiro.” Brasilia, Brazil: Ministério da Fazenda, Secretaria de Política Econômica. Mimeographed document.

Missale, A. and O. Blanchard. 1991. “The Debt Burden and the Debt Maturity.” NBER Working Paper 3944. Cambridge, United States: National Bureau of Economic Research.

New Zealand, Ministry of Finance. 1997. *Financial Statements of the Government of New Zealand (For the Year Ended 30 June 1997)*. Wellington, New Zealand: Ministry of Finance.

Oliveira, F.E.B., and K.I. Beltrão, K.I. 1995. "A Reforma da Seguridade Social no Brasil." Research, Rio de Janeiro, Brasil: Banco de Investimento Garantia.

Pierotti, P. 1998. "Choques Macroeconômicos e o Manejo Ótimo da Dívida Pública Brasileira." Rio de Janeiro, Brazil: PUC-Rio. M.Sc.Thesis.

Price, R. 1997. "The Rationale and Design of Inflation-Indexed Bonds." IMF Working Paper Series 97/12. Washington, DC, United States: International Monetary Fund.

Sargent, T. 1986. "The Ends of Four Big Inflations." In: T. Sargent, editor. *Rational Expectations and Inflation*. New York, United States: Harper and Row.

Sochaczewski, A. 1980. "Financial and Economic Development of Brazil, 1952-1968." London, United Kingdom: London School of Economics. Doctoral dissertation.

Stiglitz, J.E., and A. Weiss. 1981. "Credit Rationing in Markets with Imperfect Information." *American Economic Review* 71(3): 373-409.

Werneck, R.L.F. 1986. "Poupança Estatal, Dívida Externa e Crise Financeira do Setor Público." *Pesquisa e Planejamento Econômico* 16 (3): 55-74.

----. 1987. "Retomada do Crescimento e Esforço de Poupança: Limitaçöes e Possibilidades." *Pesquisa e Planejamento Econômico* 17 (1):1-18.

----. 1988. "Um Modelo de Simulação para Análise do Financiamento do Setor Público." *Pesquisa e Planejamento Econômico* 18(3).

----. 1989 "Aspectos Macroeconômicos da Privatização no Brasil." *Pesquisa e Planejamento Econômico* 19 (2).

----. 1990. "A Questão do Financiamento do Setor Público na Economia Brasileira: O Espaço para Ajuste nos Dispêndios Não-Financeiros." *Revista de Economia Política* 10(1).

----. 1991. “Public Sector Adjustment to External Shocks and Domestic Pressures, 1970-85.” In: M. Selowsky and F. Larrain, editors. *The Public Sector and the Latin American Crisis, 1970-1985*. San Francisco, United States: International Center for Economic Growth.

----. 1995. “Federalismo Fiscal e Política de Estabilização no Brasil.” *Revista Brasileira de Economia* 49(2).

----. 1994. “Wretched Statecraft: Brazil’s Vicious Circle.” In: G. Ranis, editor. *En Route to Modern Growth: Essays in Honor of Carlos Díaz-Alejandro*. Washington, DC, United States: Inter-American Development Bank/Johns Hopkins University Press.

----. 1996. “The Changing Role of the State in Brazil.” *Quarterly Review of Economics and Finance* 36(2): 153-165.

----. 1997. “Privatização e Dívida Líquida do Setor Público.” *O Estado de São Paulo*. May 16, 1997.

Table 1. Trends in Public Debt, 1971-1979

Year	Debt/GDPRatio (%)	Real Debt Growth(%)	Share of Private Holding of Public Debt (%)	Share of Fixed Interest Bonds in Private Holding of Public Debt (%)	Average Maturity of Total Public Debt (months)
1971	4.5	13.0	95.5	14.9	14.2
1972	5.4	38.1	92.9	25.3	14.5
1973	5.9	42.0	89.4	41.3	15.2
1974	5.3	-0.5	90.5	32.6	20.1
1975	6.2	30.4	90.4	33.2	23.7
1976	7.2	25.9	92.0	39.7	22.8
1977	7.1	6.4	89.1	47.0	17.5
1978	7.4	8.3	89.2	52.7	14.8
1979	6.4	-8.1	89.5	49.5	13.5

*Source: Séries Históricas - Dívida Pública, Andima (1993).

Table 2. Trends in Public Debt, 1980-89

Year	Debt/GDP Ratio (%)	Real Debt Growth (%)	Share of Private Holding of Public Debt (%)	Share of Fixed Interest Bonds in Private Holding of Public Debt (%)	Average Maturity of Total Public Debt(months)
1980	4.2	-32.3	82.3	30.5	20.0
1981	5.6	23.1	76.3	31.0	24.9
1982	7.1	31.0	63.3	24.5	26.6
1983	6.6	-20.0	48.9	11.9	28.4
1984	7.4	11.7	46.0	2.9	22.8
1985	11.2	73.6	63.1	7.7	14.5
1986	9.9	1.9	46.7	4.0	8.8
1987	10.8	1.5	38.2	0.3	9.8
1988	13.9	13.2	34.3	0.0	7.7
1989	16.3	11.1	47.4	0.0	11.4

Source: Séries Históricas - Dívida Pública, Andima (1993).

Table 3. Trends in Public Debt, 1990-98

Year	Debt/GDP Ratio (%)	Real Debt growth (%)	Share of Private Holding of Public Debt (%)	Share of Fixed Interest Bonds in Private Holding of Public Debt (%)	Average Maturity of Total Public Debt (months)
1990	13.5	-15.8	34.4	10.0	34.9
1991	8.5	-36.2	27.0	4.6	34.3
1992	10.7	21.4	30.0	43.6	30.1
1993	10.5	-3.2	33.2	43.7	17.5
1994	12.3	50.6	61.2	28.3	6.9
1995	12.6	21.4	76.7	34.8	5.9
1996	20.2	66.2	86.2	53.9	6.7
1997	23.2	22.3	91.9	51.5	n.a.
1998	32.9	68.9	77.7	27.9	38.1

* Source: Séries Históricas - Dívida Pública, Andima (1993), and Brazilian Central Bank Bulletin (several issues).

Table 4.

Brazil, Non Financial Public-Sector Net Debt, 1994-1998 (in percent of GDP)

	December 1994 (A)	December 1995 (B)	December 1996 (C)	December 1997 (D)	December 1998 (E)	Change 94-98 (E) – (A)
(1) Federal Government & Central Bank Net Debt	12.3	13.0	16.4	18.2	25.3	13.0
Gross Debt	31.7	34.0	40.9	45.7	55.0	23.3
Domestic Debt	19.9	23.6	31.4	37.3	44.8	24.9
Foreign Debt	11.8	10.4	9.5	8.4	10.2	-1.6
(-) Foreign Reserves	5.8	7.0	7.8	6.4	5.9	0.1
(-) Other Assets	13.7	14.0	16.6	21.1	23.8	10.1
(2) State and Municipal Governments Net Debt	9.5	10.4	11.9	13.5	14.4	4.9
Domestic Net Debt	9.2	10.1	11.5	13.0	13.7	4.5
Foreign Net Debt	0.3	0.3	0.4	0.5	0.7	0.4
(3) Public Enterprises Net Debt	6.7	6.5	6.1	2.8	2.9	-
Domestic Net Debt	4.9	4.8	4.0	0.9	1.3	3.8
Foreign Net Debt	1.9	1.7	2.0	1.9	1.7	-
						3.6
						-
						0.2
Public-Sector Net Debt [(1) + (2) + (3)]	28.5	29.9	34.4	34.5	42.6	14.1

Source: Banco Central do Brasil.

Figure 1.
Total Federal Debt and Debt Held by the Private Sector, 1970-99

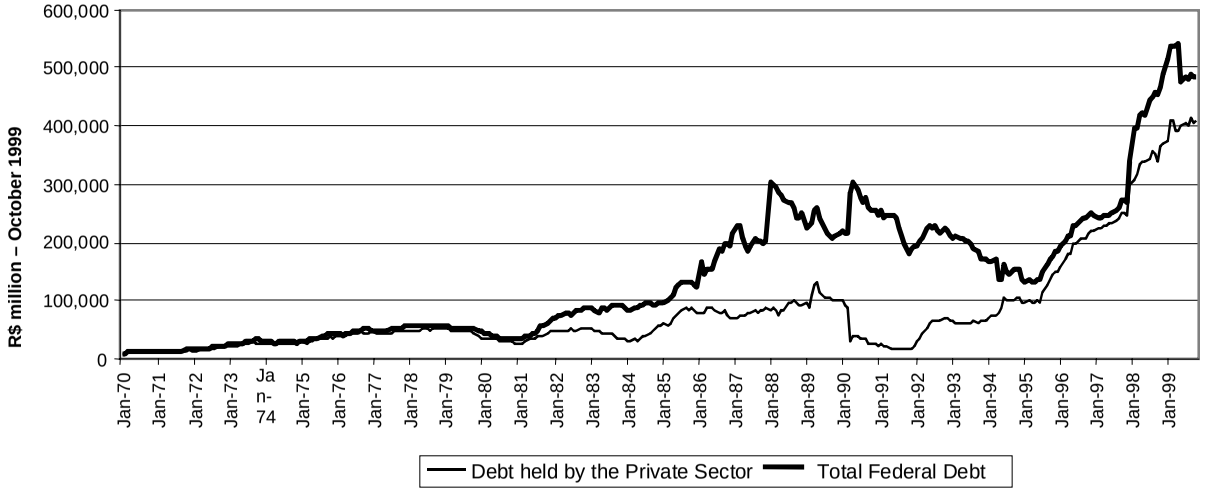


Figure 2.
Evolution of the Ratio OTN / Price (official inflation)

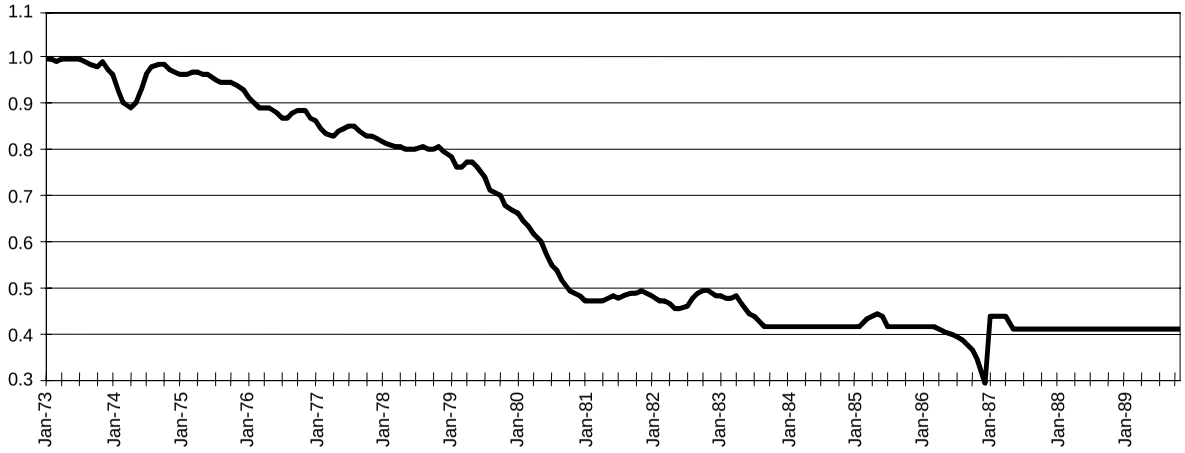


Figure 3.
Total Federal Debt and Debt Held by the Private Sector, 1970-79

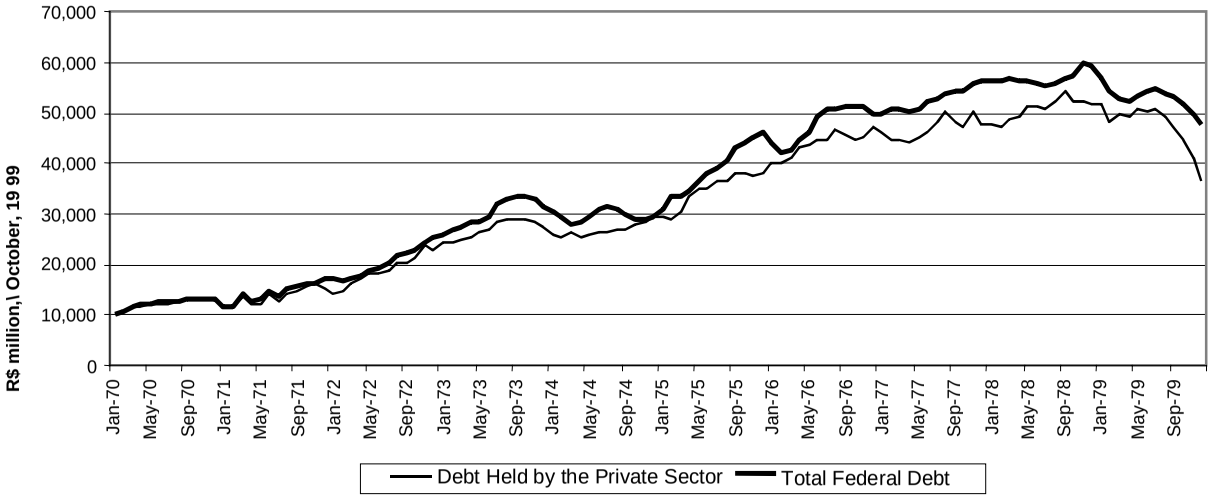


Figure 4 A.
Composition of Federal Bonds, 1970-79

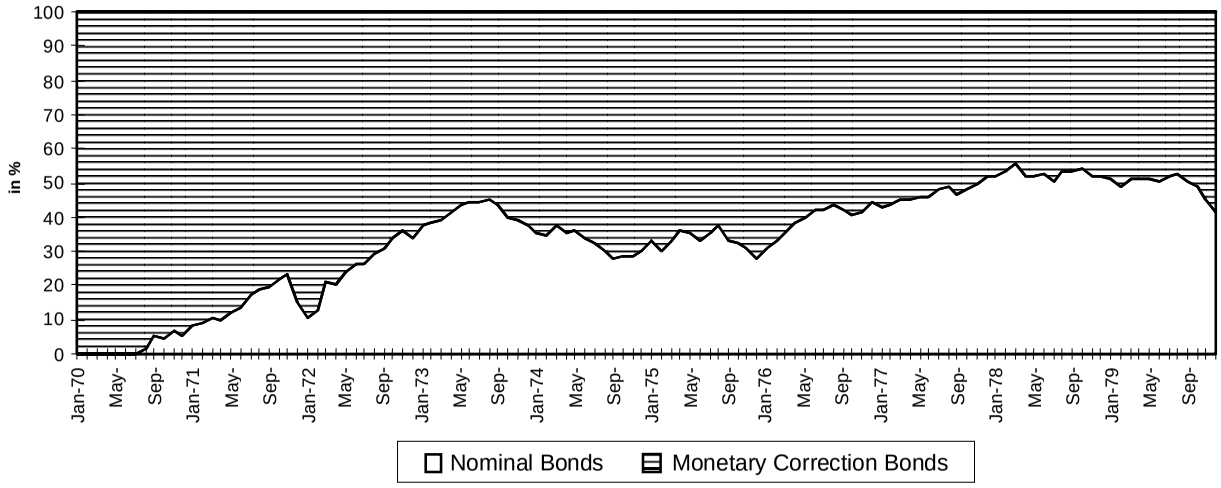


Figure 4 B.
Composition of Federal Securities, 1970-79

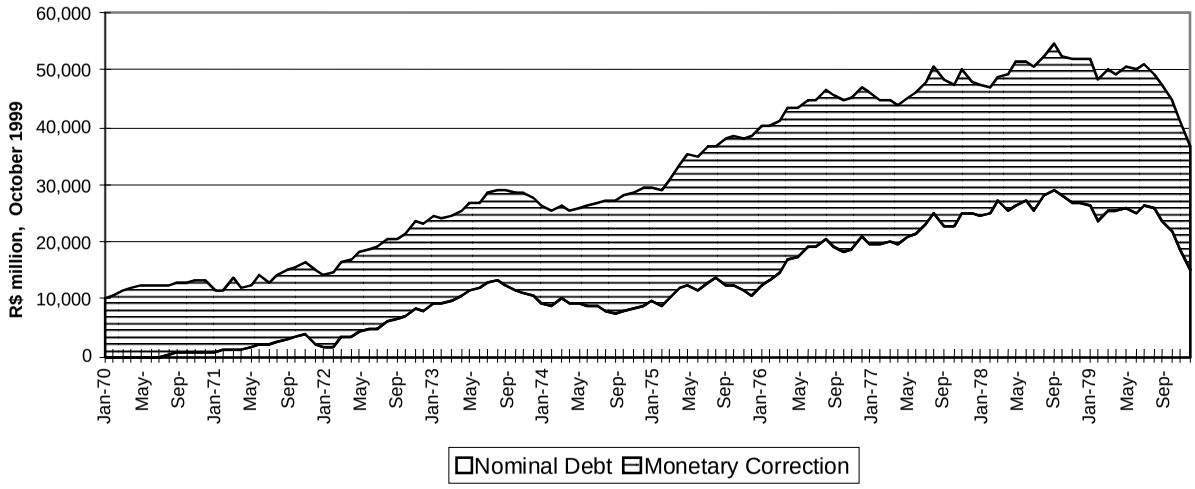


Figure 5.
Average Remaining Life and Inflation, 1977-96

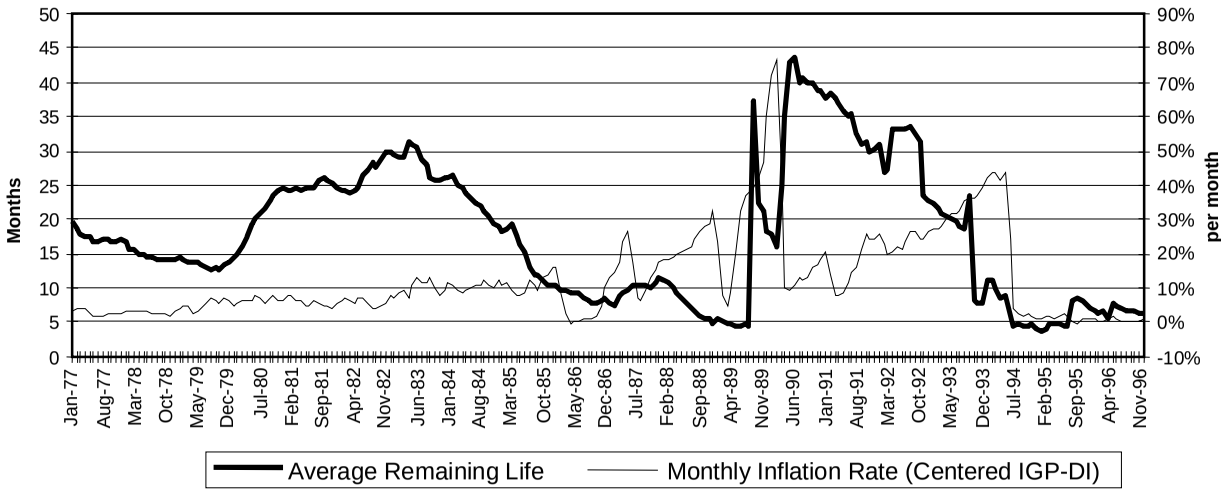


Figure 6.
Total Federal Debt and Debt Held by the Private Sector, 1980-89

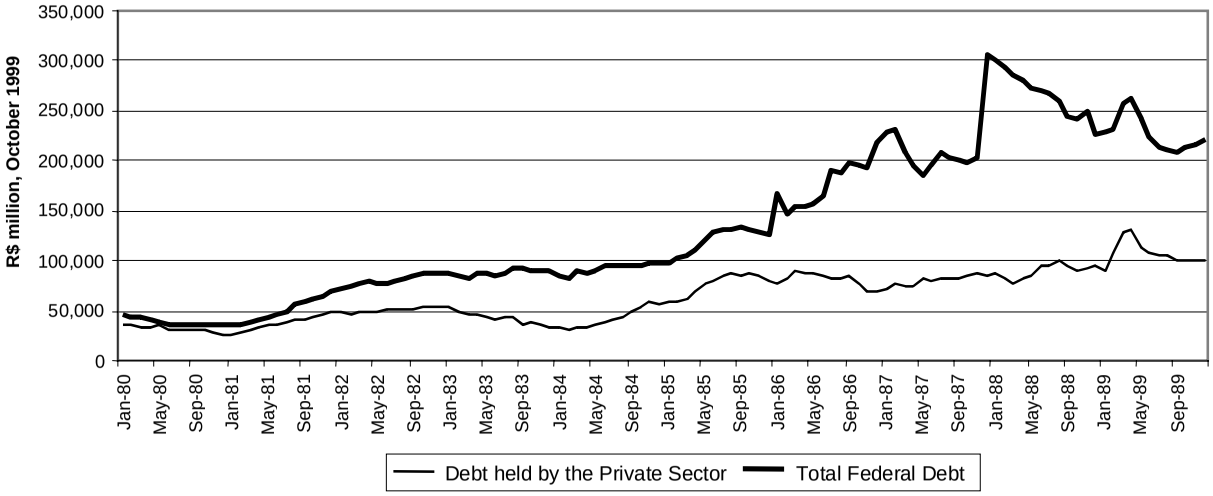


Figure 7 A.
Composition of Federal Bonds, 1980-89

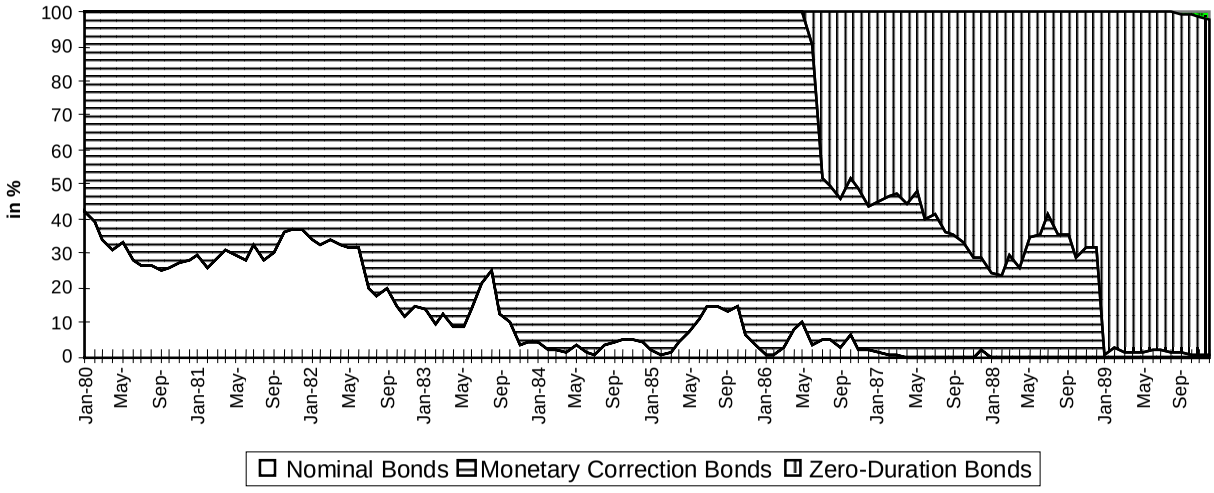


Figure 7B.
Composition of Federal Securities, 1980-89

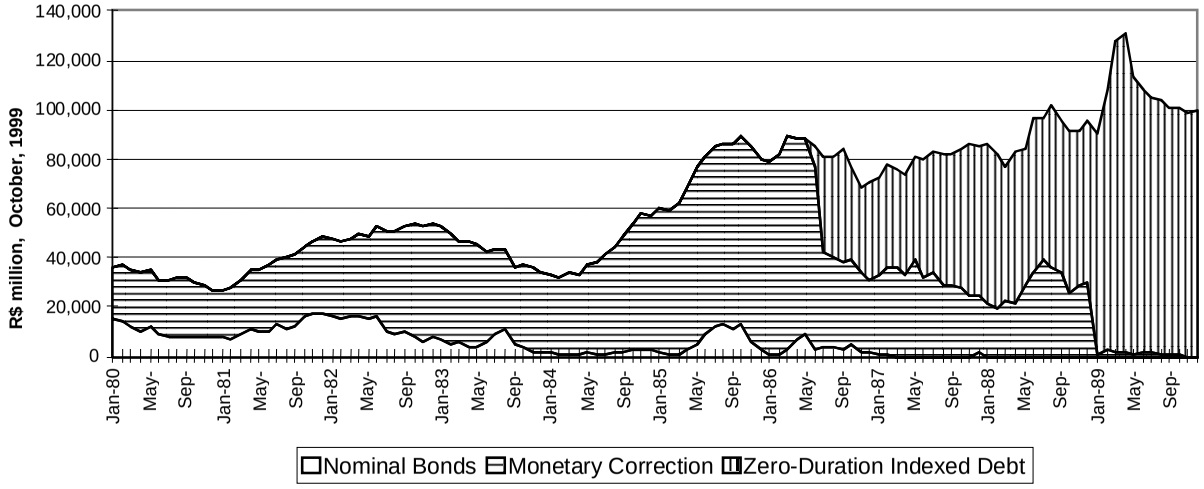


Figure 8.
Total Federal Debt and Debt Held by the Private Sector, 1990-99

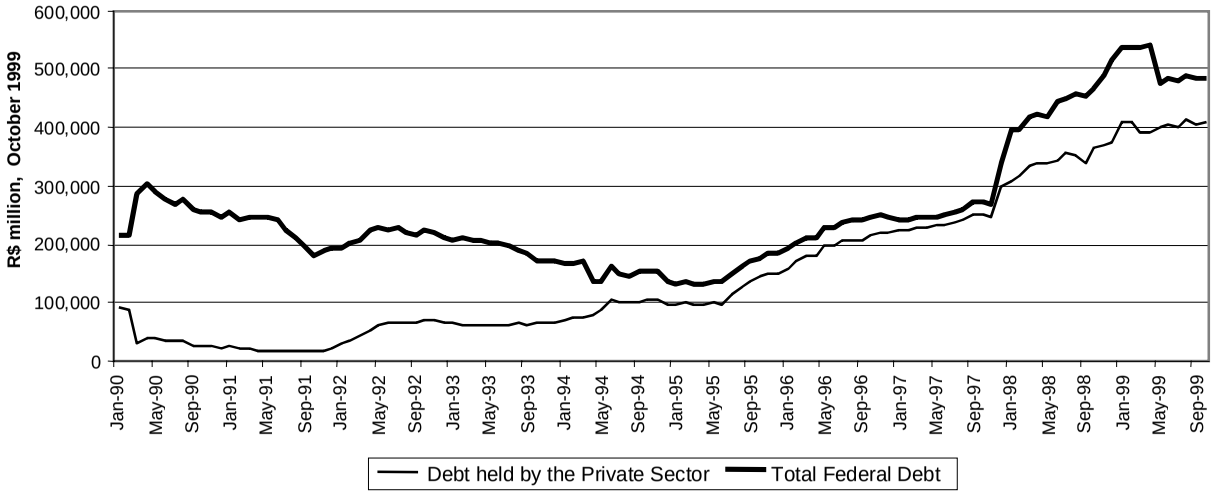


Figure 9 A.
Federal Bonds, Composition 1990-1999

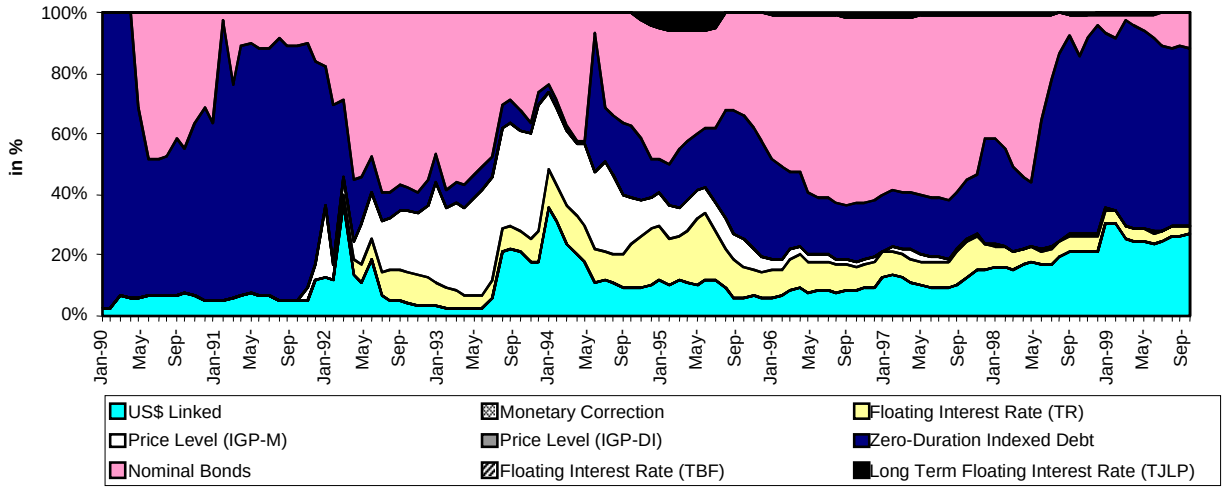


Figure 9B.
Federal Bonded Bonds : Composition and Average Maturity

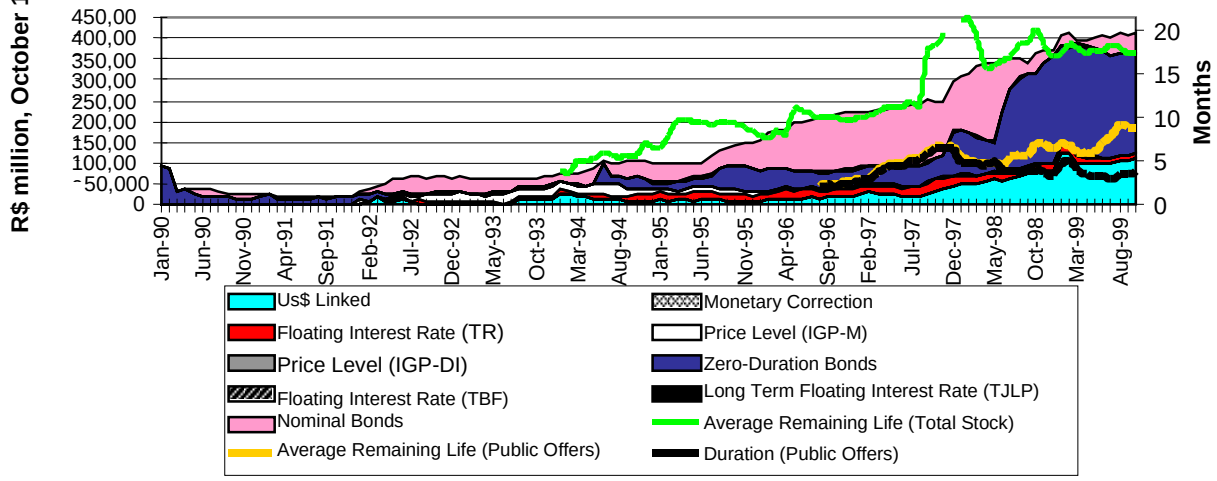


Figure 9C.
Federal Bonded Bonds: Composition and Average Maturity

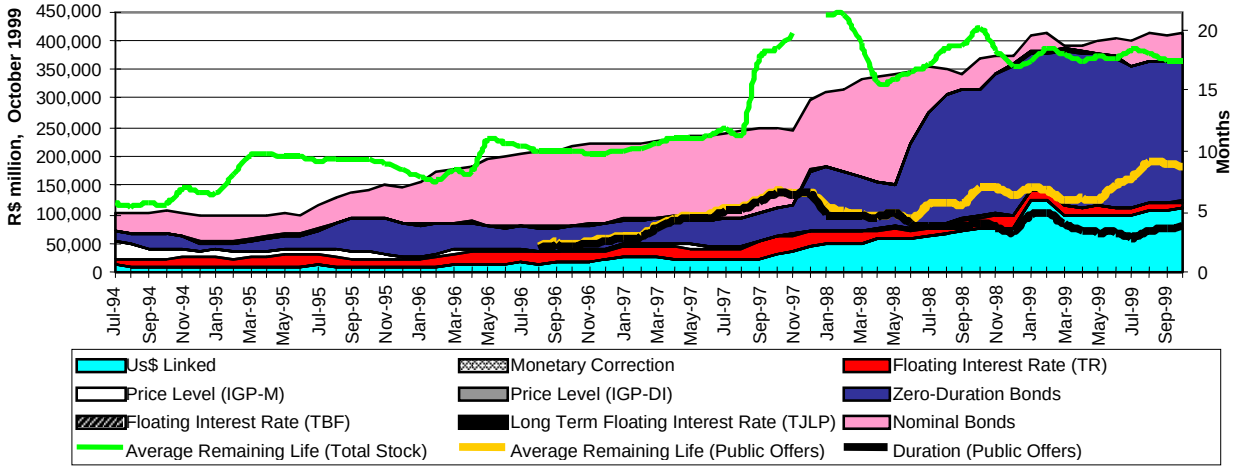


Figure 10.
Domestic Net Effective Federal Debt and Foreign Reserves Accumulation

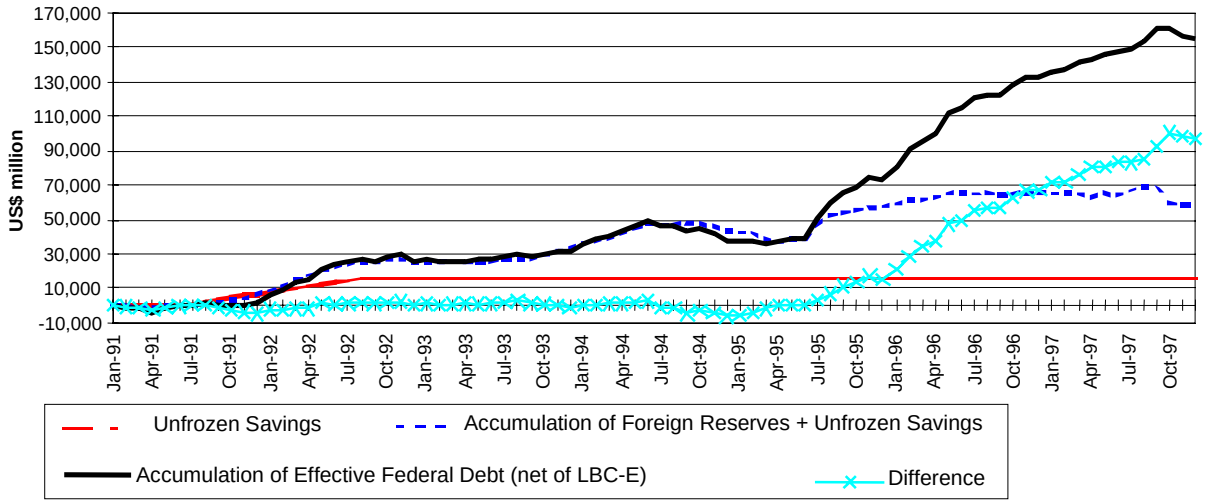


Figure 11.
Public Debt Auctions - Nominal Bonds : 1997.III and IV

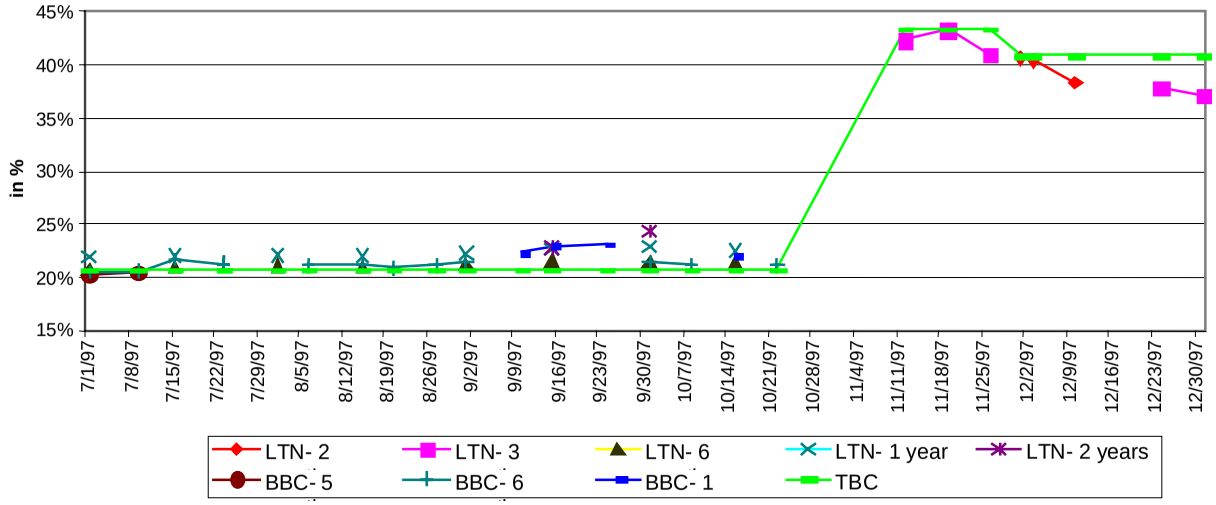


Figure 12.
Public Debt Balance (Redemption - Placement)

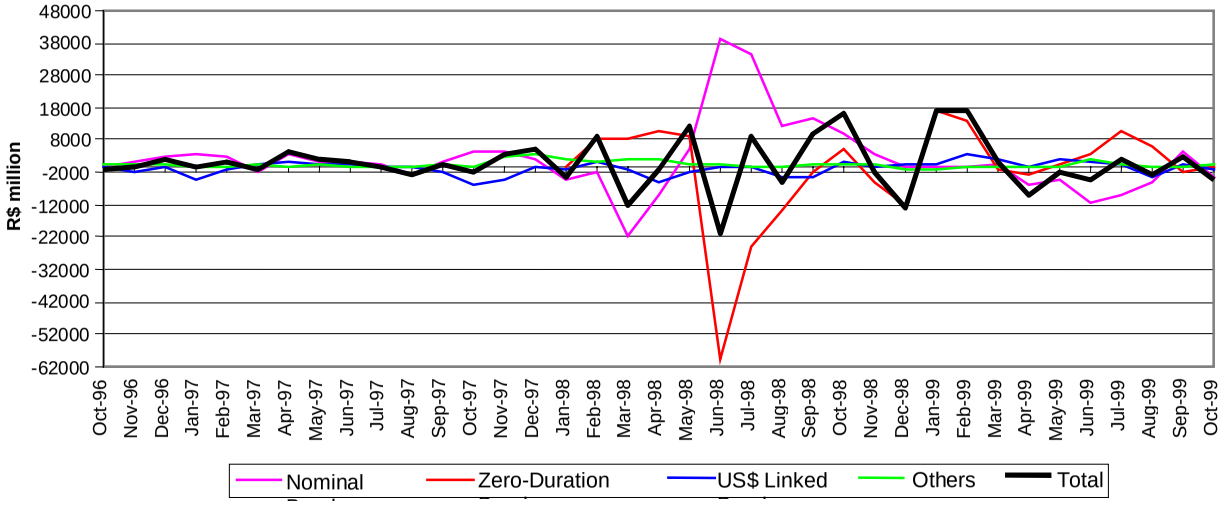


Figure 13.
Public Debt Redemption

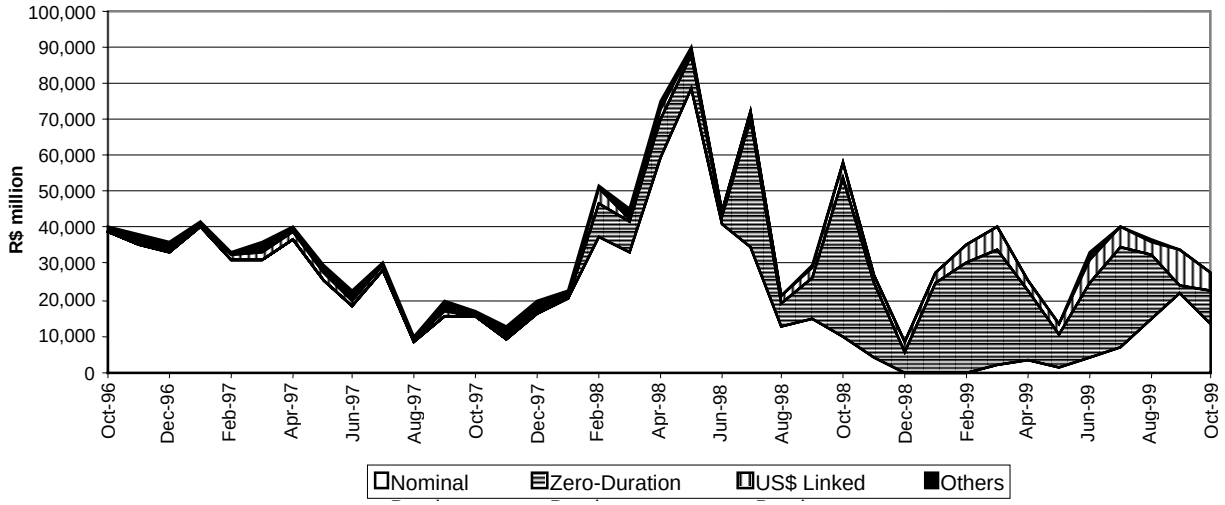


Figure 14.
Public Debt Placement

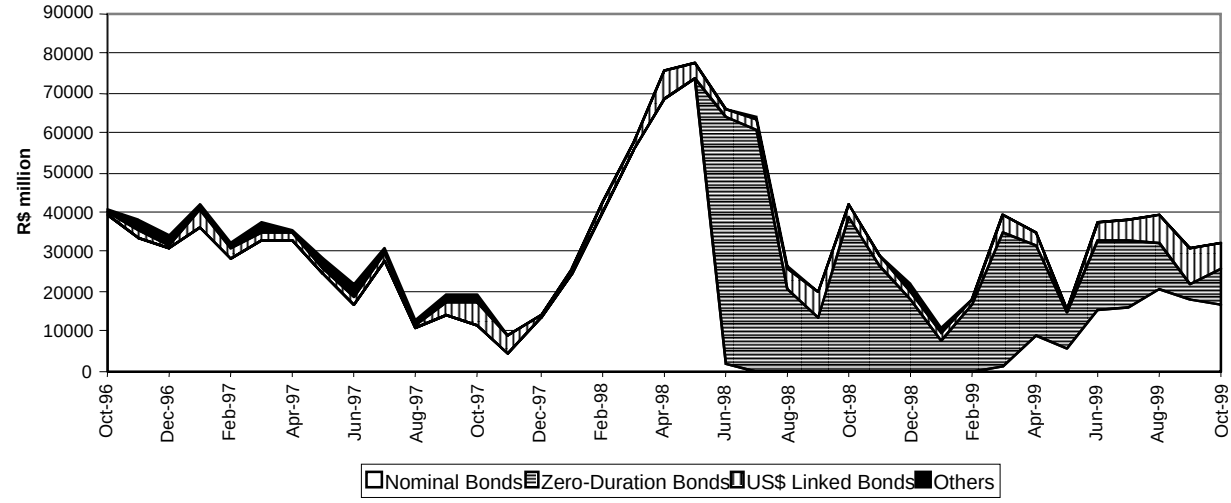


Figure 15.
Public Debt Auctions - Nominal Bonds : 1998.I and II

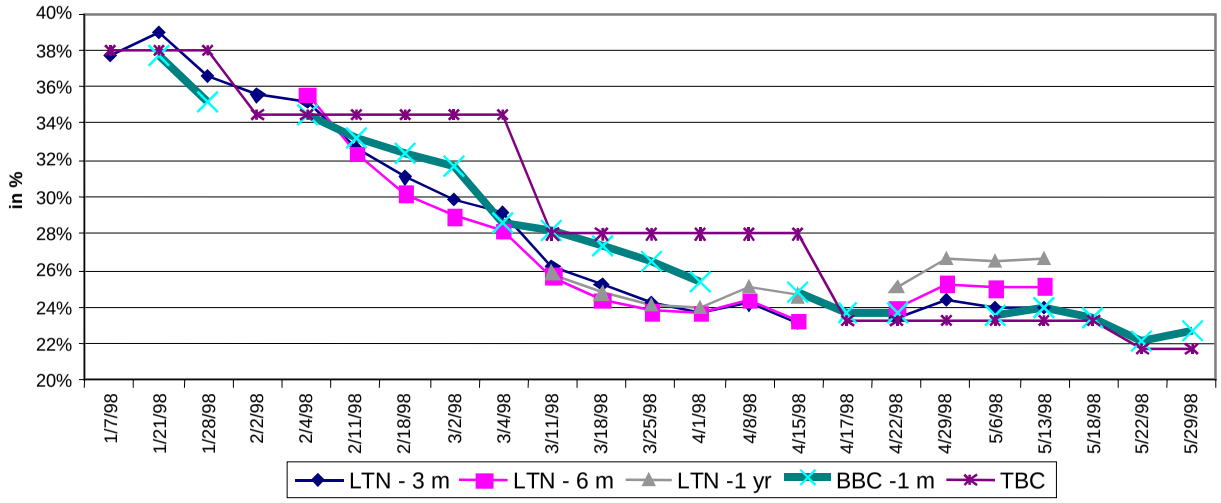


Figure 16.
3-Month Interest Rate

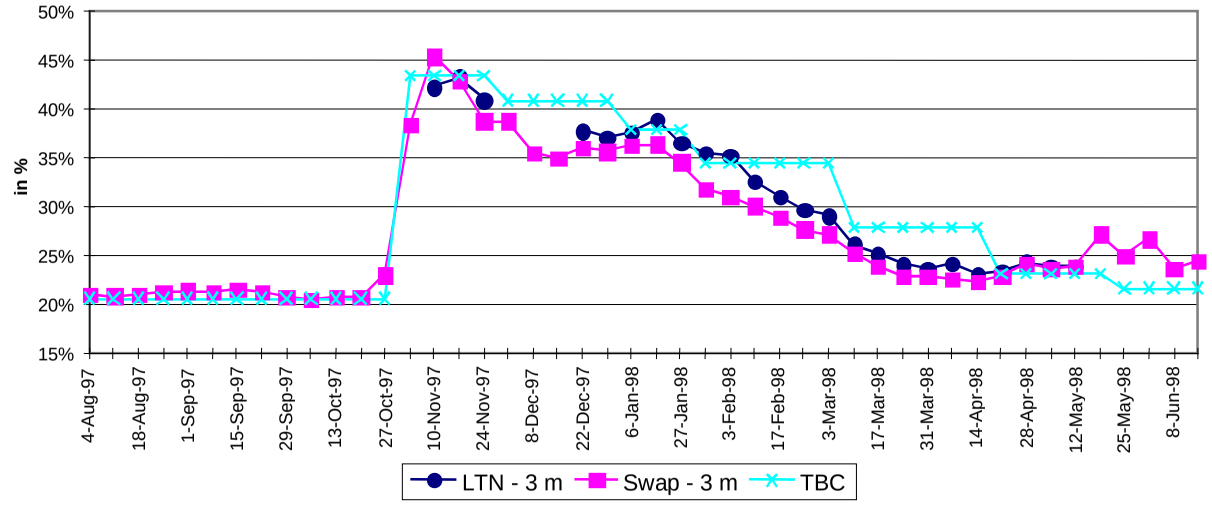


Figure 17.
6-Month Interest Rate

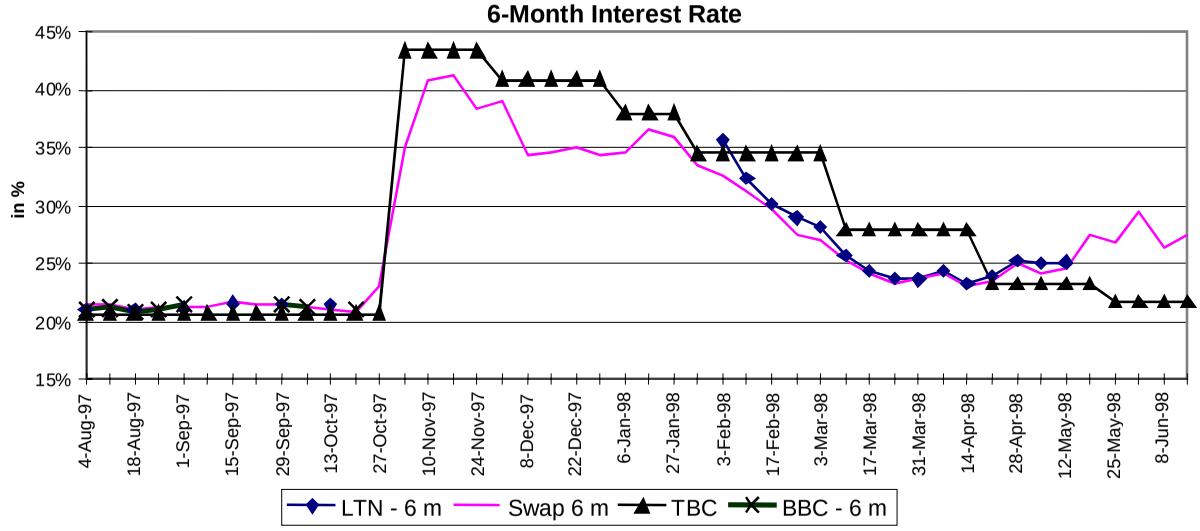


Figure 18.
1-Year Interest Rate

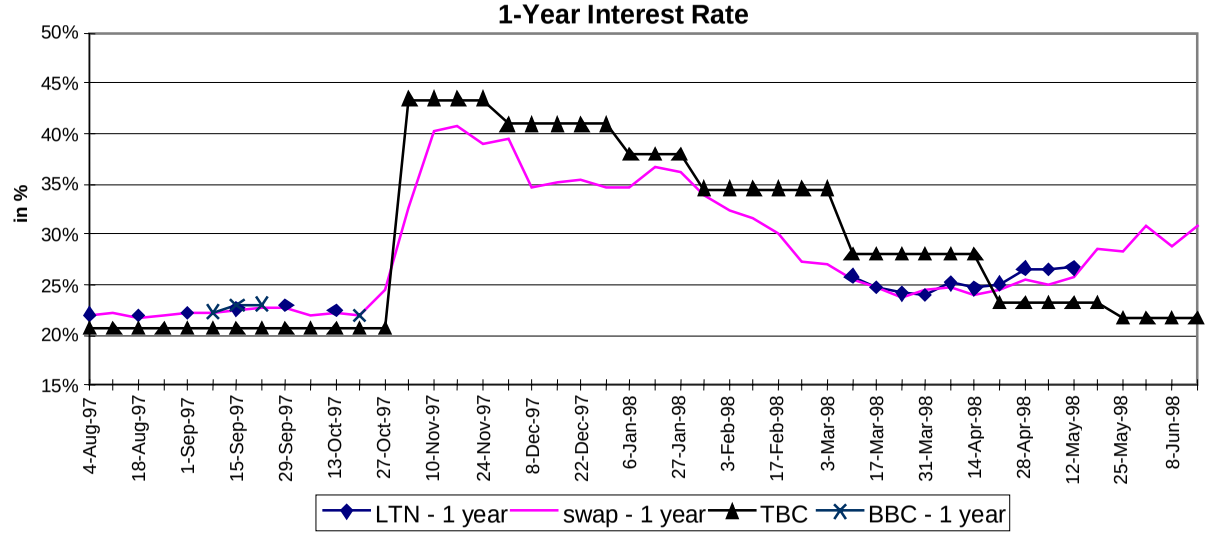


Figure 19.

Public Debt Auctions : LTN and BBC - 1999

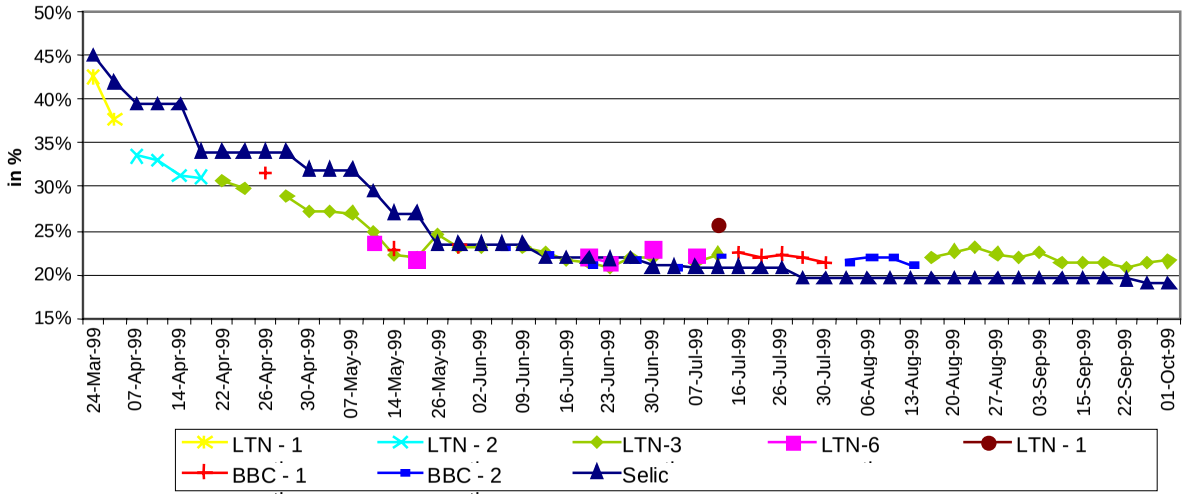


Figure 20.

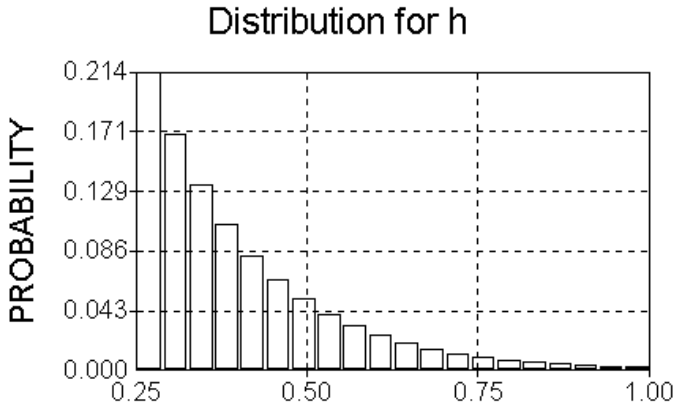


Figure 21.

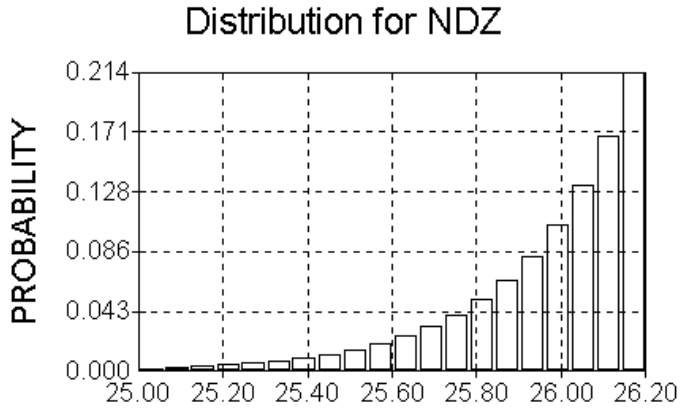


Figure 22. Effect on Implicit Interest Rates

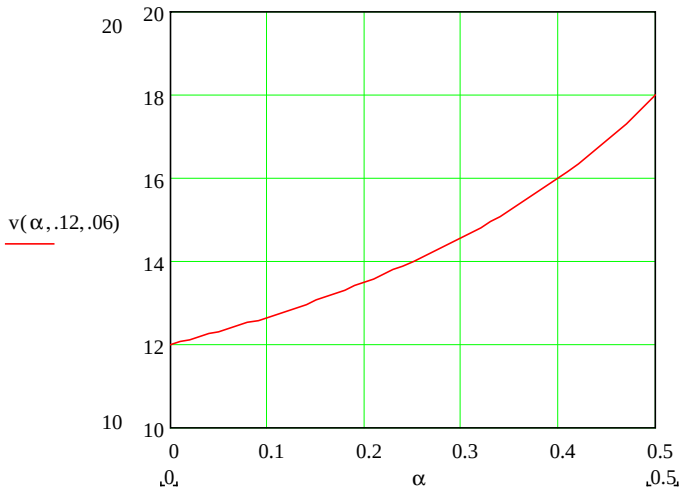


Figure 23.

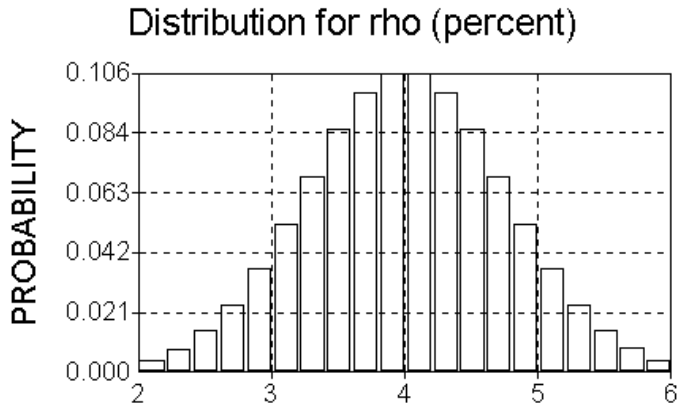


Figure 24.

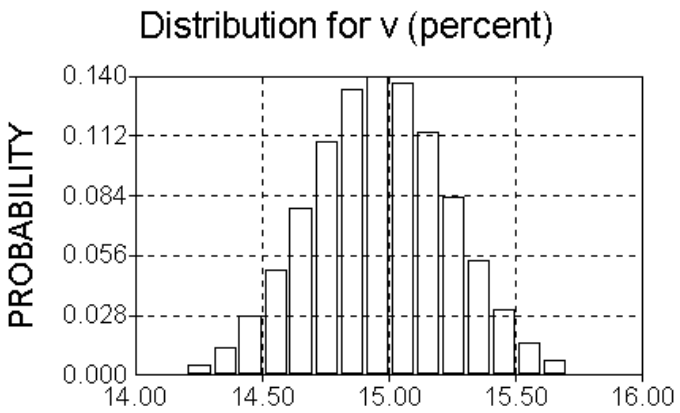


Figure 25. Effects on NDA

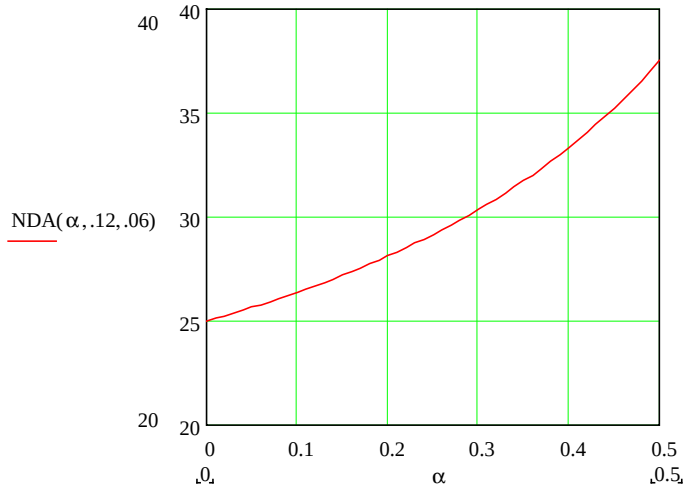


Figure 26.

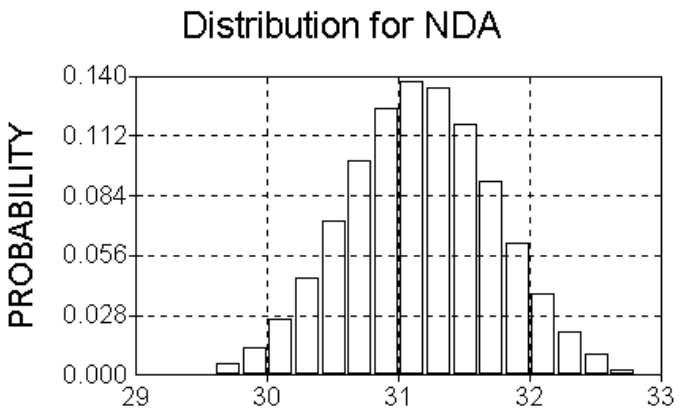
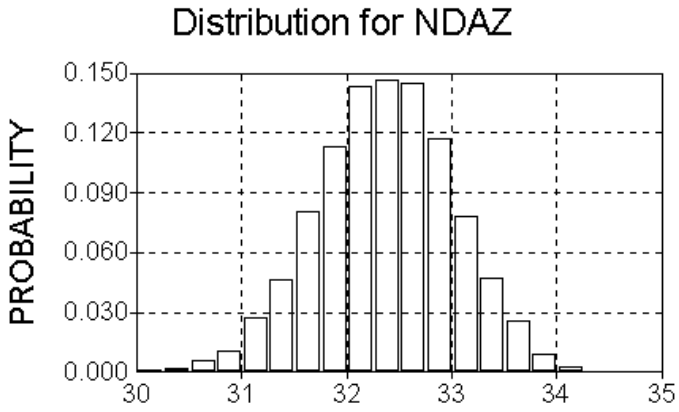


Figure 27.



Appendix 1

Description of the Public Bonds

Bond	Function/Issuing Agent	Term and Interest Rates	Sort and Placement	Nominal Value Updating	Interest Payment	Principal Redemption	Selic Code
			Issuing Agent - Tesouro Nacional				
NTN-E	- Bond issued by the Tesouro Nacional to cover budget deficits, as well as credit operations for receipts antecipation	Up to 30 anos Interest Rates: TBF, with monthly renegotiation of interest.	- Book entry, nominative and negotiable	-	Semianually	On the due date	90
NTN-F	- Warranty to the Banco do Brasil in operations contracted by bramps with the FAT	Up to 6 years Interest Rates: 6% p.a.	- Book entry, nominative and negotiable - Direct to the interested one	TR	On the redemption date	On the due date	75
NTN-H	- Bond issued by the Tesouro Nacional to cover budget deficits, as well as credit operations for receipts antecipation	At least 3 months.	- Book entry, nominative and negotiable - Public Offering.	TR	-	On the due date	79
NTN-I	- To obtain resources for the payment of interest rates equalization of the financing of exports of brazilian goods and services supported by the Proex.	Up to 25 years.	- Book entry, nominative and negotiable - Direct to the interested one	Commercial dollar, considering the average selling rates of the week days immediately before the issuance and redemption dates of the bond	-	Up to the due date of the respective parcel of interest of the exports financing.	88 89
NTN-J	- Capitalization of Banco do Brasil	Up to 15 years. Interest Rates: average return of LTN or average Selic	- Book entry, nominative and negotiable - Direct to the interested one	-	Only after 3 years. Interests until the end of these 3 years are incorporated to the principal.	On the due date	-
NTN-L	- Are issued to be exchanged for Tesouro Nacional bonds which belong to the Banco Central portfolio. They must be issued only up to the limit of the foreign passive of the Bank, which must be undertaken by the Tesouro Nacional, according to the Plano Brasileiro de Refinanciamento and Clube de Paris.	Up to 2 years. Interest Rates: 6% p.a.	- Book entry, nominative and negotiable	Commercial dollar, considering the average selling rates of the week days immediately before the issuance and redemption dates of the bond.	On the redemption date	On the due date, possibly redeemed before as a consequence of the assumption, by the Tesouro Nacional, of the foreign debt, which is currently a Central Bank's responsibility.	90
NTN-M	- Obtained with resources of capitalizations for the support of the Contrato de Troca e Subscrição de Bônus de Contrato Novo e de Consenso de Dívida, in 11/29/93.	- 15 years. Interest Rates: Libor semianual plus a spread of 0,875% p.a., up to 12% p.a.	- Book entry, nominative and negotiable - Direct to the interested one	Commercial dollar.	Semianually, with adjustment in the first period of fluency when necessary.	17 semianual and consecutive parcels, beginning in 4/15/2001.	95/96
NTN-P	- To be exchanged for the product in money of the transfers of goods and claims occurred in the ambit of the PND.	At least 15 years. Interest Rates: 6% p.a.	- Book entry, nominative and negotiable - Direct to the interested one	TR	On the redemption date	On the due date	74/81

Source: Banco Central do Brasil, Tesouro Nacional and Andima.

Description of the Public Bonds

Bond	Function/Issuing Agent	Term and Interest Rates	Sort and Placement	Nominal Value Updating	Interest Payment	Principal Redemption	Selic Code
			Issuing Agent - Tesouro Nacional				
NTN-R	- To be purchased by social security private institutions which have, as sponsors, exclusive or not, state owned enterprises; mixed economy societies, from the federal or state government, including the ones of special nature and foundations created by the government. It is facultative the purchase of NTN-R by other private owned social security institutions, insurance and capitalization companies. This bond is divided in:						
	NTN-R1	2 years. Interest Rates: 8 % p.a.	- Nominative and negotiable. - Direct to the interested one	Commercial dollar, considering the average selling rates.	On the redemption date.	On the due date.	83
		10 years. Interest Rates: 12 % p.a.	- Nominative and negotiable. - Direct to the interested one	Commercial dollar, considering the average selling rates.	Monthly.	In 10 annual, equal and successive parcels.	84
NTN-S	- Bond issued by the Tesouro Nacional to cover budget deficits, as well as credit operations for receipts anticipation.	First period of at least 7 days, prefixed. Second period of at least 21 days, prefixed.	- Nominative and negotiable. - Public Offering.	Average adjusted rate of the financing, according to the Selic, for federal bonds, accumulated from the beginning of the second period.	–	On the due date.	97/69*
NTN-T	- Warranty to Banco do Brasil in operations contracted by the Ministério da Saúde with the FAT.	Up to 15 years. Interest Rates: 6 % p.a.	- Nominative and negotiable. - Direct to the interested one	Based on an index generated from the TJLP, publicized by Bacen from the issuance date to the due date.	On the redemption date.	On the due date.	82
NTN-U	- Warranty to Banco do Brasil in operations contracted by the Ministério do Planejamento e Orçamento with the FAT.	Up to 15 years. Interest Rates: 6,03 % p. a. calculated over the updated nominal value.	- Nominative and negotiable. - Direct to the interested one	Based on an index generated from the TJLP, publicized by Bacen from the issuance date to the due date.	Monthly.	Monthly, each parcel corresponds to the result obtained dividing the remaining balance, updated and capitalized, on the due date, by the number of remaining parcels, including the one which is due.	91
LFT	- To provide the necessary resources to cover the budget deficit, as well as credit operations for budget receipts anticipation.	Prazo: determined by the BTN.	- Book entry, nominative and negotiable. - Direct to the interested one or public offering.	Average adjusted rate of the financing, according to the Selic, for federal bonds.	–	On the due date.	21
A	- Bonds which are used by the Federal Government to undertake debts which are responsibility of the states and the Federal District.	15 years. Interest Rates: average Selic plus 0,0346% p.m.	- Book entry, nominative and negotiable. - Direct to the interested one.	–	On the due date of each of the 168 monthly parcels.	In 168 monthly and consecutive parcels, selling the first in the first month after the issuance. Each parcel corresponds to the result obtained through the division of the remaining debt verified on the due date of each parcel by the number of remaining parcels, including the one which is due.	23
B	- Bonds which are used by the Federal Government to undertake debts which are responsibility of the states and the Federal District.	15 years. Interest Rates: average Selic.	- Book entry, nominative and negotiable. - Direct to the interested one.	–	On the redemption date.	On the due date.	24

Source: Banco Central do Brasil, Tesouro Nacional and Andima.

Description of the Public Bonds

Bond	Function/Issuing Agent	Term and Interest Rates	Sort and Placement	Nominal Value Updating	Interest Payment	Principal Redemption	Selic Code
Issuing Agent - Tesouro Nacional							
LTN	- Bond issued by the Tesouro Nacional to cover budget deficits, as well as credit operations for receipts anticipation.	At least 28 days. Interest Rates:	- Book entry, nominative and negotiable. - Public Offering.	–	–	On the due date.	100
Issuing Agent - Banco Central							
NBC-E	- Monetary Policy instrument, so as to serve as an exchange rate hedge to the institutions.	At least 3 months. Interest Rates: 6% p.a.	- Book entry, nominative and negotiable. - Public Offering.	Commercial dollar, considering the average selling rates of the week days immediately before the issuance and redemption dates of the bond.	Up to 6 months: on the redemption. More than 6 months: semiannually, according to the redemption month, with adjustment in the fluency period, when necessary.	On the due date.	13760
NBC-F	- Monetary Policy instrument, so as to serve as an exchange rate hedge to the institutions.	At least 3 months. Interest Rates: 6% p.a.	- Book entry, nominative and negotiable. - Public Offering.	Floating dollar, considering the average selling rates of the week days immediately before the issuance and redemption dates of the bond.	Up to 6 months: on the redemption. More than 6 months: semiannually, according to the redemption month, with adjustment in the fluency period, when necessary.	On the due date.	14
NBC	- Monetary Policy instrument.	At least 28 days. Interest Rates: –	- Book entry, nominative and negotiable. - Public Offering.	–	–	Nominal value on the due date.	11
NBC-A	- Monetary Policy instrument.	First period of at least 7 days, prefixed. Second period of at least 21 days, postfixed.	- Book entry, nominative and negotiable. - Public Offering.	Average adjusted rate of the financing, according to the Selic, for federal bonds, accumulated from the beginning of the second period.	–	On the due date.	15717
LBC (I)	- Monetary Policy instrument.	Up to 30 months. Interest Rates: –	- Book entry, nominative and negotiable. - Public Offering.	Average adjusted rate of the financing, according to the Selic, for federal bonds.	–	On the due date.	20722
NBC-A	- Monetary Policy instrument.	First period with at least 1 month and 0% p.a. interest rates. Second period with at least 2 months.	Nominative and negotiable. - Public Offering.	Commercial dollar, considering the average selling rates of the week days immediately before the issuance and redemption dates of the bond. Average adjusted rate of the financing, according to the Selic, for federal bonds, accumulated from the beginning of the second period.	Up to 6 months: on the redemption. More than 6 months: semiannually, according to the redemption month, with adjustment in the fluency period, when necessary.	No data do vencimento	16
Issuing Agents - States and Municipalities							
LFTE-M	- States' and Municipalities' Treasury bonds used to support credit operations for receipts anticipation, roll over public debt and financing of plans.	At least 6 months. Interest Rates: 0%	- Book entry, nominative and negotiable.	Average adjusted rate of the financing, according to the Selic, for federal bonds.	On the redemption date.	On the due date.	

Source: Banco Central do Brasil, Tesouro Nacional and Andima.

Appendix 2. Sources of Figures

Figure 1, 2, 5, 7: Brazilian Central Bank's home page*:* www.bcb.gov.br Economic Data, Press Release, Fiscal Policies, Table XVIII (nominal data). We use centered IGP-DI to calculate real data.

Figure 3. IGP-DI data come from Gazeta Mercantil: www.gazetamercantil.com.br

Figure 4-A, 7-A, 7-A: Brazilian Central Bank's home page*:* www.bcb.gov.br Economic Data, Press Release, Fiscal Policies, Table XX and real data as calculated above.

Figure 4-B, 7-B, 7-B: Brazilian Central Bank's home page*:* www.bcb.gov.br Economic Data, Press Release, Fiscal Policies, Table XX; the same real data; Average Remaining Life (total stock) data are directly sent from Central Bank; Duration (public offers) and Average Remaining Life (public offers) data come from Economic Data, Press Release, Fiscal Policies, Table XVII.

Figure 6: Price (official inflation) data come from a chained serie of different price indexes used by brazilian government. In the last three years of the 1980s, the government adopted IPC/IBGE as the official price index. OTN data come from Brazilian Central Bank's home page: www.bcb.gov.br

Figure 10: Brazilian Central Bank's home page*:* www.bcb.gov.br

Figures 11, 12 and 13: Andima's home page: www.andima.com.br. Publications, Monthly Synopsis, Table 7.6.

Figure 14, 15, 16: Andima's home page: www.andima.com.br. Publications, Monthly Synopsis, Table 7.

Figure 17, 18, 19: Andima's home page: www.andima.com.br. Publications, Monthly Synopsis, Tables 7 and 9.5 TBC data come from Brazilian Central Bank's home page: www.bcb.gov.br

Figure A.4.1: Data source: Bloomberg and Andima's home page: www.andima.com.br (Publications, Monthly Synopsis).

Appendix 3. Exchange-Rate and Country Risk in Brazil

In order to assess the exchange-rate and the country risks in Brazil, one must resort to derivative markets, because there is very little liquid in the secondary market for domestic public debt. The main instruments are exchange-rate (R$/US$) futures contracts for maturities up to six months and exchange-rate (R$/US$) swaps for longer maturities. Since the Brazilian swaps do not entail coupon payments, their pricing formula is akin to the one of a futures or forward contract (if one is willing to disregard the daily mark-to-market feature of the futures contract, see Hull (1999), Chap 3). The pricing formula for a forward exchange-rate contract is:

$$F = S \times e^{\left(r - r^* - y\right)T} \qquad (1)$$

Where:

F = forward price;

S = spot price;

r = domestic interest rate;

r^* = foreign interest rate;

y = country risk;

T = time to maturity.

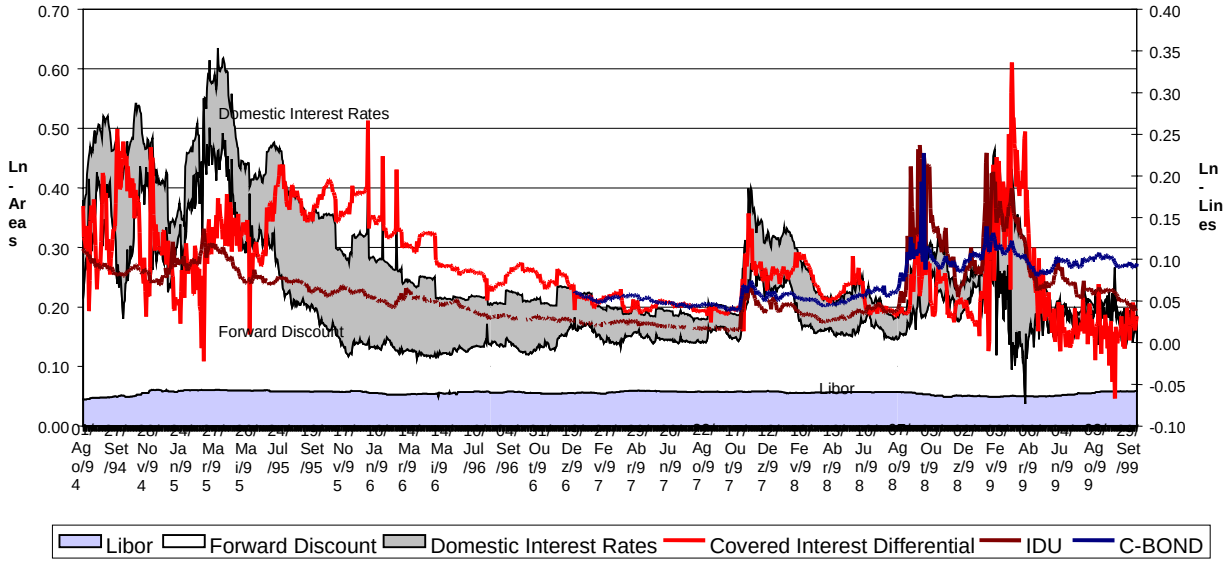
To see that y is indeed the country risk, one may rearrange eq. (1) to get the well known covered interest parity condition:

$$r = r^* + \frac{1}{T} ln\left(\frac{F}{S}\right) + y \qquad (2)$$

Where y is the covered interest parity differential, i.e., y would be zero if CIP held, as it is the case of well integrated international financial markets (see Frankel [1991]). Therefore, eq. (2) tells us that the domestic interest rate equals the foreign interest rate plus the reward required to face two sources of risk: The exchange-rate risk and the country risk.

Table 20 contains these components time-series, and Figure A.3.1 displays their evolution.

Figure A.3.1
Covered Interest Diferential



Appendix 4 - Interest Rate Gap Analysis

Figures A.4.1 and A.4.2 illustrate data regarding the Interest Rate Gap Analysis.

"Price Level Risk" is obtained by the subtraction (compound interest is used) of the return of inflation-linked bonds from the domestic interest rate.

"Country Risk" is obtained by the subtraction of the international interest rate (Libor) from the secondary market yield of the Brazilian Brady bond IDU.

The "Devaluation Risk" is obtained by the subtraction of the secondary market yield of the Brazilian Brady bond IDU from the domestic interest rate.

Figure A.4.1.
Interest Rate Gap Analysis

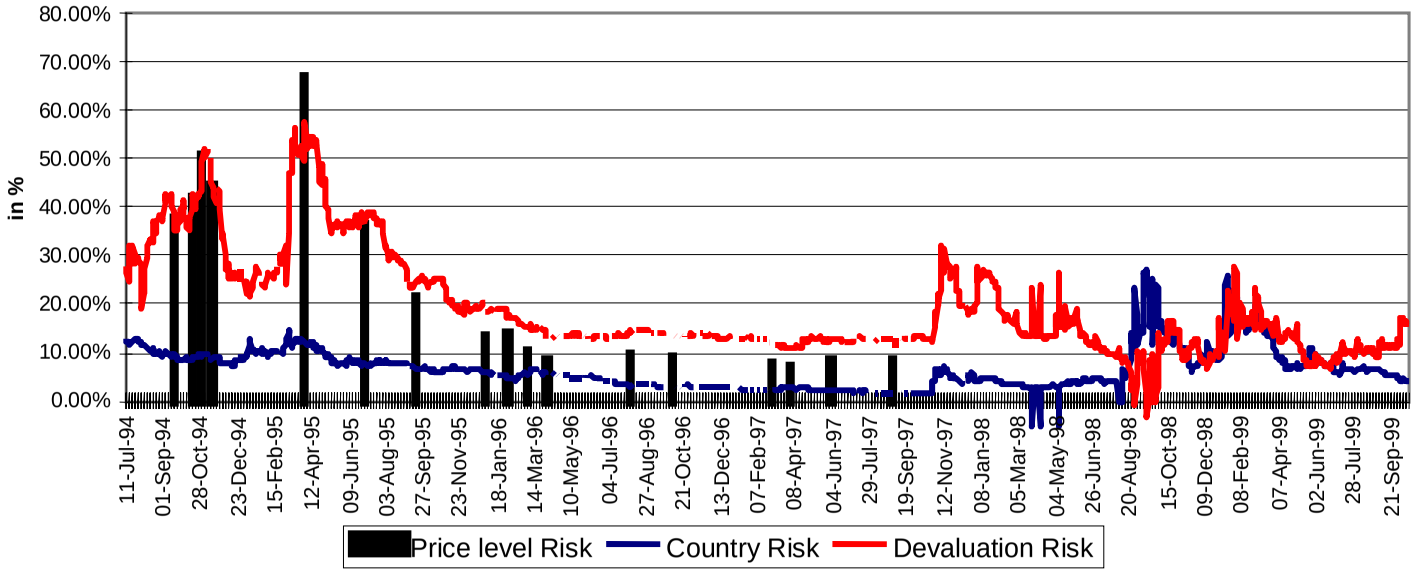


Figure A.4.2. Interest Rate Gap Analysis