

**KEYWORDS**

Financial crisis  
 Fiscal policy  
 Macroeconomics  
 Foreign exchange rates  
 Interest rates  
 Economic stabilization  
 Brazil

# Fiscal policy in times of crisis: macroeconomic effects of the primary surplus

*Manoel Carlos de Castro Pires, Fábio Goto and Bruno Rocha*

**T**he international financial crisis that hit the Brazilian economy in the third quarter of 2008 called forth several economic-policy responses. In the case of fiscal policy, expansionary measures rendered the existing fiscal target unviable, and it was formally reduced in April 2009. The purpose of this article is to analyse the macroeconomic effects of reducing the primary budget-surplus target and to evaluate its repercussions on the level of activity, time-structure of interest rates and the exchange rate.

Manoel Carlos de Castro Pires  
 Technical Officer of the Institute  
 of Applied Economic Research  
 (IPEA) and Coordinator General  
 of Fiscal Policy at the Economic  
 Policy Secretariat (SPE), Ministry of  
 Finance

✉ [manoel.pires@ipea.gov.br](mailto:manoel.pires@ipea.gov.br)

Fábio Goto  
 Coordinator General of Model  
 Building at the Economic Policy  
 Secretariat (SPE), Ministry of  
 Finance

✉ [fabio.goto@fazenda.gov.br](mailto:fabio.goto@fazenda.gov.br)

Bruno Rocha  
 Finance and Control Analyst at the  
 Economic Policy Secretariat (SPE),  
 Ministry of Finance

✉ [bruno.r.silva@fazenda.gov.br](mailto:bruno.r.silva@fazenda.gov.br)

# I

## Introduction

The intensification of the international financial crisis that began in the third quarter of 2008 generated renewed interest in the countercyclical role of fiscal policy among macroeconomic theorists. Interest in that function—which was previously very clear and founded on the perceived need for active aggregate-demand-management (Keynesian) policies—faded in the mid-1970s for two main reasons. The first, recognized by Tobin (1982), is that the Keynesian analytical models of the time were static and, consequently, underestimated the repercussions of fiscal policy on the sustainability of the public debt. The second reason is that increases in public debt today would need to be matched by primary surpluses in the future. In that case, economic agents would anticipate the future tax increases, and fiscal expansion would have no macroeconomic effects, since it would be perfectly offset by a reduction in private aggregate demand. This argument is known as “Ricardian equivalence” (Barro, 1979).

For many years, concern about debt sustainability and theoretical doubts about the effectiveness of fiscal policy relegated the countercyclical fiscal tool to secondary status behind other measures, including monetary policy.<sup>1</sup>

Despite attempts to revive a number of aspects of fiscal policy, such as the notion that positive exogenous factors can increase the return on private capital—including public investment in infrastructure and education expenditure—the focus of the debate has changed, and fiscal policy is now viewed in a much more structural context than as a countercyclical tool.

Nonetheless, those policy recommendations were rejected by policymakers in the global economy when reacting pragmatically to the events caused by the financial crisis; and highly expansionary and unconventional fiscal-policy measures were adopted,

such as giving financial assistance to firms and purchasing “toxic” assets from banks.

Although the policy measures adopted in Brazil to cope with the crisis were more conventional than elsewhere in the world, they have been subject to various criticisms. The first type of criticism is based on the general perception that the Brazilian economy faces a borrowing constraint, which limits the countercyclical potential of fiscal policy.<sup>2</sup> Consequently, reducing the primary surplus target would be constrained by other objectives, in which case the function of policymakers would be to calibrate the reduction to avoid compromising the sustainability of the public debt, even in the short term.<sup>3</sup> In view of that concern, it can be argued that the debate on the effect on activity levels of reducing the fiscal target has not yet run its course.

The second type of criticism is that Brazil was not in the limiting situation of setting a lower bound for the operation of monetary policy. Thus, the countercyclical function of fiscal policy would hinder a sharper reduction in interest rates (Parnes and Goldfajn, 2008). Moreover, it is well known that monetary-policy-transmission channels in Brazil are not perfect, so even a sharp cut in interest rates might not be sufficient to stimulate economic activity as quickly as desired.<sup>4</sup>

<sup>2</sup> For example, when it was announced that the target for the primary surplus would be lowered from 3.8% of gross domestic product (GDP) to 2.5% in April 2009, public-debt projections were published without estimating the repercussions of the fiscal stimulus on GDP, which was the main purpose of the measure.

<sup>3</sup> It is important to consider existing proposals for the measurement of fiscal indicators. Hemming and Ter-Minassian (2004) recognize that the primary-surplus concept can cause sacrifices that have repercussions for long term growth, including cutbacks in infrastructure investment. Nonetheless, they claim that many countries are not technically prepared to adhere to an alternative rule, such as the golden rule that seeks to balance the budget using the target for the current balance rather than the capital balance. One possibility is the proposal developed by Blanchard and Giavazzi (2004) to exclude investment from the concept of primary surplus. Here, Brazil has gained relevant experience with the procedure through the *Projeto Piloto de Investimentos-PPI*. For further information on the Brazilian case see Silva and Pires (2008).

<sup>4</sup> Nonetheless, the institutional characteristics of the domestic financial system make the lower bound on the interest rate different from zero. In reality, in Brazil it is around 8.5%, owing to the yield paid by savings banks, which impose a very firm limit on the action of monetary policy.

□ The opinions and results contained in this article are the authors' exclusive responsibility and do not necessarily represent the view of the institution to which they are affiliated.

<sup>1</sup> Blinder (2006) discusses the evolution of that thinking and concludes that fiscal policy should be used only when monetary policy is exhausted. This occurs when the nominal interest rate falls to near-zero levels, thus reaching what the literature refers to the “lower bound on interest rates”.

The third criticism is that countercyclical fiscal policy would worsen the Brazilian economy's external deficit by stimulating aggregate demand, causing an excessive exchange-rate devaluation and fuelling inflation (Bacha, 2008). The validity of this argument would depend on the response of exports and imports on the domestic and international market, the way in which global deflation is passed through to local price indices, and the combination of exchange-rate devaluation and lower commodity prices.

The purpose of this article is to discuss the macroeconomic effects of the reduction of the

primary-surplus target in Brazil in 2009, focusing on the short-run repercussions. Apart from this introduction, the article is divided into four sections. The second section describes the main fiscal stimulus measures adopted by the federal government up to the first half of 2009, which led to a lowering of the primary-surplus target for that year, while the third describes the methodology of the study and database. The fourth section estimates the effects of the primary surplus on economic activity, the time structure of interest rates and the exchange rate; and the last section sets out the main conclusions.

## II

### Main fiscal stimulus measures

The speed with which the crisis took hold in Brazil as from the third quarter of 2008 provoked different reactions in the various economic policy instruments. Although initial uncertainty as to the future course of inflation constrained monetary-policy decision-making, the first steps to stimulate aggregate demand were taken through fiscal policy.<sup>5</sup>

In December 2008, the Ministry of Finance announced three tax-cutting measures, as follows:

- i) Lowering of the rate of personal income tax (IRPF) in 2009 (estimated at 4.9 billion reais), to stimulate aggregate demand.
- ii) Reduction, until March of the rate of industrialized products tax (IPI) for the purchase of motor vehicles (estimated at 1 billion reais), to reduce the sector's inventories, which had grown rapidly as a result of the slump in demand.
- iii) Decrease in financial transactions tax (IOF) on consumer loans (estimated at 2.5 billion real), to revive private credit.

In late March 2009, the Ministry of Finance announced an extension of the lower IPI rate on automobiles, and extended it to cover motorcycles, including, in that case, the Social Security Funding Contribution (COFINS). To offset the concomitant loss of revenue, IPI was raised on tobacco. The net loss of revenue as a result of the measure was estimated at 700 million reais.

In April, two other tax cuts were announced: a reduction of IPI on home appliances (estimated at 170 million reais) and a lower rate on certain civil construction items (estimated at 90 million reais), both of which aim to revive aggregate demand. In June, the federal government extended all existing tax cuts and also lowered rates on certain categories of capital goods. The total loss of revenue thus caused was estimated at 12.5 billion real (see table 1).

In terms of expenditure-stimulus measures, when the depth of the crisis became clear, the federal government increased investments as a countercyclical measure, adopting the following initiatives for that purpose: removal of firms in the Petrobras group from the primary-surplus calculation, with the aim of reducing their investment constraints (estimated at 15 billion reais in 2009); an increase in the minimum wage to stimulate aggregate demand (estimated at 8.7 billion reais); and a housing package (estimated at 6 billion reais), which gave incentives to the civil construction sector. In addition, the social protection network

<sup>5</sup> The initial effects of the crisis caused liquidity problems in the interbank system and in foreign-exchange operations through financial derivatives issued by various companies. Although discussion of the interest rate was contaminated by inflationary risks, the central bank implemented nonconventional policies, such as using international reserves to finance firms in difficulties and lowering reserve requirements to alleviate liquidity problems in the interbank system.

TABLE 1

**Fiscal stimulus through tax reductions**  
(Billions of reais)

Fiscal measures	Stimulus in 2009
<i>Tax cuts in December 2008</i>	
Personal income tax (IRPF)	4.90
Industrialized products tax (IPI) - automobiles	1.00
Financial transactions tax (IOF) - consumer credit	2.50
<i>Total</i>	<i>8.40</i>
<i>Tax cuts in March 2009</i>	
Extension of IPI - automobiles	1.00
Social Security Funding Contribution (COFINS) - motorcycles	0.15
IPI - civil construction	0.35
Restoration of IPI revenue - tobacco	-0.80
<i>Total</i>	<i>0.70</i>
<i>Tax cuts in April 2009</i>	
IPI - civil construction	0.09
IPI - white line	0.17
<i>Total</i>	<i>0.26</i>
<i>Tax cuts in June 2009</i>	
IPI - capital goods	0.41
Extension of IPI - automobiles	1.79
Extension of IPI - white line	0.20
Extension of COFINS - motorcycles	0.05
Extension of IPI - civil construction	0.69
<i>Total</i>	<i>3.15</i>

Source: Prepared by the authors.

was expanded by increasing access to unemployment insurance and the *Bolsa Família* programme. The total value of those measures is estimated at 30,930 million reais (see table 2).<sup>6</sup>

As a result of that set of measures, in April the federal government announced that the primary surplus target for 2009 was being lowered from 3.8% to 2.5% of GDP, with the possibility of also making use of the fiscal slack generated by the PPI. Petrobras was excluded from the calculation of the target reduction, estimated at 0.5% of GDP. The federal government share shrank from 2.15% of GDP to 1.4% of GDP, while the share of the states and municipalities decreased from 0.95% to 0.90% of GDP.

TABLE 2

**Fiscal stimulus through expenditure increases**  
(Billions of reais)

Fiscal measures	Stimulus in 2009
Increase in expenditure	
Petrobras <sup>a</sup> investments	15.00
Minimum wage	8.70
Housing package	6.00
Unemployment insurance	0.23
<i>Bolsa Família</i> program	1.00

Source: Prepared by the authors.

<sup>a</sup> Petr leo Brasileiro.

### III

## Methodology and description of the database

The model-building strategy used in this article follows what Hoover, Johansen and Juselius (2008) define as the probabilistic approach (Haavelmo, 1944). Nonetheless, contrary to what might be imagined, the probabilistic approach does not mean research without theoretical backing. The basic idea is that data can often be used to give orientation to the theory.

The structure chosen includes a highly stylized "core", model and auxiliary models to complement it. As Bardsen and others (2005) point out, building macroeconomic models in that format has the

advantage of incorporating elements that are not yet sufficiently analysed by theory, and also provides flexibility to meet the demands of model users, particularly policy-makers. This methodology implies

<sup>6</sup> Although the rise in the minimum wage was a pre-crisis measure, it has been included in the analysis because of its clear expansionary effect. Although the same could be said of the wage increase paid to civil servants, this was not included since its expansionary effects would only be felt as from the second half of 2009, when the results already showed that the economy was recovering.

“encompassing models”, proposed by Clements and Hendry (2008).<sup>7</sup>

A major concern in model building, particularly when using Brazilian data is the existence of structural breaks. The parameters obtained need to be constant and invariant with respect to certain types of intervention, including manipulations in the exogenous variables (Bardsen and others, 2005). Thus, robust parameters are sought through alternative forms of estimation, changes in the sample size and by using variable-parameter methods.

Applying that methodology, the analysis was divided into three parts. The first part (estimation of the core) evaluated the effect of the primary surplus on the level of activity through a model equivalent to that used by central banks, consisting of three equations: an IS curve, a Phillips curve, and a monetary-policy rule. Whereas the primary surplus is modelled directly in the IS curve (following Lambertini and Rovelli (2003)), the joint estimation of those equations is important for controlling the endogeneity of economic policy, which could bias the results.

The IS curve is described as follows:

$$y_t = c_y + \alpha_1 y_{t-1} + \alpha_2 (i_{t-1} - \pi_t) + \alpha_3 s_t + e_{y,t} \quad (1)$$

where  $c_y$  is the intercept and  $e_{y,t}$  is an error term with zero mean and constant variance. The IS curve, as specified in (1), shows how the primary surplus ( $s_t$ ) and the real interest rate ( $i_{t-1} - p_t$ ) affect the level of economic activity ( $y_t$ ).

The Phillips curve is specified as:

$$\pi_t = \phi_1 \pi_{t-1} + (1 - \phi_1) E_t \pi_{t+1} + \phi_2 y_t + e_{\pi,t} \quad (2)$$

where  $\pi_t$  is the inflation rate,  $e_{\pi,t}$  is an error term with zero mean and constant variance.

Monetary policy reacts according to the following rules:

$$i_t = \lambda_1 i_{t-1} + \lambda_2 (E_t \pi_{t+1} - \bar{\pi}) + \lambda_3 y_t + e_{i,t} \quad (3)$$

which indicates that the nominal interest rate responds to the deviation of inflation ( $\pi_t$ ) from its target ( $\bar{\pi}$ ) and the output gap, while allowing also for an interest-rate mitigation component.

A point to note about the proposed model is that it aims to evaluate the effect of fiscal policy in the short run, because only in this way can the primary surplus be treated as an exogenous variable. In medium-term evaluations, the primary surplus has to respect the government’s budget constraint, as shown in the literature on public-debt sustainability (Bohn, 1997).

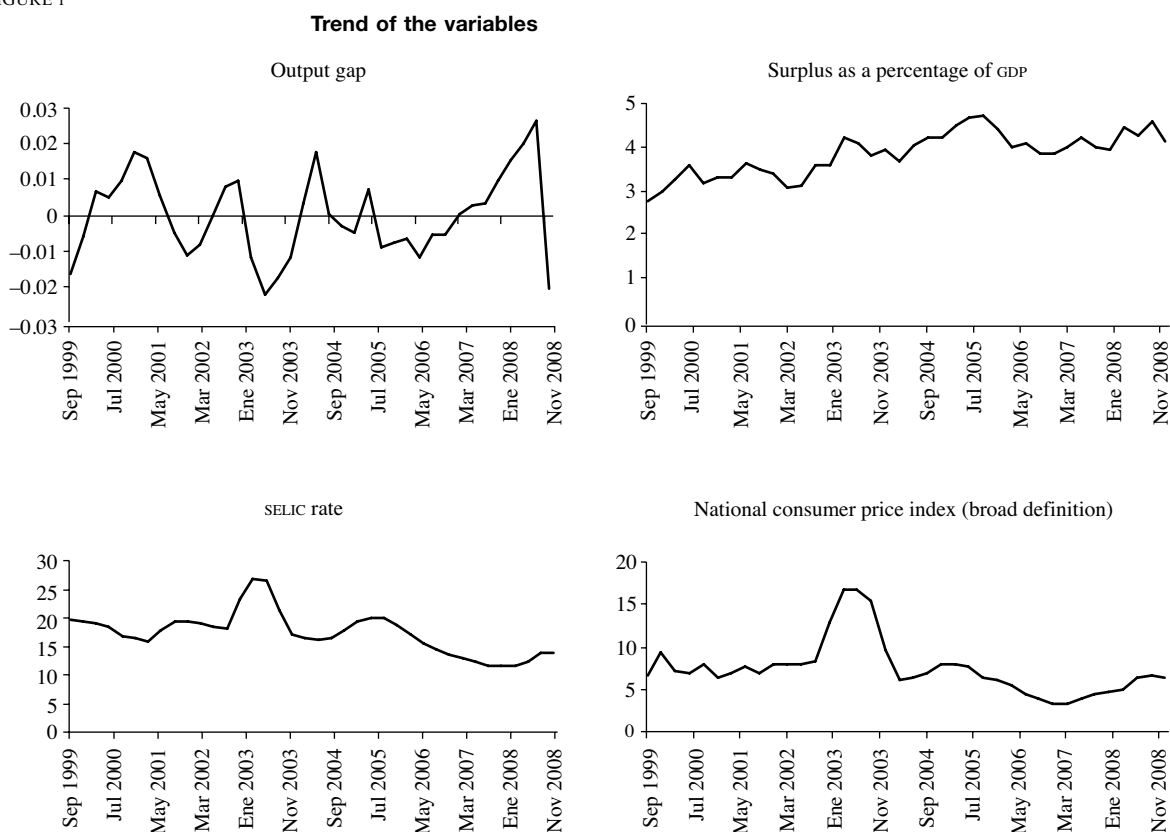
The database for estimating the core of the model consists of the output gap calculated using a linear and quadratic trend; the short-term nominal interest rate is the Special Settlement and Custody System (SELIC) rate; the primary surplus refers to the consolidated public sector as a percentage of GDP; and the inflation rate is measured by the national consumer price index in its broad definition (IPCA) accumulated over 12 months. Figure 1 shows the trend of those variables in the period running from the third quarter of 1999 to the fourth quarter of 2008.

As figure 1 shows, the trend of the output gap displays mean reversion, which characterizes the series as stationary. This does not occur after 2005. In the case of the primary surplus as a proportion of GDP, the series displays a rising trend in the period under study, with a number of additional disturbances in 2003 and 2005. Given this growth trend, it can be said that the series displays mean reversion around the trend, so that variable would also be stationary. The SELIC interest rate is harder to characterize as a stationary series, because mean reversion is less clear. Nonetheless, this rate suffered a sharp disturbance in the second half of 2002, and when this is controlled for, reversion to mean is more evident. The inflation rate is analogous: when the observations of the second half of 2002 are considered as aberrations, it can be concluded that the series is also stationary.

To test those impressions regarding the characteristics of the variables, the Ng and Perron (2001) unit-root test was used, together with the Saikkonen and Lutkepohl (2002) test which allows for the existence of structural breaks in the dataset. Although the Ng and Perron test does not reject the null hypothesis of a unit root in the case of the primary surplus, the Saikkonen and Lutkepohl test shows that this primary surplus series can be considered stationary when the structural break in 2003 is controlled for (modelled with a dummy

<sup>7</sup> According to these authors, a good model should at least absorb or encompass already-existing models, to ensure that the research program moves in a positive direction.

FIGURE 1



Source: Prepared by the authors.

impulse variable). The two tests produced the same conclusions for the other variables.

The second part of the analysis evaluates the auxiliary models, the first of which estimates the effect of the primary surplus on the time-structure of interest rates. For this, a theoretical hypothesis for the behaviour of the time structure is needed, and traditional expectations hypothesis is adopted, although Brazilian data frequently reject the expectations hypothesis.<sup>8</sup> To adapt the model to existing empirical tests, a specification of the expectations theory is adopted, which assumes that the risk premium can vary through time (following Guillén and Tabak (2007)).

<sup>8</sup> For further details on the rejection of expectations theory in Brazil under the hypothesis that the risk premium is constant through time, see Tabak and Andrade (2003), and Lima and Issler (2003).

The time structure can thus be modelled through a state-space model of the following form:<sup>9</sup>

$$R_t^{swap,d} = i_t + r_t^d + v_t \quad (4)$$

( $i_t$  = SELIC rate)

$$r_t^d = r_{t-1}^d + \mu_t \quad (5)$$

where  $R_t^{swap}$  is the interest rate swap at maturities of 30, 60, 90, 120, 180 and 360 days (d). The excess yield (given by  $R_t^{swap} - i_t$ ) is defined as a risk premium ( $r_t$ ) modelled as a time variable aggregated from a random variable  $v_t \sim (0, \omega^2)$ . To estimate the variable risk premium over time, using the Kalman filter,

<sup>9</sup> For an analysis of space-state models see Commandeur and Koopman (2007).

a stochastic structure needs to be imposed. Our hypothesis is that it follows a random walk, in which  $\mu_t \sim (0, \sigma^2)$  according to equation (5).

Next we aim to establish how the macroeconomic variables (inflation, output gap, and primary surplus) affect the risk premium through the system of equations:<sup>10</sup>

$$r_t^d = \rho^d r_{t-1}^d + \beta_0^d + \beta_\pi^d \pi_t + \beta_s^d s_t + \beta_y^d y_t + \varepsilon_t^d \quad (6)$$

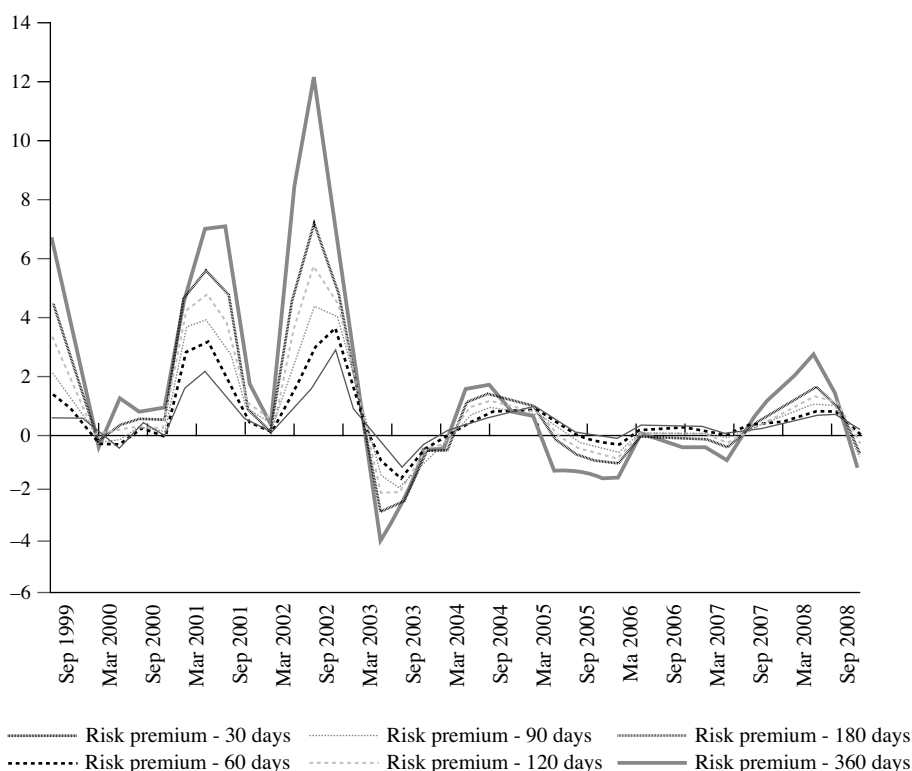
<sup>10</sup> By allowing the risk premium to be a random walk in equation (5), and then modelling the risk premium as a distributed lag (ADL) function in (6), one is assuming that the non-stationary nature originating in (5) occurs because of a possible problem of mis-specification. The time-series literature stresses that non-stationarity can arise as a result of a lack of linearity, structural breaks, or missing variables that are relevant in the data-generating process. This hypothesis can be rejected in the case where the parameter estimation  $\rho$  is less than 1, as is the case with the estimations obtained.

Figure 2 shows the trend of the risk premium estimated through the Kalman filter at various maturities, which displays high volatility in the period 1999-2003 before stabilizing. The second interesting feature is that the longer rates fluctuate by more than the shorter rates.

The second auxiliary model evaluates the repercussions of the primary surplus on the exchange rate. The most traditional exchange-rate model is purchasing power parity (PPP); and research into its validity generally consists of testing whether the real exchange rate can be modelled as a stationary variable (Rogoff, 1996). In that regard, the analysis closely follows the results of Juselius (2007), which tests PPP in Germany. These show that PPP is only upheld when the analysis includes the effect of the spread between the short- and long-term interest rate. The first finding of the study is that systematic deviations from PPP would be possible if the exchange-rate effects of capital movements are included in the analysis.

FIGURE 2

Trend of the risk premium



Source: Prepared by the authors.

Here the natural candidate for deviations from a PPP exchange rate would be the interest-rate spread.

Following that literature, an exchange-rate model is proposed that is similar to that used for the time-structure of interest rates. Exchange-rate movements are defined on the basis of fluctuations in domestic prices relative to the international price level. The resulting deviations are modelled as a function of the risk premium, as obtained in (5).<sup>11</sup> In addition to using the risk premium to model the real exchange rate, it should be noted that the equilibrium level of the exchange rate cannot be considered constant, since several factors can affect its value, including nominal shocks and productivity differentials.<sup>12</sup>

Figure 3 shows the trend of the real exchange rate in natural logarithm form, for the period running

from the third quarter of 1999 to the fourth quarter of 2008. The first relevant feature of the series is the difficulty in observing reversion to mean. The second is that there were a number of significant positive shocks in 2001 and 2002. The Ng and Perron test was used to confirm the absence of mean reversion, because the null hypothesis of unit root is not rejected. When the real exchange rate is modelled with a structural exchange break, the Saikonen and Lutkepohl test confirms the results obtained earlier.

Consequently, having rejected PPP, the proposed model incorporates the effect of the risk premium on the real exchange rate, and models the mean as a time variable process using the Kalman filter, as follows:

$$q_t = \psi_t + \omega r_t^d + \varepsilon_{q,t} \quad (7)$$

$$\psi_t = \psi_{t-1} + \varepsilon_{\psi,t} \quad (8)$$

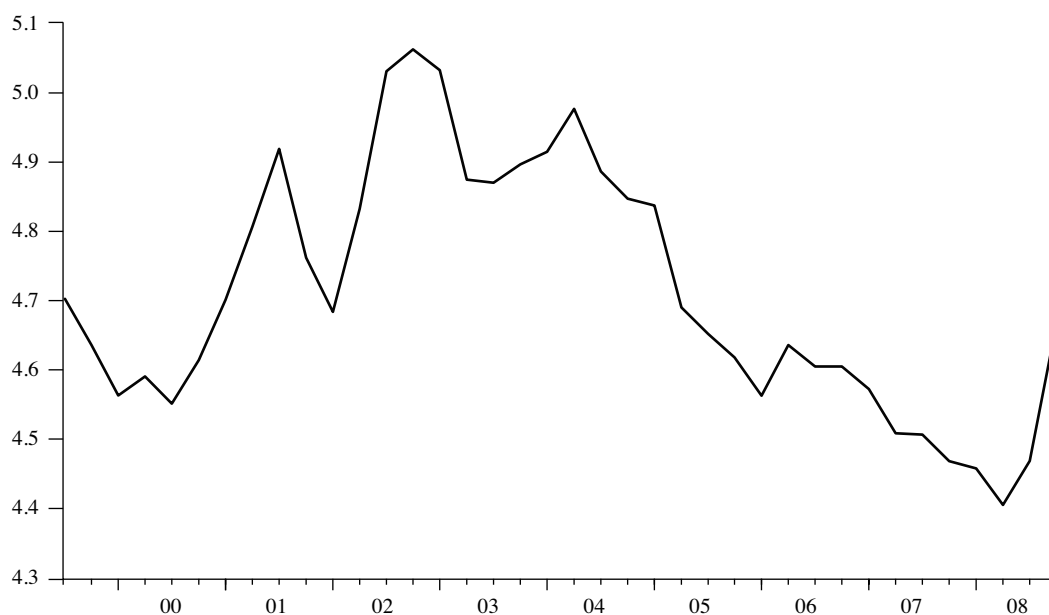
where  $q$  is the real exchange rate,  $\psi_t$  is the time-variable mean which follows the structure of a random walk, and  $\varepsilon_{\psi,t}$  and  $\varepsilon_{q,t}$  are error terms with zero mean and constant variance.

<sup>11</sup> With regard to the results obtained by (2007), it should be noted that that study used the risk premium rather than the interest-rate spread because of the possibility of multi-collinearity, since the two variables are functions of the short-term interest rate. It should also be noted that while for Germany it is reasonable to assume a risk premium close to zero, this is not true for Brazil; and this is a relevant factor in the composition of the yield spread between foreign and domestic assets.

<sup>12</sup> See Dornbusch (1976), Balassa (1964) and Samuelson (1964).

FIGURE 3

Trend of the logarithm of the real exchange rate



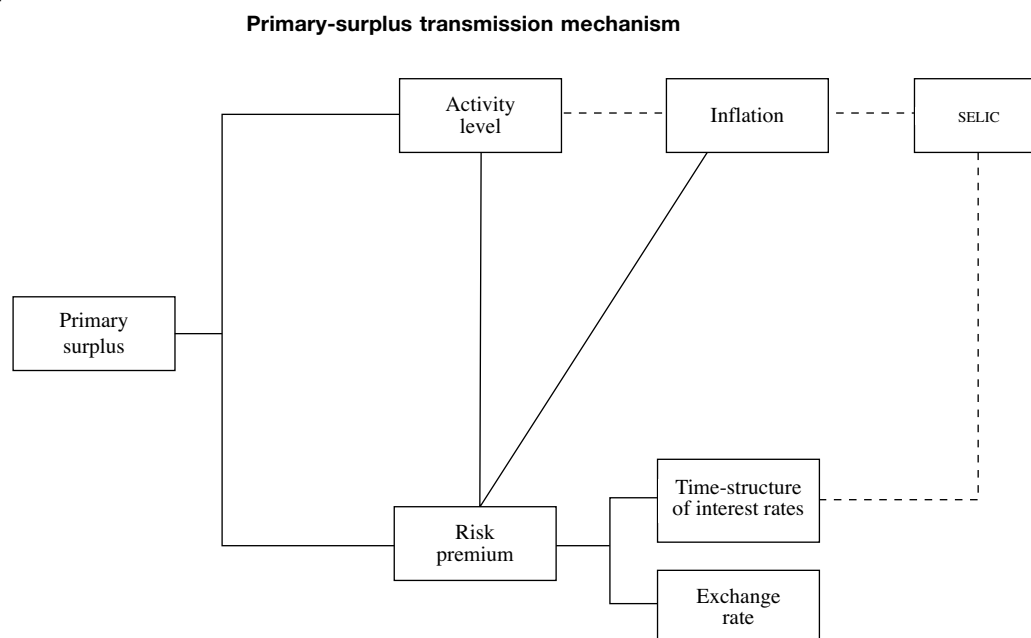
Source: Prepared by the authors.



In brief, the model consists of a core and two auxiliary models. The transmission mechanism to be evaluated thus shows how the primary surplus affects the levels of activity, time structure and exchange rate in the short run. Figure 4 illustrates the primary

surplus macroeconomic transmission mechanism. In addition to the effects described, the indirect effects acting through economic activity should also be considered, including the rate of inflation, the short-term interest rate and the time structure.

FIGURE 4



Source: Prepared by the authors.

SELIC: Special settlement and custody system.

## IV

### Estimations

The core of the model was estimated using ordinary least squares (OLS), seemingly unrelated regression (SUR) and the generalized method of moments (GMM). In the latter case, the list of instruments includes lags 1 to 3 in the model's own variables. The parameters are very similar in the three methods of estimation. For example, the effect of the primary surplus on the level of activity is estimated at between -0.377 and -0.430, although the effect is only significant according to GMM. In terms of statistical significance, the same is true for monetary policy, the effects of which are estimated at between -0.131 and -0.142.

The Phillips curve indicates a high degree of inflationary inertia, with an estimated coefficient of between 0.779 and 0.835, suggesting a highly regressive inflation. The coefficient of the output gap is significant in all three estimations (between 0.373 and 0.424).

The gradualism of monetary policy (measured by parameter  $\lambda_I$ ) is quite high. In reality, that parameter approximates to a unit root, which may raise doubts as to the stationary nature of the process and, therefore, the validity of the inference. Although unit-root tests were applied to make it possible to undertake the

analysis, the fact is they tend to pose problems of low testing power. Nonetheless, the results obtained by Rothenberg and Stock (1997) show that conventional inference close to the unit root can be considered valid, so the results obtained are a good approximation.

The estimated effect of the primary surplus on the time structure suggest that this raises the interest rate at various maturities (see table 4). In both estimation periods, it is common to find that estimations using OLS and seemingly unrelated regression indicate significant

effects, whereas the results in GMM estimations are not statistically significant at the shorter maturities (30 and 60 days). The test results also show that the effects vary by maturity. In general, the longer the maturity, the greater the estimated repercussion of fiscal policy. This can be clearly seen in figure 5, which shows the parameter measuring the effect of the primary surplus in the period running from the third quarter of 1999 to the fourth quarter of 2008, by maturity.

TABLE 3

Estimations of the small-scale model

Variables	Ordinary least squares		Seemingly unrelated regression		Generalized method of moments	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
$c_{and}$	0.026	1.42	0.027	1.60	0.028	4.01
$\alpha_1$	0.471	2.97	0.482	3.22	0.493	10.69
$\alpha_2$	-0.137	-1.51	-0.131	-1.55	-0.142	-3.269
$\alpha_3$	-0.377	1.02	-0.430	-1.25	-0.400	-2.778
$R^2$	0.3107		0.3100		0.3096	
$\phi_1$	0.779	9.75	0.801	10.88	0.835	29.60
$\phi_2$	0.373	1.76	0.397	1.95	0.424	10.28
$R^2$	0.8221		0.8217		0.8196	
$\lambda_1$	0.965	79.42	0.965	87.31	0.966	205.7
$\lambda_2$	0.757	4.32	0.638	4.19	0.826	11.90
$\lambda_3$	0.439	2.72	0.477	3.13	0.405	10.06
$R^2$	0.9052		0.9033		0.9049	

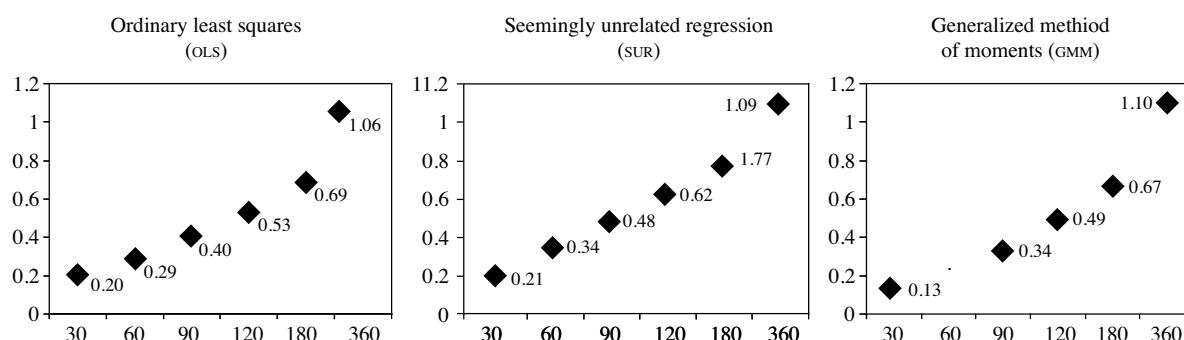
Source: Prepared by the authors.

Note: Total number: 100 observations. In the case of GMM, the J-statistic does not reject the null hypothesis of validity of the instruments tested. The instruments used were lags 1, 2 and 3 of the output gap and primary surplus, lags 1 and 2 of the broadly defined national consumer price index (IPCA) and lags 1, 2 and 3 of the interest rate.

$R^2$ : Goodness of fit.

FIGURE 5

Effect of the primary surplus by maturity



Source: Prepared by the authors.

TABLE 4

## Macroeconomic determinants of the risk premium

Variables	Ordinary least squares		Seemingly unrelated regression		Generalized method of moments	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
$\beta_0^{30}$	0.0097	2.82	0.0093	2.92	0.0062	1.63
$\rho^{30}$	0.8623	9.83	0.6860	14.09	0.8499	9.77
$\beta_\pi^{30}$	-0.0300	-2.11	-0.0180	-1.44	-0.0191	-1.87
$\beta_s^{30}$	0.1955	2.36	0.2060	2.68	0.1257	1.27
$\beta_y^{30}$	0.1260	3.49	0.1332	3.98	0.1979	3.73
$R^2$	0.80		0.78		0.77	
$\beta_0^{60}$	0.0142	2.84	0.0151	3.28	0.0104	1.79
$\rho^{60}$	0.8332	9.81	0.6726	15.26	0.8273	10.39
$\beta_\pi^{60}$	-0.0410	-1.96	-0.0236	-1.31	-0.0278	-1.89
$\beta_s^{60}$	0.2898	2.36	0.3396	3.03	0.2130	1.45
$\beta_y^{60}$	0.1923	3.65	0.2084	4.29	0.2797	3.91
$R^2$	0.82		0.80		0.81	
$\beta_0^{90}$	0.0196	2.98	0.0217	3.58	0.0165	2.13
$\rho^{90}$	0.8180	9.76	0.6771	16.08	0.8205	10.62
$\beta_\pi^{90}$	-0.0542	-1.99	-0.0340	-1.44	-0.0439	-2.09
$\beta_s^{90}$	0.4038	2.48	0.4833	3.28	0.3376	1.77
$\beta_y^{90}$	0.2379	3.43	0.2614	4.12	0.3154	3.64
$R^2$	0.83		0.82		0.83	
$\beta_0^{120}$	0.0258	3.03	0.0286	3.72	0.0242	2.40
$\rho^{120}$	0.7979	9.43	0.6990	16.90	0.8171	10.49
$\beta_\pi^{120}$	-0.0697	-2.02	-0.0519	-1.75	-0.0681	-2.30
$\beta_s^{120}$	0.5307	2.50	0.6237	3.33	0.4907	2.06
$\beta_y^{120}$	0.2689	3.05	0.2935	3.66	0.3123	3.00
$R^2$	0.84		0.83		0.85	
$\beta_0^{180}$	0.0332	3.09	0.0360	3.75	0.0333	2.59
$\rho^{180}$	0.7838	9.07	0.7154	16.93	0.8155	10.12
$\beta_\pi^{180}$	-0.0878	-2.05	-0.0727	-1.97	-0.0964	-2.35
$\beta_s^{180}$	0.6850	2.54	0.7745	3.30	0.6686	2.28
$\beta_y^{180}$	0.3005	2.72	0.3238	3.24	0.3035	2.30
$R^2$	0.84		0.83		0.85	
$\beta_0^{360}$	0.0517	3.12	0.0527	3.63	0.0561	2.90
$\rho^{360}$	0.7939	8.51	0.7789	16.23	0.8470	9.21
$\beta_\pi^{360}$	-0.1398	-2.10	-0.1343	-2.40	-0.1818	-2.37
$\beta_s^{360}$	1.0582	2.51	1.092	3.06	1.1003	2.60
$\beta_y^{360}$	0.3180	1.89	0.3268	2.17	0.1836	0.84
$R^2$	0.83		0.84		0.84	

Source: Prepared by the authors.

Note. Total number: 216 observations of the system. In the case of GMM, the J-statistic does not reject the null hypothesis of validity of the instruments tested. The instruments used were lags 1 and 2 of the explanatory variables.

$R^2$ : Goodness of fit.

To evaluate the robustness of the results obtained, the model was reapplied to a subsample covering the period from the first quarter of 2003 to the fourth quarter of 2008, excluding the period of greatest volatility caused by the large number of supply shocks that occurred in 1999-2002 (see

table 5). Figure 2 shows that the excluded time corresponds to the period when the various risk premia were most volatile.

The new results show that the primary surplus only affects the interest rate in the longer-term risk premia (particularly 360 days). In relation to the

TABLE 5

**Macroeconomic determinants of the risk premium,  
first quarter of 2003 to fourth quarter of 2008.**

Variables	Ordinary least squares		Seemingly unrelated regression		Generalized method of moments	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
$\beta_0^{30}$	0.0028	0.58	0.0029	0.74	0.0024	0.68
$\rho^{30}$	0.6326	7.50	0.6355	13.02	0.6257	11.29
$\beta_{\pi}^{30}$	-0.0339	-3.08	-0.0340	-4.64	-0.0326	-4.16
$\beta_s^{30}$	0.0314	0.28	0.0333	0.36	0.0231	0.28
$\beta_y^{30}$	0.0680	2.76	0.0680	3.10	0.0739	4.20
$R^2$	0.83		0.83		0.83	
$\beta_0^{60}$	0.0049	0.70	0.0045	0.80	0.0041	0.86
$\rho^{60}$	0.6277	7.24	0.6188	12.92	0.6187	10.11
$\beta_{\pi}^{60}$	-0.0421	-3.21	-0.0414	-3.92	-0.0400	-3.47
$\beta_s^{60}$	0.0737	0.45	0.0655	0.49	0.0588	0.53
$\beta_y^{60}$	0.1159	3.28	0.1162	3.71	0.1258	5.02
$R^2$	0.83		0.83		0.83	
$\beta_0^{90}$	0.0081	0.93	0.0074	1.06	0.0073	1.25
$\rho^{90}$	0.6187	7.05	0.6044	12.61	0.6089	9.16
$\beta_{\pi}^{90}$	-0.0488	-2.94	-0.0473	-3.56	-0.0461	-3.30
$\beta_s^{90}$	0.1467	0.73	0.1309	0.79	0.1292	0.99
$\beta_y^{90}$	0.1588	3.56	0.1598	4.05	0.1718	5.51
$R^2$	0.83		0.83		0.83	
$\beta_0^{120}$	0.0133	1.29	0.0121	1.44	0.0122	1.69
$\rho^{120}$	0.6083	6.96	0.5879	12.24	0.5971	8.15
$\beta_{\pi}^{120}$	-0.0558	-2.76	-0.0532	-3.29	-0.0524	-2.98
$\beta_s^{120}$	0.2652	1.09	0.2398	1.19	0.2431	1.53
$\beta_y^{120}$	0.2073	3.78	0.2100	4.36	0.2243	5.49
$R^2$	0.84		0.84		0.83	
$\beta_0^{180}$	0.0186	1.51	0.0171	1.69	0.0173	1.96
$\rho^{180}$	0.5945	6.80	0.5717	11.77	0.5824	7.53
$\beta_{\pi}^{180}$	-0.0636	-2.60	-0.0601	-3.06	-0.0593	-2.71
$\beta_s^{180}$	0.3867	1.34	0.3553	1.47	0.3673	1.90
$\beta_y^{180}$	0.2611	3.89	0.2655	4.53	0.2827	0.00
$R^2$	0.84		0.83		0.83	
$\beta_0^{360}$	0.0330	2.23	0.0329	2.57	0.0309	2.69
$\rho^{360}$	0.5552	6.93	0.5529	11.49	0.5380	8.14
$\beta_{\pi}^{360}$	-0.0695	-2.06	-0.0689	-2.58	-0.060	-1.94
$\beta_s^{360}$	0.7363	2.10	0.7338	2.39	0.6991	2.88
$\beta_y^{360}$	0.3729	4.11	0.3739	4.80	0.4132	4.61
$R^2$	0.84		0.84		0.84	

Source: Prepared by the authors.

Note. Total sample: 144 observations. In the case of GMM, the J-statistic does not reject the null hypothesis of validity of the instruments tested. The instruments used were lags 1 and 2 of the explanatory variables.

$R^2$ : Goodness of fit.

other parameters, the results are equivalent to those obtained previously, with inflation having a negative effect and the output gap a positive one.

In conclusion it can be inferred that, apart from increasing the risk premium, the reduction in the primary surplus could increase the gradient of the time structure. This conclusion is very similar to the results obtained by Evans (1985, 1987a and 1987b) from a study of the effects of fiscal deficits on North American interest rates.

Table 6 shows the repercussion of the risk premium on the exchange rate, which seems to decrease with

the length of maturity and is smaller in the three cases presented (360 days, 180 days or 120 days). The primary surplus thus affects the exchange rate through the pressure exerted on the risk premium. Nonetheless, unlike the results obtained for the time structure, where the primary surplus has greater effects as the maturity term lengthens, its repercussions on the exchange rate are offset by the fact that the risk premium at longer maturities has less influence of the behaviour of the exchange rate.

Figure 6 shows the trend of the exchange rate and the model's predictions with the 360-day risk premium.

TABLE 6

Effect of the risk premium on the exchange rate

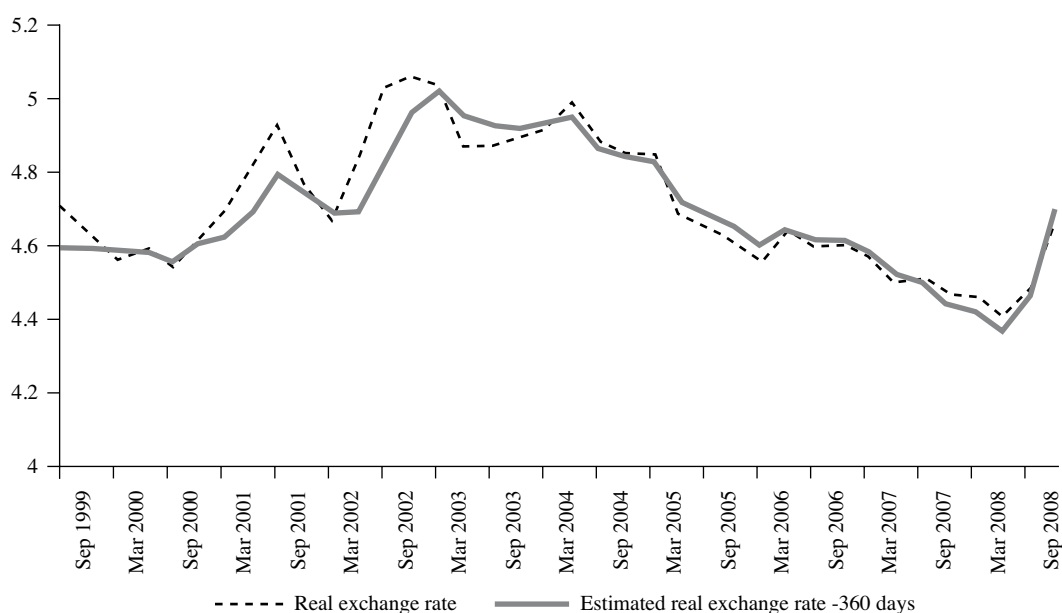
Model	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	"Invariable" model
$\Psi_t$	4.69 (743.9)	4.69 (766.7)	4.69 (751.2)	4.68 (81.74)
$r_t^{360}$	0.0172 (4.07)	-	-	0.0248 (1.99)
$r_t^{180}$	-	0.0253 (4.00)	-	-
$r_t^{120}$	-	-	0.0305 (3.85)	-
$R^2$	0.8451	0.8435	0.8399	0.1177

Source: Prepared by the authors.

$R^2$ : Goodness of fit.

FIGURE 6

Comparison of prediction power of the 360-day model



Source: Prepared by the authors.

Although the model seems not to have a good fit at the start of the sample, its prediction power improves considerably through time. Much of an improvement is the result of modelling the equilibrium value as a time variable, although the statistical significance of the risk premium is not necessarily due to that. This borne out in the last column of table 6, which shows the performance of the model with a time-invariant intercept. Lastly, it should be noted that the effect on the exchange rate is qualitatively small, although statistically significant.

## V

### Conclusions

The speed with which the international financial crisis took hold in the Brazilian economy in the final quarter of 2008 had devastating effects on the real economy and required equally rapid economic policy responses, with major macroeconomic repercussions.

The purpose of this article was to describe the short-term macroeconomic effects of reducing the primary surplus target as an economic-policy response which, apart from maintaining the level of budgetary expenditure to sustain aggregate demand, also aimed to speed up public investment. The article therefore evaluated the effect of reducing the primary surplus on the level of activity, the time structure of interest rates and the exchange rate.

The results showed that reducing the primary surplus should increase the activity level significantly; and, with a three-equation model, commonly used in central banks, the reduction of the primary surplus should increase the level of economic activity,

In general, the results suggest a markedly expansionary effect for fiscal policy, without major collateral repercussions on macroeconomic balances such as the external deficit or higher interest rates. In economic terms, that short-term strategy makes sense given the size of Brazilian domestic market, which absorbs the effect of the policies adopted almost entirely. In countries that are more dependent on international trade, it is possible that most of the fiscal stimulus will suck in imports and be less effective than estimated for the Brazilian case.

and thus serve as an effective policy for reviving the economy.

It was also seen that the reduction of the primary surplus could have a counterparts in an increase in the gradient of the time-structure of interest rates, particularly at the longest maturities, and in a devaluation of the exchange rate. Nonetheless, the exchange-rate effect can be considered small, as it would be an exaggeration to claim that countercyclical fiscal policy could worsen the external deficit.

In general, the results show that countercyclical fiscal policy should have satisfactory effects on the level of activity, without negative collateral repercussions. In short, although the activity level will need to be stimulated considerably, it is important to note that the effect on the time-structure of interest rates should only occur through the longer rates, and the effect on the external deficit —by exerting pressure on the exchange rate— should be small.

*(Original: Portuguese)*

## APPENDIX

## Ng and Perron (2001) unit-root test

Variable	Model	Significance level (5%)	Test statistic (MZA)
$y$	constant	-8.10	-26.74
$\pi$	constant	-8.10	-12.99
$i$	constant	-8.10	-17.71
$s$	constant and trend	-17.30	-10.46
$q$	constant and trend	-17.30	-10.71
$d(q)$	constant	-8.10	-36.95

Source: Prepared by the authors.

## Saikkonen and Lutkepohl (2002) unit-root test

Variable	Model	Date of break	Significance level (5%)	Test statistic
$y$	constant	2004 (Q2)	-2.88	-3.77
$\pi$	constant	2003 (Q3)	-2.88	-2.91
$i$	constant	2002 (Q3)	-2.88	-2.97
$s$	constant and trend	2003 (Q1)	-3.03	-3.13
$q$	constant and trend	2003 (Q1)	-3.03	-2.08

Source: Prepared by the authors.

## Bibliography

- Andrade, J.P. and M.C.C. Pires (2009), "Uma análise da transmissão da política monetária e o canal da dívida pública com aplicação aos dados brasileiros", *Texto para discussão*, No. 1379, Rio de Janeiro, Institute of Applied Economic Research (IPEA).
- Bacha, E. (2008), "O choque externo e a resposta possível", *Como reagir à crise? Políticas econômicas para o Brasil*, E. Bacha and I. Goldfajn (orgs.), Rio de Janeiro, Editora Imago.
- Balassa, B. (1964), "The purchasing-power parity doctrine: a reappraisal", *Journal of Political Economy*, vol. 72, Chicago, University of Chicago Press.
- Bardsen, G. and others (2005), *The Econometrics of Macroeconomic Modelling*, New York, Oxford University Press.
- Barro, R. (1979), "On the determination of the public debt", *Journal of Political Economy*, vol. 87, No. 5, Chicago, University of Chicago Press.
- Blanchard, O. and F. Giavazzi (2004), "Improving the SGP through a proper accounting of public investment", *CEPR Discussion Papers*, No. 4220, London, Centre for Economic Policy Research.
- Blinder, A. (2006), "The case against the case against discretionary fiscal policy", *The Macroeconomics of Fiscal Policy*, R. Kopcke, G. Tootell and R. Triest, Cambridge, Massachusetts, The MIT Press.
- Bohn, H. (1997), "The behavior of U.S. public debt and deficits", *The Quarterly Journal of Economics*, vol. 113, No. 3, Cambridge, Massachusetts, The MIT Press.
- Clements, M. and D. Hendry (2008), *Forecasting Economic Time Series*, Cambridge, Cambridge University Press.
- Commandeur, J.J.F. and S.J. Koopman (2007), *An Introduction to Space State Time Series Analysis*, New York, Oxford University Press.
- Dornbusch, R. (1976), "Expectations and exchange rate dynamics", *Journal of Political Economy*, vol. 84, No. 6, Chicago, Chicago University Press.
- Evans, P. (1987a), "Interest rates and expected future budget deficits in the United States", *Journal of Political Economy*, vol. 95, No. 1, Chicago, Chicago University Press.
- \_\_\_\_\_ (1987b), "Do budget deficits raise nominal interest rates? Evidence from six countries", *Journal of Monetary Economics*, vol. 20, No. 2, Amsterdam, Elsevier.
- \_\_\_\_\_ (1985), "Do large deficits produce high interest rates", *American Economic Review*, vol. 75, No. 1, Nashville, Tennessee, American Economic Association.
- Guillén, O.T. and B. Tabak (2007), "Characterizing the Brazilian term structure of interest rates", *Anais do XXXV Encontro Nacional de Economia*, No. 108, Salvador, National Association of Centers for Post-graduation in Economics (ANPEC).
- Haavelmo, T. (1944), "The probability approach in econometrics", *Econometrica*, vol. 12, Bethesda, Econometric Society.
- Hemming, R. and T. Ter-Minassian (2004), "Making room for public investment", *Finance and Development*, Washington, D.C., International Monetary Fund, December.

- Hoover, K.D., S. Johansen and K. Juselius (2008), "Allowing the data to speak freely: the macroeconomics of the cointegrated vector autoregression", *American Economic Review*, vol. 98, No. 2, Nashville, Tennessee, American Economic Association.
- Juselius, K. (2007), "The PPP puzzle: what the data tell when allowed to speak", *The Handbook of Econometrics*, T. Mills and K. Patterson (eds.), London, Palgrave.
- Lambertini, L. and R. Rovelli (2003), "Monetary and fiscal policy coordination and macroeconomics stabilization: a theoretical analysis", *Working Papers*, No. 464, Bologna, University of Bologna.
- Lima, A. and J. Issler (2003), "A hipótese das expectativas na estrutura a termo da taxa de juros no Brasil: uma aplicação de modelos de valor presente", *Revista brasileira de economia*, vol. 57, No. 4, Rio de Janeiro, Getulio Vargas Foundation.
- Ng, S. and P. Perron (2001), "Lag length selection and the construction of unit-root tests with good size and power", *Econometrica*, vol. 69, No. 6, Bethesda, Econometric Society.
- Parnes, B. e I. Goldfajn (2008), "Como reagir à crise: política fiscal", *Como reagir à crise? Políticas econômicas para o Brasil*, E. Bacha and I. Goldfajn (orgs.), Rio de Janeiro, Editora Imago.
- Rogoff, K. (1996), "The purchasing power parity puzzle", *Journal of Economic Literature*, vol. 34, No. 2, Nashville, Tennessee, American Economic Association.
- Rothenberg, T. and J. Stock (1997), "Inference in a nearly integrated autoregressive model with nonnormal innovations", *Journal of Econometrics*, vol. 80, No. 2, Amsterdam, Elsevier.
- Saikkonen, P. and H. Lutkepohl (2002), "Testing for a unit root in a time series with a level shift at unknown time", *Econometric Theory*, vol. 18, Cambridge, Cambridge University Press.
- Samuelson, P. (1964), "Theoretical notes on trade problems", *Review of Economics and Statistics*, vol. 46, Cambridge, Massachusetts, The MIT Press.
- Silva, A.M.A. and M.C.C. Pires (2008), "Dívida pública, poupança em conta corrente do governo e superávit primário: uma análise de sustentabilidade", *Brazilian Journal of Political Economy*, vol. 28, No. 4, São Paulo, Centro de Economia Política.
- Tabak, B. and S. Andrade (2003), "Testing the expectations hypothesis in the Brazilian term structure of interest rates", *Revista brasileira de finanças*, vol. 1, No. 2, São Paulo, Sociedade Brasileira de Finanças.
- Tobin, J. (1982), *Asset Accumulation and Economic Activity: Reflections on Contemporary Macroeconomic Theory*, Chicago, The University of Chicago Press.