

14 de julio de 2010

ORIGINAL: INGLÉS

CEPAL
Comisión Económica para América Latina y el Caribe

Taller “Volatilidad macro y espacio fiscal”

Santiago, 3 y 4 de agosto de 2010

**MACROECONOMIC VOLATILITY AND POLICY RESPONSE:
THE CASE OF BRAZIL**

*Viviane Luporini**

Este documento se ha realizado con la ayuda financiera de la Unión Europea en el marco del proyecto *Macroeconomía y Equidad*.

Este documento no ha sido sometido a revisión editorial.

* Professor of Economics, Universidade Federal do Rio de Janeiro (UFRJ).
E-mail: viviane.luporini@ie.ufrj.br

Abstract: The purpose of this paper is to analyze the relationship between macroeconomic volatility and relevant fiscal variables, and verify how the main restrictions to the Brazilian fiscal space have affected the country's capacity to respond to crises. Using monthly data from 1991 through 2009, the analysis indicate that domestically, the nominal interest rate has been the major source of macroeconomic instability while the exchange rate market has been the main channel through which international shocks have affected the Brazilian economy. The main results are that although the government debt has been sustainable during the period analyzed (in the sense that the government has consistently reacted to increases in the debt/income ratio by increasing the primary surplus), the government's capacity to respond to crises have been limited by the institutional organization of the public sector, the quality of government's expenditures and the reliance on tax revenues for fiscal consolidation.

I. Introduction

Crises may generate macroeconomic volatility through the financial and trade channels and through the economic activity channel. Through the financial channel, the effects of international crises spread to domestic financial markets, affecting capital flows, stock market, the exchange rate and domestic credit conditions. Through the trade channel, crises affect foreign investment, the exchange rate and the current account. Finally, the financial and trade channels have an impact on domestic economic activity, affecting output, the employment level and domestic prices. The 2008 crisis initially generated volatility mainly through the financial channel.

Governments around the world have responded to the crisis by reducing domestic interest rates and supporting financial institutions, directly or indirectly. In countries where monetary policy was not able to provide a sufficient response to the crisis and price stability was not a main concern, governments turned to fiscal instruments to mitigate the effects of the global crisis by discretionally changing fiscal variables. Yet the economic literature (see for example Baunsgaard and Symansky, 2009), points to two main shortcomings of discretionary fiscal policy. First, discretionary changes in fiscal variables, notably government expenditures, usually depend on long political negotiations that end up delaying the effects of policy. Second, a discretionary change in a fiscal variable may not be easily reversed when the economy improves, adversely affecting the government's budget. Still, the magnitude of the global crisis has led most governments to discretionally use its fiscal policy despite its shortcomings. The actual capacity of the government to improve the economy and deal with business cycles depends fundamentally on the fiscal space at the government's disposal, i.e., the amount of fiscal resources that can potentially be used by the government to improve the country's economic performance without jeopardizing fiscal sustainability and price stability (Heller, 2005). At the same time, given a certain fiscal space, policies directed to price and fiscal stabilization more often than not compete with the objective of stabilizing the business cycle, generating a trade-off for governments facing economic volatility.

According to Fanelli (2009), the fiscal space available for countercyclical fiscal policies must be related to institutional and economic aspects of the country, particularly, the organization of its public sector, its economic institutions and the constraints to its fiscal resources. In the case of Brazil, the nature of the budgeting process with a large portion of earmarked expenditure items, constitutional transfers to lower levels of the government and the reliance on tax revenues for a sustainable fiscal discipline may be seen as the main aspects to consider when analyzing the restrictions to the Brazilian fiscal space and the country's capacity to respond to macroeconomic volatility.

In Latin America, countries have faced high macroeconomic and fiscal budget volatility. Gavin and Perotti (1997) showed that the volatility of the primary surplus, measured as standard deviation, averaged 3.3% for Latin America against 1.6% for industrialized countries between 1970 and 1995, while government expenditures and revenues are shown to be three or four times more volatile in Latin America. Periods of high macroeconomic volatility may be associated with a higher probability of unexpected economic shocks

affecting the budget and the government's capacity to deal with crises. The purpose of this paper is to analyze the relationship between macroeconomic volatility and relevant fiscal variables and investigate how the main restrictions to the Brazilian fiscal space has affected the country's capacity to respond to crises. The article is organized as follows, besides this introduction. Section two presents the institutional framework for fiscal sustainability and the evolution of the fiscal stance of the Brazilian government. In section three, we present an analysis of the fiscal responses of the government to changes in its debt/output ratio in the context of a fiscally sustainable policy. Section four discusses the effects of macroeconomic volatility on fiscal space and the role of automatic stabilizers. The fifth section summarizes the main conclusions of the article.

II. The context of fiscal space in Brazil: institutional framework and evolution of fiscal resources

In Brazil, the main aspects that shape the use of fiscal space in fiscal policies to respond to macroeconomic volatility and crisis are related to the institutional organization of the public sector, the quality of the government expenditures and the reliance on tax revenues for fiscal consolidation. This section presents the evolution of the institutional organization of the public sector that are relevant to the Brazilian fiscal space, particularly the relationship between the Treasury and the Central Bank, the fiscal responsibility law and the main characteristics of public expenditures and revenues. The restriction on debt financing will be discussed in a separate section below.

The Institutional framework for Fiscal Sustainability

Until the 1970s, Brazil was amongst the countries with the highest real growth rates in the world. For instance, in 1973, growth rates reached 13.6%. High growth rates were the result of both state led developing programs and abundant external funds. With the oil shocks of 1979 and the Mexican default on its external debt in 1982, external credit conditions deteriorated and capital flows to Brazil were reduced. Until then, external borrowing and seignorage were the main forms of government financing. A decade of stop-and-go economic growth, high and volatile inflation rates, and a sequence of unsuccessful price stabilization programs followed.

From a fiscal point of view, until mid 1980s, Brazilian public sector accounting was peculiar in the sense that it did not follow international standards. At the federal level, the Treasury kept some fiscal items as part of the central bank accounts and resources could be transferred from the central bank to *Banco do Brasil*, one of the largest federal owned commercial bank in Brazil, through the so-called "movement account". *Banco do Brasil* was the executing agent for the Central Bank as it had operating branches in several locations in the country. The "movement account" was created to deal with imbalances of funds between the two institutions and it was cleared weekly. At the same time, *Banco do Brasil* was an important agent for the government's lending programs. In order to meet lending targets, the "movement account" was used to transfer resources from the Central Bank and feed lending operations.¹ At the local level, versions of these arrangements were

¹ For details, see Luporini (2000a).

also available to state governments through state owned banks. These institutional arrangements at the federal and local levels posed virtually no limits on government expenditures and on the public sector's capacity to give a fiscal response to macroeconomic shocks. This apparently comfortable position in terms of dealing with the business cycle had the cost of high inflation rates and increasing budget deficits during the 1980s. Moreover, the institutional setting blurred the effective fiscal position of the government and with the failure of a sequence of price stabilization programs, credibility problems began to emerge at the end of the decade posing questions on the sustainability of the government debt.

In 1986, the newly instituted democratic government initiated important changes in the relationship between the Treasury and the Central Bank that were consolidated in the constitution promulgated in 1988, and implemented throughout the decade. In 1986, an administrative reform shaped the relationship between the Treasury and the Central Bank in at least three important ways. First, it created the National Treasury Secretariat (STN) whose function was to manage the central government's budget, its debt and borrowing operations (domestic and external). Second, it created a "single account" for the Treasury (*conta única do Tesouro*) at the *Banco do Brasil*, which consolidated the accounts held by the Treasury and allowed for a better control over revenues and expenditures, limiting them to the approved budget. Finally, the "movement account" was eliminated.

In 1987, the government established the guidelines for the unifications of the Treasury's budget and starting in 1988, the Central Bank could not be involved in any credit operation not related to the implementation of monetary policy. That is, the Central Bank could no longer finance the Treasury directly. Debt management was transferred from the Central Bank to the Treasury and the later could no longer participate in the primary market for government debt. That is, the reform initiated in 1986 legally prevented the Central Bank from financing the public sector, and better equipped the Treasury with the instruments to gain control over its finances.

During the 1990s, most state owned banks were sold to the private sector. Between 1995 and 2002, ten banks were privatized, including the ones owned by governments of São Paulo, Rio de Janeiro and Minas Gerais. These states, along with Rio Grande do Sul, were responsible for 88.5% of all securities issued by local governments (state and municipalities) at the end of 1997, when a broad debt renegotiation program was implemented by the federal government under the Law 9.496/97 [Mawad and Luporini, (2006)]. According to Bevilacqua (2002), the rescue package represented 12% of GDP in 1997.

In 2000, congress approved one of the most important set of institutional arrangements that regulate the budgetary process in Brazil. The Fiscal Responsibility Law (*Lei de Responsabilidade Fiscal*) set the rules and guidelines for the budget planning and execution, established limits and targets for fiscal indicators, and determined corrective measures and sanctions in case of non-compliance to fiscal rules. The limits imposed to government expenditures and debt apply to federal and local level governments. The guidelines of the Law and complementary legislation include:

- a) ceilings on government expenditures with payroll (salaries and benefits) as a proportion to net revenues (50% for the federal government and 60% for local governments);
- b) ceilings on public debt defined as a percentage of net revenues (Senate Resolution 40 of December 2001) for state and local governments. As their fiscal stance varied at the time of the approval, the Resolution allowed state and local governments to comply to debt limits within 15 years (1/15th of the adjustment per annum). The targets are Debt/Net Revenue = 2 for states, and Debt/Net Revenue = 1.2 for municipalities.
- c) expenditure decisions whose execution lasts more than two fiscal years may not be created without provision of resources or reduction in other expenditure items and are forbidden in the last year of government's mandate;
- d) the Law requires regular administrative fiscal reports with a detailed account of the budget execution according to the fiscal targets established by the previously approved budget and the compliance to the Law's provisions. Annual fiscal targets must be established for revenues (based on a "technically sound" revenue forecasts), expenditures, nominal and primary deficits, and the public debt.
- e) Credit operations are limited to 16% of net revenues, debt services to 11.5%, and credit operations based on anticipated revenue (ARO's) are limited to 7% of net revenues.²

The Fiscal Responsibility Law instituted, moreover, the so-called *golden rule* according to which local level governments may not borrow to meet current expenditure items so that credit operations, for every fiscal year, are associated solely to capital expenses.

Until 1994, high inflation rates helped covering up bad budget practices as government revenues were partially indexed while expenditures were not. It was common practice to postpone payments so that government expenditures were reduced in real terms. As prices stabilized after 1994, the possibility of reducing real outlays through inflation to balance the budget was over. The adoption of fiscal rules constrained fiscal policy and allowed for the beginning of a fiscal consolidation process for the public sector in Brazil. In theory, a more discretionary fiscal policy may be considered superior to fiscal rules that actually represent a binding constraint on government's budgets [Kennedy and Robbins (2003)]. The reason is that a fiscally responsible discretionary policy may produce the same results as a fiscal rule and has the benefit of endowing the policymaker with a greater degree of flexibility when dealing with unexpected events. Political pressures, credibility problems and concerns on long-term fiscal sustainability, among other reasons, make fiscal rules a good practical solution for curbing present and future governments from engaging in bad fiscal practices. In Brazil, even though it subtracts some of the policymaker's flexibility for making use of its fiscal space, the adoption of a fiscal rule such as the Fiscal Responsibility Law not only set the guidelines for fiscally responsible practices, but also, as argued by

² For a more detailed account of the Fiscal Responsibility Law, see Goldfajn (2003).

Oliveira (2004), it increased the government's interest in the budgetary process and in administrative practices for a better control of expenditures and tax collection.

The Quality of Government Expenditures

Fiscal space may be generated by increasing the efficacy of government expenditures through improvements in government institutions to efficiently manage, execute or regulate the use of public resources. Besides improving efficiency, fiscal space may also be generated by reallocating the government's budget towards expenditure items that can directly affect aggregate demand or generate positive externalities for growth, such as investments in infrastructure, education and health.

Although the efficiency of the public expenditure is difficult to measure, the composition of government expenditures can be more easily analyzed. In Brazil, the actual capacity of the federal government to improve the quality of its expenditures is limited by the relative participation of earmarked expenditure items or those dictated by law, mainly payroll and transfers. The evolution of these two main earmarked expenditures is displayed in Figure 1.

The relative participation of earmarked outlays in total expenditures has declined from over 70% in early 1990s to an average of 40% after 2000. On the other hand, as a percentage of GDP, one observes an upward trend on this variable, which reached over 10% in 2009. In fact, although Treasury's total expenditure has grown faster than earmarked items, the later has doubled between 1991 and 2009.

Figure 1

Earmarked Expenditures in Total Expenditure and GDP (%), 1991-2009 a/



a/ Rolling moving-average means, 12-month window. % of GDP on right scale.

Source: Author's calculation based on Central Bank data; see Appendix for detailed information.

— Earmarked/GDP
 ---- Earmarked/Total Expenditure

According to Velloso (2005), if one includes other expenditure items such as non-financial expenses with the public debt, benefits and social programs, the relative participation of expenditure items that cannot be easily reduced reaches 90% of total expenditures at the federal level. Adding expenses related to the regular operation of the federal government (item known as “*custeio*”), the budget becomes almost totally “earmarked” and limits the government’s capacity to invest. This characteristic of the federal budget implies that the actual capacity of the government to reallocate resources in the budget to respond to unexpected shocks may be rather limited. When facing external shocks that cause inflationary pressures, the government has answered by increasing the domestic interest rate. This response by the monetary policy, in the context of a operationally independent central bank, has had relevant fiscal effects through interest payments on the public debt, which in turn requires increments in the primary surplus and further reduces the government’s investment capacity.

Table 1 presents recent fiscal results for the central government. One observes that both total expenditures and revenues have increased substantially between 2004 and 2007. During this period, revenues net of transfers and total expenditure (as a ratio increased 1.6 and 2.0 percentage points, respectively. In 2008, the central government’s expenditures with payroll and pensions reached 11.43% of GDP and represented 66.4% of total expenditure.

Table 1: Fiscal Results for the Central Government (% of GDP), 2000-2009 a/ b/

	2000-2003	2004	2005	2006	2007	2008	2009*
I. Total Revenue	20.83	21.61	22.74	22.93	23.82	24.80	24.19
II. Transfers to Local Governments	3.57	3.48	3.91	3.92	4.07	4.61	4.11
III. Total Revenue Net of Transfers	17.26	18.13	18.84	19.02	19.76	20.20	20.08
IV. Total Expenditure	15.29	15.59	16.38	16.96	17.54	17.23	18.68
IV.1. Payroll and Social Benefits	4.66	4.31	4.30	4.45	4.48	4.53	5.06
IV.2. Pensions	5.91	6.48	6.80	6.99	7.13	6.91	7.33
IV.3. Current and investments	4.64	4.70	5.18	5.42	5.83	5.68	6.29
V. Sovereign Wealth Fund		-	-	-	-	0.49	

a/ Source: Secretaria do Tesouro Nacional/Ministério da Fazenda.

b/ Includes Treasury, Central Bank and Social Security System.

* Expected Values

Among expenditure items, *current expenditure and investment*, that includes important social programs such as *Bolsa Família*, increased of 1.14 percentage points between 2004 and 2007.

Public investment has been timid, however. External restrictions and, more recently, fiscal adjustments have contributed to the reduction of public investment. The evolution of government expenditures in fixed capital is presented in Figure 2.

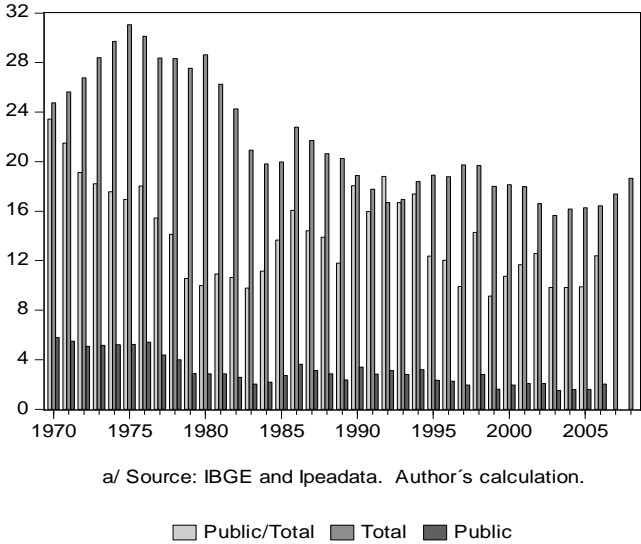
In 1970, the investment rate of the Brazilian economy was around 24.8% of GDP while the investment rate of the public administration represented 5.8% of GDP. In the last 5 years, the rate of investment represented 17% of GDP, with the public administration investing

1.75% of GDP. That is, of the total rate of investment, the public administration was responsible for 23.5% in 1970 and for 12.4% in 2006, a decline of 11 percentage points.³

There has also been a decline in the relative participation of the government in the overall Brazilian rate of investment in fixed capital (Table 2). The average investment rates for the public administration declined from 3.58% of GDP during the 1970s to a mere 1.84% in recent years, with the average relative participation on the overall investment rate declining 32%.

Figure 2

Investment Rates of the Public Administration and Total (% of GDP), 1970- 2008. a/



In 2009, the federal government invested 21.9% more than in the same period in 2008, but as ratio to GDP, federal investments are expected to remain in 1%. In 2007, a broad government program of investment in infrastructure was put in place under the “*Programa de Aceleração do Crescimento- PAC*”. The program includes fiscal incentives to private investment in transports, civil construction, energy and sanitation services, the acquisition of capital goods by small businesses, and public investments in energy, transports (railroads and ports), and social infrastructure (public housing, water and sanitation services). But in three years, only 9.8% of the originally planned program has been concluded. A sluggish budget process, lack of good projects from local governments, and environmental issues are pointed as the main difficulties for increasing government investments.

³ Gobetti (2006) forcefully argues that the official Brazilian data for public investment (“Formação Bruta de Capital Fixo da Administração Pública” from IBGE and from Ipeadata) overestimates the resources actually directed to public investment, implying that the values might be even lower than the ones officially presented.

Table 2: Investment Rates, averages in % of GDP a/

	Public Administration	Total	Public/Total
1970-1980	3.58	21.60	16.82
1981-1995	2.93	20.94	14.10
1996-2001	1.90	16.78	11.29
2002- 2008	1.84*	16.61	11.45

a/ Source: Ipeadata.

* Average of value for 2004, 2005 and 2006.

In 2008, the government created a sovereign wealth fund (*Fundo Soberano*) with the purpose of improving investments or acquire foreign reserves. The resources came from primary fiscal surpluses. For 2008, the fiscal target was 2.2% of GDP, but the actual surplus represented 2.5% of GDP, according to the Secretaria do Tesouro Nacional (STN). The extra resources (R\$ 14.2 billions) were used to create the sovereign fund. In 2009, given the reduction in overall tax revenues, the federal government might use the deposits to meet the fiscal target set at 2.5% of GDP.

Table 3 presents the fiscal position of the general government, federal, state and municipalities for 2008, the most recently available consolidated data.⁴

Table 3: Fiscal Results for the Government, federal and local levels (% of GDP), 2008. a/ b/ c/

	Government	Federal	States	Municipalities d/
I. Total Revenue	39.00	24.06	13.58	8.08
I.1. Tax Revenue e/	18.74	8.57	8.58	1.59
IPI	1.26	1.26	0	0
ICMS	7.31	0.0	7.31	0
Import taxes	0.58	0.58	0	0
ISS	0.79	0	0.02	0.76
IOF	0.68	0.68	0	0
IPTU	0.43	0	0.01	0.42
IPVA	0.56	0	0.56	0
IR	6.03	6.03	0	0
Other taxes	1.10	0.02	0.67	0.41
I.2. Contributions	13.60	12.81	0.57	0.23
Social Contributions	13.27	12.57	0.55	0.15
Economic Contributions	0.33	0.23	0.02	0.08
I.3. Other Revenue	6.66	2.68	4.43	6.26
II. Total Expenditure	35.55	21.64	12.69	7.95
Payroll	14.31	4.40	6.29	3.62
Intergovernmental Transfers (1)	0.00	4.48	2.22	0.02

⁴ The original data are presented in current values (thousands of Reais) by the Secretaria do Tesouro, FINBRA system. The percentages of GDP were computed using the December accumulated, valorized and centered, GDP value presented by the Central Bank. This calculation may result in some discrepancy between fiscal figures presented at Table 3 and elsewhere. Moreover, the data does not include results from the Central Bank and state enterprises and are not strictly comparable.

Transfers to Social Security and social programs	6.75	6.72	0.01	0.02
Other expenditures (3)	14.50	6.04	4.17	4.30
III. Primary Result (I-II)	3.45	2.42	0.89	0.14
IV. Nominal interest payments (2)	5.87	3.65	1.87	0.34
V. Nominal Result (III-IV)	-2.42	-1.23	-0.98	-0.21

a/ Source: Secretaria do Tesouro Nacional, Sistema FINBRA, "Resultado Nominal do Governo Geral".

b/ GDP from Central Bank, Series 4384, December 2008.

c/ Results do not include operations by the Central Bank or State Enterprises

d/ Data covers 90.76% of Brazilian municipalities.

e/ Taxes on income (IR), on industrialized products (IPI), on financial transactions (IOF), on sales (ICMS and ISS), on urban property (IPTU), on vehicles (IPVA). Contributions include contribution to social security financing (Cofins), provisory contribution of financial transactions (CPMF), contributions for the Social Integration Program (PIS/PASEP), contribution of profits (CLPJ) and contribution of fuel imports (CIDE).

(1) Consolidated result, excludes inter-governmental transfers.

(2) Accrual basis, Central Bank.

(3) Includes resources to integrate the FFIE in the Foreign Wealth Fund according to Law no. 11.887/2008, MP no. 542/2008 and Decree no. 6.713/2008.

According to this data, payroll represents 49.6% of total expenditure for states and 45.5% for municipalities, while for the federal government, payroll accounts for 20.4%. The data also illustrates the relative importance of contributions for fiscal revenues at the federal level, representing more than 50% of total revenue. The reasons for this elevated relative participation are presented ahead.

The item "Other expenditures" include resources from the central government allocated to the Sovereign Wealth Fund. As mentioned earlier, the Fund was created in 2008 with resources from the primary fiscal result of the federal government that surpassed the fiscal target established for that year, 2.2% of GDP. One of the sovereign fund's objective is to generate public savings and smooth out fiscal fluctuations due to the business cycle. In order to achieve this goal, the government created the so-called Investment and Stabilization Fiscal Fund (FFIE- Fundo Fiscal de Investimento e Estabilização), which is operated by a federal financial institution. Although the resources destined to the FFIE come from the federal government, the fund has an independent law of obligations and rights. At the same time, it is managed by the Ministry of Finance. In time of crises, the fund can be used to meet the targeted primary surplus, thus reducing uncertainties about the government's capacity to keep its net public debt on a sustainable path. In good times, according to the minister of finance, the fund may reduce the pressure on the monetary authority as the extra government savings will not simply be converted into potentially inflationary public expenditures. In practice, the institutional structure of the Fund allows the federal government to allocate resources more freely and accumulate savings when the economy is increasing.

Government Revenues

The generation of fiscal primary surpluses of the Brazilian public sector has relied heavily on the expansion of revenues with overall tax revenues reaching 38% of GDP in 2007. The tax burden had been increasing from its historical level of around 25% of GDP since early 1990s: it represented 24.4% of GDP in 1992. In 2008, the tax burden fell to 36.54% of GDP and continued its decline in 2009 (36% of GDP in the first semester) because of the

international crisis and the reduction in tax collection. Yet, the performance of overall tax revenues shows that the Brazilian tax system does not have structural problems to generate revenues. But it is a complex system with a myriad of tax rates and contributions, some inefficiently inciding over the same tax base. Considering only the federal level of government, there are nine different kinds of taxes and contributions. Table 4 presents the relative participation of the main taxes and contributions of the federal government. Calculations are based on monthly averages of accrued values reported by the Central Bank.

Table 4: Composition of Federal Tax Revenues, accrual basis (%)^a

	IR ^b	IPI	IOF	Imports	Contributions	Others	
1990	34.4	18.9	10.5	3.0	25.1	8.1	100.0
1991	33.0	21.1	5.8	4.1	25.9	10.1	100.0
1992	40.0	0.0	6.5	4.2	29.7	19.5	100.0
1993	45.2	0.1	7.4	4.5	35.1	7.7	100.0
1994	31.8	16.1	7.6	3.0	37.3	4.2	100.0
1995	34.5	16.3	3.8	5.9	32.6	6.9	100.0
1996	35.4	16.3	3.0	4.4	33.5	7.3	100.0
1997	32.4	14.9	3.4	4.6	36.7	8.1	100.0
1998	34.4	12.2	2.7	4.9	31.6	14.1	100.0
1999	34.0	10.9	3.2	5.2	37.8	8.9	100.0
2000	31.9	10.7	1.8	4.8	41.7	9.1	100.0
2001	33.0	9.9	1.8	4.6	42.9	7.8	100.0
2002	35.3	8.1	1.7	3.3	43.7	7.9	100.0
2003	34.0	7.2	1.6	3.0	45.4	8.8	100.0
2004	31.8	7.1	1.6	2.9	47.6	8.9	100.0
2005	34.5	7.3	1.7	2.5	47.9	6.0	100.0
2006	35.3	7.2	1.7	2.6	47.4	5.7	100.0
2007	35.7	7.5	1.7	2.7	46.5	5.8	100.0
2008	38.0	7.8	4.0	3.4	40.3	6.5	100.0
2009*	39.7	6.2	3.9	3.4	40.8	6.0	100.0

^a Average values based on monthly data.

^b Taxes on income (IR), on industrialized products (IPI), on financial transactions (IOF). *Contributions* include contribution to social security financing (Cofins), provisory contribution of financial transactions (CPMF), contributions for the Social Integration Program (PIS/PASEP), contribution of profits (CLPJ) and contribution of fuel imports (CIDE).

* Data from January to September.

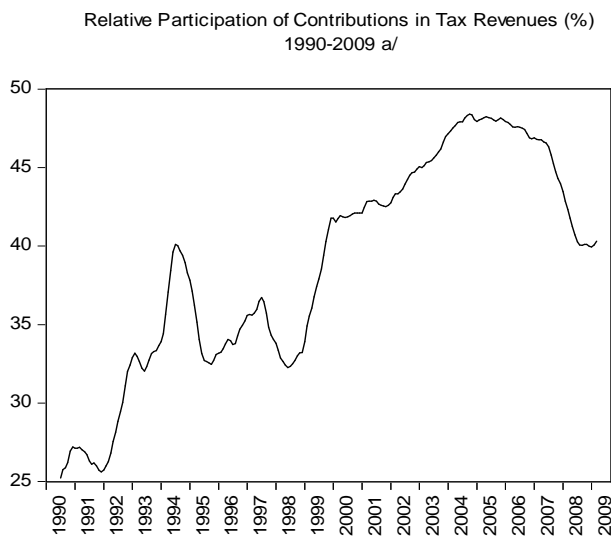
Source: Banco Central do Brasil.

At the federal level, 39.7% of the total tax revenue in 2009 (data up to September) came from income taxes and 6.2% from taxes on industrialized products (IPI). Taxes on income and on industrialized products are considered the main tax items of the federal government. Taxes on imports accounted for 3.4% of total revenue only. Of the revenues from income taxes, 3.34% were paid by individuals (*pessoa física*) while 17.37% were paid by businesses (*pessoa jurídica*); from these 17.37%, the major part (approximately 82.4%) was imposed on non-financial businesses.

Contributions also represented a very important part of federal tax revenues in 2009 (40.8%). The political negotiations that culminated in the tax reform approved in 1988 led

to increases in federal transfers to state and local governments and to a reduction of the federal government's tax base. As contributions are not included in the partition of resources with state and local governments, their increases were used to compensate for the loss of resources at the central government's disposable. Figure 3 shows the sharp increase in contributions relative to taxes until the end of 2007, based on data provided by the Central Bank.

Figure 3



a/ Twelve-month rolling mean.

Source: Author's calculation based on data from Banco Central do Brasil.

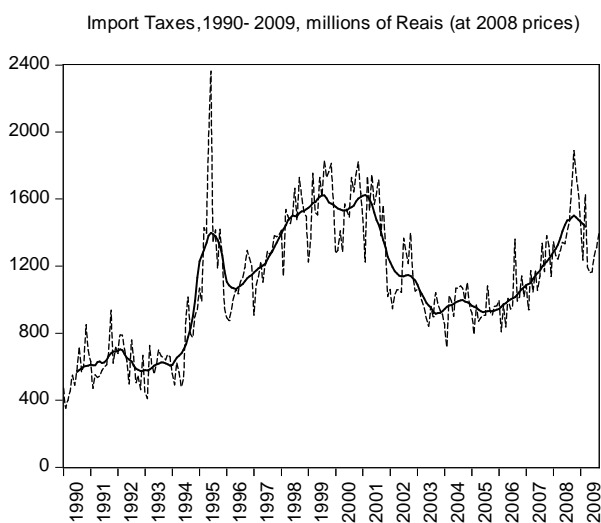
In the early 1990s, contributions represented around 25 of federal tax revenues; in mid 2000s, their relative participation had reached almost 48% of tax revenues.

The Constitution approved in 1988 promoted a relative decentralization of the tax system and attended to a demand for more financial autonomy claimed by states and municipalities. Article 159 increased the percentage of tax resources that are transferred to local governments through funds, namely the “*Fundo de Participação dos Estados*” (FPE) and the “*Fundo de Participação dos Municípios*” (FPM). The reduction of the federal government's tax base led to the increase in the number of federal contributions. Fiscal resources from contributions are linked to specific expenditure items, however, and the result was a budget even more rigid at the federal level. (For example, resources from the contribution of profits (CLPJ) are directed to social security). In 1994, in order to have access to resources free from earmarking, the government created a special fund, the *Fundo Social de Emergência* (FSE), later called *Fundo de Estabilização Fiscal* (FEF) and *Desvinculação de Receitas da União* (DRU). The DRU allowed the federal government to retain 20% of all legally earmarked revenues, the so-called social contributions. The resources have been used to cover unanticipated expenses and deficitary programs, as well as to generate fiscal surpluses. As a consequence of the DRU, programs that depended on earmarked revenues, such as education and health, have suffered a reduction in their

budgets.⁵ Resende (2006) lists three main reasons for the relative increase in contributions at the federal level. First, the decentralization of the discretionary power to manage fiscal resources dictated by the Constitution of 1988 along with an increase in legal transfers to state and local governments left the federal government with few alternatives to get revenue and meet its fiscal targets. Second, according to the author, the legal restrictions on contributions are less stringent than those applied to traditional tax sources. Finally, given their legal status, contributions are easier to manage and collect. The consequence is that the federal budget became even more rigid as revenues from a new contribution are legally directed to specific expenditure items, for example, social security. Thus, although contributions have increased government's revenues at the federal level, they do not improve the government's fiscal space or its capacity to respond to shocks.

Taxes on industrialized products and import taxes are closely related to economic activity levels. The evolution of revenues from taxes on imports is presented in Figure 4.

Figure 4



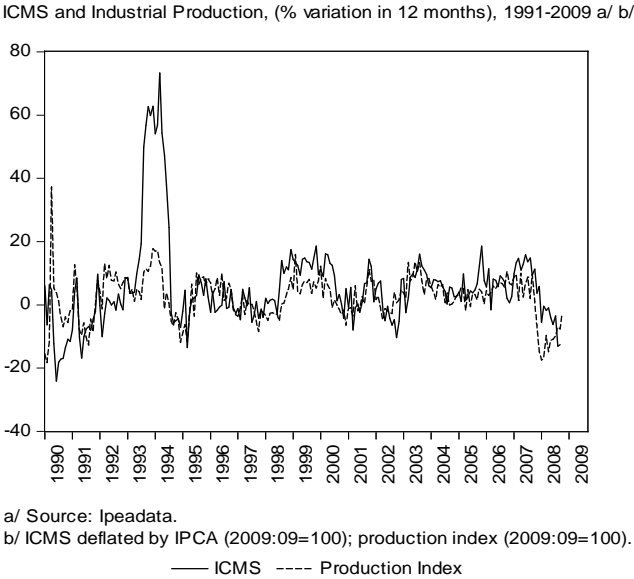
Source: Banco Central do Brasil.

As expected, revenues follow closely the pattern of imports. The quantum imported increased 230 percent between 1990 and 1999, a period of increasing economic openness and integration with the world economy. In early 1999, a speculative attack put an end to the crawling peg exchange rate system and the *Real* was allowed to float. Instability in the exchange rate market hurt both imports and exports. The quantum imported reassumed its upward trend after 2003. Import taxes represented an average of 6.3% of the federal government tax revenues (net of contributions) during the period of 1991-2009.

⁵ Recently, the Senate has approved the reduction of the percentage for the *DRU*, from 20% to 5% in 2010 and 0% from 2011 on.

At the local level, transfers by the federal government and sales taxes (ICMS) are the main sources of revenue. Figure 5 shows the twelve-month variation of real revenues from ICMS. As expected, with the exception of the high inflation period that preceded price stabilization (July 1994), sales taxes follow closely the variation of economic activity, here proxied by the industrial production index. In 2008, we observe a sharp decline in sales taxes.

Figure 5



The picture that emerges from the analysis in this section is that at the federal level, government expenditures have increased over the years with payroll and transfers representing over 40% of total expenditures. On the revenue side, although the tax burden may be considered high for a country of medium income level such as Brazil, the government has not encountered great difficulties in generating more tax revenues.

Budget practices have improved over the years with the Central Bank operating independently from the Treasury and the approval of the Fiscal Responsibility Law. Yet, the fiscal relationship between the federal and local governments and the nature of the main expenditure items limit the federal government’s capacity to use its fiscal policy in a discretionary fashion to deal with economic shocks. For a given fiscal space, moreover, stabilizing the debt/income ratio and meeting inflation targets may compete with the discretionary use of fiscal policy to smooth the business cycle.

III. Debt Management and Fiscal Sustainability

Public debt management and fiscal sustainability are important for fiscal space for at least three reasons. First, high levels of public debt mainly when combined with securities of

short maturity limit current fiscal space as interest outlays have to be made in the short run. Second, when credibility problems cast doubts on the sustainability of the public debt, the government faces adverse market conditions when issuing new securities, having to pay higher interest rates or issue securities whose characteristics may please security holders but creates debt management difficulties in the long run. Finally, if the debt assumes an unsustainable path, the government may have to divert fiscal resources from investment projects, that could generate more fiscal space, to primary surpluses to stabilize the debt/income ratio. Depending on the size of the government, pulling out public investment may substantially affect the growth rate of the economy, making fiscal sustainability more difficult to achieve. Moreover, for a given fiscal space, dealing with sustainability problems may override the government's goal to stabilize the economy through the business cycle, making fiscal policy procyclical. These issues are discussed in this and the following sections.

Borrowing Requirements of the Public Sector

The fiscal stance of a government can be summarized by its borrowing requirements. The recent borrowing requirements of the Brazilian public sector is presented in Table 5. One observes that the fiscal stance of the public sector as a whole has improved until 2008, with the nominal deficit decreasing from 3.4% in 2000 to 1.2% of GDP in 2008. At the local level, borrowing requirements also improved substantially with the nominal deficit decreasing from 2.0% of GDP in 2000 to 0.56% in 2007. This trend of improvement is interrupted in 2008 and partial results for 2009 indicate a deterioration of the fiscal stance. The financial crisis, along with an expansive fiscal policy, explains the partial results. Positive fiscal results obtained by public enterprises have helped the nominal results for the public sector as a whole and borrowing requirements for interest payments assumed a decline trend after 2006 along with a less restrictive monetary policy initiated in 2005.

Table 5: Borrowing Requirements of the Public Sector (% of GDP), 2000-2009^a

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009 b/
Nominal	3.37	3.29	4.42	5.13	2.79	3.38	3.54	2.75	1.98	3.30
Federal Level	1.33	1.33	0.66	3.68	1.00	3.17	2.98	2.19	0.72	3.76
Federal Government	1.88	2.06	1.14	4.36	1.70	3.45	2.77	1.85	1.27	3.76
Central Bank	0.24	-0.12	-0.47	-0.70	-0.31	-0.04	0.37	0.45	-0.41	-0.06
Public Enterprises	-0.79	-0.61	-0.02	0.02	-0.39	-0.25	-0.17	-0.10	-0.14	0.06
Local Level	2.04	1.96	3.76	1.45	1.79	0.21	0.56	0.56	1.26	-0.46
Interest Payments	6.61	6.67	7.63	8.47	6.59	7.31	6.78	6.21	5.66	5.51
Federal Level	3.93	3.63	2.91	5.97	3.78	5.95	5.15	4.48	3.27	4.99
Federal Government	3.65	3.80	3.36	6.65	4.41	6.06	4.95	4.16	3.76	5.12
Central Bank	0.20	-0.17	-0.52	-0.71	-0.32	-0.05	0.36	0.42	-0.43	-0.08
Public Enterprises	0.08	0.00	0.07	0.04	-0.31	-0.06	-0.16	-0.10	-0.06	-0.06
Local Level	2.68	3.04	4.72	2.50	2.81	1.36	1.63	1.73	2.39	0.52
Primary Deficit c/	-3.24	-3.38	-3.21	-3.34	-3.80	-3.93	-3.24	-3.45	-3.68	-2.21
Federal Level	-2.59	-2.30	-2.25	-2.29	-2.78	-2.79	-2.18	-2.29	-2.55	-1.23
Federal Government	-2.63	-2.73	-3.36	-3.84	-4.36	-4.36	-3.95	-4.04	-3.74	-2.87
Central Bank	0.04	0.05	0.05	0.01	0.02	0.01	0.01	0.02	0.02	0.02
Social Security	0.85	0.99	1.15	1.55	1.65	1.75	1.78	1.73	1.25	1.50
Public Enterprises	-0.86	-0.61	-0.09	-0.01	-0.09	-0.19	-0.01	0.00	-0.08	0.12
Local Level	-0.64	-1.08	-0.96	-1.05	-1.02	-1.14	-1.07	-1.16	-1.13	-0.98

^a Source: Boletim do Banco Central, Central Bank of Brazil. Current values accumulated in the year.

^b As of August.

^c Government expenditures (except interest payments) minus revenues. Negative values indicate a surplus.

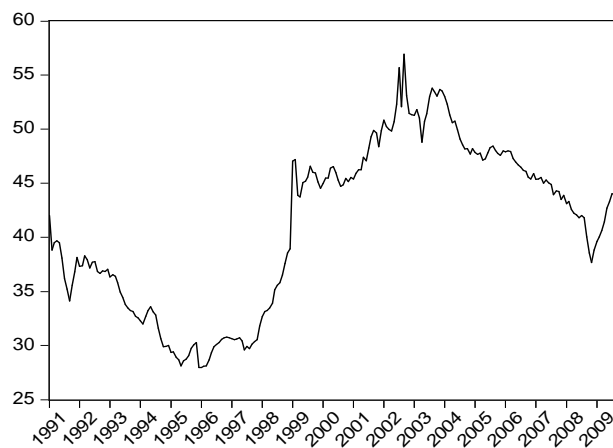
The primary result (nominal net of interest payments) indicates surpluses during the period analyzed, both at the federal and local levels, but the results obtained have not been enough to compensate for interest payments. The coordinated approach (Kopits, 2001) adopted to improve the fiscal stances of sub national governments under the Fiscal Responsibility Law and the debt-restructuring program of 1997 created the conditions for the overall fiscal performance of the public sector. At the federal level, social security remains the main source of fiscal pressure.

The evolution of the net public debt for the consolidated public sector is presented in Figure 6.⁶ The net debt had assumed a declined trend after 2004 due to overall primary surpluses, reductions of the domestic interest rates and a decline in foreign debt. The international crisis of 2008 interrupted this trend and the observed increase in the net debt reflects the worsening of the fiscal stance of the government in 2009.

⁶ Different from international practice, the concept of the net debt for the consolidated public sector published by the Brazilian National Treasury includes financial assets and liabilities of the central bank.

Figure 6

Net public debt, Consolidated public sector (% GDP), 1991-2009



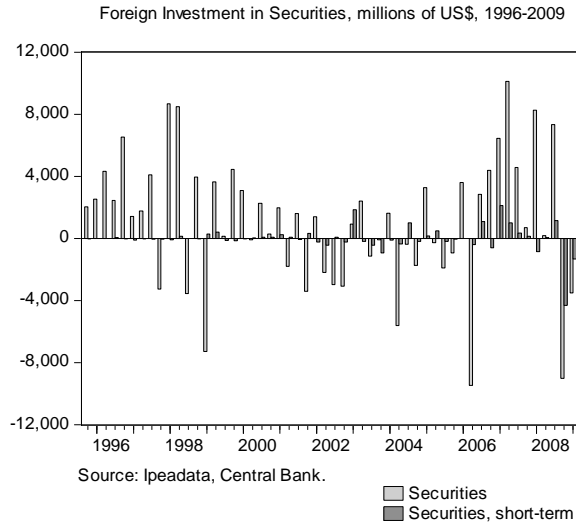
Source: Central Bank.

Externally, due to accumulated international reserves (US\$ 188.3 bi), Brazil became a foreign net lender in February 2008. In December 2009, the country's net external debt was a negative US\$ 61.4 billions or approximately -3.9% of GDP. International reserves reached US\$ 239.1 billions in the same period.⁷

The financing of the public debt has also benefited from good external conditions until 2008. In 2007, there was a substantial increase in foreign investment in securities, as shown in Figure 7.

⁷ The country's net external liability defined as the net external debt plus the stock of net foreign direct investment is greater than the accumulated international reserves, though, and may lead to worse conditions for external financing in a context of a sustained decline in exports.

Figure 7



Fiscal Sustainability

The theory of government finance states that a fiscal policy is fiscally sustainable when the government's budget is inter-temporally balanced. In the absence of monetary financing and shocks, the government's budget constraint in real terms and as a ratio to income can be written as:

$$b_t - b_{t-1} = g_t - t_t + (r_{t-1} - k_{t-1})b_{t-1}$$

where,

b is the par value of the stock of government debt;

g and t are net of interest government expenditures and tax revenue, respectively;

r is the *ex post* after-tax real rate of interest;

k is the growth rate of income.

As the budget constraint above indicates, the evolution of the debt/income ratio depends mainly on the primary deficit ($g - t$) and on the product of the accumulated debt/income ratio and the difference between the rate of interest paid on government's securities and the growth rate of the economy. If the difference is positive, the government needs a primary surplus to keep the debt/income ratio from raising; if it is negative, the debt/income ratio may be stable even in the presence of some level of primary deficit.⁸

Assuming no growth and a constant interest rate just for mathematical simplicity, applying forward substitution to the budget constraint, taking expectations as of time t and applying the limit gives the well known *no-Ponzi* scheme condition:

⁸ In fact, the budget constraint is not binding when k is greater than r .

$$\lim_{N \rightarrow \infty} B_{t+N} = 0, \quad \text{with } B_{t+N} \equiv 1/(1+r)^N b_{t+N}$$

That is, in the absence of uncertainty, sustainability requires that the government debt be offset by expected future primary surpluses of equal present-value. Empirically, the *no Ponzi* condition is tested as a co-integrating relationship between revenues and interest inclusive government expenditures or, equivalently, as a mean-reverting process for the debt/income ratio series [Hamilton and Flavin (1986), Trehan and Walsh (1988), Wilcox (1989), Hakkio and Rush (1991), Ahmed and Rogers (1995), Uctum and Wickens (2000), amongst others].⁹ In a stochastic environment, the real return on government bonds commonly used as a discount rate will actually depend on how the overall level of government debt is distributed across states of nature.¹⁰

In a stochastic environment, Bohn (1998, 2005) thus proposes a simple linear fiscal reaction function that ensures sustainability in a variety of stochastic situations. The function consists of searching for evidence of corrective action by the government in response to changes in its debt/income ratio:

$$s_t = \rho b_t + \mu_t$$

where,

s_t and b_t stand for the primary surplus/income and debt/income ratios. The “error term” μ_t is bounded as a share of income and represents other determinants of fiscal surplus.

Tax smoothing considerations suggest that budget deficits might be higher than normal during economic downturns. So a measure of the economic cycle may be included in the reaction function. Bohn (2005) shows that a positive coefficient on b_t implies that a negative shock that results in an increase in the debt/income ratio, regardless of its nature, leads eventually to an increase in the primary surplus, ensuring compliance to an inter-temporal budget constraint and thus fiscal sustainability.

Estimation of the fiscal reaction function is straightforward if all variables involved may be considered stationary processes. Tanner and Samake (2008) suggest that the price level, and thus the real debt, might be endogenous as, in accordance to the fiscal theory of the price level, price itself would adjust to increases in the expected primary surplus, leading to a biased estimated coefficient. Here, the coefficient of the reaction function refers to the debt/income ratio so that the price level actually “cancels out”. Moreover, Portugal and Fialho (2005) and, more recently, Divino e Gadelha (2008) did not find empirical support for the fiscal theory of the price level on the Brazilian data. So, as long as the variables do not present unit roots, the reaction parameter may be consistently estimated by ordinary least squares (*OLS*).

⁹ For analysis of the Brazilian case, see for example Rocha (1995), Tanner (1995), Issler and Lima (1997), Luporini (2000). For a probabilistic treatment of the sustainability of the Brazilian public debt see Mendoza and Oviedo (2004), Tanner and Samake (2008), and Luporini and Licha (2009).

¹⁰ See Bohn (1995) and (2005) for a detailed discussion of this point.

In order to control for the possible counter cyclical effect of the primary surplus, we generated the cycle variable $yvar = (1 - gdp / gdp^{trend})$. The coefficient on $yvar$ is expected to be negative as increases in the output gap (or unemployment) are usually accompanied by an increase in the budget deficit or, equivalently, a reduction in the fiscal surplus.

Tests for the null of unit root and stationarity are presented in Table 6.

Table 6: Unit Root and Stationarity Tests a/

Variable	ADF b/	ADF-GLS	KPSS
s_t	-1.628	-1.035	0.476*
b_t	-0.974	-0.990	1.125*
$yvar$	-4.531*	-3.075*	0.039

^a ADF (Augmented Dickey-Fuller) and ADF-GLS (Generalized Augmented Dickey-fuller Test); KPSS (Kwiatkowski, Phillips, Schmidt and Shin stationarity test).

^b * indicates rejection of the null of a unit root (in the case of ADF and ADF-GLS tests) or the null of stationarity (in the case of KPSS test) at the 5% level.

The unit root tests indicate that both the primary surplus and the net public debt may have stochastic trends. As such, the search for a sustainable relationship between the primary surplus and the public debt will rely on a possible co-integrating vector relating these two fiscal variables. As expected, the cyclical variable $yvar$ is stationary. Co-integration tests are presented below.

Table 7: Cointegration tests^a

	Trace Statistic	p-value b/	Max Eigen Statistic	p-value b/
	Model 1		Model 1	
None	74.645*	0.000	74.170*	0.000
At most 1	0.475	0.554	0.475	0.554
	Model 2		Model 2	
None	51.956*	0.000	51.029*	0.000
At most 1	0.927	0.336	0.927	0.336

^a Model 1: VAR (s and b endogenous; $yvar$ and dummies exogenous); Model 2: VAR (s and b endogenous; no exogenous variables; estimated to control for possible bias in the results as critical values assume no exogenous variables).

^b MacKinnon, Haug and Michelis (1999) p-values, EvIEWS- version 6.0.

As Table 7 indicates, both the trace and maximum eigenvalue co-integration tests reject the null of no co-integration and do not reject the presence of one co-integrating relation between the primary surplus and the debt/income ratio.

As discussed previously, a fiscally sustainable policy implies a positive coefficient on the debt/income ratio indicating corrective measures in the primary surplus. Estimates for a vector error correction model, assuming no trend in the co-integrating vector, are reported in Table 8.

Table 8: Vector Error Correction Estimates a/

	Period I (High inflation)		Period II (Crawling-peg regime)		Period III (Floating exchange rate regime)		Full Period	
Cointegrating Eq:								
s_{t-1}	1		1		1		1	
b_{t-1}	0.0711*		0.0483*		0.0719*		0.0648*	
	-0.0120		-0.0212		-0.0052		-0.0061	
	[5.95464]		[2.28195]		[13.9771]		[10.7152]	
Error Correction:								
	Δs_t	Δb_t	Δs_t	Δb_t	Δs_t	Δb_t	Δs_t	Δb_t
Coint. Eq.	-0.9656*	-0.0205	-0.5590*	0.0399	-1.0132*	0.1120*	-0.7390*	0.0780*
	-0.2461	-0.0642	-0.1793	-0.0275	-0.1348	-0.0557	-0.0896	-0.0294
	[-3.92290]	[-0.31994]	[-3.11714]	[1.45059]	[-7.51806]	[2.00896]	[-8.24455]	[2.65219]
Δs_{t-1}	-0.1364	-0.0508	-0.2995*	-0.0347	-0.0172	-0.0601	-0.1822*	-0.0463
	-0.1592	-0.0415	-0.1354	-0.0208	-0.0952	-0.0394	-0.0660	-0.0217
	[-0.85678]	[-1.22441]	[-2.21156]	[-1.67047]	[-0.18074]	[-1.52705]	[-2.75931]	[-2.13659]
Δb_{t-1}	-0.5472	0.3013*	0.4701	0.3619*	-0.1418	-0.1343	-0.1883	-0.0565
	-0.5099	-0.1329	-0.9344	-0.1435	-0.2158	-0.0892	-0.2033	-0.0667
	[-1.07336]	[2.26690]	[0.50315]	[2.52247]	[-0.65691]	[-1.50446]	[-0.92601]	[-0.84701]
Yvar	-5.4630	1.3521	-12.7348	1.5170	-12.0757	0.5915	-10.4671*	1.6066
	-3.9412	-1.0273	-9.3942	-1.4423	-6.6414	-2.7462	-3.4964	-1.1473
	[-1.38614]	[1.31612]	[-1.35561]	[1.05174]	[-1.81827]	[0.21540]	[-2.99368]	[1.40037]
Adj. R-squared	0.6093	0.1277	0.3951	0.1908	0.5260	0.0220	0.4809	0.0305
F-statistic	21.2702	2.9034	12.5374	5.1665	48.3479	1.9596	69.5503	3.3272
Determinant resid covariance (dof adj.)		2.729		2.965		13.533		10.055
Log likelihood		-129.380		-178.435		-530.055		-886.164
Akaike info. criterion		6.969		6.979		8.373		8.037
Schwarz criterion		7.391		7.347		8.595		8.190
Observations		40		54		129		223
LM (6), p-values b/		0.317		0.363		0.275		0.373
White (6), p-values c/		0.105		0.860		0.115		0.818

a/ * Indicates significance at the 5% level, asymptotic critical value of 1.96.

b/ Null of no serial correlation up to lag 6. For most models, the null of no serial correlation up to lag 12 is not rejected by the data.

c/ Null of homoscedasticity, no cross-terms.

d/ Period I (1991:01 through 1994:06); Period II (1994:07 1998:12); Period III (1999:01 2009:09).

The results for the long-run relationship between the fiscal variables (cointegrating equation) indicate a positive and systematic response of the primary surplus to the debt/income ratio, indicating a sustainable fiscal policy. Coefficients are positive and statistically significant for the whole sample and for the three periods analyzed. It is interesting to note that the cointegration coefficient is smaller for period II (crawling-peg regime). During this period, in order to maintain the exchange rate afloat, the government's adopted an active monetary policy which, with high domestic interest rates, resulted in

important increments of the public debt. In fact, price stabilization was the main goal at this point and the response of the fiscal surplus to increases in the debt/gdp ratio was below the one observed for the whole sample.

The short-term dynamics of the primary surplus as a ratio to income is reported in the second part of Table 8. We observe that for all samples, the coefficient on the error correction term (see Coint. Eq.) is negative and statistically significant in the primary surplus equation. This indicates that temporary deviations from the long-term surplus-debt relationship are compensated by changes in the primary surplus. That is, when shocks imply a primary surplus above the debt/income ratio as determined by the long-term coefficient ($s_{t-1} > \rho b_{t-1}$), there is a negative change in the primary surplus in the next period so that its value tends to return to its long term estimated equilibrium. Similarly, if a shock induces a surplus below the long-term relationship with the debt/income ratio, the results indicate that there will be a compensating positive change in the surplus/income ratio. In fact, for the whole sample, one percentage point deviation from the estimated long-term surplus-debt relation induces, approximately, a 0.74 percentage point correction in the primary surplus. Cyclical variations in output have the expected negative sign in the surplus equation, but it is statistically significant only for the whole sample.

The general results presented indicate that the fiscal policy has been sustainable during the period analyzed. But how are the conditions for financing the public debt?

Debt Management

At the federal level, the conditions for financing the public debt had also improved substantially until 2007 (Table 9). The relative participation of nominal securities (sold at a discount) increased from 5.5% in 2002 to 39.5% in 2007. The results for 2008 and 2009 (partial), given the increasing uncertainty, seem to indicate a reversion of this trend, but it is too early to call. Average maturity and duration remain improving over the years.

Volatility is essentially a measure of risk. As such, one may assume that the probability of shocks increases as volatility rises. As a measure of risk, macroeconomic volatility has potential effects on government debt management. As explained earlier, Brazil became a net external creditor in February 2008. As such, foreign debt and debt indexed to the exchange rate lost relative importance. External conditions may still affect Brazilian fiscal conditions however, through the exchange rate. In periods of persistent depreciation of the local currency, fears of inflationary pressures via a pass-through effect, has led the central bank to increase domestic rates and provide liquidity in foreign currency. In periods of persistent appreciation of the local currency, a deterioration of the trade balance may lead to a reduction in economic activity

Table 9: Federal Securities, Relative Participation by Correction Clause (%) and Maturity a/

	Indexed	Exchange Rate	Interest Rate	Price and Others	Nominal	Total	Maturity b/	Duration b/
2002	94.5	19.8	61.8	12.9	5.5	100.0	21.82	11.10
2003	85.7	9.9	61.7	14.1	14.3	100.0	23.99	10.88
2004	77.4	4.8	55.9	16.7	22.6	100.0	20.59	11.40
2005	71.3	2.6	51.2	17.5	28.7	100.0	21.80	12.22
2006	66.2	1.2	37.4	27.6	33.8	100.0	26.73	18.41
2007	60.5	0.8	34.1	25.6	39.5	100.0	33.09	24.35
2008	68.7	0.8	38.7	29.2	31.3	100.0	36.31	24.98
2009c/	69.7	0.5	39.9	29.3	30.3	100.0	38.41	26.69

a/ Source: Central Bank.

b/ Average, in months.

c/ Value of October.

Table 10 shows the correlations between the volatility of the exchange rate, inflation and interest rates, and the relative participation of government securities by correction clause.

Table 10: Correlations between Volatility and Government Securities by Correction Clauses a/ b/

	Exchange			
	Rate	Interest Rate	Prices	Nominal
Inflation	0.16*	0.20*	-0.23*	-0.17*
t-Statistic	2.3726	2.9684	-3.4338	-2.5616
p-value	0.0185	0.0033	0.0007	0.0111
Real Exchange Rate	0.17*	0.35*	-0.19*	-0.39*
t-Statistic	2.6183	5.6263	-2.8519	-6.2901
p-value	0.0095	0.0000	0.0048	0.0000
Real Interest Rate	-0.07	0.10	0.03	-0.11
t-Statistic	-1.0222	1.5547	0.4971	-1.6031
p-value	0.3078	0.1215	0.6196	0.1104
Nominal Interest Rate	0.07	0.19*	-0.07	-0.21*
t-Statistic	1.0396	2.8267	-1.0783	-3.2159
p-value	0.2997	0.0051	0.2821	0.0015
Nominal Exchange Rate	0.17*	0.23*	-0.03	-0.34*
t-Statistic	2.5441	3.4576	-0.4556	-5.3812
p-value	0.0116	0.0007	0.6491	0.0000
		Real Exchange Rate	Real Interest Rate	
Nominal Exchange Rate	0.01	0.80*	0.31*	
	0.1005	19.7915	4.8286	
	0.9200	0.0000	0.0000	

a/ Source: Author's calculation. Data from Banco Central do Brasil.

b/ * indicates statistical significance at the 5% level.

When the volatility of inflation increases, the market associates a greater risk to price-indexed and nominal securities. As expected, the correlation between the volatility of

inflation and price-indexed and nominal securities is negative.¹¹ From the government's point of view, an increase in the relative participation of price-indexed securities in moments of high inflation volatility represents an increment of its budgetary risk: an unexpected reduction in inflation rates increases government expenditures in real terms. As we see in the lower part of Table 7, the volatility of the nominal exchange rate is not significantly correlated to the volatility of inflation.

A real depreciation of the local currency increases the costs of the government's public debt. Thus, to minimize its budgetary risk, the government should reduce the participation of exchange rate indexed securities in periods of high exchange rate volatility. We observe a low, yet positive, correlation between real exchange rate volatility and securities indexed to the exchange rate. In fact, the government has used its securities to provide the market hedge and help stabilized the exchange rate market.

An increase in the volatility of the real interest rate rises the risks associated with the financial component of the government budget. From this point of view, less exposure to interest risk would be desirable in a context of increased interest rate volatility and we should expect a negative correlation between the volatility of interest rates and interest-indexed securities. We observe, however, that the correlation between the real interest rate and interest-indexed securities is not statistically significant.

IV. Fiscal Space and Macroeconomic Volatility

Given the pattern of government expenditures, the government's budget constraint is affected directly or indirectly by the growth rate of the economy, tax revenues, the interest rate paid on government debt, (the net return on foreign assets, mainly reserves) and the exchange rate. This section presents the pattern and volatility of the main economic variables considered important to the government's fiscal space.¹²

The financial globalization and a more integrated world economy initiated in the 1990s led to greater volatility in international markets and often to episodes of exchange rate crisis. In Brazil, domestic nominal interest rates increased sharply following the Asian and Russian crisis of 1997 and 1998, with the annualized *selic* rate reaching over 40%. In 1999, not even sharp increases in the domestic rates were sufficient to prevent a speculative attack against the local currency. Brazil abandoned the crawling-peg system and the *Real* was allowed to float. In 2001, following a domestic energy crisis, domestic rates increased again and uncertainties surrounding presidential elections led to a new round of domestic rates' increases.

Considering the government's budget constraint, more fiscal space can be generated by increasing government revenues, either mobilizing more tax resources or rationalizing its collection, by improving the efficiency and efficacy of government expenditures, and by

¹¹ Inflation volatility is not significantly correlated with the volatility of interest or exchange rates, in nominal or real terms.

¹² For an extensive analysis of Brazilian macroeconomic volatility see Souza, Filho and Carvalho (2008).

increasing its public debt.¹³ How relevant has macroeconomic volatility been to the components of fiscal space? And what are the restrictions imposed on fiscal space?

The fiscal results of a government can be more directly analyzed by looking at its borrowing requirements. The overall public sector budget constraint is given by:

$$\dot{M} + \dot{B} + E(\dot{I} + \dot{F} - \dot{R}) - \dot{A} = (G - T) + iB - iaA + i^* E(F + I - R)$$

where,

- M = monetary base
- B = stock of government debt
- I = stock of exchange rate indexed government debt
- F = stock of foreign government debt
- A = domestic assets
- R = foreign assets (mainly reserves)
- E = exchange rate
- i = domestic interest rate
- ia = interest rate on domestic assets
- i^* = international interest rate
- $(G - T)$ = primary surplus

Dot variables refer to the variation with respect to time.

As the overall government's budget constraint indicates, the public sector borrowing requirements have a fiscal component given by the primary result and a financial component represented mainly by net financial outlays of interest payments on domestic and foreign debt. Analytically, the fiscal component is directly affected by variations in the primary surplus while the financial component is affected by variations in interest and exchange rates. For fiscal sustainability, it is the effects of changes in the real exchange rate that matters. Obviously, the stock of government debt, domestic and foreign, affect the financial component as they determine the amount of interest payments due. An increase in foreign reserves, on the other hand, reduces the borrowing requirements of the public sector, *ceteris paribus*. But, in order to avoid expansions of the monetary base, the Central Bank has been partially exchanging foreign reserves for treasury securities. Although for the public sector as a whole the operation does not affect the borrowing requirements, eventual differences between the return on foreign reserves and treasury securities are beard by the public sector.¹⁴

In the context of an independent central bank, fiscal and monetary authorities should coordinate their actions in order to keep price stability as well as fiscal sustainability. In Brazil, given the characteristics of the public debt, mainly short maturities and indexation, as the Central Bank increases the domestic interest rate to avoid inflationary pressures, it

¹³ The specific conditions under which more fiscal space can be generated in the Brazilian case are discussed in Luporini and Licha (2009).

¹⁴ The relative importance of this effect on federal government finances have not received too much academic attention, but it should be explored from a fiscal point of view.

worsens the fiscal stance of the government, affecting the conditions for government financing not only when issuing new securities, but also when rolling over the debt.

Table 11 gives the descriptive statistics of the main variables considered in this section. The data set, obtained primarily at the Central Bank, consists of monthly values from 1991 through 2009 transformed at constant prices of 2008 and, for analytical purposes, we divide the data in three periods. The first one is defined as the high inflation period and refers to the months between January of 1991 (beginning of our sample) and June of 1994, when the price stabilization program, the Real Plan, was put in place. The second period, comprises the months that followed price stabilization and is characterized by the adoption of the crawling-peg system for the exchange rate (effective in July of 1995). Period III starts in January 1999, when under a speculative attack, the domestic currency was allowed to float. In July of 1999, Brazil adopted the inflation targeting system. As inflation rates declined after the Real Plan, averages for nominal and interest rates also fell over time. Annual growth rates of real output averaged 2.6%, 2.5% and 3.0% in the first, second and third periods, respectively.

Following the great majority of empirical studies, we define volatility as the standard deviation of the proportional change in the variables.¹⁵ As some variables assume very extreme values (the inflation rate, for example, reached a maximum of 47.4% in June of 1994 and a minimum of -0.51% in August of 1998), we calculate the deviations of the level value from a moving average centered at 7. That is, with monthly data, we are calculating the deviations from a mean value obtained for each quarter of data. In Table 11, “volatility” represents the average volatility for the period. As the deviation of the proportional change in the variables, volatility values are unit free and may be directly compared.

Looking at the results of Table 11, it is interesting to note that although inflation rates were high during the first period, with a mean value of 26.2% per month, rates became more volatile after stabilization. For the interest rate, nominal and real, volatility is higher in the second period when compared to period III. This is expected as the interest rate was one of the main instruments used by the monetary authority to support the domestic currency vis-à-vis the US dollar. The fixed exchange rate was kept afloat at the expense of high domestic interest rates. As a result, the net public debt of the consolidated public sector increased from 31.2% of GDP in 1995 to 43.3% in 1998.

¹⁵ An alternative way of measuring volatility is the standard deviation of the difference between the variable and its long-term trend (an Hodrick-Prescott-filtered series) as in Taylor (2000). This alternative measure yielded very similar results for our series (not reported here). The program executed for the calculation of the volatility used in this paper is presented below in the appendix.

Table 11: Descriptive statistics of macroeconomic variables, 1991:01 to 2009:09a/ b/

		Period I	Period II	Period III	Full Period
		(High inflation)	(Crawling-peg regime)	(Floating exchange rate regime)	
Inflation (%)	Mean	26.20	0.99	0.56	5.45
	Median	25.10	0.63	0.48	0.59
	Maximum	47.43	6.84	3.02	47.43
	Minimum	4.99	-0.51	-0.21	-0.51
	Volatility	0.1317	0.9785	1.0804	0.8762
Nominal Interest Rate (%)	Mean	28.50	2.63	1.33	6.71
	Median	28.44	2.29	1.30	1.60
	Maximum	50.62	6.87	3.33	50.62
	Minimum	6.85	1.48	0.69	0.69
	Volatility	0.0819	0.1076	0.0902	0.0929
Real Interest Rate (%)	Mean	1.80	1.62	0.77	1.17
	Median	2.39	1.57	0.74	0.98
	Maximum	6.03	2.92	2.21	6.03
	Minimum	-11.49	0.03	-1.44	-11.49
	Volatility	4.2949	2.2625	0.6197	1.7146
Nominal Exchange Rate (R\$/US\$)	Mean	0.07	1.02	2.31	1.58
	Median	0.00	1.02	2.19	1.79
	Maximum	0.84	1.21	3.81	3.81
	Minimum	0.00	0.84	1.50	0.00
	Volatility	0.0277	0.0132	0.0284	0.0246
Real Effective Exchange Rate c/	Mean	89.19	75.51	106.00	95.55
	Median	90.31	74.01	105.59	91.64
	Maximum	95.76	92.09	154.55	154.55
	Minimum	77.31	72.08	82.23	72.08
	Volatility	0.0208	0.0119	0.0285	0.0230
Real Output (R\$ Millions of 2008)	Mean	149346.30	208076.00	223566.80	205994.50
	Median	150961.90	213017.00	220498.20	213363.80
	Maximum	179426.60	245471.80	269650.50	269650.50
	Minimum	106927.90	165280.40	182465.30	106927.90
	Volatility	0.0376	0.0365	0.0314	0.0338
International Reserves (US\$ Millions)	Mean	21396.55	52881.07	80774.45	62996.16
	Median	22721.00	54721.50	50539.74	47645.19
	Maximum	42881.00	74656.05	224212.70	224212.70
	Minimum	7863.00	31887.00	28265.00	7863.00
	Volatility	0.0409	0.0408	0.0395	0.0401
Terms of Trade d/	Mean	81.69	104.55	97.31	96.13
	Median	80.92	104.29	96.49	96.67
	Maximum	91.70	113.19	111.38	113.19
	Minimum	72.01	89.02	89.37	72.01
	Volatility	0.0275	0.0177	0.0171	0.0192
	Obs	42	54	129	225

a/ Author's calculation, based on monthly data.

b/ Period I (1991:01 through 1994:06); Period II (1994:07 1998:12); Period III (1999:01 2009:09).

c/ Index (2005 mean =100), source Ipeadata.

d/ Index (2006 mean =100), source Funcex.

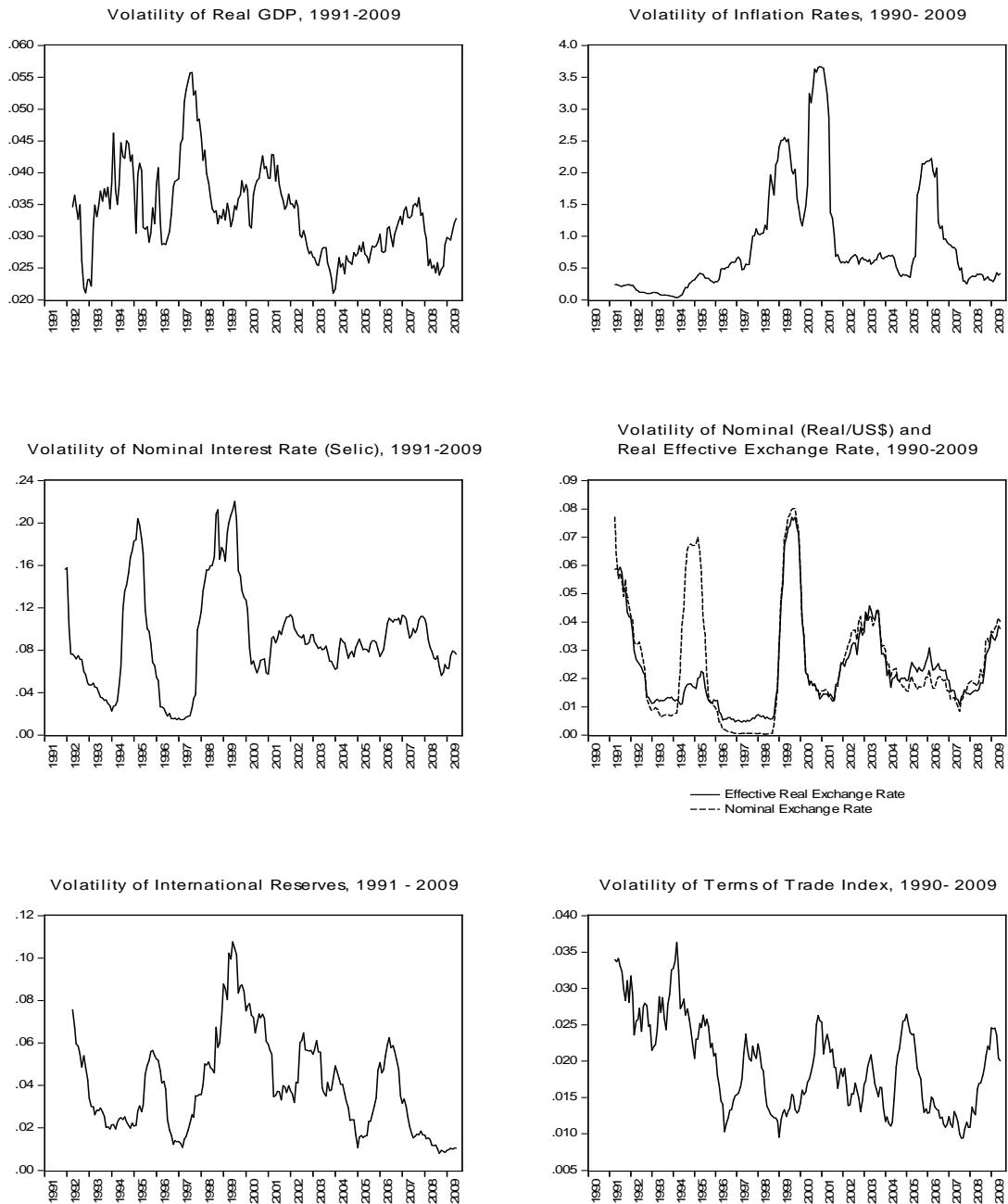
At least in theory, the volatility of reserves should be close to zero in a truly flexible regime and high under fixed rate regime. According to Table 11, the average volatility of reserves did not vary significantly between the periods, remaining around 0.04. Regarding the exchange rate, as expected, volatility is much higher under the floating regime than under the crawling-peg system. In fact, dealing with volatility in the exchange rate has been an important challenge for emerging market economies under an inflation targeting regime, as episodes of currency depreciation often lead to revisions in expected inflation rates. In the case of Brazil, in particular, fears of upward pressure on domestic prices have led the monetary authority to increase the domestic basic interest rate. As almost 40% of federal securities are indexed to the interest rate, increases in the basic rate have an immediate impact not only on new securities being issued, but also on the stock of the debt. Increases in the interest rate, moreover, have a negative effect on economic activity, worsening fiscal indicators.

The evolution of volatility along the time is presented in Figure 9. The graphs show rolling standard deviations for a twelve-month centered window. The standard deviation reported for a particular month in the graph actually reflects the volatility over months 1 through 12, centered at the current observation.

Figure 9 indicates that, for most variables, macroeconomic volatility may be considered high in the period of price stabilization of 1994, the exchange rate crisis of 1999 and the appreciation of the domestic currency in 2006. The volatility of international reserves also rises during the exchange rate crisis, the presidential elections in 2002 and after 2004, when the Central Bank initiated a program to accumulate international reserves. In 2006, although the Brazilian economy presented a positive performance with low inflation rates, high external trade balances (related more to increases in export prices than to the quantum exported), and strong demand for domestic goods, output increased less than expected, at 2.8%. The strong appreciation of the domestic currency affected the quantum exported, increased imports, affected the domestic industry and current transactions. Volatility rises again after 2008 with the international crisis. With the adoption of a floating exchange rate regime after the crisis of 1999 and the inflation targeting regime, the exchange rate market became one of the main sources of economic instability in Brazil. As mentioned, variations in the exchange rate market has led to frequent changes in expected inflation, particularly when volatility is associated to depreciation episodes [Goldfajn and Werlang, (2000)].

Figure 9

Macroeconomic Volatility, 1991-2009



a/ Twelve-month rolling standard deviation.
Source: Author's calculation.

But how has macroeconomic volatility affected the components of fiscal space? An exploratory analysis of the data is presented in Table 12.

Table 12: Correlations of Fiscal Variables and Macroeconomic Volatility a/

Volatility	Debt/GDP b/	Expenditures	Revenues	Borrowing Requirements
Nominal Exchange Rate	0.14*	-0.01	0.04	0.18*
t-Statistic	2.0324	-0.0795	0.5327	2.7408
p-value	0.0433	0.9367	0.5948	0.0066
Real Exchange Rate	0.26*	0.09	0.12	0.09
t-Statistic	3.9022	1.3889	1.7831	1.3958
p-value	0.0001	0.1663	0.0760	0.1642
Inflation	0.18*	0.11	0.13	-0.02
t-Statistic	2.6239	1.6201	1.9700	-0.3049
p-value	0.0093	0.1067	0.0501	0.7607
GDP	-0.13	-0.13	-0.11	0.11
t-Statistic	-1.8589	-1.9622	-1.6230	1.5615
p-value	0.0644	0.0510	0.1061	0.1199
Reserves	0.04	-0.07	-0.07	0.12
t-Statistic	0.5325	-0.9978	-0.9587	1.8428
p-value	0.5950	0.3195	0.3388	0.0667
Interest Rate	0.09	0.00	0.05	-0.06
t-Statistic	1.2879	0.0162	0.7902	-0.8476
p-value	0.1992	0.9871	0.4303	0.3976
Real Interest Rate	-0.19*	-0.21*	-0.21*	-0.01
t-Statistic	-2.8511	-3.2150	-3.0870	-0.1074
p-value	0.0048	0.0015	0.0023	0.9146
Terms of Trade	-0.22*	-0.18*	-0.21*	0.02
t-Statistic	-3.2733	-2.6367	-3.2208	0.3594
p-value	0.0012	0.0090	0.0015	0.7197

a/ Author's calculations.

b/ Federal government

* Significant at the 5% level.

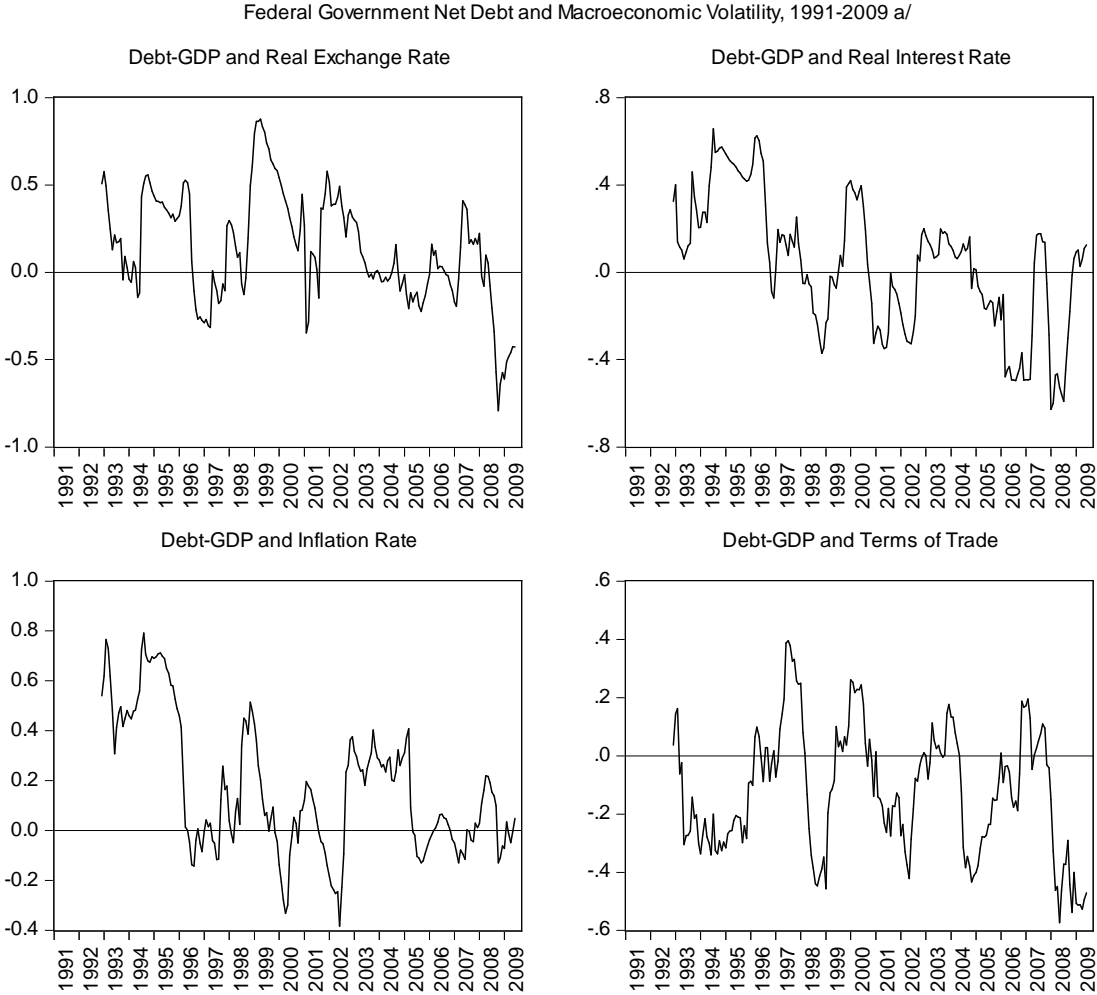
The results indicate that the volatility of real exchange rate, inflation and real interest rate are statistically significant at 5% for the debt/GDP ratio. For expenditures and revenues, only the volatility of real interest rate and terms of trade are significant. For the borrowing requirements of the public sector, only the volatility of the nominal exchange rate is statistically significant at the 5% level. In other words, only the volatility of the exchange and interest rates, inflation and terms of trade have significant correlation coefficients.

The correlation values obtained for these variables are low, however. As a measure of linear association between variables, correlation coefficients in the interval of -0.30 and $+0.30$ are considered weak, as they imply coefficients of determination of about 10%. For instance, the highest significant value in Table 12 is the correlation between the volatility of real exchange rate and the debt/GDP ratio (0.26). This correlation implies that 7% of the variance in the debt/GDP ratio might be associated to the volatility of the real exchange rate. An increase in the volatility of international reserves is marginally associated to increases in the borrowing requirements of the federal government, with a correlation coefficient of 0.12.¹⁶ Although the correlation values are rather low, let's observe the

¹⁶ Given the relationship between the components of the government's borrowing requirements, the relative impact of macroeconomic volatility on fiscal space should be better analyzed through a system of vector autoregressions (VAR).

evolution of the correlation coefficients for the debt/GDP level and volatility over our sample period.

Figure 11



a/ Twentyfour-month rolling correlations
Source: Author's calculation.

Correlation coefficients vary over time reflecting the impact of different shocks in each 12-month period. There seems to be a declining trend in the correlation coefficient of debt/income ratio and the volatility of real interest rates, suggesting that in recent years the debt tended to decrease as interest rate volatility increased. Inflation volatility seems to have been relevant for the debt/income ratio only until price stabilization.

But consistent fiscal data for some variables are only available after 1997. The models estimated rendered poor results and were not reported here.

Comovements with Output and Automatic Stabilizers

Although the volatility of GDP cannot be significantly associated to fiscal space variables, as expected, the level of economic activity is relevant for the fiscal component of the government's borrowing requirements. Government revenues and expenditures vary strongly with output, with correlation coefficients of 0.71 and 0.78, respectively, in the period analyzed here. The government's fiscal variables vary due to changes in economic conditions and to discretionary changes in fiscal policy. The passive response of fiscal results to changes in economic conditions are known as automatic fiscal stabilizers.

The distinction between these two types of fiscal responses, automatic and discretionary, is important because it allows an evaluation of whether or not the fiscal targets established by the Brazilian government are compatible with its structural primary results and whether or not automatic stabilizers have been important for smoothing the business cycle. The problem is that, unlike for other countries, Brazilian fiscal statistics do not provide a measure for the structurally adjusted deficit.¹⁷

Mello and Moccero (2006) estimated the cyclically adjusted fiscal result for Brazil using data from 1995 and 2005. Using the methodology proposed by the OECD, the authors find the elasticity of the primary fiscal balance to the business cycle to be around 0.32%, a value much lower than those estimated for developed countries.¹⁸

Rocha (2007) analyses the relationship between the macroeconomic cycle and fiscal variables for Brazil using data from 1995 through 2005. Using the elasticity value of 0.32% and a Taylor-like fiscal rule, the author compares the cyclically adjusted primary surplus with the primary result that would be required for compliance to the government's fiscal target. She concludes that, at least after 1999, the cyclically adjusted primary surpluses have been compatible with the government's fiscal target, although the response of the primary surplus has not been significantly different when output is above or below trend. That is, Brazilian fiscal policy has been symmetrical over the business cycle. The author shows, moreover, that the role of automatic stabilizers has been rather limited and that, during the period analyzed, there was no systematic or deliberated efforts by the fiscal authorities to stabilize the economic cycle through discretionary fiscal policy. Yet, fiscal policy became less procyclical after the adoption of the Fiscal Responsibility Law.

The considerations made earlier about the nature of government expenditures and revenues, and the rigidity of the government's budget support Rocha's results and lead us to the conclusion that there are structural difficulties for the government to implement an active discretionary fiscal policy.

¹⁷ The two mostly used methodologies for calculating the structural deficit are the ones by the IMF (1999) and by the OECD. In both cases, the methodology involves calculating the reduced-form elasticities of the fiscal variable to the output gap. From the calculated elasticities, the structural result is obtained by the difference between the effective fiscal result and its automatic response to the output gap. The output gap may be obtained by a simple hodrick-prescott filter or through the direct estimation of the production function.

¹⁸ According to Rocha (2007), the calculated elasticity is around 0.44%, on average, for OCDE countries. For Japan (0.33) and the United States (0.34), the elasticities are similar to the Brazil's.

V. Final Remarks

This article presented an analysis of the channels through which macroeconomic volatility may affect the government's budget constraint and how Brazilian institutions and organization of the public sector has affected the country's fiscal space and its capacity to respond to crises. Using monthly data from 1991 through 2009, the analysis indicate that domestically, the nominal interest rate has been the major source of macroeconomic instability while the exchange rate market has been the main channel through which international shocks have affected the Brazilian economy.

The main findings are:

- a) advances in the relationship between the Treasury and the Central Bank has rendered the later with sufficient autonomy to implement monetary policy and independently pursue price stability. The Fiscal Responsibility Law along with the adoption of fiscal targets has helped organize public finances at all levels of government and stabilize the debt/income ratio;
- b) the net public debt has been sustainable during the period analyzed in the sense that the government has consistently reacted to increases in the debt/income ratio by increasing the primary surplus. The results suggest that the fiscal reaction has been stronger after 1999. The net public debt increased as a ratio to income after the international crisis of 2008. The reasons for this are more related to the crisis' impact on economic activity and tax collection than to the government's exposure to international shocks;
- c) debt management by the Treasury has significantly reduced the country's exposure to external shocks. After 2006, Brazil adopted a policy of accumulating foreign reserves (US\$ 239.1 bi in December 2009), which according to government officials works as an insurance against balance of payment crises. This policy has a fiscal cost, however, given by the difference between the rate paid on government securities used to avoid monetary expansion and the return on foreign assets. The government argues that the cost is small if compared to the cost of macroeconomic volatility. Indeed, analyzing macroeconomic volatility, the exchange rate market has represented on of the main sources of macroeconomic instability through its effects on expected inflation. The Central Bank has, on several occasions, made use of its foreign reserves to stabilize the exchange rate market and curb inflationary pressures;
- d) the government's capacity to respond to crises have been limited by the institutional organization of the public sector, the quality of government's expenditures and the reliance on tax revenues for fiscal consolidation. The high relative participation of earmarked expenditures and other items that cannot be easily reduced limits the government fiscal space to relocate budget resources towards investment or to respond to unexpected shocks;

- e) from the revenue side, the Brazilian tax system has been adequate in generating tax revenues. But it is extremely complex and diversified, with a myriad of instruments, and excessively dependent on contributions and taxes levied on production (for instance, contributions over labor reach 50.8% of total hours paid raising the costs of hiring). The tax burden, furthermore, has increased almost steadily from its historical level of 25% of GDP. In 2009, the tax burden represented 36% of GDP, a level considered high for countries with similar income. A viable tax reform, however, would require extensive political negotiation and the tax reform proposal recently sent to Congress has not been voted yet. Given the pattern of government expenditures, fiscal consolidation has relied heavily on revenues and whether Brazilian society will accept further increases in the tax burden is an open question;

- f) finally, although the size of the government, measured by total expenditures over output, may function as a natural stabilizer, the procyclical characteristics of Brazilian fiscal policy, combined with legal restrictions on expenditures, impose limits upon the government's capacity to use fiscal policy to neutralize adverse shocks on the economy. As shown by Rocha (2007), Brazilian fiscal policy has been procyclical with a limiting role for automatic fiscal stabilizers, but the cyclically adjusted primary surpluses have been, on average, compatible with the government's fiscal targets. The author shows, moreover, that between 1999 and 2005, the government did not make deliberated efforts to stabilize the economy through fiscal policy. More recently, however, the federal government has issued securities to transfer resources to its federal development bank, the *Banco Nacional de Desenvolvimento Econômico e Social* (BNDES). The Bank offers subsidized credit lines mainly to viable investment projects in infrastructure and had an important role in supporting credit levels during the international crisis of 2008. The transfer of resources from the Treasury to the Bank did not impact the consolidated net public debt, but eventual differences between the interest paid on securities and the net return on credit lines will be beard by the Treasury with fiscal consequences. As in other countries, the government responded to the crisis by lowering interest rates and adopting an active fiscal policy. Tax incentives, mainly reduction of taxes on industrial products (IPI), that were already in place before the international crisis were broadened. These fiscal incentives and the reduction of economic activity have inevitably led to a reduction in government revenue. On the expenditure side, the federal government maintained outlay levels as originally planned before the crisis, making recent fiscal policy countercyclical face the decline in economic activity.

In 2010, Brazil is expected to growth over 5.5% (Focus, April 2010), with an expected inflation rate of around 5% (the Central Bank's target is 4.5%) and a nominal interest rate projected at 11.25% a year. In this context, if the net public debt stays around 40% of GDP, the probability that a fiscal crisis may occur in four years is al low as 5%, according to Luporini and Licha (2009)]. Given the perspectives for the Brazilian economy in 2010, risks may come from adverse international conditions and inflationary pressures. Increases in the baseline interest rate is expected for this year, but their impact on economic activity is not expected to be very strong as rates have already increased in the credit market. The appreciation of the local currency and the world economic slowdown led to a current account deficit of 1.3% of GDP in 2009 and an expected 3.3% of GDP for 2010. Brazil has

not had problems financing the deficit so far, as it has been attractive to foreign capital looking for “low risk” emerging markets. Questions remain, however, on how the world economy will react to the end of fiscal impulses currently in place and whether or not emerging economies in general and China, in particular, will be able to keep present levels of demand for Brazilian products and commodities.

References

- Ahmed, S. and J. Rogers (1995). "Government budget deficits and trade deficits: are present-value constraints satisfied in long-term data?" *Journal of Monetary Economics*, 36.
- Baunsgaard and Symansky, 2009. "Automatic fiscal stabilizers: how can they be enhanced without increasing the size of government?" IMF, Fiscal Affairs Department.
- Bevilacqua, A. (2002). "State government bailouts in Brazil", apud IMF "Fiscal risks: sources, disclosure and management", Fiscal Affairs Department, 2008.
- Bohn, H. (1995). "The sustainability of budget deficits in a stochastic economy". *Journal of Money, Credit, and Banking*, v. 27(1).
- Bohn, H. (1998). "The behavior of U.S. public debt and deficits". *The Quarterly Journal of Economics*, v. 113(3).
- Bohn, H. (2005). "The sustainability of fiscal policy in the United States." University of California at Santa Barbara, CESifo/LBI Conference on the sustainability of public debt.
- Divino, J. and S. Gadelha (2008). "Dominância fiscal ou dominância monetária no Brasil? Uma análise de causalidade." *Economia Aplicada* v. 12 (4).
- Fialho, M. and M. Portugal (2005). "Monetary and fiscal policy interactions in Brazil: an application of the fiscal theory of the price level." *Estudos Econômicos* v. 35 (4).
- Gavin, M and R. Perotti (1997). "Fiscal policy in Latin America", NBER Macroeconomic Annual, n. 12.
- Girouard, N. and C. Andre (2005). "Measuring cyclically adjusted budget balances for OECD countries." OECD Economics Department, Working Paper 434.
- Gobetti, S. (2006). "Estimativa dos investimentos públicos: um novo modelo de análise da execução orçamentária aplicado às Contas Nacionais". *Finanças Públicas*, XI Prêmio Tesouro Nacional.
- Goldfajn, I. (1998). "Public debt indexation and denomination: the case of Brazil." IMF, Working Paper 98/18.
- Goldfajn, I and S. Werlang (2000). "The pass-through from depreciation to inflation: a panel study." Central Bank, Working Paper Series n. 5.
- Goldfajn, I. (2003). "Fiscal rules and sustainability in Brazil. Banco Central do Brasil." *Technical Notes*, n. 39.
- Hakkio, C. and M. Rush (1991). "Is the budget 'too large'?" *Economic Inquiry*, 39.

Hamilton, J. and M. Flavin (1986). "On the limitations of government borrowing: a framework for empirical testing." *The American Economic Review*, v. 76(4).

Heller, P. (2005). "Understanding fiscal space". *IMF Policy Discussion Paper*. Available at: <http://www.imf.org/external/pubs/ft/pdp/2005/pdp04.pdf>.

Issler, J. and R. Lima (1997). "Public debt sustainability and endogenous seignorage in Brazil: time series evidence from 1947-1992." *Ensaio Econômicos da EPGE*, 306.

Kennedy, S. and J. Robbins (2003). "The role of fiscal rules in determining fiscal performance." Department of Finance, Canada.

Kopits, G. (2001). "Fiscal rules: useful policy frameworks or unnecessary ornament?" IMF Working Paper 01/145.

Luporini, V. (2000). "Sustainability of the Brazilian fiscal policy and central bank independence". *Revista Brasileira de Economia*, v.54(2).

Luporini, V. (2000a). The degree of independence of the Brazilian Central Bank: repurchase agreements and Central Bank securities. Cedeplar-UFMG Working Paper No. 136. Available at SSRN: <http://ssrn.com/abstract=262421>

Luporini, V. and A. Licha (2009). "Espacio fiscal para el crecimiento em Brasil", in J. Fanelli (org.) *Espacio Fiscal para el crecimiento el Mercosur*. Red Mercosur de Investigaciones Económicas, Zonalibro, Uruguay.

Mawad, A. and V. Luporini (2006). "Da estruturação ao equilíbrio fiscal: uma análise das finanças públicas estaduais no governo FHC." Texto para Discussão, no.206, Universidade Federal Fluminense.

Mello, L. and D. Moccero (2006). "Brazil's fiscal stance during 1995-2005: the effect of indebtness on fiscal policy over the business cycle". OCDE Economics Department, Working Paper 485.

Mendoza, E. and P. Oviedo (2004). "Public debt, fiscal solvency and macroeconomic uncertainty in Latin American: the case of Brazil, Colombia, Costa Rica and Mexico." NBER, Working Paper 10637.

Oliveira, W. (2004). "Lei de Responsabilidade Fiscal, margem de expansão e processo legislativo federal". *Finanças Públicas*, IX Prêmio Tesouro Nacional.

Resende, F. (2006). "Conflitos federativos e reforma tributária". Available at http://www.adenauer.org.br/livros/caderno/03_06rezende.pdf.

Rocha, F. (1995). "Monetary regimes and macroeconomic policy: an empirical analysis of the Brazilian economy". Ph.D. Dissertation , University of Illinois at Urbana-Champaign.

_____. (2007). “Política fiscal através do ciclo e operação dos estabilizadores fiscais”. ANPEC.

Souza, F.E.P, G. S. Filho and F.Carvalho (2008). Brazil, in Fanelli, J. (ed) “Macroeconomic Volatility, Institutions and Financial Architectures: the developing world experience”. Palgrave- Macmillan.

Tanner, E. (1995). “Intertemporal solvency and indexed debt: evidence from Brazil, 1976-1991.” *Journal of International Money and Finance*, v.14(4).

Tanner, E. and I. Samake (2008). “Probabilistic sustainability of public debt: a vector autoregression approach for Brazil, Mexico, and Turkey” *IMF Staff Papers*, vol. 55 n. 1.

Taylor, J. (2000). “Recent changes in trend and cycle.” Remarks for the Pannel Discussion, Structural Change and Monetary Policy Conference, Federal Reserve Bank of San Francisco.

Trehan, B. and C. Walsh (1988). “Common trends, intertemporal balance, and revenue smoothing.” *Journal of Economic Dynamics and Control*, 12.

Uctum, M. and M. Wickens (2000). “Debt and deficit ceilings, and the sustainability of fiscal policies: an intertemporal analysis.” *Oxford Bulletin of Economics and Statistics*, 62(2).

Velloso, R. (2005). “Rigidez orçamentária e difíceis escolhas”. Fórum Nacional, Instituto Nacional de Altos Estudos (INAE), Estudos e Pesquisas, no.93.

Wilcox, D. (1989). “The sustainability of government deficits: implications of the present-value borrowing constraint.” *Journal of Money, Credit, and Banking*, v. 21(3).

Apendix

Volatility:

```
'program vol_monthly
```

```
genr var1= inf
genr var1d=(var1 - var1(-1))/var1(-1)
genr mean_roll = @movavc(var1d,7)
genr volatility= ((var1d-mean_roll)^2)^0.5
genr volatility_roll = @movav(volatility,12)
```

Data Set – Monthly observations, 1990m01 – 2009m09.

1 Expenditure Series

2269 - Despesas do Tesouro Nacional (Fluxos) - Pessoal e encargos - u.m.c. (milhões)
2270 - Despesas do Tesouro Nacional (Fluxos) - Transferências a estados e municípios - u.m.c. (milhões)
2271 - Despesas do Tesouro Nacional (Fluxos) - Outras vinculações - u.m.c. (milhões)
2272 - Despesas do Tesouro Nacional (Fluxos) - Encargos da dívida mobiliária da carteira do Bacen - u.m.c. (milhões)
2273 - Despesas do Tesouro Nacional (Fluxos) - Operações oficiais de crédito - u.m.c. (milhões)
2274 - Despesas do Tesouro Nacional (Fluxos) - Encargos da dívida contratada - Interna e externa - u.m.c. (milhões)
2275 - Despesas do Tesouro Nacional (Fluxos) - Custeio, investimento e restos a pagar - u.m.c. (milhões)
2276 - Despesas do Tesouro Nacional (Fluxos) - Total
6036 - NFSP com desvalorização cambial - Fluxo mensal corrente - Juros nominais - Total - Governo Federal e Banco Central
Source: Central Bank
Note: Earmarked Expenditures refers to series 2269, 2270 and 2271.

2 Revenue Series

7615 - Receitas tributárias - Regime de competência - Imposto de renda - Total - u.m.c. (milhões)
7625 - Receitas tributárias - Regime de competência - IPI - Total - u.m.c. (milhões)
7631 - Receitas tributárias - Regime de competência - IOF - u.m.c. (milhões) (OU FINANCIAL TRANSACTIONS)
7632 - Receitas tributárias - Regime de competência - Cofins - u.m.c. (milhões)
7633 - Receitas tributárias - Regime de competência - CLPJ - u.m.c. (milhões)
7634 - Receitas tributárias - Regime de competência - PIS/Pasep - u.m.c. (milhões)
7635 - Receitas tributárias - Regime de competência - Imposto de importação - u.m.c. (milhões)
7636 - Receitas tributárias - Regime de competência - CPMF - u.m.c. (milhões)
7637 - Receitas tributárias - Regime de competência - CIDE - u.m.c. (milhões)
7638 - Receitas tributárias - Regime de competência - Outros tributos - u.m.c. (milhões)
7639 - Receitas tributárias - Regime de competência - Total - u.m.c. (milhões)
Source: Central Bank
Imposto sobre a circulação de mercadorias (ICMS) (deflator: IPCA) - R\$(mil) - Min. Fazenda/Cotepe - CONFAZ12_ICMSN12
Source: Ipeadata

3 Debt and Fiscal Results

Borrowing requirements of the public sector (% of GDP)
Source: Boletim do Banco Central, several issues.
"Resultado Nominal do Governo Geral"
Source: Secretaria do Tesouro Nacional, Sistema FINBRA
"Resultado Fiscal para o Governo Central"
Source: Secretaria do Tesouro Nacional/ Ministério da Fazenda, SIAFI.
4513 - Net public debt (% GDP) - Total - Consolidated public sector - %
4503 - Net public debt (% GDP) - Total - Federal Government and Banco Central - %
Source: Central Bank

4 Primary surplus

17127-NFSP sem desvalorização cambial (%PIB)- Fluxo mensal corrente- Resultado primário-Total- Setor público consolidado com Petrobras-%

5364 - NFSP sem desvalorização cambial (% PIB) - Fluxo mensal corrente - Resultado primário - Total - Setor público consolidado - %

Source: Central Bank

5 Output series

4380 - PIB mensal - Valores correntes (R\$ milhões) - R\$ (milhões)

4384 - PIB acumulado no ano - Valorizado pelo IGP-DI centrado do mês (R\$ milhões) - R\$ (milhões)

Source: Central Bank

Produção industrial - indústria geral - quantum - índice (média 2002 = 100) - IBGE/PIM-PF - PIMPFN12_QIIG12

Source: Ipeadata

6 Interest Rate

Taxa de juros - Over / Selic - (% a.m.) - BCB Boletim/M. Finan. - BM12_TJOVER12

Source: Ipeadata (www.ipeadata.gov.br)

7 Exchange Rate

Taxa de câmbio - efetiva real - INPC - exportações - índice (média 2005 = 100) - IPEA - GAC12_TCERXTINPC12

Taxa de câmbio - R\$ / US\$ - comercial - venda - média - R\$ - BCB Boletim/BP - BM12_ERV12

Source: Ipeadata (www.ipeadata.gov.br)

8 Federal securities by correction clause and maturity

Source: Central Bank; series temporais.

9 Inflation

Inflação - IPCA - (% a.m.) - IBGE/SNIPC - PRECOS12_IPCAG12

Source: Ipeadata (www.ipeadata.gov.br)

10 Investment Rates

Capital fixo - formação bruta - adm. pública - R\$(milhões) - IBGE/SCN 2000 Anual - SCN_FBKFGN

Capital fixo - formação bruta - empresas e famílias - R\$(milhões) - IBGE/SCN 2000 Anual - SCN_FBKFPN

Capital fixo - formação bruta - R\$(milhões) - IBGE/SCN 2000 Anual - SCN_FBKFN

Source: Ipeadata

11 Foreign Reserves

Reservas internacionais - liquidez internacional - US\$(milhões) - BCB Boletim/BP - BM12_RESLIQ12

Source: Ipeadata

12 Terms of Trade

Termos de troca - índice (média 2006 = 100) - Funcex - FUNCEX12_TTR12

Source: Ipeadata

13 Foreign investment in securities

Conta financeira - investimentos estrang. em carteira - títulos renda fixa - US\$(milhões) - BCB Boletim/BP - BPN4_FINIDECRF4

Conta financeira - investimentos estrang. em carteira - títulos renda fixa- curto prazo- US\$(milhões)- BCB Boletim/BP - BPN4_FINIDECRF4

Source: Ipeadata

14 External Sector

Dívida externa - curto prazo - US\$(milhões) - BCB Boletim/BP - BM4_DEXCP4

Dívida externa - registrada - US\$(milhões) - BCB Boletim/BP - BM_DEXR

Source: Ipeadata
