HOW TO MAKE BANKERS RICHER: THE BRAZILIAN FINANCIAL MARKET WITH PUBLIC AND PRIVATE BANKS

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Abstract

In this paper the literature on state owned banks and on the determinants of high spread and profitability of Brazilian banks are briefly reviewed. Then the paper proceeds to forward the hypothesis that the way state owned banks have interacted with public owned banks in the market is partially responsible for such high profitability and interest rates spreads of Brazilian banking system. A model is presented to explain how this interaction can generate this profitability and spreads. The results also show that governments that stretch social policies are those that are most likely to raise profitability and spreads. Furthermore, the model also shows that if the government is generous with employees of state owned banks, it will also contribute to the profit performance of private banks and high interest rates spreads. Two empirical tests of the major hypothesis of this paper are presented. Both rely on time series data for the Brazilian economy, but one of them estimates a structural expanded CAPM model for banks, while the second one uses a Factor Augmenting Vector Auto-Regression (FAVAR) model. Both tests give support to the major hypothesis.

Key words*:* State owned banks; bank interest rates spreads; bank profitability, regulation of financial markets.

JEL Classification: G21, G32

HOW TO MAKE BANKERS RICHER: THE BRAZILIAN FINANCIAL MARKET WITH PUBLIC AND PRIVATE BANKS

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1. Introduction

The Brazilian banking market has the peculiarity of being comprised of privately owned banks (POB) and state owned banks (SOB) competing in the same market. Most commercial operations are performed indistinctively by any of these two types of agents and customers can rely on all of them to obtain most of their regular banking services. In December 2003, state owned banks were responsible for 42.43% of total deposits and they had 37.23% of total assets of all banks in Brazil. They were also responsible for 32.73% of total credit for companies and consumers.[2] The largest Brazilian bank, Banco do Brasil, is a state owned bank. These data indicate that the state owned banks stake of the market are not marginal.

Many countries also have SOB,[3] as there was a widespread idea among economists that there were several market failures on the banking sector, so that public ownership of banks could improve social welfare.[4] The major market failures presented are: (i) intrinsic potential instability;[5] (ii) asymmetric and costly information; (iii) the existence of social externalities emerging from private investments; and (iv) individual minimum scale demand for access to financial services, what tends to exclude poor and isolated populations from such market.[6]

SOBs in Brazil are actually state controlled banks, as they are all companies whose shares can be freely negotiated in the market.[7] Nevertheless, governments are the major shareholders. This assures them control on the banks governance and helps them to rely on these banks to obtain most of their demanded banking services, as they do not have to go through public

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[2] Data are from Brazilian Central Bank.
[3] For data on several countries and group of countries, see La Porta, Lopez-de-Silanes and Shleifer (2002).
[4] The classical work by Gerschenkron (1962) is always mentioned as a source defending state intervention on the banking sector.
[5] See, for example, Stiglitz (1994).
[6] These market failures are extracted from the justifications for state intervention on the banking sector, presented by Yeyati, Micco and Panizza (2004).
[7] For more details on the characteristics, attributes and working of SOB in Brazil, see Neto (2004). Such scheme of operation of SOB are also common in many countries, as can be seen from the data collected by La Porta, Lopez-de-Silanes and Shleifer (2002), if their data on the several levels of state controls of banks are compared.

competitions for their acquisition. Brazilian legislation that regulates the governmental purchases allows the public sector to buy goods and services directly from these state controlled companies, without having to engage in a public competition. The Federal Government controls the five major state owned banks.[8]

Brazilian private banks are among the most profitable in the world. Particularly, their profitability is high when compared to other sectors in the local economy. Bank shareholders controllers have created some companies that work in parallel to the banks, providing services to their own controlled banks, so that they can disguise part of their profits.[9] Nevertheless, the figures of their gains have been causing social astonishment and the media has given special attention to this phenomenon, as it knows the population is always shocked by the figures reached.

Brazilian banks also practice one of the highest interest rate spreads in the world.[10] The level of these spreads has raised many social concerns, as it has reduced the rate of credit to total GDP, and consequently, harmed local development.[11] Very often, the profitability of banks and the interest rates spreads are considered to be part of the same phenomenon, although this is not necessarily true.

The good performance of banks has been generally explained by few factors. Firstly, the industrial organization of the banking market, which seems to be an oligopoly, is pointed as a crucial determinant.[12] The excessive financial risk of operating in an economy such as the Brazilian one is also identified as a major source of such extraordinary profits.[13] The first argument has always faced some difficulties to explain how state owned banks share the same practice of private agents in the oligopoly and do not force banking spreads and tariffs to fall through competition.[14] Very often, this apparent contradiction has been forwarded as a strong argument that government authorities work under excessive influence of private bankers.

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[8] They are Banco do Brasil, Caixa Econômica Federal, BNDES, Banco do Nordeste and Banco da Amazônia.
[9] This partially explains why their profitability is small in spite of their high net interest margins, as pointed by Belaisch (2003) and Singh et. Al. (2005).
[10] See for example Antunes, Cavalcanti and Villamil (2005).
[11] Many recent studies have pointed that financial development increases growth. See for example Beck, Levine and Loayza (2000) and La Porta, Lopez-de-Silanes and Shleifer (2002).
[12] This is the view defended by Belaisch (2003), although Nakane (2001) had found evidence that there is no cartel and there is some competition on the Brazilian banking market. Nevertheless, he rejected the hypothesis that there is perfect competition, what led to accept the hypothesis that there is some market power by banks working on local market.
[13] Afanasieff, Lhacer and Nakane (2002) have found that macroeconomic factors constitute a more important determinant of banks interest rates spreads than microeconomic factors.
[14] A possible argument would be the relative inefficiency of SOB, as shown by Nakane and Weintraub (2004).

Some explanations for the high interest rates spreads have also been disseminated. One of those is the high tax burden on financial activities.[15] There are also claims that market powers of banks and inefficiency have also been the source of such distortion,[16] although some studies have investigated this hypothesis, but have not found correlation between interest rates and concentration on the banking industry.[17] The idea that banks work under high risk as a consequence of macroeconomic instability is also pointed out as a crucial source of the existence of high spreads.[18] The idea that there is a high default on banks credits is also pointed as a source of high spreads on interest rates.[19] It is worth noting that many of these arguments could explain the high spread even if profitability of the banks was low, as they in fact generate low efficiency level of banks.

This paper will argue that the way SOBs have interacted with POBs in the market is partially responsible for such high profitability and interest rates spreads of Brazilian banking system. It presents a model that explains how this interaction can generate this great profitability of private banks and the prevailing high interest rates spread. The results also show that governments that stretch social policies are those that are most likely to raise profitability and spreads. Furthermore, the model also shows that if the government is generous with employees of SOBs, it will also contribute to the profit performance of private banks and high interest rates spreads. Some empirical evidence giving support to some corollary of this major hypothesis is forwarded, as a way to indicate that the hypothesis may have some appeal in explaining the high interest rates spreads prevailing in Brazil.

The paper is organized as following. Next section brings some empirical evidence on stylized facts that support some of the hypotheses on which the model relies to explain the relationship between interest rate spreads and profitability on one side and the share of SOBs on total banks assets on the other. Section 3 introduces the way the banking market works with interaction of SOB and POB, and section 4 presents an intuitive view of the main hypotheses of this paper, relying on a graphical analysis. Sections 5 and 6 bring a formal model that indicates how the main hypotheses can arise from appealing assumptions and parameter space restrictions. Section 7 forwards some empirical evidence and section 8 summarizes the conclusions and discusses some policy implications of the model.

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[15] See Cardoso and Koyama (2000) and Brazilian Central Bank (1999 and 2003).
[16] Belaisch (2003).
[17] See Tonooka and Kayama (2003).
[18] See Tonooka and Kayama (2003)
[19] Cardoso and Koyama (2000) and Brazilian Central Bank (1999 and 2003).

2. Some relevant facts

Figure 1 shows the relationship between inflation rate of producer or wholesale prices and the interest rate spreads between deposit and lending rates. The data are from the International Financial Statistics for 2002 and include 62 countries in the sample. A full line that represents an average of the relationship between these two variables for the whole sample is also included. This line was obtained through a simple regression of interest rate spread on inflation rate and it can be seen as a world standard for this relationship. It is slightly distorted because of the existence of some outliers. Nevertheless, a dashed line that excludes these outliers (Brazil and Argentina) is also included. It can be easily noted that the relationship remains positive.

The results shown in figure 1 indicate that Brazilian spread rates are over the world average, regardless of the inclusion of the two most prominent outliers, as the point that represents Brazil in the figure is over both regression lines. Furthermore, a glance at the absolute values of individual countries deviations from this regression line also indicates that Brazilian banking spreads are the highest ones in relation to world standards. This indicates that interest rate spread is high in the country.

Figure 1
Relationship between banking spreads and inflation rates

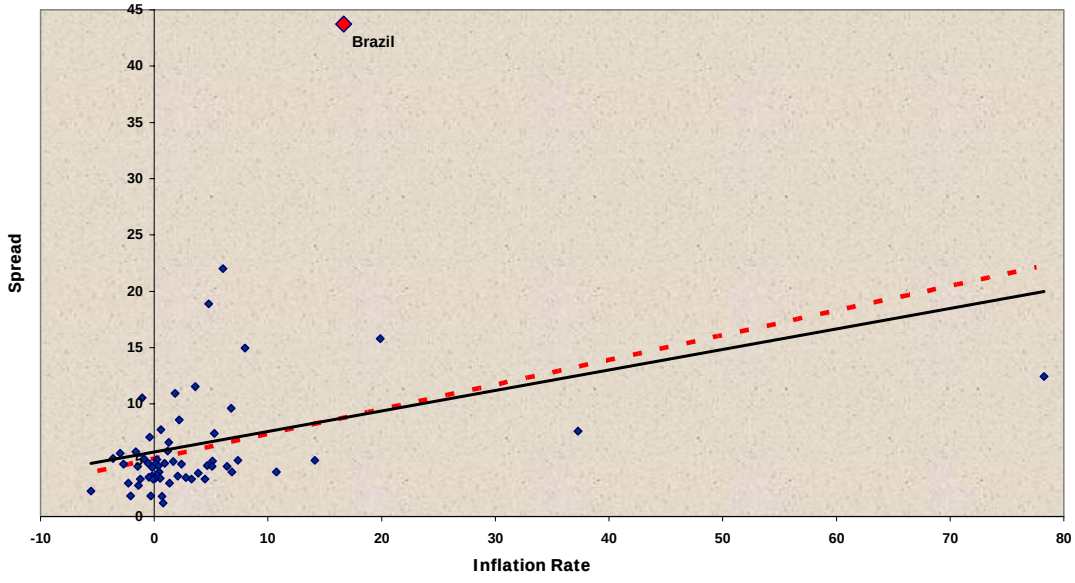


Figure 2 brings an even more restricted relationship that also indicates that Brazil has a high interest rate spread. In this case, deviations for each country, generated through a cross-section regression of interest rate spreads on inflation and deposit rates are ordered by their absolute value. The results for this regression are presented on table 1. They indicate that spreads are

determined not only by inflation rate, but also by the original deposit rate. Data on figure 2 also indicate that Brazilian spreads are among those that deviate more from world average, given the deposit interest and inflation rates. Therefore, these results, together with those previously extracted from figure 1, unveil the first important stylized fact: Brazil has a high interest rate spread when compared to world standards.

Table 1
Results of the regression of interest rate spreads on inflation and deposit rates

Variable	Coefficient	T-Statistic	Significance
Constant	2,881	2,229	0,026
Deposit	0,757	1,754	0,080
Inflation	-0,217	-1,122	0,262
Usable Observations	60		
R^2	0,246		
Durbin-Watson	1,874		

Source: own calculation

Figure 3 brings the relationship between the average rate of return for each sector estimated from the stocks of the several companies traded in BOVESPA (Bolsa de Valores do Estado de São Paulo) and the growth rate of GDP of the sector to which their major activities belong. The period covered by these data is between 1998 and 2003. As in figure 1, the estimated linear relationship is also included as an inter-sectoral standard. As the average rate of return of shares of companies in any sector is correlated to the sectoral performance, this estimated relationship yields significant parameters for standards in Economics, and gives a benchmark to compare individual sector performance in the stock exchange.

The SOB and POB were separated in figure 3, therefore they appear as two independent sectors. While the average rate of return of SOB is below the economy benchmark (line included), this same rate for POB is over the average line. This indicates that while the profitability of the former was below the market standard, the profitability of the latter was over market averages. This is true even when the restriction mentioned previously, that the profit of such banks is frequently disguised by their partial transference to other companies, which belong to economic groups of their major shareholders. Therefore, this data seem to indicate that the high profitability of POB is not extended to SOB.

Figure 2
Errors terms of the regression of spreads on inflation rate and deposit rates

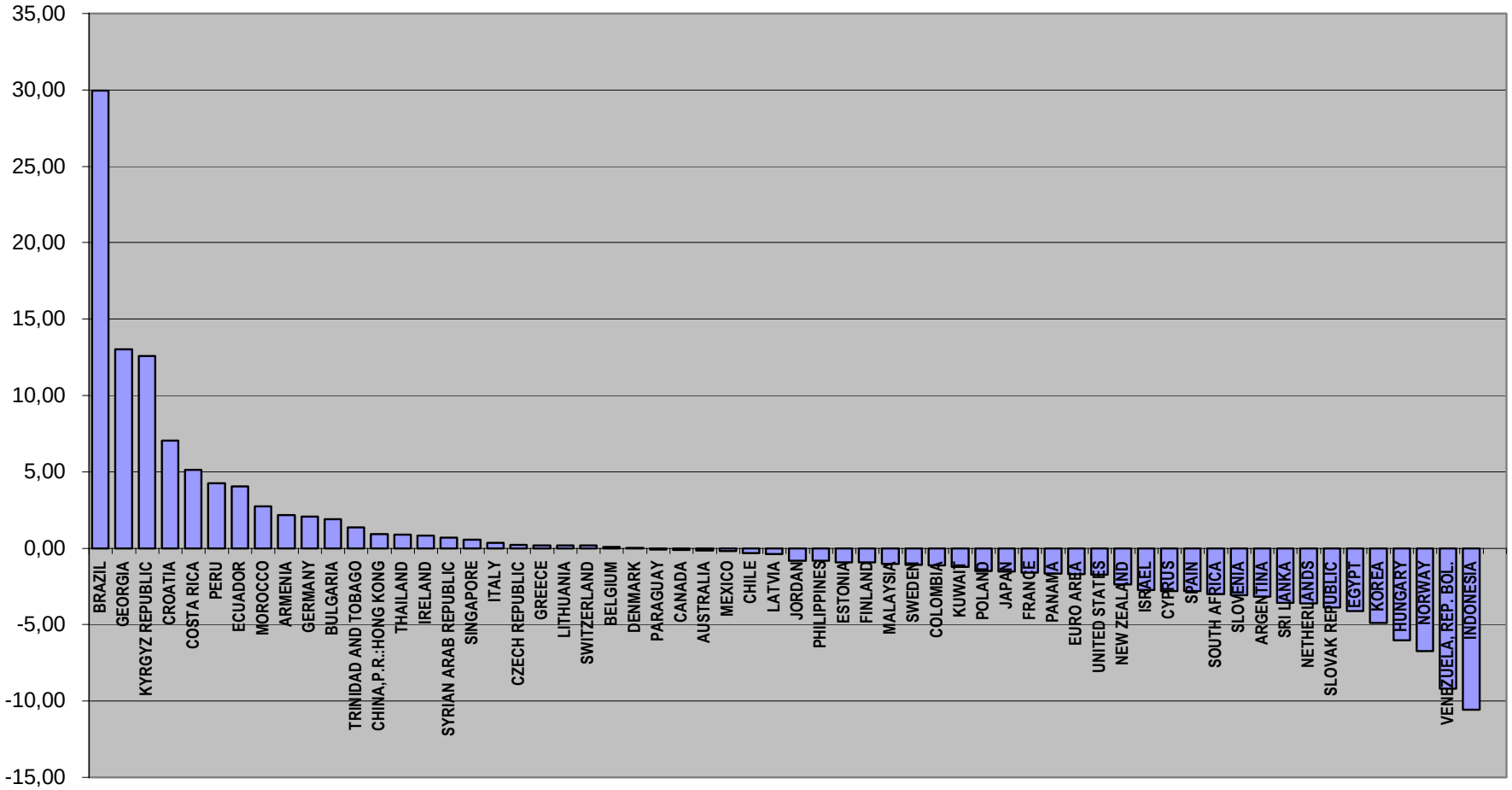


Figure 3
Growth rates of stock prices and setorial GDP

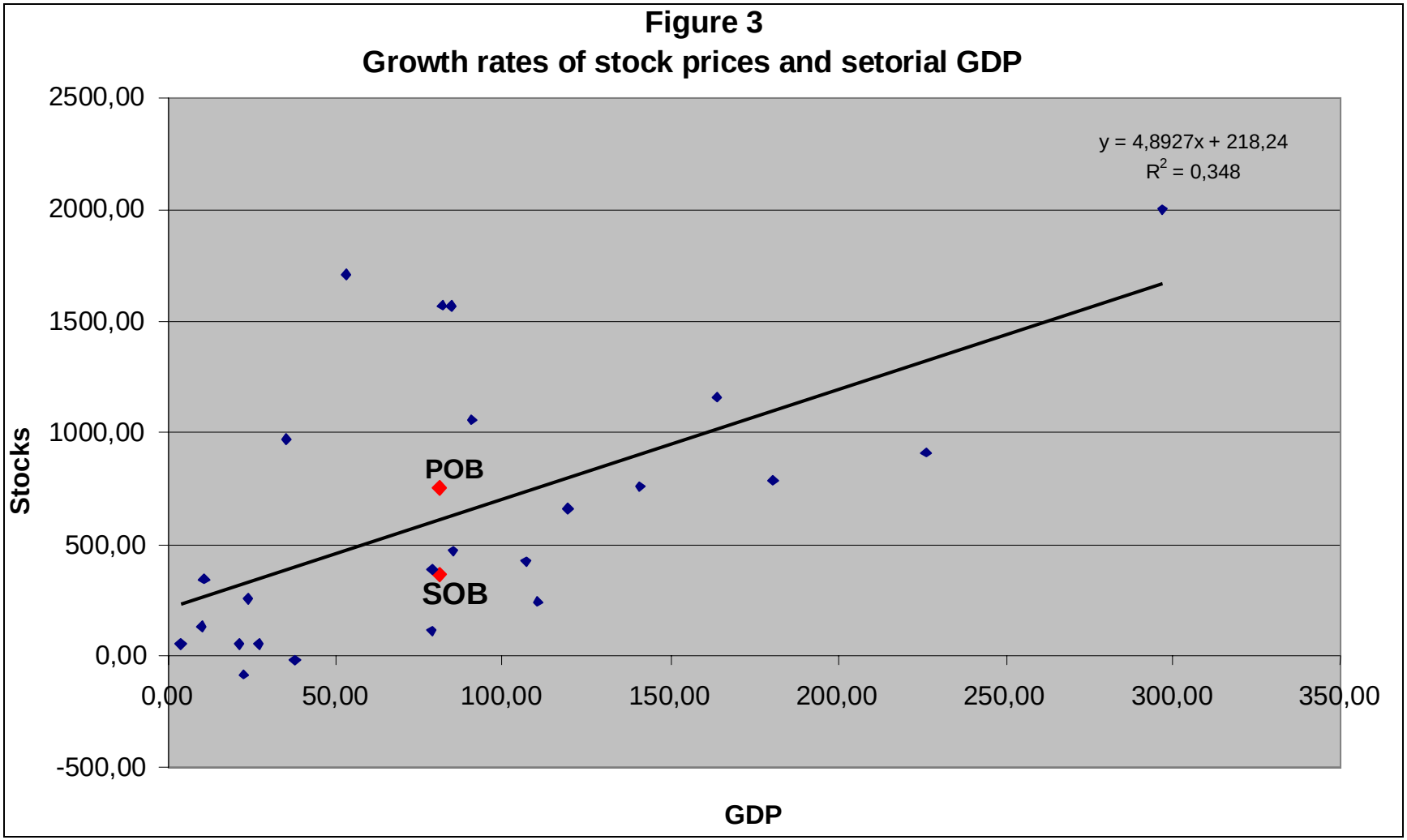
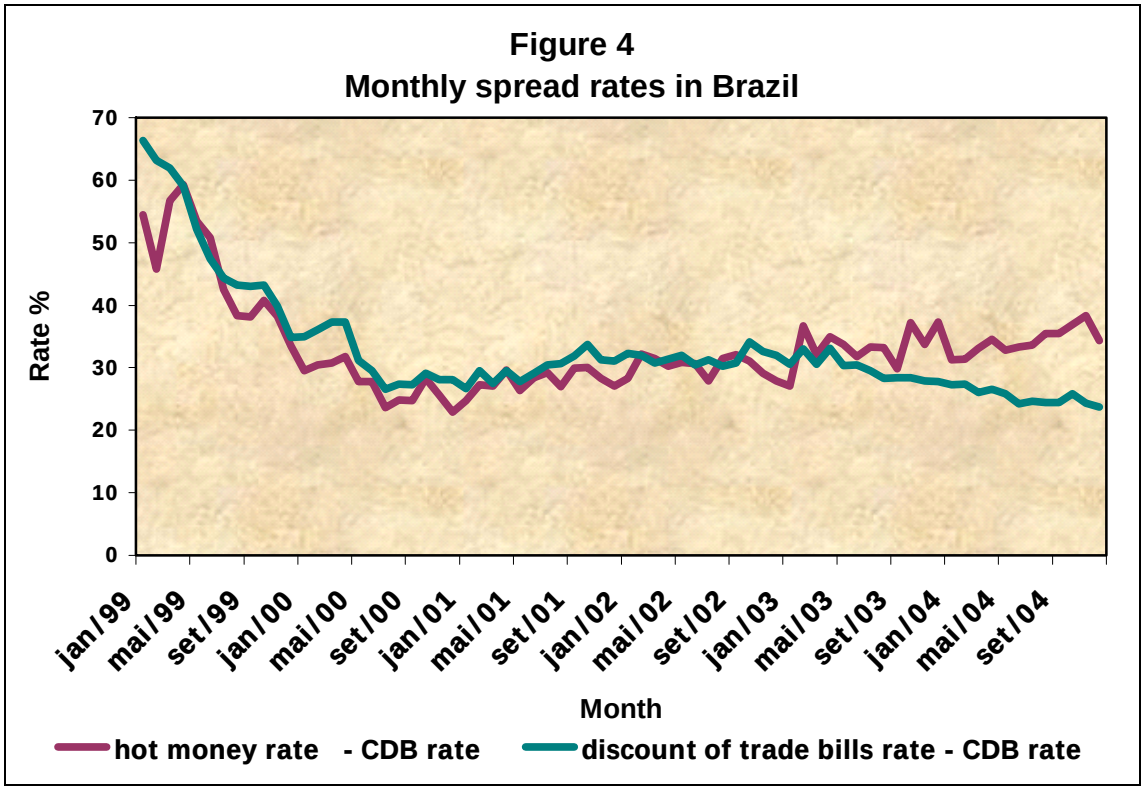


Table 2, extracted from Belaisch (2003), indicates that bank profits in Brazil are not especially high for world standards. Nevertheless, this study does not create any relevant benchmark to compare such returns. All the conclusions are formulated based solely on the absolute comparison, as it appears on table 2. It is important to note that information on both private and state owned banks is mixed on these statistics and that very often profits of banks in Brazil are masked, as mentioned before.

Figure 4 brings a monthly evolution of interest rates spread in Brazil between 1999 and 2004. It is built using CDB average rates as deposit rates and hot money as lending rates. Although these are not the only sources for both deposit and lending resources, the time trend of interest margins certainly is represented in this figure. It indicates that there was a tendency of interest rate spreads to fall in this period. This denotes that despite the high level of spreads in Brazil, they have already been decreasing lately, as a consequence of a general concern with this subject.



3. A brief introduction to the way the Brazilian banking market works[20]

State owned banks in Brazil, with the exception of BNDES, comprise all the services of commercial banks. They offer current accounts, saving accounts, and short and long term credits, both for business and individuals. They also engage in fund managements, exchange rate operations, and so on. As the private owned banks, their income arises from spreads between deposits and loans, purchasing and selling exchange rates and tariffs, charged on the several services they offer, such as bills

[20] For more details on the role of the state owned banks in the Brazilian Bank Systems, see Neto (2004).

clearances, assets evaluations and so forth. They compete in the market for the same customers as the POB.

Table 2
Brazil: Commercial Banks, Profitability Indicators, 1995-2000

		Brazil	LATAM[2]	USA	EU-11[3]	Japan
Source of revenue						
Net interest margin/ Assets	2000	5.2	4.2	3.1	n.a.	1.2
	1998	5.8	4.5	3.2	1.9	1.3
	1995	7.4	5.1	3.3	1.9	1.4
Total loans/ Earning assets	2000	36.8	68.0	67.8	n.a.	63.5
	1998	32.9	69.8	65.5	51.5	73.2
	1995	45.8	71.2	64.9	52.2	72.2
Asset quality						
Non performing loans/ Total Loans	2000	3.9	8.6	0.9	n.a.	6.1
	1998	16.9	12.2	0.7	1.2	5.6
	1995	9.5	11.5	0.9	1.3	3.0
Efficiency	2000	88.8	69.0	60.5	n.a.	60.9
Operating costs/ Operating income	1998	80.0	71.7	62.8	67.1	67.8
	1995	76.1	65.1	62.8	68.4	60.0
Of which:						
Personnel costs/ Operating income	2000	33.9	27.8	24.1	n.a.	6.9
	1998	32.9	31.7	24.9	35.9	13.7
	1995	42.4	25.6	26.3	38.3	16.1
Profitability						
ROA	2000	1.12	1.08	1.83	n.a.	0.08
	1998	0.62	0.58	1.85	0.66	- 1,14
	1995	- 0.03	0.82	1.81	0.59	- 0,32
ROE	2000	11.17	12.05	22.03	n.a.	1.73
	1998	7.24	6.84	22.69	16.80	- 30.40
	1995	- 0.38	9.09	24.62	23.80	- 8.81

Source: Belaisch (2003).
1/ Based on banks that publicly disclose their balance sheets and income statements. Selected sample includes only commercial banks. For a complete list, see Bankscope.
2/ Aggregation of Argentina, Chile, Colombia, Mexico and Peru.
3/ Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain.
Notes: Performance indicators may differ from traditional definitions to improve cross-country comparability. For this reason, operating costs exclude provisions, which are often year- and bank-specific; ROA, or return on assets, is the ratio of pre-tax (instead of the usual post-tax) profits to average assets to abstract from differences in taxation across countries. Similarly, ROE, or return on equity, is the radio of pre-tax profits to average equity.

Besides these activities, they are also responsible for providing support to public policies, when they demand banking services. They provide retirement and

unemployment benefits payments,[21] micro-credit, and the many poverty alleviation grants that are distributed by the Federal Government. All these banking services require on their supply the engagement of a reasonable amount of resources. Very often, the provisions allocated by the Government to pay for these services do not correspond to their costs to SOB. This fact forces these financial institutions to bear the extra costs arising from the deficit on the resources provided to supply the financial services included on such policies.

The other differences in management state owned bank face, when compared to privately owned banks, are typical for state owned companies. They have restrictions on the purchasing policies, as they are subjected to the contracting laws for the public sector, which demands, for example, that they should undertake a public competition on any purchase over some value. They also face restrictions on their employees hiring and firing policies. All these restrictions impose some cost inefficiency for these banks, when their performance is compared to privately owned banks.

Apart from the burden of these governmental policies and these other restrictions, SOBs are managed as privately owned institutions. They are supposed to allocate their available resources so as to generate as much profit as possible. The fact that they also have private shareholders compels them to work as any private company and to be profit maximizers, although they work under special restrictions to bear costs from some services, whose amount they cannot determine by their own rationality, and to face some relatively high cost management rules.

Therefore, the banking market in Brazil works with two types of institutions. Both are profit maximizers, but one of them, the state owned banks, has a few additional restrictions on its strategy, which is to carry the burden of some public policies and to face some management inefficiencies. The privately owned banks, on their turn, do not have to carry such losses, but they also do not have access to some of these policies, which to some extent, and with proper choice of customers, could be profitable. Retirement benefits payments are exceptions in which they can engage. These disbursements have been reasonably profitable for POB, especially as an instrument to keep the fidelity of potentially profitable customers.

4. An intuitive view of the main hypothesis

The major hypothesis of this paper is that when governments enforce state owned banks to bear part of the transaction costs of public policies and operational inefficiency, they force such banks in their optimal strategy to push prices of their services up. This increases the relative competitiveness of privately owned banks and also allows than to practice higher prices on their services, which is not matched by proportionally higher costs. Therefore, they benefit from higher profits and higher spread of interest rates paid and charged from their customers. Restrictions to enter in

[21] Privately owned banks also have the right to make retirement benefits payments, as they may be profitable. Nevertheless, differently from POB, SOB cannot refuse to make such payments.

the banking market assure that these high profits and higher spreads are not worn out by competition.

A second hypothesis presented by this paper is that when there is an increase in the salaries of employees of the SOB, there is also an increase on the profits of privately owned banks and the spread they charge on interest rates. The intuitive explanation for this is very similar to the case of higher burden from public policies. SOBs are forced to increase their prices (spreads) and the POBs benefit from higher demand and the possibility of charging more for their services, which also means charging higher spreads between borrowing and lending interest rates. Although the simple intuition is very appealing, a more profound understanding of these hypotheses could be reached through a graphical analysis, with which we proceed in the rest of this section.

Both types of banks are service suppliers that employ some inputs to offer specific services, in exchange for payments. In general, banks have two major functions, which are receiving deposits and lending funds to firms and citizens. In their first function, they pay an interest to depositors. In their second function they earn an interest on the funds lent. Their incomes come from a spread among these two interest rates. Therefore, it is possible to define a full transaction of these institutions as a unit of service or output. A full transaction involves a unit loan with the consequent deposits, which are necessary to make this loan. The unit in which these full transactions are measured could be a monetary unit. Tariffs and other services are even simpler to be seen as services provided in exchange for a payment. Nevertheless, to simplify the argument, the developments below will focus only on this service previously described, which is a chain of monetary resources collection and its loan to another agent who is willing to pay an interest on its immediate availability.

These institutions face a demand for their outputs, which is similar to what is found in most industries. Working under monopolistically competitive markets, they face a negative correlation between the price they get for a transaction and the total amount of services sold. For a given market structure, the capture of an extra unit of resource will involve higher cost of advertising or higher interest rate paid. Therefore, the cost to capture an extra monetary unit will increase. Likewise, the loan made will either be more risky or will demand extra informational costs to maintain the same risk of the previous marginal unit lent. Consequently, the gains from this marginal loan will also be lower than before. These two facts together imply that the marginal spread from a full transaction, which is the price of the banking service, is lower when the amount of transactions increases.

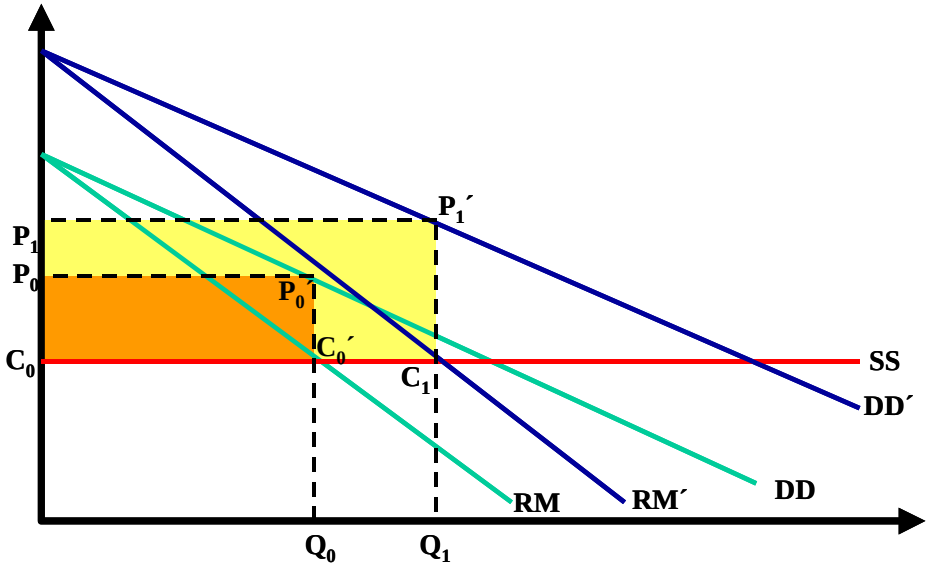
Given these arguments, it is possible to show graphically the core of the argument on this paper, which explains why the use of public banks to indirectly subsidize public policies increases the profitability of private banks. Obviously, such graphical analysis is very simple and restrictive in the sense that it does not capture all the general equilibrium effects, which will be taken into account in the more formal

model forwarded next section. Nevertheless, it makes the intuitive explanation of the hypothesis more appealing.

Figure 1 brings the demand function faced by a POB, which is represented by DD. As argued before, this function is negatively sloped, as each POB has some market power, but it faces some competition from other POBs and from SOBs. This demand function for the services of a POB generates a marginal revenue function such as the one represented by RM in figure 1.

This same figure also brings the supply function, which is horizontal in this example. The simplifying assumption that there is a constant marginal cost function, and

Figure 1
Equilibrium for a Privately owned bank



consequently a horizontal supply function, was introduced only to make it easier to unveil the logic of the argument, although the model forwarded in next section will rely on a decreasing marginal productivity function. This marginal cost function is represented by line SS in Figure 1.

Equilibrium in this model would be at the quantity of services sold in which the marginal cost function meets the marginal revenue function, and equilibrium price will be the one in which this quantity meets the demand function. Therefore, P_0 is the original equilibrium price and Q_0 is the equilibrium quantity of services effectively supplied. The total profit of the POB is the area between the straight lines which links the points P_0, C_0, $C_0´$, and $P_0´$.

Figure 2 brings the same equilibrium for a SOB. DD represents the same demand function. Now the marginal and average cost functions are positively sloped in their relevant parts. They are represented by CMg and CMe, respectively. This change is necessary to capture the impact of changes in the burden of public policies on profit of these SOBs. In the first equilibrium, profit is given by the area within the lines linking the points P_0, C_0, $C_0´$, and $P_0´$.

When there is an increase in the burden for SOB caused by any public policy, for instance, an increase in the disbursements for unemployment benefits, their demand functions move up to DD´. This happens because this new service brings more people to their agencies and consequently increases their ability to sell services at each specific price. Nevertheless, their average cost function also moves up, as the expanded public policy also imposes a burden on them, which in these curves represents a fixed cost.

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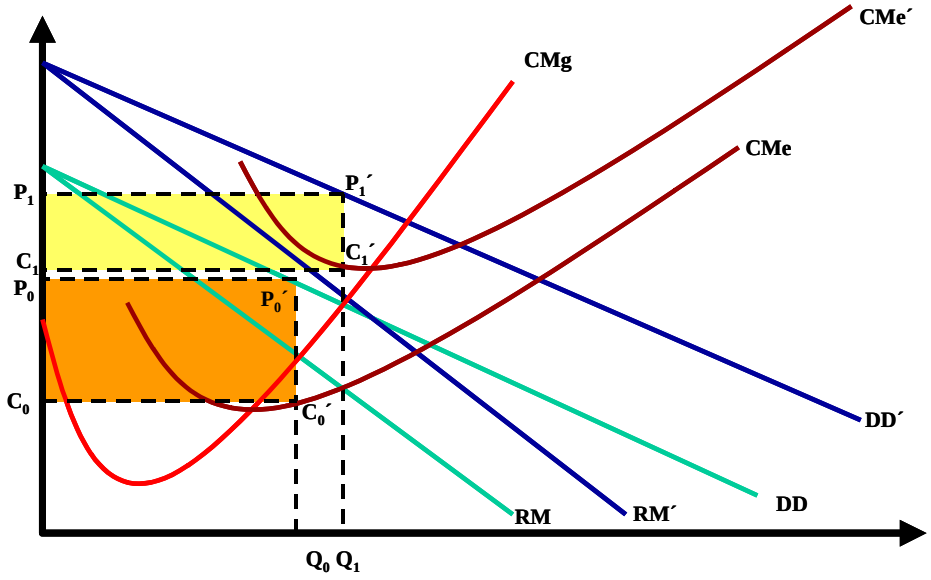
Figure 2
Equilibrium for a State Owned Bank



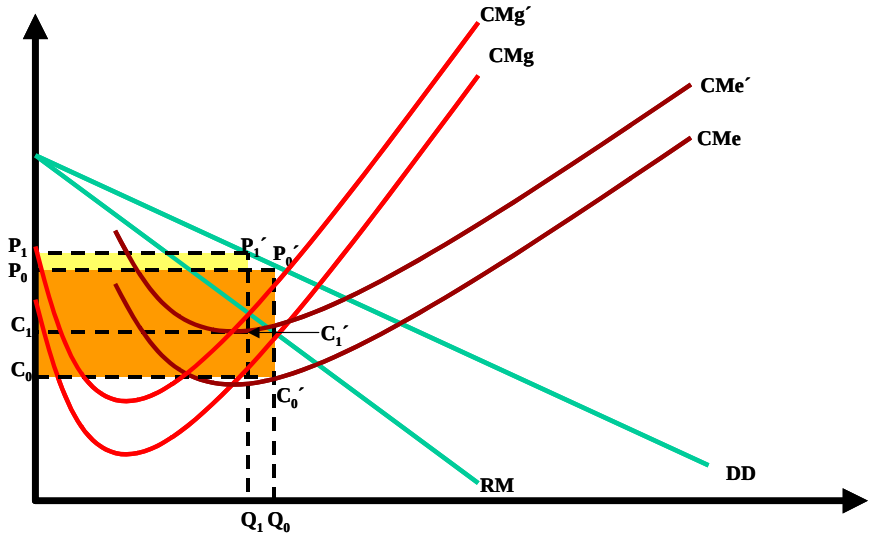
The final result for them is a new equilibrium, where P_1 is the equilibrium price and Q_1 is their new optimal quantity of service supplied. Their profits become the rectangle between the points P_1, C_1, $C_1´$, $P_1´$. This profit could be greater or smaller than the profit in the original equilibrium. Nevertheless, if it is greater, private banks would be interested in participating in such policy, what rarely happens. Therefore, by assumption, this new profit is smaller than the previous one.

As a consequence of the increase in prices of the SOB, the demand function for POB also moves up. In figure 1, it goes from DD to DD´. Therefore, the new equilibrium for the POB is at (Q_1, P_1). This equilibrium is at a higher price (spread between borrowing and lending rates) and a higher quantity supplied. In addition, there is also a clear expansion on the total profit obtained by these banks, as it now becomes the rectangle inside the lines connecting P_1, C_0, C_1 and $P_1´$. Therefore, the increase in the burden of policies to state owned banks raises the profit of privately owned banks, as hypothesized in this paper. The more formal model developed in the next section will show this same conclusion, but at this time unveiling most of the necessary assumptions that were implicit in this graphical presentation.

An increase in salaries in SOB, which is the exogenous shock whose consequences are addressed by the second major hypothesis of this paper, causes a raise in the marginal and average cost functions of the SOB. Each additional unit of their output will be more expensive after this change, in whatever level this output is originally. It means that the average cost will also rise for all possible quantities supplied. These changes imply in movements of these two functions such as those presented in figure 3.

The final prices of services or spread charged by these banks will increase. Profit, which was defined as the rectangle inside the lines connecting the points P_0, C_0, $C_0´$ and $P_0´$, now becomes the area of the rectangle inside the lines connecting points P_1, C_1, $C_1´$ and $P_1´$. The consequence of this change for the POB is exactly the same as when there is an increase in the policy burden. Higher prices of services charged by SOB lead to a move on the demand function POB faces and consequently to higher profits, prices and spreads charged by them.

Figure 3
Equilibrium for a State Owned Bank after change in salaries paid



5. Modelling the Brazilian banking market

A simple model can also prove the above conclusions, but under a more rigorous analysis. This section will forward this model. The arguments in the previous section leads to a definition of a demand function for banks services as:

$$Y_i = B_i P_i^{-\eta} P^{\delta\eta} \qquad (1)$$

Where Y_i is the demand for services of a representative bank of type i, for i=S or i=P, for a state owned bank or a privately owned bank, respectively. P_i is the price of a unit transaction, which is the spread obtained by the representative bank of type i. P is a market reference price of all the banks, which will be better defined subsequently. B_i is

a market power coefficient, which determines the quantity and quality of clients each financial institution can attract. η is a parameter, so that $\eta>1$.[22] It measures the level of competition among institutions and the relative fidelity of their customers. More formally, it is the price elasticity of the demand faced by financial institutions.

The inclusion of P in this equation is a consequence of the potential substitution by customers. If prices of other institutions rise, consumers will shift part of their demand for this representative institutions, so that it will sell more services at the same price it had before,. δ in this model is such that $0<\delta<1$. This implies that the elasticity of demand with respect to its own price is higher than this same elasticity with respect to the index of other banks prices.

The sectorial price index P is defined as:[23]

$$P = P_S^{\frac{a}{1+(a+m)\delta}} P_P^{\frac{m}{1+(a+m)\delta}} \qquad (2)$$

Where *a* is the number of state owned banks and *m* is the number of privately owned banks in the economy. These numbers will be both taken as given, as there are several barriers to entry this market in Brazil, including the legal approval by Central Bank.

The higher the coefficient B_i, is the larger is the market power of a financial institution. The value of B_i for a particular financial institution depends on: (i) the social capital of its managers, (ii) its reputation in the market and (iii) agency costs. The higher the social capital of its manager, the lower will be the incentive to default of his/her clients.[24] The higher this social capital, the lower will be the adverse selection and moral hazard problems faced by the firm. In the same way, the higher this social capital, the lower will be the cost to attract deposits. The higher the necessary cost to control managers and their incentives to sheet (agency costs), the higher will be the cost per transaction and the lower will be the spread for a given number of transactions. Therefore, the lower will be B_i.

In this model, two different assumptions will be made for the two Bs. While B_P is exogenous and fixed, B_S is not given. It varies according to the public policies burden SOBs have to carry. Therefore, it is possible to define:

$$B_S = BR^{\gamma} \qquad (3)$$

Where R is the total expenditures on public policies management and services provision. B is a constant and γ is a parameter such that $0<\gamma<1$. This restriction implies

[22] This is necessary to assure that when Y grows, so does the total revenue from sales in this market if there is no consumer surplus.
[23] Appendix A justifies the use of such weighted geometric mean.
[24] For an empirical study which supports this hypothesis, see Guiso, Sapienza and Zingales (2004).

that the higher the burden of public policies the less internally efficient the state owned banks will be in order to benefit from their management, through fidelity expansion of potentially good customers and sales of other services for the customers attracted by these policies. It is also reasonable to assume that R>0.

These banks face a production function similar to the one of any other sector. For simplicity, it will be assumed that they only employ labour as a factor of production. Therefore, this production function may be defined as following:

$$Y_i = A_i L_i^{\rho} \tag{4}$$

Where Y_i is the total output of firms in sector i, L_i is the amount of hours of labour used in production and A_i is a productivity parameter, which is assumed as constant. ρ is a fixed parameter with $0<\rho<1$, so that there is decreasing marginal return in the production function. The fact that oncoming workers will have less qualification would justify this relationship.

Given these specifications, the problem of the managers of private banks become:

$$Max\ \pi_P = B_P^{\frac{1}{\eta}} P^{\delta} Y_P^{\frac{\eta-1}{\eta}} - w_P \left(\frac{Y_P}{A_P}\right)^{\frac{1}{\rho}} \tag{5}$$

Where w_P is the wage rate of private banks employees. In the same way, state owned banks managers have to maximize their profit function:

$$Max\ \pi_S = B^{\frac{1}{\eta}} R^{\frac{\gamma}{\eta}} P^{\delta} Y_S^{\frac{\eta-1}{\eta}} - w_S \left(\frac{Y_S}{A_S}\right)^{\frac{1}{\rho}} - \varphi R \tag{6}$$

Where φ is the unit cost for the state owned bank of a unit of expenditures with public policies and w_S is the wage rate of public banks employees.

First order condition for the problems defined in equations (5) and (6) yields:

$$Y_P^{\frac{1-\rho}{\rho}+\frac{1}{\eta}} = \left(\frac{\eta-1}{\eta}\right) B_P^{\frac{1}{\eta}} P^{\delta} \frac{\rho}{w_P} A_P^{\frac{1}{\rho}} \tag{7}$$

and

$$Y_S^{\frac{1-\rho}{\rho}+\frac{1}{\eta}} = \left(\frac{\eta-1}{\eta}\right) B^{\frac{1}{\eta}} R^{\frac{\gamma}{\eta}} P^{\delta} \frac{\rho}{w_S} A_S^{\frac{1}{\rho}} \tag{8}$$

These two equations, together with the two demand functions, represented in equation (1), and equation (2), determine simultaneously the equilibrium values for Y_P, Y_S, P_P, P_S and P.

It is possible to substitute these two equations on the profit functions defined in equations (5) and (6) to obtain:

$$\pi_P = B_P^{\frac{1}{\eta}} P^{\delta} Y_P^{\frac{\eta-1}{\eta}} \left[1-\rho\left(\frac{\eta-1}{\eta}\right)\right] \qquad (5')$$

and

$$\pi_S = B^{\frac{1}{\eta}} R^{\frac{\gamma}{\eta}} P^{\delta} Y_S^{\frac{\eta-1}{\eta}} \left[1-\rho\left(\frac{\eta-1}{\eta}\right)\right] - \varphi R \qquad (6')$$

If $Y_P>0$ and $P>0$, equation (5´) implies that $\pi_P>0$, given the postulated value of the parameters. Nevertheless, even if $Y_S>0$ and $P>0$, π_S can be negative if R is too large. Equation (5´) indicates that if the impacts on Y_P and P of a change in R or w_S are determined, it is also possible to establish the impact on π_P. The qualitative analysis of such impacts is the object of next section.

6. The impact of changes in the policy burden and of state owned banks salaries on the profit of privately owned banks

The two demand functions represented in equation (1) can be used to substitute for P_P and P_S in equation (2). As a consequence, equations (7), (8), and this new version of equation (2) together can determine Y_P, Y_S and P, simultaneously. Taking natural logarithm from these three equations, the system they form can be represented in a matrix form as:

$$\begin{vmatrix} \frac{1}{1+(a+m)\delta} & \frac{a}{\eta[1+(a+m)\delta]} & \frac{m}{\eta[1+(a+m)\delta]} \\ -\delta & 0 & \frac{1-\rho}{\rho}+\frac{1}{\eta} \\ -\delta & \frac{1-\rho}{\rho}+\frac{1}{\eta} & 0 \end{vmatrix} \begin{vmatrix} \ln P \\ \ln Y_S \\ \ln Y_P \end{vmatrix} = \begin{vmatrix} \frac{a\gamma}{\eta[1+(a+m)\delta]}\ln R \\ \ln\left(\frac{\eta-1}{\eta}\right)+\ln\left(\frac{\rho}{w_P}\right) \\ \ln\left(\frac{\eta-1}{\eta}\right)+\ln\left(\frac{\rho}{w_S}\right)+\frac{\gamma}{\eta}\ln R \end{vmatrix} \qquad (9)$$

From these equations, it is possible to get:

$$\Delta = -\left[\frac{1-\rho}{\rho}+\frac{1}{\eta}\right]\left(\frac{1}{1+(a+m)\delta}\right)\left[\frac{1-\rho}{\rho}+\frac{1}{\eta}+\frac{\delta(a+m)}{\eta}\right] < 0$$

$$\Delta_{1R} = -\frac{\gamma a(1-\rho)}{\eta[1+(a+m)\delta]\rho}\left(\frac{1-\rho}{\rho}+\frac{1}{\eta}\right) < 0 \qquad \Delta_{3R} = -\frac{\delta\gamma a(1-\rho)}{\eta[1+(a+m)\delta]\rho} < 0$$

$$\Delta_{1Ws} = -\frac{a}{\eta[1+(a+m)\delta]}\left(\frac{1-\rho}{\rho}+\frac{1}{\eta}\right) < 0 \qquad \Delta_{3Ws} = -\frac{\delta a}{\eta[1+(a+m)\delta]} < 0$$

and:

$$\frac{\partial \ln P}{\partial \ln R} = \frac{\Delta_{1R}}{\Delta} > 0 \tag{10}$$

$$\frac{\partial \ln Y_P}{\partial \ln R} = \frac{\Delta_{3R}}{\Delta} > 0 \tag{11}$$

$$\frac{\partial \ln P}{\partial \ln w_S} = \frac{\Delta_{1Ws}}{\Delta} > 0 \tag{12}$$

$$\frac{\partial \ln Y_P}{\partial \ln w_S} = \frac{\Delta_{3Ws}}{\Delta} > 0 \tag{13}$$

Equations (10) and (11), when combined with equation (5´), imply that the profit of POBs, π_P, rises when there is an increase in the burden of public policies for private banks, R. In the same way, equations (12) and (13), together with equation (5´), also imply that there is a rise in π_P when w_S increases. The results for the impact on the spread charged by POBs when these two variables, R and w_S, increase are seen directly from equations (10) and (12), respectively. Therefore, the solution of this model reaches the same conclusions as the graphical analysis of the previous sections, but taking into consideration all the interaction between the two types of banks.

7. Empirical tests

The main hypothesis of this paper is that the way Brazilian banking market works, when there is an increase in the costs of SOB as a consequence of the burden of public policy costs, there are increases in interest rates spreads and in the profitability of private banks. The two parts of this hypothesis will be tested separately. Therefore, two hypotheses will be tested. One that checks the existence of a positive impact of the costs of SOBs on the profitability of privately owned banks. The second one tests the existence of a positive impact of costs of SOB on the banking spreads.

7.1. Test of the impact on profitability

Brazilian SOBs have a great advantage to be used in the test of the hypothesis developed in the model of previous sections. Although they are State controlled

companies, some of them have shares in the major stock exchange in the country, which is BOVESPA (Bolsa de Valores de São Paulo), so that changes in their expected profitability can be easily captured by the performance of these shares. As many privately owned Brazilian banks also have shares in this same stock exchange, an investigation on the relationship among the returns of these two types of shares may be a good way to test the hypothesis on the impact of cost changes in SOBs on the expected profitability of POBs. This section proceeds to such an exercise.

Similarly to all shares, the rate of return of any bank can be represented as:

$$R_{it} = \alpha_i + \beta_i R_{Mt} + e_{it} \tag{14}$$

This is a standard representation, where R_{it} is the rate of return of the shares of the bank i in period t and R_{Mt} is a market rate of return in period t, which represents the return of the portfolio that includes all market assets in the exact proportion they are available in the economy. The coefficients α_i and β_i are parameters, which are assumed to present some intertemporal stability. The term e_{it} is a random deviation of R_{it} from its stable relationship with R_{Mt} in period t, such that $E(e_{it})=0$ and $Var(e_{it})<\infty$, where E(.) and Var(.) represent the statistical expected value and variance of the variable within brackets, respectively. R_{Mt} and e_{St} are such that $E(R_{Mt}e_{St})=0$ by construction.

It is possible to define a portfolio that includes the shares of all banks in the economy whose rate of return is represented here as R_{bt}. By construction, it is reasonable to expect that $E(R_{bt}e_{it})\neq 0$, as part of the orthogonal deviations of R_{it} from R_{Mt} is explained by particular shocks to the rate of return of the banking sector, which are not explained by changes in the rate of return of the whole set of assets in the economy.[25] Furthermore, it is possible to define:

$$e_{it} = \alpha'_i + \beta_{Bi} R_{Bt} + e'_{it} \tag{15}$$

Where, α'_i and β_{Bi} are parameters and β_{Bi} particularly relates the deviations of the rate of return of the bank i with respect to the market rate of return to the rate of return of the banking sector. The term e'_{it} is such that $E(e'_{it})=0$ and $Var(e'_{it})<\infty$. Substitution of equation (15) in equation (14) yields:

$$R_{it} = \alpha''_i + \beta_i R_{Mt} + \beta_{Bi} R_{Bt} + e'_{it} \tag{16}$$

Where $\alpha_i''=\alpha_i+\alpha_i'$ and the other variables and parameters are as previously defined.

It is also possible to define a R_{St} that is the rate of return of a portfolio including all state owned banks in the economy. This rate of return will be particularly affected by public policies towards SOBs, such as the salaries of their employees, costs emerging from burden of public policies, etc, although it is also affected by general

[25] Obviously, it is reasonable to expect that $E(R_{Bt}R_{Mt})\neq 0$, as the portfolio that includes all banks also will have its rate of return in any period affected by the market rate. When the economy goes well, the banks also tend to perform well.

economic developments and particularities of the banking sector. Therefore, this rate may be decomposed as:

$$R_{St} = \delta_0 + \phi_0 R_{Bt} + v_t \tag{17}$$

The market rate R_{Mt} was not included in equation (17) because its effect on R_{St} is already captured by its impact on R_{Bt}. As δ_0 and ϕ_0 are stable parameters in this equation, v_t is the variable that captures the impact of public policies on the return of SOB. By construction, it is possible to say that $E(v_t)=0$ and by assumption $Var(v_t)<\infty$. Whenever the government reduces the economic efficiency of SOB through some policy, v_t is negative and R_{St} also falls, *ceteris paribus*. Normally, it is reasonable to assume that $\phi_0>0$, as the rate of return of SOBs tend to increase when the rate of return of the bank sector in the economy rises.

Given these definitions, the hypothesis under scrutiny here implies that $E(e'_{Pt} R_{St})\neq 0$ and more precisely:

$$e'_{Pt} = \delta_1 + \phi_1 R_{St} + u_t \tag{18}$$

Where e'_{Pt} is e'_{it} for the privately owned bank P and u_t is an error term such that $E(u_t)=0$ and $Var(u_t)<\infty$. The parameters δ_1 and ϕ_1 are also stable and $\phi_1<0$. This means that the rate of return of privately owned banks respond negatively to changes in the rate of return of state owned banks.

Substitution of equation (17) in equation (18) yields:

$$e'_{Pt} = \delta_2 + \phi_2 R_{Bt} + \phi_1 v_t + u_t \tag{19}$$

Where $\delta_2=\delta_1+\phi_1\delta_0$, $\phi_2=\phi_1\phi_0$. Equation (19) can be substituted back into equation (16) to yield:

$$R_{Pt} = \alpha_{P1} + \beta_P R_{Mt} + \beta'_{BP} R_{Bt} + \phi_1 v_t + u_t \tag{20}$$

Where $\alpha_{P1} = \alpha''_P + \delta_2 = \alpha''_P + \delta_1 + \phi_1\delta_0$, $\beta'_{BP} = \beta_{BP} + \phi_2 = \beta_{BP} + \phi_1\phi_0$. As $\phi_1<0$, $\phi_0>0$ and β_{BP} can be positive, the sign of β'_{BP} is not defined a priori. Furthermore it can have different signs for different banks. Nevertheless, if equation (20) is estimable, the test of the hypothesis $\phi_1<0$ can be made from the coefficient for v_t. The method of the empirical test of this subsection is exactly to estimate equation (20).

There are three non-observable variables in equation (20). They are R_{Mt}, R_{Bt} and v_t. The two first ones will be estimated through a principal component analysis method. The market rate of return R_{Mt} very often is taken as the rate of return of a broad index of the stock exchange. In Brazil this would be IBOVESPA. Nevertheless, another way to estimate it is to take the first principal component of the rate of return of a set of assets. Both procedures were used in the tests below. The assets included in

the second approach were (i) IBOVESPA; (i) Interbank Certificate Deposits (Certificados de Depósitos Interbancários), which is an asset traded by banks with each other to adjust their liquidities; (iii) US dollars in Brazilian currency, which is also a potential asset for Brazilian agents, (iv) US Federal discount rate, (v) LIBOR (London Interbank Operational Rate), which are both not assets but alternatives for financial resources applications; (vi) Dow Jones index and (vii) Nasdaq index.

The hypothesis underlying this method of estimation of the market ratio is that there is a common movement for all these assets that represents the market behavior, as the rate of return of all these assets to some extent are closely related to the weighted rate of return of all the market assets of the economy. Some of them fluctuate with the total market assets, such as the stock exchange indexes and US dollar price in Real, while others are important to determine the performance of the market, such as LIBOR and US Federal discount rate. The data on the tests below are presented for the two hypotheses on the definition of market rate of return, the first principal component and the rate of return for IBOVESPA.

The estimation of the ratio of return for the banking sector, R_{Bt}, relied on the same method as the one for the market ratio. In this case the principal component included the share of all Brazilian banks quoted in BOVESPA, whose shares were available for the whole period, January 1994 to February 2004, and they had a clear classification, either as a privately owned or a state owned bank. Only BANESPA was left out of the sample, as it changed its control during this period.[26]

The estimation of v_t was made in two steps. The first one created a rate of return for the state owned banks. In this case the first component from a principal component analysis including the rate of returns of the shares of all SOBs in the sample was obtained. This component was considered to be R_{St}. The shares included in this case were for Banco do Brasil, Banco da Amazônia S.A. and Banco do Nordeste. Then, equation (17) was estimated with R_{Bt} defined as above. The residual was taken to be v_t.

These previous steps generated the variables to allow estimation of equation (20) proceed. Two alternative hypotheses on the error term were introduced. The first one is that they are not serially correlated. This arises directly from the market efficient hypothesis. Nevertheless, the variance of the error was still left free to differ among periods. In this case White (1980) correction for heteroskedasticity of the errors was used. The second hypothesis was that the efficient market hypotheses could fail and a simultaneous correction for heteroskedasticity and auto-correlation of the errors using the method of Newey and West (1987) was introduced.[27]

[26] Banrisul was left out of the sample because the data for its share was not for the whole period. The sample included Bradesco, Itaú, Unibanco, Alfa, Mercantil, BASA (Banco da Amazônia S.A.), Banco do Brasil, and Banco do Nordeste.
[27] In some estimated models the Durbin-Watson statistics indicated that this was the case. The parameter ℓ of Newey and West was set equal to one.

Equation (20) was estimated for each privately owned bank in the sample separately. The data was monthly. The rates of returns were calculated as the first difference of the natural logarithm of the monthly averages prices of stocks. The results of the estimation, with the two definitions of the market rate of return and with the two assumptions for the existence of autocorrelation of the error terms, are all included in tables 1 to 4.

The results indicated that all estimated coefficients for v_t, which is the estimated value for ϕ_1, are negative. Most of them are significantly different from zero at standard p-values. These results strongly support the hypothesis that there is a negative impact running from the economic performance of state owned banks to the expected profitability of privately owned banks, as predicted by the model of the previous sections.

Table 1
Models with calculated market return and White correction for heteroskedasticity

		Constant	R_m	SOB (V_t)	Banks (R_B)	R^2	Durbin Watson
Bradesco	Coefficient	0.0136	-0.0048	-0.3369	0.6571	0.9009	1.9154
	t-statistics	2.1754**	-7.7936***	-3.2039***	20.3189***		
Alfa	Coefficient	-0.0041	0.0066	-0.1002	0.0612	0.3527	1.4182
	t-statistics	-0.4370*	9.0035***	-0.6376*	2.6439***		
Itaú	Coefficient	0.0020	0.0042	-0.3290	0.1561	0.5419	2.0011
	t-statistics	0.2668*	4.3587***	-2.9749***	5.3664***		
Mercantil	Coefficient	0.0000	0.0022	-0.3032	0.2034	0.3682	1.8247
	t-statistics	3.0575*	2.2125**	-2.2617**	4.8402***		
Unibanco	Coefficient	-0.0069	0.0049	-0.7586	0.0964	0.3395	1.8065
	t-statistics	-0.6279*	3.7245***	-3.3970***	1.6895*		

Note: * indicates that the coefficient is significantly different from zero at 10%
** indicates that it is significant at 5%
*** indicates it is significant at 1%.

Table 2
Models with Ibovespa as market return and White correction for heteroskedasticity

		Constant	IBOVESPA	SOB (V_t)	Banks (R_B)	R^2	Durbin Watson
Bradesco	Coefficient	-0.0066	-0.5293	-0.3673	0.7439	0.9155	1.6884
	t-statistics	-1.2330*	-6.3427***	-3.9439***	22.3361***		
Alfa	Coefficient	0.0261	0.1340	-0.0965	0.1074	0.1785	1.2798
	t-statistics	3.0586***	0.9439*	-0.5204*	2.2558**		
Itaú	Coefficient	0.0189	0.5914	-0.2941	0.0436	0.6733	1.7873
	t-statistics	3.5259***	8.0934***	-3.0991***	1.6934*		
Mercantil	Coefficient	0.0086	0.4056	-0.2788	0.1181	0.4190	1.8389
	t-statistics	0.9739*	3.2840***	-2.1230**	2.2630**		
Unibanco	Coefficient	0.0135	0.5890	-0.7245	-0.0057	0.3982	1.6634
	t-statistics	1.4210*	4.3250***	-3.6316***	-0.1078*		

Note: * indicates that the coefficient is significantly different from zero at 10%
** indicates that it is significant at 5%
*** indicates it is significant at 1%

Table 3

Models with calculated market return and Newey and West correction for heteroskedasticity and autocorrelation

		Constant	R_m	SOB (V_t)	Banks (R_B)	R^2	Durbin Watson
Bradesco	Coefficient	0.0136	-0.0048	-0.3369	0.6571	0.9009	1.9154
	t-statistics	2.1302**	-7.3814***	-3.4498***	19.5631***		
Alfa	Coefficient	-0.0041	0.0066	-0.1002	0.0612	0.3527	1.4182
	t-statistics	-0.3898*	9.7238***	-0.6034*	2.5297**		
Itaú	Coefficient	0.0020	0.0042	-0.3290	0.1561	0.5419	2.0011
	t-statistics	0.2638*	4.2389***	-2.8903***	5.3460***		
Mercantil	Coefficient	0.0000	0.0022	-0.3032	0.2034	0.3682	1.8247
	t-statistics	0.0003*	2.1923**	-2.3582**	4.7251***		
Unibanco	Coefficient	-0.0069	0.0049	-0.7586	0.0964	0.3395	1.8065
	t-statistics	-0.5964*	3.2515***	-3.5814***	1.5980*		

Note: * indicates that the coefficient is significantly different from zero at 10%
** indicates that it is significant at 5%
*** indicates it is significant at 1%.

Table 4

Models with Ibovespa as market return and Newey and West correction for heteroskedasticity and autocorrelation

		Constant	Ibovespa	SOB (V_t)	Banks (R_B)	R^2	Durbin Watson
Bradesco	Coefficient	-0.0066	-0.5293	-0.3673	0.7439	0.9155	1.6884
	t-statistics	-1.1534*	-5.6222***	-4.0231***	20.0861***		
Alfa	Coefficient	0.0261	0.1340	-0.0965	0.1074	0.1785	1.2798
	t-statistics	2.6984***	0.8115*	-0.5067*	2.0374**		
Itaú	Coefficient	0.0189	0.5914	-0.2941	0.0436	0.6733	1.7873
	t-statistics	3.3616***	7.7365***	-2.9810***	1.6794*		
Mercantil	Coefficient	0.0086	0.4056	-0.2788	0.1181	0.4190	1.8389
	t-statistics	0.9262*	3.1272***	-2.1583**	2.1084**		
Unibanco	Coefficient	0.0135	0.5890	-0.7245	-0.0057	0.3982	1.6634
	t-statistics	1.3292*	4.3271***	-3.6422***	-0.1062*		

Note: * indicates that the coefficient is significantly different from zero at 10%
** indicates that it is significant at 5%
*** indicates it is significant at 1%.

7.2. Time series test of the impact on banking spread of shocks to perspective of profitability of state owned banks

Another test for the impact on banking spread of autonomous changes on the perspective return of state owned bank was developed relying on Brazilian time series data and a Factor-Augmented Vector Auto-regression, a method developed by Bernanke, Boivin and Eliasz (2005). In this model SOB and POB returns were taken to be unobservable variables while banking spreads were taken to be observable. The three variables were taken to have their dynamics determined by:

$$\begin{bmatrix} 1 & a_{12} & a_{13} \\ a_{21} & 1 & a_{23} \\ a_{31} & a_{32} & 1 \end{bmatrix} \begin{bmatrix} R_{St} \\ R_{Pt} \\ \Delta S_t \end{bmatrix} = \phi(L) \begin{bmatrix} R_{St-1} \\ R_{Pt-1} \\ \Delta S_{t-1} \end{bmatrix} + \begin{bmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \end{bmatrix} \quad (21)$$

Where ΔS_t is the monthly change in the natural logarithm of the banking spread in Brazil and R_{St} and R_{Bt} are the rates of return of SOB and POB, respectively, a_{ij} are coefficients. $\phi(L)$ is a 3x3 polynomial in the lag operator and u_{it} is the autonomous innovation to equation i, all with mean zero and finite variance. R_{St} and R_{Pt} are taken to be unobservable variables, while banking spread is defined as the difference between lending and borrowing interest rates.[28]

By construction, innovation u_{it} is fully associated with innovations to the variable whose coefficient is $a_{ii}=1$. This happens because by assumption it is orthogonal to the other two endogenous variables in the model. Therefore, u_{1t} represents exogenous innovations to R_{St} and, by the hypotheses of the paper, it has a negative impact on S_t. In words, it means that a positive shock to the expected performance of state owned banks will reduce the banking spread, or that any autonomous change that make SOBs less efficient (negative shocks) will increase the interest rate spreads in the economy.

The method used consisted on a two step estimation, where the first step estimates the variables R_{Bt} and R_{St} by a principal component, as made in section 5.1, and the second step estimates the VAR represented in equation (21).[29] Estimation of equation (21) was made by instrumental variable method, which relied, as instruments, on distributed lags of LIBOR, US Federal discount rate, and the implicit rates of return of Dow Jones and Nasdaq indexes.

The model strategy selection was the Akaike criteria, which indicates that the two rates of return equations had two lags of each variable, while the equation for changes in the natural logarithm of spreads had three lags of each variable. A constant and a set of seasonal dummies were introduced as exogenous variables. Some outliers were identified and were easily related to policy measures trying to reduce spreads. Dummies were introduced to isolate the changes which are caused by such policies.

There was a test of the hypothesis that there is at least one vector co-integrating vector relating the variables S_t, P_{St}, P_{Pt}, where P_{St} and P_{Pt} are indexes of the natural logarithm of the estimated price of the assets of SOBs and POBs, respectively, which are obtained from integration of R_{St} and R_{Pt}. This test indicated that there was a co-integrating vector. Consequently, another variable, Z_t, which represents the deviations from the long-term equilibrium among these variables in level was also included in the model as an exogenous variable. This variable was estimated as the errors of a simple regression of the variables in level, as suggested by Engle and Granger (1987).

An impulse response analysis was carried on with the estimated results from the model. This impulse was estimated under the imposed assumption that the errors are orthogonal among them. A confidence interval with two standard deviations around

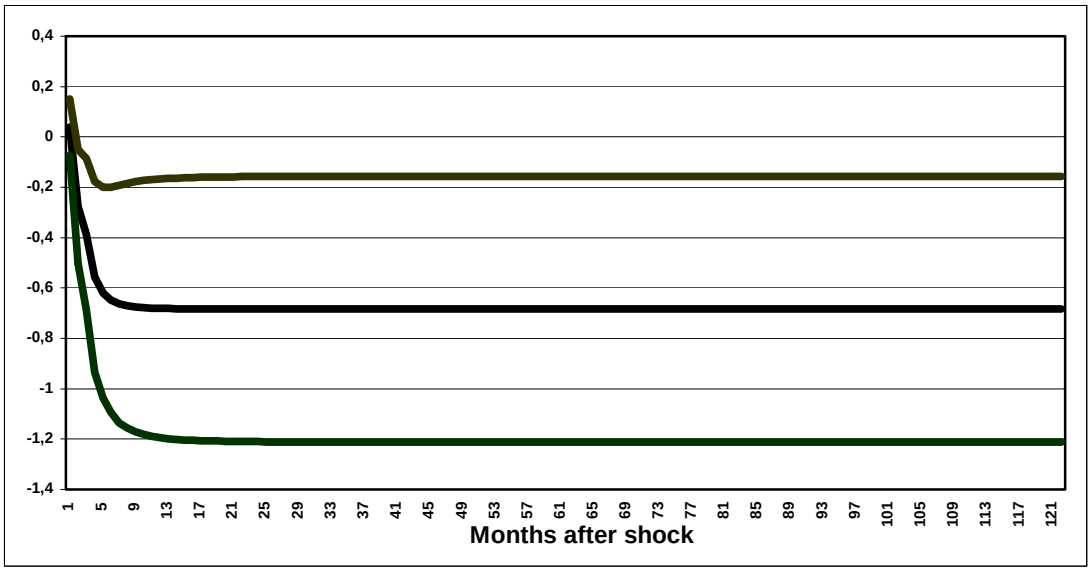
[28] CDB (bank deposit certificates) rates were used as borrowing rates and an average of rates for firms and consumers was used as lending rates.

[29] An alternative maximum likelihood method is also possible and theoretically more efficient, but the gains in precision are small and the estimation costs are substantially high. See Bernanke, Boivin and Eliasz (2005).

the mean value was estimated by a Monte Carlo simulation of the model, with estimated variances for the coefficients. The results of the impulses that indicates the dynamic impact of a shock in the expected performance of state owned banks on the spread rate is presented in figure 1.

The results in figure 1 indicate that the exercise pursued in this subsection gives support to one of the main hypotheses of the paper. The point estimation of the impact of a fall in the perspective of profit by state owned banks increases the interest rate spread in the economy. Although this impact is not immediately observed in the short run, it is strong and robust in the long run.

Figure 1
Dynamic impact on the interest rate spread of an autonomous innovation to the expected return of state owned banks



5. Concluding remarks and Policy implications

The empirical literature on the state ownership of banks have stressed that it can reduce growth and financial development, as it tends to reduce the relationship between credit and GDP. Theoretical developments that explain the relatively low efficiency of public companies is the most common argument to elucidate such empirical conclusion. This paper offers a theoretical model that can enlighten this causality, relying on other mechanisms, although the intention is neither to refute the alternative explanations nor to claim that the two together are the only sources of such relationship.

The reliance on state owned banks to carry part of the costs of public policies can boost the interest rate spreads and profitability of private banks, leading to less credit and less investment than would be possible, otherwise. This jeopardizes long-term economic growth and can even promote income concentration in the hands of the richest agents. These are consequences of public policies that are normally seen as unpleasant. Therefore, the final impact of state ownership of banks can be the reverse of the initial goals.

This major hypothesis was split into two parts, both stressing the consequences of state ownership and the reliance of governments on the state controlled banks to bear part of the costs of public policies. The first part stresses the impact of such ownership on profit of privately owned banks. The second part stresses the impact of such ownership and inefficiency on the prevailing interest rates spreads. Both hypotheses, which emerge from the economic model forwarded above, were tested empirically, using time series and cross section data.

All tests of these hypotheses gave strong support to them. The one that relied on the efficient market hypothesis and built on time series data for Brazilian banks concluded that the shares of most privately owned banks quoted in the Brazilian major stock exchange (BOVESPA) respond negatively to an increase in the expected return of the shares of SOBs. This is an indication that profits of POBs increases when government imposes a higher burden of costs of public policies to SOBs and consequently harms their expected profitability.

A cross section of data for a large set of countries in the world also indicated that the higher the share of SOBs on the total assets of banks, the higher tend to be the interest rate spread in that country. If it is assumed that the higher the share of SOBs, the more the governments tend to rely on them to bear the costs of public policies, it is reasonable that this is also a support of the major hypotheses of this paper, in this case its second part, which relates the burden of public policies and the interest rate spreads.

A second test of this hypothesis that higher burden of public policies on SOBs and banking spreads was also pursued. A factor augmented vector auto-regression (FAVAR) model was estimated for Brazilian data, including interest rates spreads, expected rates of return of privately owned banks and state owned banks. The results indicated that an autonomous shock to the expected return of SOBs has a negative and persistent impact on the interest rates spreads. This means that whenever governments push costs of public policies to SOBs and their expected profitability falls, interest rate spreads rises.

Although simple, the major hypotheses of this paper have important policy implications. First of all, they have indicated that state owned banks should not be used as an instrument to subsidize the operational mechanisms of some public policies, as it often happens in Latin American countries, for example. This could penalize the whole economy with higher interest rates for the borrowers and generates higher than necessary spreads. High spreads may cause unnecessary liquidity restraints to the public and to the non-banking private sector, having a negative impact on domestic economic activity.

The best practice toward state owned banks is to avoid carrying the policies directly through them, without public competition and any directly indication of actual costs of these policies for these banks. All the demand for banking services of public policies should be object of a public competition, in which both privately and public

owned banks have equal opportunity to compete. The resulting costs of the banking services demanded by these policies should be disbursed by the government, as an additional cost of the policy. The profits accruing to the Government from the state owned banks can be part of the resources it can rely upon to expand its policies, but both the costs of the policies and the profits generated by SOB must be part of the public budget, one in the income side and the other one in the expenditures side. Implicit compensations, avoiding this way through the public budget, can hurt the whole society with higher interest rates than is necessary.

Another important policy implication is that the Government should be very careful when negotiating salaries with workers of the state owned banks. An excessive generosity may have non-marginal impact on the whole economy, as it will increase the interest rate through its impact on the spread charged by banks. A tentative to attract the sympathy of banking workers can have a high social cost. Therefore, the idea of having a collective negotiation in which privately owned banks and public owned banks negotiate the salaries jointly and the private sector representatives take the lead on negotiations, with the government being a mere follower, is the best strategy to avoid damaging the whole society because of particular sectorial interests.

Appendix A: generation of price index for the banking sector

Following Blanchard and Kiyotaki (1987), it is possible to define a demand function for the whole banking sector as:

$$Y = BP^{-\eta} \tag{A1}$$

Where Y is an index for the output of the whole sector, P is the sectorial price index and η is a parameter. By normalization, the price index for the other goods and services demanded by consumers was made equal to one. By definition:

$$\ln Y = \frac{1}{m' + a'} \sum_{i=1}^{a'} \ln Y_{Si} + \frac{1}{m' + a'} \sum_{i=1}^{m'} \ln Y_{Pi} \tag{A2}$$

Where the output index is a geometric average of individual banks outputs, which appears divided between the two major categories in equation (A2), state owned banks, with subscript S, and privately owned banks, with subscript P. By assumption, there are a´ SOBs and m´ POBs in this economy.

By assumption, the output of all POBs will be made equal and, in the same way, the output of all SOBs will also be made equal. Therefore:

$$\ln Y = a \ln Y_S + m \ln Y_P \tag{A3}$$

Where:

$$a = \frac{a'}{a' + m'} \qquad\qquad m = \frac{m'}{a' + m'}$$

Substituting equation (1) from the main text, it is possible to get:

$$\ln Y = a \ln B_S - a\eta \ln P_S + a\eta\delta \ln P + m \ln B_P - m\eta \ln P_P + m\eta\delta \ln P \qquad \text{(A4)}$$

Given equations (A1) and (A4), it is possible to define:

$$B = B_S^a B_P^m$$

In the same way, (A1) and (A4) together yields:

$$P = P_S^{\frac{a}{1+(a+m)\delta}} P_P^{\frac{m}{1+(a+m)\delta}} \qquad \text{(A5)}$$

That is exactly equation (2) on the main text.

Appendix B: Description of variables included in the empirical tests

The variables used in the regressions of this paper are better defined here, including their sources. The description and source of the data for each variable appear on table 6.

Table 6
Variables description and their data sources

Variable	Description	Source
Bradesco	First difference of the natural logarithm of the monthly average stock prices of BRADESCO, incorporating all distribution of dividends in the amount to which the price is calculated. Data defined for january, 1994 to february 2004.	Economatica
Alpha	First difference of the natural logarithm of the monthly average stock prices of Alpha, incorporating all distribution of dividends in the amount to which the price is calculated. Data defined for january, 1994 to february 2004.	Economatica
Itaú	First difference of the natural logarithm of the monthly average stock prices of Itaú, incorporating all distribution of dividends in the amount to which the price is calculated. Data defined for january, 1994 to february 2004.	Economatica
Mercantil	First difference of the natural logarithm of the monthly average stock prices of Mercantil, incorporating all distribution of dividends in the amount to which the price is calculated. Data defined for january, 1994 to february 2004.	Economatica
Unibanco	First difference of the natural logarithm of the monthly average stock prices of Unibano, incorporating all distribution of dividends in the amount to which the price is calculated. Data defined for january, 1994 to february 2004.	Economatica
Banco do Nordeste	First difference of the natural logarithm of the monthly average stock prices of Banco do Nordeste do Brasil, incorporating all distribution of dividends in the amount to which the price is calculated. Data defined for january, 1994 to february 2004.	Economatica
Banco do Brasil	First difference of the natural logarithm of the monthly average stock prices of Banco do Brasil, incorporating all distribution of dividends in the amount to which the price is calculated. Data defined for january, 1994 to february	Economatica

	2004.	
BASA	First difference of the natural logarithm of the monthly average stock prices of Banco da Amazônia SA, incorporating all distribution of dividends in the amount to which the price is calculated. Data defined for january, 1994 to february 2004.	Economatica
IBOVESPA	Index of Bovespa, Brazilian major stock exchange. Data defined for january, 1994 to february 2004.	Economatica
Interbank Certificate Deposits	Average rate of interest for CDB, 30 days. Data defined for january, 1994 to february 2004.	Central Bank of Brasil.
US dollars in Brazilian currency	Exchange rate of Reais (Brazilian currency) to US dollars. Measured in Brazilian currency R$. Data defined for january, 1994 to february 2004.	Central Bank of Brasil.
LIBOR	London Interbank Borrowing Rate. Data defined for january, 1994 to february 2004.	Economatica
Dow Jones index	Major index of US Stock market. Data defined for january, 1994 to february 2004.	Economatica
Nasdaq index	Index of NASDAQ, US stock market. Data defined for january, 1994 to february 2004.	Economatica
US Federal discount rate	FED rate. Data defined for january, 1994 to february 2004.	Economatica
R_B	Estimated rate of return for banks whose stocks are quoted in Bovespa. Data defined for january, 1994 to february 2004.	Generated by the author through principal components method.
R_S	Estimated rate of return for state owned banks whose stocks are quoted in Bovespa. Data defined for january, 1994 to february 2004.	Generated by the author through principal components method.
R_P	Estimated rate of return for privatelyowned banks whose stocks are quoted in Bovespa. Data defined for january, 1994 to february 2004.	Generated by the author through principal components method.
P_S	Variable generated as integration of R_S.	Generated through integration of R_S.
P_P	Variable generated as integration of R_P.	Generated through integration of R_P.
S	Interest rate bank spread, which was calculated as the difference between lending and borrowing rates for the banks. CDB was taken as borrowing rates and average banking rates for firms and consumers were taken as the lending rate. Data available for july, 1994 to february, 2004.	Central Bank of Brazil

Appendix C: Unit root and co-integration tests for variables included in the FAVAR

The Factor Augmented Vector Auto-regression included three variables, which are the monthly rates of return of state owned banks (R_{St}) and privately owned banks (R_{Pt}) and monthly changes in the natural logarithm of the interest rate spreads (ΔS_t). These variables were taken to be the first differences P_{St}, P_{Pt} and S_t, respectively. A first set of tests to determine the proper specification of the FAVAR was for the existence

of unit roots in all these variables, including R_{St}, R_{Pt}, ΔS_t, P_{St}, P_{Pt} and S_t. These tests followed the methodology suggested by Phillips (2001), which included a combination of traditional unit root tests and KPSS test. The results appear in table 6.

The ADF test is the augmented Dickey and Fuller (1979) test which includes a trend and the lag length is chosen by Schwartz Criteria. All the lags length determined were zero, for all tests reported in table 6. Phillips-Perron tests are the tests of Phillips and Perron (1988), which also include a time trend and the bandwidth is determined by Newey and West (1987) using Bartlett Kernel. The null hypothesis in both these tests is that the series has a unitary root. The KPSS test is the Kwiatkowski, Phillips, Schmidt and Shin (1992) test that includes a time trend. The bandwidth also relied in Newey and West using Bartlett kernel. Its null hypothesis is that the series does not have a unit root. Table 7 brings the bandwidth truncation parameter selected for each of these tests.

Table 6
Unit root tests of the variables included in the FAVAR

Test	P_{Pt}	P_{St}	S_t	R_{Pt}	R_{St}	ΔS_t
ADF	-2.784695	-2.680092	-1.291065	-8.1378***	-8.7266***	-10.7186***
Phillips-Perron	-2.939635	-2.904343	-1.454564	-8.1305***	-8.6844***	-10.7508***
KPSS	0.206478**	0.211894**	0.204249**	0.0651	0.0558	0.0605

Notes: * is significance at 10%, ** indicates significance at 5% and *** indicates significance at 1%.

Table 7
Bandwidth truncation parameters used in each test

Test	P_{Pt}	P_{St}	S_t	R_{Pt}	R_{St}	ΔS_t
ADF	0	0	0	0	0	0
Phillips-Perron	6	4	3	1	5	3
KPSS	9	9	9	5	3	2

The tests clearly indicate that all the variables in level, P_{St}, P_{Pt} and S_t, have a unit root, while all the variables in first difference of the natural logarithm, R_{St}, R_{Pt}, ΔS_t, do not have a unit root. Therefore, estimation of the FAVAR with all the variables in first difference yields consistent estimated parameters.

Johansen (1995) tests for co-integration of the three variables P_{St}, P_{Pt} and S_t, were also made. The model included a constant and no time trend. The trace and maximum eigenvalue statistics were estimated. The results appear in table 8. Both tests indicate that the null hypothesis of no co-integrating vectors is rejected at 10% significance level. Taken this result as a proper feature of the data generation process, there is an error correction mechanism, such as the one relied on section 4.3 to represent the model. This was the estimated model.

Table 8
Results of the Johansen's co-integration trace and maximum eigenvalue tests

Hypothesized number of cointegrating vectors	Eigenvalue	Trace statistics	Maximum Eigenvalue statistics	10% critical value for trace statistics	10% critical value for maximum eigenvalue statistics
None	0.166071	33.52675	20.15835	0	0
At most 1	0.073427	13.36840	8.465167	0	0
At most 2	0.043212	4.903235	4.903235	0	0

Note: Statistics bigger than critical value rejects the hypothesis of at most the number of co-integrating vectors indicated in the first column.

Appendix D: Estimated equations of the FAVAR

The FAVAR model relied on the estimation of four equations. The estimated parameters and statistics for these equations appear in tables 9 to 12.

Table 9

Dependent Variable: Index of stocks of State Owned Banks

Variable	Coefficient	T-Statistic	Significant
Constant	1,2180	1,4347	0,1541
Value index of privately owned banks	0,5067	15,1653	0,0000
Natural logarithm of interest rate spread	-0,0494	-0,3217	0,7483
R^2	0,9238		
Durbin-Watson	0,1438		

Table 10

Dependent Variable: First difference of natural logarithm of interest rate spreads (Spread)

Variable	Coefficient	T-Statistic	Significant
Constant	-0,0181	-1,4911	0,1359
Spread with one lag	-0,2566	-2,9557	0,0031
Spread with two lags	0,1555	1,8799	0,0601
Spread with three lags	0,1493	2,1010	0,0356
Rate of return of privately owned banks	-0,0289	-0,4142	0,6787
Rate of return of privately owned banks with one lag	-0,1609	-3,0393	0,0024
Rate of return of privately owned banks with two lags	-0,0239	-0,5108	0,6095
Rate of return of privately owned banks with three lags	-0,0431	-1,0625	0,2880
Rate of return of state owned banks	0,0945	1,1673	0,2431
Rate of return of state owned banks with one lag	-0,0411	-0,8366	0,4028
Rate of return of state owned banks with two lags	-0,0409	-0,7724	0,4399
Rate of return of state owned banks with three lags	-0,0095	-0,2866	0,7744
Co-integrated variable	0,0080	0,4666	0,6408
Dummies for outliers 01/1996; 02/1996; 11/1997; 04/1999; 08/2001; 06/2002 and 09/2003	Yes		
Seasonal Dummies	Yes		
R^2	0,7009		
Durbin-Watson	1,9658		

Table 11

Dependent Variable: Rate of return of privately owned banks (POB)

Variable	Coefficient	T-Statistic	Significant

Constant	0,0312	1,3971	0,1624
First difference of natural logarithm of interest rate spread	-1,0770	-2,4429	0,0146
Spread with one lag	0,0162	0,0751	0,9401
Spread with two lags	0,2852	1,5976	0,1101
Rate of return of privately owned banks with one lag	-0,1183	-1,0141	0,3105
Rate of return of privately owned banks with two lags	-0,1728	-1,5649	0,1176
Rate of return of state owned banks	0,9152	8,1403	0,0000
Rate of return of state owned banks with one lag	-0,0331	-0,2948	0,7682
Rate of return of state owned banks with two lags	0,1383	1,3620	0,1732
Co-integrated variable	0,0986	2,9864	0,0028
Seasonal Dummies	Yes		
R^2	0,6867		
Durbin-Watson	1,9919		

Table 12
Dependent Variable: Rate of return of State Owned Banks (SOB)

Variable	Coefficient	T-Statistic	Significant
Constant	-0,0130	-0,5666	0,5710
First difference of natural logarithm of interest rate spread	0,5526	1,7152	0,0863
Spread with one lag	0,1264	0,5131	0,6079
Spread with two lags	-0,1330	-0,8505	0,3950
Rate of return of privately owned banks	0,7758	10,0332	0,0000
Rate of return of privately owned banks with one lag	0,0537	0,5982	0,5497
Rate of return of privately owned banks with two lags	0,1766	1,8012	0,0717
Rate of return of state owned banks with one lag	0,1105	1,4190	0,1559
Rate of return of state owned banks with two lags	-0,1353	-1,3504	0,1769
Co-integrated variable	-0,0942	-3,6246	0,0003
Seasonal Dummies	Yes		
R2	0,7501		
Durbin-Watson	1,9805		

Appendix E: Other dynamic impacts from the FAVAR

Other dynamic impacts could also be estimated from the FAVAR, in addition to the one reported in figure 1. These dynamic impacts are for shocks of one standard deviation of each of them. They appear in figures 2 to 9, together with a one standard deviation of the shck, added and subtracted from point estimator. As in the text, these standard deviations were calculated through simulations with 5000 replications. A first result is that all shocks in this model have some persistence on the variables through which they enter the model. It is curious to observe that autonomous shocks to interest rate spreads do not have a clearly identifiable impact on the prices of shares of both state owned and privately owned banks. Shocks on interest rates spreads could com, for example, from expected higher default rates on loans. This normally tends to lead to a fall on expected profitability of banks. Nevertheless, as they can offset such shocks through higher interest rate spreads, the final impact tend to be marginal and they do not appear significantly different from zero in our estimations.

Figure 5 indicates that when banks become more efficient, there is a sensible long term fall in interest rates spreads, which seems to be significantly different from

zero. This would be an expected result. It is also possible to see that autonomous positive shocks to P_{Pt}, such as improvements in their technology, falls in taxes on financial transactions or rises in demand for financial services, have a positive impact on P_{St}. As most of these shocks are indistinctively extended to state owned banks too, they are able to enhance their profitability, justifying such results.

Figure 8 indicates that the shocks on P_{St} can be of two natures. They can arise from autonomous changes in policy burdens or productivity rises. Both shocks have similar impact on interest rate spreads and on P_{St} itself. Nevertheless, they have different impact on P_{Pt}. Productivity shocks tend to be imitated and as such have a positive impact on P_{Pt}, while policy shocks tend to have a negative impact on this same variable. The former shocks prevail in the period of estimations and consequently, the positive impact prevails.

Figure 2
The impact of a shock to spread on itself

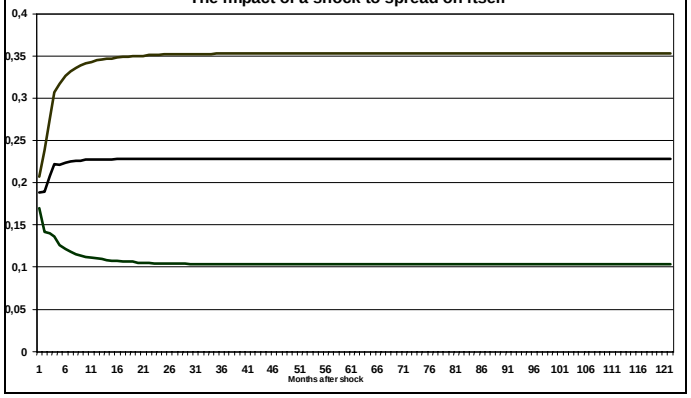


Figure 3
The impact of a shock to spread on P_{Pt}

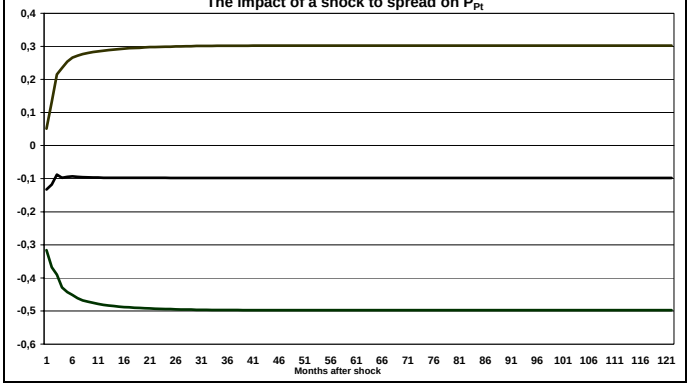


Figure 4
The impact of a shock to spread on P_{St}

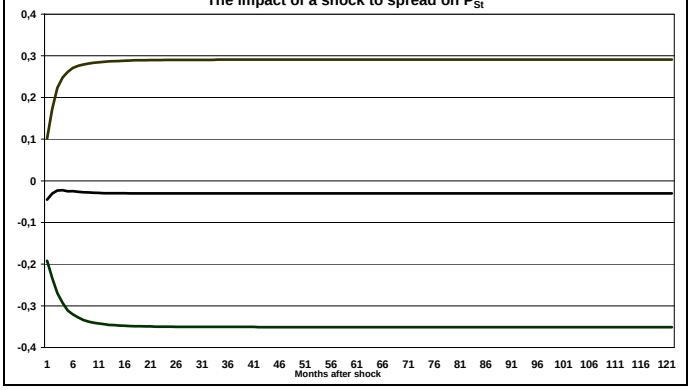


Figure 5
The impact of a shock to P_{Pt} on spread

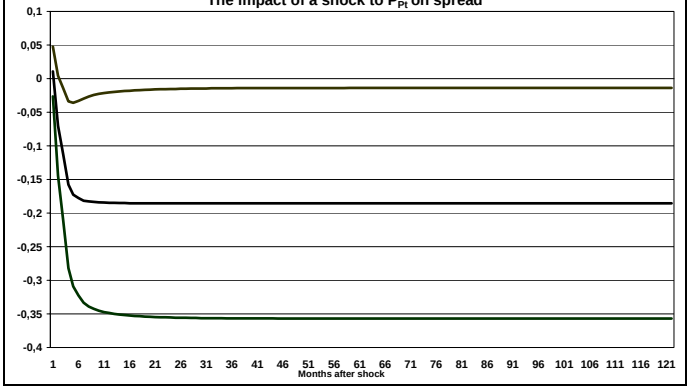


Figure 6
The impact of a shock to P_{Pt} on itself

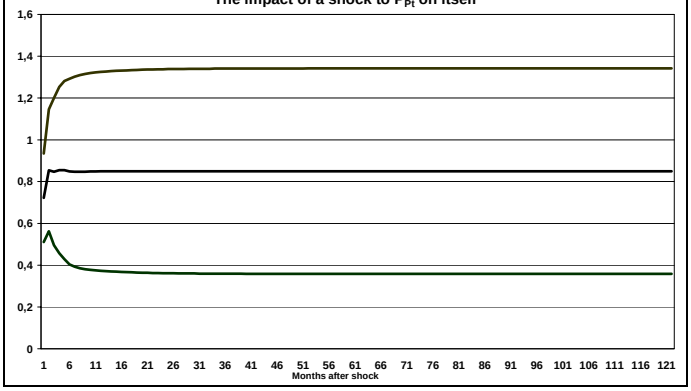


Figure 7
The impact of a shock to P_{Pt} on P_{St}

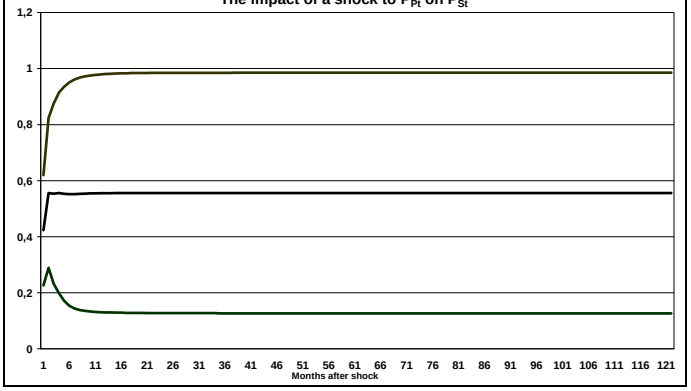


Figure 8
The impact of a shock to P_{St} on P_{Pt}

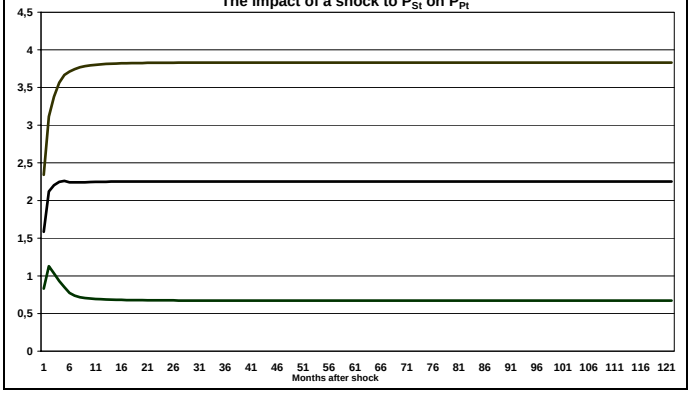
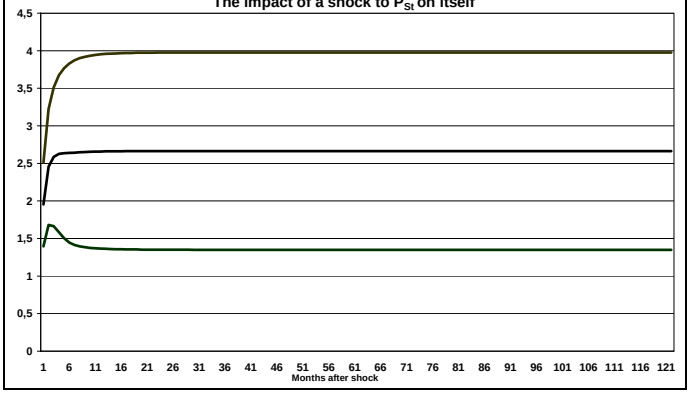


Figure 9
The impact of a shock to P_{St} on itself



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