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***The Contagion Effect of Public Debt on  
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# The Contagion Effect of Public Debt on Monetary Policy: The Brazilian Experience\*

*Fernando de Holanda Barbosa\*\**

## *Abstract*

*This paper attempts to explain why the Brazilian inter-bank interest rate is so high compared with rates practiced by other emerging economies. The interplay between the markets for bank reserves and government securities feeds into the inter-bank rate the risk premium of the Brazilian public debt.*

*Key words: Inter-Bank Interest Rate, Public Debt Risk Premium, Monetary Policy Operational Procedures.*

*JEL Classification Numbers: E4, E5.*

## 1. Introduction

Lucas began his Nobel lecture making the following statement: “The work for which I have received the Nobel Prize was part of an effort to understand how changes in the conduct of monetary policy can influence inflation, employment and production. So much thought has been devoted to this question and so much evidence is available that one might reasonably assume that it had been solved long ago: It had not been solved in the 1970s when I began my work on it, and even now this question has not been given anything like a fully satisfactory answer.” [Lucas (1996), p.661]. My understanding of the meaning of a **fully satisfactory answer** is that money is still a headache from a theoretical point of view. Both workhorse frameworks of modern macroeconomics, the Arrow-Debreu and Samuelson overlapping-

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\*This paper is an extended and revised version of a note written for a 2000 Brazilian Central Bank seminar on the transmission mechanism of monetary policy. I have benefited from comments and discussions with João Luiz Mascolo, José Luiz Oreiro and José Júlio Senna.

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generation general equilibrium models, have no room for money as a medium of exchange. This is at variance with the empirical evidence available, which cannot reject the hypothesis that money is essential for the functioning of a market economy. The only way out of this problem is to use some short cut, and to conduct empirical research based on it. Lucas's statement notwithstanding, there has been great progress in the last half-century about the effects and how monetary policy works.

There is no doubt that money does matter, for good or for evil. In the short run money, in general, affects real output, but in the long run it affects only the price level. The mechanisms through which monetary policy are transmitted into changing nominal variables can be divided into two channels. The direct channel affects the inflation rate through the expectation mechanism, as in the work reported by Sargent (1986) about the end of several hyperinflation episodes. The experiences of Argentina and Brazil ending hyperinflation overnight, with the Convertibility and Real Plans, can be added as additional evidence supporting the direct channel of monetary policy transmission. The indirect channel encompasses a very rich menu, suitable for different tastes, and it is natural for economists writing on this subject to try to differentiate their products, as in a monopolist competitive firm.

I will not address the issues involved in the transmission mechanism of monetary policy, since there are excellent surveys [see the papers presented at the 1995 Journal of Economic Perspectives Symposia and at the 1995 Federal Reserve Bank of St. Louis Conference] available in the literature and I regard those issues a matter to be settled by hard econometric work. Since I have no empirical evidence on this subject to report, I will take this opportunity to address a problem that is rather peculiar to the Brazilian monetary policy environment: the interplay between monetary policy and public debt management policy. This interrelation helps one to understand the reasons why the basic rate of interest of the economy, the SELIC overnight rate of interest for Central Bank funds, is so high in real terms.

The goal of this paper is not to give a fully articulated answer of how to disentangle, in the short run, the Central Bank reserves interest rate from the treasury bill interest rate, because I do not have one, but just to raise some questions that could help in providing solutions that can improve the operational procedures of the Brazilian Central Bank. I think that the new monetary policy regime introduced after a smooth and successful transition from the exchange rate crisis to the floating exchange rate system in 1999, will have to deal with some issues, such as reserve requirements, financial taxes, operational procedures of the inter-bank reserve market, inherited from the

past. Otherwise, lack of public support can jeopardize the hard work of building an independent and strong central bank.

The paper is organized as follows: Section 2 defines the contagion effect and provides some background information on the development of the Brazilian inter-bank market for reserves; Section 3 presents a very simple model that tries to capture the subtleties involved when an asset indexed to the inter-bank market rate of interest is introduced in the economy and Section 4 contains the concluding remarks.

## **2. The Contagion Effect**

The contagion effect of public debt on monetary policy will be defined as the risk premium ( $\theta$ ) built into the nominal rate of interest of central bank reserves,

$$r_t = \rho_t + \pi_t + \theta_t$$

where  $\rho$  is the risk-free real interest rate and  $\pi$  is the expected rate of inflation. This risk premium is indeed the risk of Brazilian government securities, which are not considered by the market to be risk-free. To understand the reasons for the contagion effect, we have to go back to the very beginning of the current framework of monetary policy, and to highlight some facts that were very important in shaping its development.

The Brazilian open market and Central Bank reserves market were created in the early 1970s. At that time there was no secondary market for treasury bills, because this type of security was not issued by the Treasury. Because the indexed bonds (ORTN) issued by the Treasury were not suitable for open market operations, the Brazilian Central Bank, through its public debt management, decided to create a bill (LTN), nominally issued by the Treasury, but as a matter of fact managed by the Central Bank, to carry out open market operations. With this instrument, the Central Bank was entitled to create quasi-fiscal deficits, as can be verified by looking at its balance sheets over the years.

Since the early 1980s, with the introduction of a new system of clearance and settlement of government securities (SELIC), the exchange of securities for Central Bank funds occurs on the same business day the trade is

agreed upon.<sup>1</sup> Therefore, government securities and Central Bank reserves have become perfect substitutes as a store of value, and the banks would not hold excess reserves because they are dominated by government securities.<sup>2</sup>

The high leverage ratio of Brazilian financial institutions during the 1980s compelled the Central Bank Public Debt Director, the official name of the director in charge of monetary policy at that time, to create a Central Bank bill indexed to the overnight interest rate in 1986.<sup>3</sup> Since then, the Brazilian Central Bank has issued bills and notes, some of them indexed to the American dollar, to provide a hedge against exchange rate risk.

The flexibility allowed by the Central Bank charter imposed no limits to the amount of international reserves the Central Bank could buy, due to the fact that it could always sterilize it by issuing bills and notes, at a price. If it were not for this institutional arrangement, it would have been impossible to sustain for so long the former regime, adopted during the first term of President Fernando Henrique Cardoso, which collapsed in January of 1999.

This whole set up, which allowed the Central Bank to issue not only money but bills, notes and bonds, was very important to avoid the dollarization of the Brazilian economy during the hyperinflation period, because it allowed the banking system to create money funds, backed by government securities, with full liquidity in Central Bank reserves. These money funds worked as indexed money since their yield followed very closely the rate of inflation. Thus, in that environment government securities did not have to pay a risk premium, owing to the fact that they provided a full hedge against inflation.

After the successful stabilization under the Real Plan and the adoption of the inflation target system, there is no need for a system that distorts the whole yield curve or term structure of interest rates, contaminating the private sector on account of public debt risk. The hard task is how to disentangle the Central Bank reserves market from the government securities market. The first best solution is to have a fiscal regime in which government securities become risk free. However, this solution is not at hand, because the primary fiscal surplus implemented since 1999, and followed through President Cardoso's second term and President Lula tenure, is not based on institutions but on the personal commitment of both Presidents. The market has full information

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<sup>1</sup> SELIC ( Sistema Especial de Liquidação e Custódia) is an electronic book-entry system that records all operations with domestic government securities. In the market for bank reserves there is no credit risk because government securities, quoted below market prices, are used as collateral.

<sup>2</sup> Barbosa(1991) presents an analysis of this operational procedure and its implications for the central bank reserves market. For a very interesting description of the American securities market see Fleming (1997).

<sup>3</sup> This indexed bill is free of interest rate variation risk, and the market would be willing to buy it when the rate of interest is expected to go up, as shown in the Appendix.

about this fiscal weakness and demands a risk premium on government securities.

The fragility of the Brazilian fiscal system has been decreasing, but it will take some time for fiscal discipline to become embedded in our institutional environment. One important step in this direction was the approval of the Fiscal Responsibility Law by the Congress in May 2000. According to this law, the Brazilian Central Bank is prohibited from issuing bills, notes or bonds since 2002, and is free to be concerned with its fundamental job, which is to issue money.

The question that has to be raised, within the arrangements that have to be carried out to implement this new legal framework, is whether or not the time has come for the Central Bank to introduce major changes in its operational procedures, in such a way that the rate of interest on Central Bank reserves would be free of government securities risk. The answer to this question is not very simple because it is very likely that there is a trade-off between the risk of government securities and that of Central Bank funds. The price that has to be paid to transform the Central Bank overnight rate into a risk-free rate is to increase the premium risk on government securities. Is the benefit to society resulting from eliminating this distortion worth the fiscal cost involved? As I stated earlier in this paper, I have no answer to this question, but I am convinced that it is worthwhile for the Brazilian Central Bank to carry out research that would clarify this issue. The next section presents a simple model that tries to pinpoint the issues related to the contagion effect.

### **3. Model**

In this simple economy model there are two markets, one for SELIC indexed treasury bills and another one for bank reserves. The demand curve for SELIC indexed treasury bills (LFT's) is upward sloping because an increase in the interest rate would increase the demand for such bills (see Fig.1). After the securitization of Brazilian external debt in 1994, the Brazilian government issues securities denominated in domestic and foreign currencies. By arbitrage with government securities issued in foreign currencies, the law of one price states that the rate of return in SELIC indexed treasury bills is given by the rate of interest paid on government securities issued on foreign currencies, corrected by the expected exchange rate depreciation. Let us call

this rate  $r^*$ . When the government supplies an amount of SELIC indexed treasury bills equal to  $OA$ , this market is in equilibrium.<sup>4</sup>

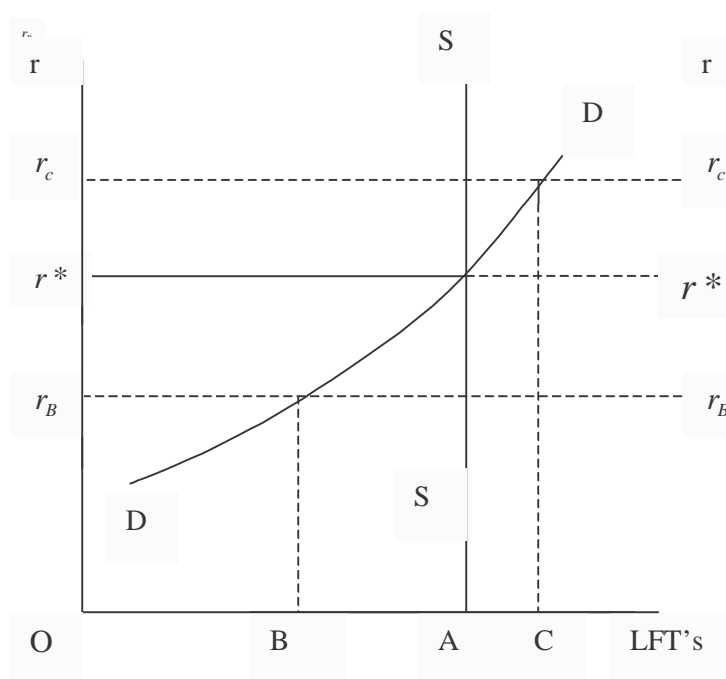


Fig.1 – Market for SELIC Indexed Treasury Bills

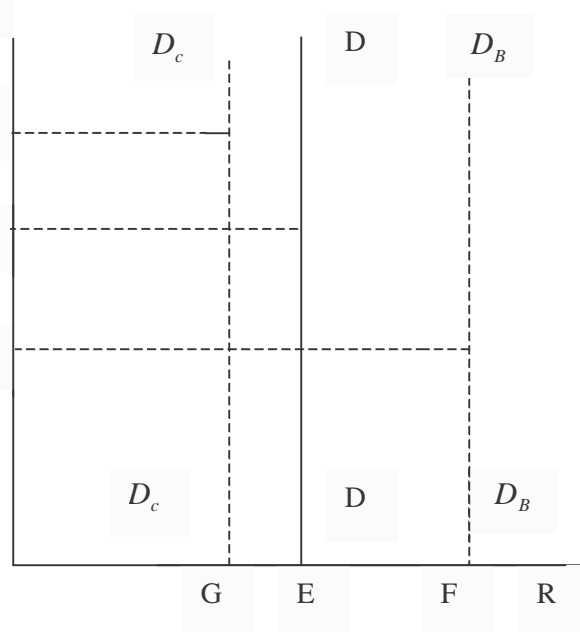


Fig. 2 – Market for Bank Reserves

The demand curve for bank reserves is completely inelastic, as shown in Fig. 2, since reserves and government securities are perfect substitutes [see Barbosa(1991)]. The Central Bank is free to fix the level of interest rate in this market, the SELIC rate. Now, let us analyze what would happen if the Central Bank chooses an interest rate different from the interest rate ( $r^*$ ) that results from arbitrage between domestic and foreign government securities.

Let us assume that the Brazilian central bank fixes the SELIC rate at  $r_B$ , below the rate  $r^*$ , as indicated in Figures 1 and 2. In such situation there will be an excess supply ( $AB$ ) on the market for SELIC indexed treasury bills. In the case of conventional bills an excess supply would bring about a fall of their price. That is not the case with SELIC indexed treasury bills. An excess supply of SELIC bills would correspond to an equivalent excess of reserves ( $EF=AB$ ) in the market for bank reserves and the market would be undersold. The Central Bank would have to buy the excess reserves otherwise the rate of

<sup>4</sup>The Brazilian Central Bank is the banker to the government under the Brazilian Law. Thus, every time the Treasury buys (sells) securities bank reserves increases (decreases).



interest would decrease to zero, since it could not fall further due to the non-negativity constraint.

Let us assume, now, that the Central Bank fixes the SELIC rate at  $r_c$ , above the rate  $r^*$ , as shown in Figures 1 and 2. In this situation there will be an excess demand (AC) for SELIC indexed treasury bills. This excess demand in the market for SELIC bills would create a shortage of reserves in the market for bank reserves of the same amount ( $EG=AC$ ) and the market would be oversold. The Central Bank would have to clear the market for bank reserves, otherwise the rate of SELIC funds would skyrocket.

We may conclude that the only way for the Central Bank to act in a permanent basis in this environment is to fix the interest rate at  $r^*$ . Otherwise both markets would not be in equilibrium.<sup>5</sup> This is the channel through which the contagion effect of public debt on monetary policy occurs.

#### **4. Conclusion**

With hindsight, based on our historical experience, we can state that it was a mistake for the Brazilian Central Bank to introduce open market operations in the beginning of the 1970s, trying to copy the American institutions. The U.S. Treasury securities secondary market is very large and one of the most liquid markets in the world. Here, there was no treasury bill issued. The Brazilian market was created in a very artificial fashion without due considerations of the costs involved from such a course of action.

It is also true that during the hyperinflation years, this environment protected the Brazilian economy from the scourge of dollarization, because government securities were used to back indexed money issued by the financial system. This arrangement saved us from a currency board, which is a very primitive and straightjacket institution to deal with real shocks that affect the economy, as became crystal clear with the failure of the Argentinean experiment with a currency board.<sup>6</sup>

It is very usual for Brazilians to ask the question: why is the Brazilian inter-bank interest rate so high compared with the rates practiced by other emerging economies? The answer is a very simple one: we created in the past and we go on using a very peculiar asset, issued by the government, indexed

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<sup>5</sup> In this environment the Central Bank plays an important role supporting the Treasury to issue SELIC indexed bills sold at par value.

<sup>6</sup> It should be pointed out that a currency board requires fiscal discipline. That was not the case of the Argentinean experiment.

to the inter-bank interest rate. This type of security feeds into the inter-bank rate the risk premium of the Brazilian public debt.<sup>7</sup>

As a by-product of this close interrelationship between government securities and Central Bank funds, the basic rate of interest in the economy, the Central Bank funds rate, has a built-in risk premium. The contention of this paper is that it is worthwhile to change this state of affairs, after the success of the Real Plan with the implementation of the inflation target system, because this is no longer a desirable policy. Removing the premium risk of Central Bank reserves would eliminate a very special type of a distortionary tax in the price system, which affects the whole economy, providing a welfare gain for society, and would give more transparency to the fiscal regime.

## **Appendix**

Let us assume, to keep it as simple as possible, a perpetuity indexed to the interest rate. The price ( $P$ ) of such a bond is the discounted stream of payoffs,

$$P_t = \sum_{i=t+1}^{\infty} R_{t,i} r_i = 1$$

where  $r_i$  is the interest rate,  $R_{t,i}$  is the discounting factor,

$$R_{t,i} = \frac{1}{\prod_{j=t+1}^i (1 + r_j)}$$

and  $R_{t,t} = 1$ . In order to show that the price of this bond is equal to one, we write the price in period  $t$  as a function of the price in period  $t+1$ :

$$P_t = \frac{1}{1 + r_{t+1}} (r_{t+1} + P_{t+1})$$

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<sup>7</sup> There is a second issue related to the Brazilian interest rate that is spelled out by the following question: why the Brazilian natural real rate of interest is so high compared with the rates observed in other countries? This paper does not address this issue.

Thus,  $P_t = P_{t+1} = 1$  is a solution of this equation.

When  $r_i = r$ , the price of the indexed bond is given by,

$$P_t = \sum_{i=t+1}^{\infty} \frac{r}{(1+r)^{i-t}} = 1$$

Duration is a volatility measure defined as the percentage change in bond price for a change in interest rate, assuming a constant yield. The duration of the interest rate indexed bond is equal to zero because its price does not change when the interest rate changes,

$$\frac{\partial P_t}{\partial r} = 0$$

We may conclude that this type of bond does not have to include a premium to compensate for the risk of interest rate variation.

When there is credit risk the price of the indexed treasury bill is given by,

$$P_t = \frac{1}{(1+\alpha)^{\frac{M}{252}}}$$

where  $\alpha$  is the annual risk rate,  $M$  is the maturity of the treasury bill measured in days, and 252 is the number of working days in a year. We take natural log of both sides of this expression to obtain,

$$\log P_t = -\alpha \log \frac{M}{252}$$

and we use the approximation:  $\log (1+\alpha) = \alpha$ .

Table 1 reports the results of this regression for data from the period july/1994 to april/2005. The LFT price is the average price of the Treasury auction. The coefficient  $\alpha$  is positive as expected and significant from a statistical point of view. However a Chow test does reject that this coefficient is stable. When we exclude from the sample data the second half of 2002, due to the political shock of the Presidential election, the risk rate decreases from 0.78% to 0.73%, as shown in the second line of Table 1. The third line contains the estimate of  $\alpha$  for the period corresponding to the President Fernando Henrique Cardoso government, excluding the last six months of his

tenure. The fourth line shows the estimate of this parameter for the period of President Lula. Table 1 shows that this parameter has increased from 0.40% to 0.91% per year.

**Table 1**

Period		$\hat{\alpha}$
05/94	04/05	0,0078 (0,0003)
05/94-04/05, Except 07/02-12/02		0,0073 (0,0026)
05/94	06/02	0,0040 (0,0003)
07/02	04/05	0,0091 (0,0003)

Note: The values in parenthesis are the standard errors.

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