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Returns on the federal public banks versus the opportunity cost of funds invested by the National Treasury

Retorno de los bancos públicos federales versus el costo de oportunidad de los recursos invertidos por el Tesoro Nacional

Retorno dos bancos públicos federais versus custo de oportunidade dos recursos investidos pelo Tesouro Nacional

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Abstract

Objective: The aim of this study is to assess whether the yields earned by the federal public banks remunerate the National Treasury to a enough degree, to cover the opportunity cost of the capital invested by the Federal Government, which is defined as the benchmark Selic base interest rate.

Methodology: This involved using four different metrics for the return on economic capital invested by the Treasury, on the basis of the balance sheets of the Banco do Brasil (BB), Caixa Econômica Federal (CEF), Banco Nacional do Desenvolvimento Econômico e Social (BNDES) [National Bank of Economic and Social Development], Banco do Nordeste do Brasil (BNB) and Banco da Amazônia (BASA), from 2002 to 2018.

Results: The empirical comparison of parametric and nonparametric tests revealed that, on the whole, the federal public banks offered economic returns that were higher than the fundraising costs of the National Treasury. On the other hand, when examined individually, the results were as follows: i) the BB and CEF, that have retailing practices, achieve results that are consistently better than Selic; ii) despite their higher nominal returns, BNDES and BNB, did not record a statistically significant difference; and iii) BASA recorded returns that were lower than the opportunity cost.

Contributions made by this study: The results of this study have led to a better understanding of the relations between the National Treasury, and public financial institutions, with the reservation that they are not restricted to the economic/financial factors of this relationship and do not cover making inferences or dimensional testing such as efficiency or priority claims in the application of public funds.

Keywords: Public Banks; Federal Banks; Cost of debt; National Treasury; Bank Yield.

Resumen

Objetivo: El objetivo de este estudio fue evaluar si los rendimientos obtenidos por los bancos públicos federales remuneran al Tesoro Nacional en una proporción suficiente o no para cubrir el costo de oportunidad del capital invertido por el Gobierno Federal, definido como la tasa de interés básica de la economía, Selic.

Metodología: Para esto, se utilizaron cuatro métricas diferentes de rendimiento económico del capital invertido por el Tesoro, en base a los estados del Banco do Brasil (BB), Caixa Econômica Federal (CEF), Banco Nacional do Desenvolvimento Econômico e Social (BNDES), Banco do Nordeste do Brasil (BNB) y Banco da Amazonas (BASA), de 2002 a 2018.

Resultados: Las pruebas empíricas paramétricas y no paramétricas revelaron que los bancos públicos federales en su conjunto ofrecen rendimientos económicos que son más altos que los costos de recaudación de fondos del Tesoro Nacional. Por otro lado, cuando se observa individualmente: BB y CEF, que tienen operaciones minoristas, superan constantemente la Selic; BNDES y BNB, a pesar de los rendimientos nominales más altos, no registran diferencias estadísticamente significativas; y los registros de BASA son más bajos que el costo de oportunidad.

Contribuciones del Estudio: Los resultados de este estudio contribuyen a una mejor comprensión de la relación entre el Tesoro Nacional y las instituciones financieras públicas, con la excepción de estar restringidos a los aspectos económicos y financieros de esta relación, sin incluir inferencias o exámenes dimensionales como la eficiencia o la efectividad. prioridades en el uso de los recursos públicos.

Palabras clave: Bancos públicos; Bancos federales; Costo de la deuda; Tesoro Nacional Regreso de los bancos.

Resumo

Objetivo: O objetivo deste estudo foi avaliar se os retornos auferidos pelos bancos públicos federais remuneram o Tesouro Nacional em proporção suficiente ou não para cobrir o custo de oportunidade do capital investido pelo governo Federal, definida como a taxa básica de juros da economia, a Selic.

Metodologia: Para isso, foram utilizadas quatro diferentes métricas de retorno econômico do capital investido pelo Tesouro, tendo por base as demonstrações do Banco do Brasil (BB), Caixa Econômica Federal (CEF), Banco Nacional do Desenvolvimento Econômico e Social (BNDES), Banco do Nordeste do Brasil (BNB) e Banco da Amazônia (BASA), de 2002 a 2018.

Resultados: Os testes empíricos paramétricos e não paramétricos revelaram que os bancos públicos federais, no conjunto, oferecem retornos econômicos superiores aos custos de captação de recursos do Tesouro Nacional. Por outro lado, quando observados individualmente: BB e CEF, que possuem atuação de varejo, oferecem resultados consistentemente superiores à Selic; BNDES e BNB, apesar de retorno nominais superiores, não registram diferença estatisticamente relevantes; e BASA registra retornos inferiores ao custo de oportunidade.

Contribuições do Estudo: Os resultados deste estudo contribuem para a melhor compreensão das relações entre o Tesouro Nacional e as instituições financeiras públicas, com a ressalva de restringir-se aos aspectos econômico-financeiros dessa relação, não contemplando inferências ou exames de dimensões como eficiência ou prioridades na aplicação de recursos públicos.

Palavras-chave: Bancos Públicos; Bancos Federais; Custo da dívida; Tesouro Nacional; Retorno dos Bancos.

1 Introduction

The activities carried out by financial institutions are essential for the functioning of the economy because when laying down the conditions (and volume) of credit supply, they define the creation and loss of the purchasing power of economic entities for the acquisition of capital goods, and allow the independence and accumulation of capital (Paula, 1999; Mishkin & Eakins, 2015).

The banks are of great importance in the development of countries because of their ability to channel the funds of savers to productive sectors but this practice can vary depending on how far these entities are controlled. Following the aims of their controllers, private banks tend to allocate more funds to certains sectors and avoid benefiting sectors that they regard as

less profitable (Hirakawa, 2008). In contrast, largely through its control of development banks, the State finances investment projects that the private sector is not interested in supporting, either because of the degree of risk involved or the low expectation of return (Torres Filho, 2006).

Thus the role of public banks goes beyond economic goals and involves social and regulatory objectives. Hirakawa (2008) argues that the existence of public financial institutions is justified by financial and credit market imperfections. These shortcomings can be attributed to the priority given by the private institutions to maximizing profits and which by acting in this way, abandon niche markets that are not economically attractive. Costa (2015) believes that the public banks fill the gaps left by the private banks in a financial intermediation, by allocating resources derived from social funds to the sectors most in need. As well as this, according to Hermann (2010), it is feasible for public banks, by virtue of their financial autonomy - in particular those concerned with development – to be able to implement development policies which budgetary constraints prevent governments from treating as a matter of priority.

Although there is a degree of consensus about this distinct role of public banks, there is still a good deal of debate about whether it is suitable for the public authorities to invest in public financial institutions, owing to funding restrictions on the part of the Treasury and the possible questions that might be raised about the degree of efficiency of these entities. Mian (2003), for example, obtained evidence to show that, in terms of general profitability, the public banks in emerging markets have a poorer performance than the private banks, even when the cost of raising funds is often lower.

Questions of this kind have provoked discussions about the performance of these institutions when under the control of the government and led to debates about the benefits and drawbacks of privatizing these entities. Although they cater for market niches where private enterprise cannot operate effectively, the defenders of privatizing these entities believe that there will always be discussions about the likely inefficiency and high cost of the State funding used in the capitalization of the public banks – since in the scenarios characterized by public sector debt, the funds supplied by the Treasury originate from debt securities together with the issuing of government bonds.

Against this background, the purpose of this study is to answer the following question: **do the economic yields accrued by the federal public banks remunerate the National Treasury at a sufficient level to cover the opportunity cost of the capital invested, when represented by the cost of the debt burden**? In light of this, use will be made of the data obtained from the annual financial balance sheets of the following public federal banks – Banco do Brasil (BB), Caixa Econômica Federal (CEF), Banco Nacional do Desenvolvimento Econômico and Social (BNDES), Banco do Nordeste do Brasil (BNB) and Banco da Amazônia (BASA) – from 2002 to 2018. A comparative analysis will be conducted of the return measures of these entities, together with the cost of the federal public debt burden.

The results of this study can lead to a better understanding of the relations between the National Treasury and the public financial institutions, although it should be noted that they are restricted to the financial/economic aspects of this relationship and do not cover making inferences or dimensional testing such as efficiency or priority claims in the application for public funding. In addition, the study highlights how economic/financial indicators can be used for investment assessment, which is evidence of the value of accounting information systems.

2 Review of the Literature

2.1 Public Bank Practices

When the existence of public banks and the way they act is the object of discussion, they generally involve conceptions of economic models. Hermann (2011) points out that the operations of public banks often begin in incomplete financial markets with problems over regulations and a lack of particular operational sectors. As Stiglitz (1993) makes clear, the capital markets in less developed economies, are still in their early stages and very often there is a complete lack of a stock market. Thus a successful way of confronting these problems would be to rely on the practices of public banks as auxiliary agents of the political economy and a means of making credit and capital markets viable in adverse institutional environments. (Pinheiro & Oliveira Filho, 2007).

Public banks have thus emerged to foster economic development, fill the gaps in the economy that have resulted from the failings of the market and cater for markets which are not attractive to private banks and lead to inclusive banking. Gregório (2005) cites as an example, the practices of the Caixa Econômica Federal and Banco do Brasil, which are strictly subordinated to the goals of the Federal Government and are used to ensure that policies for housing or assisting rural areas are made viable, even though these operations often incur financial losses.

As well as filling in the gaps that can be found in the market, Martins, Bortoluzzo and Lazzarini (2014) argue that the public banks also exert an influence on the behavior of the private banks and adopt practices that are more purely competitive than their private enterprise rivals through more aggressive policies involving cuts in interest rates. On the basis of information from the Inter-American Development Bank, Martins, Bortoluzzo and Lazzarini (2014) drew attention to the fact that the public banks encourage competition in the financial markets by adopting policies that can address their failings, particularly when this concerns poor regulatory agents and weak financial systems.

Finally, Hermann (2010) summarizes the performance of these State-controlled entities by highlighting some of the guiding principles that shape the practices of public banks: i) the provision of credit to sectors that are neglected by the private sector and the adoption of strategies for their development; ii) ensuring premium companies with an acceptable level of risk maintain their loan portfolio as a means of protecting their asset quality; iii) setting better credit conditions than those established by the private institutions, as a means of inducing them to operate within the limits of financial intermediation without inhibiting investment; and iv) establishing a framework for supported *funding*, mainly in fiscal funds, in-house resources and loans from international development agencies.

2.2 The Profitability of Public Banks

Public banks act in a unique way by striking a balance between offering profitable services to the institution and responding to the stringent requirements of the government for remedying the shortcoming of the market. In the opinion of Yeyati, Micco and Panizza (2004), the low profitability of public banks can be explained by the stabilizing of consumption during periods of crisis and their involvement in projects where there is a high rate of social return but which are not very profitable.

Apart from the fact that they are involved in social projects and stabilizing the market, the low efficiency of public banks, can also be due to a lack of incentives. Bartel and Harrison

(2005) state that the low efficiency of public companies can be caused by the agency problem and is owing to the low degree of surveillance by the government and the environment in which they operate, which is generally that of a state monopoly, as well as the fact that the budgetary constraints are less strict since they are always liable to restructuring in the event of insolvency.

La Porta, Lopez and Shleifer (2002) concluded that the procedures followed by the government to control the banks, politicize the way funds are allocated and reduce the efficiency of the banking institutions. The government´s ownership of the banks slows down the financial and economic measures, especially with regard to poor countries.

As Silva and Jorge Neto (2002) point out, public banks in Brazil have high administrative costs because they have a large number of employees who earn high salaries and also include agencies that are maintained by political influence or are designed to meet the needs of communities that are a long way from the urban centers. It is for this reason that they prove to be less effective than the private banks. In addition, after comparing the performance of public and private banks (both domestic and foreign), Micco, Panizza and Yanez (2007) conclude that in developing countries, public banks have a lower rate of profitability than private institutions, and there is a sharper rise in this difference during an electoral year.

Following a different approach, Campos (2002) conducted a regression analysis to determine the degree of efficiency of Brazilian banks and with regard to technical efficiency, found that the public banks were the most efficient, followed by foreign banks and then private banks. In addition, Martins, Bortoluzzo and Lazzarini (2014) concluded that the public banks were able to keep prices lower and exert power over the Market, in spite of their inherent operational inefficiency

2.3 Opportunity cost of an investment in Federal Public Banks

A key factor in any investment is the cost and alternative opportunities for investing the funds. Martins (2003) thinks that the opportunity cost is the highest value that must be sacrificed in order to obtain one alternative rather than another. Beuren (1993), looks at the opportunity cost from another standpoint and states that it does not only depend on the user who is making use of the funds. In her view, the opportunity cost is the best alternative use of the resource within the market-place. Thus the value of the opportunity cost is obtained by making comparisons in the market and shows the result that could have been obtained if the funds had been allocated for an alternative purpose.

From the perspective of public management, estimating the opportunity cost is essential to determine the economic and social feasibility of a service. According to Alonso (1999), this requires the federal public management to measure the results and define the costs so that the State can have a greater control over expenditure and assess the quality.

In light of this, a benchmark must be defined to calculate the rate of return achieved by the public banks, while taking account of the funds allocated by the Treasury to these entities. It is important to determine the reason for raising the funds when establishing this parameter. Given the fact that there is a public budget deficit in Brazil, the Treasury must raise funds in the market by selling debt securities which use the basic interest rates of the economy (Selic) as a benchmark for a fixed remuneration, and is set by the Monetary Policy Committee (Copom). Thus, although not all the securities are paid at the Selic rate– there are fixed-income securities and others with post-fixed rate remuneration clauses that are index-linked to rates of inflation – for example, the basic interest rates are the key benchmark for estimating the cost of the burden of public debt. In view of this dynamic, when estimating the return on investment

from the Treasury in the public banks, it is natural to have the parameter of Selic as a *proxy* for the cost of money.

As well as acting as a dynamic for public sector indebtedness, the use of Selic as a benchmark for analyzing the performance of public banks is based on Dantas and Lustosa (2006). These authors argued that when relying on basic interest rates to estimate the degree of profitability of the Brazilian financial institutions, this is linked to the operations of the Brazilian financial system and can serve as a parameter of performance.

2.4 Testing the Research Hypotheses

As mentioned earlier, there are divergences in the literature concerning the practices of public banks that involve issues related to the economic model and the investment priorities of the public authorities. With regard to the indicators for efficiency and profitability, there is a degree of consensus among the studies in their comparison of public and private banks.

In the opinion of Oliveira (2009), for example, the public banks have a low level of profitability which can be explained by their involvement in social projects and by their operational positions which are not designed to maximize profits. In a similar way, Araújo and Cintra (2011) state that the public banks usually foster development by providing long-term loans with attractive payment conditions, which is not a course of action that appeals to the private banking sector. Empirical evidence of this, together with supporting arguments are a key feature in the work of La Porta, Lopez and Shleifer (2002), Silva and Jorge Neto (2002), Yeyati, Micco and Panizza (2004), Bartel and Harrison (2005), Micco, Panizza and Yanez (2007), and Vinhado and Silva (2017).

While making the qualification that this study does not seek to compare public and private banks but rather to make an assessment of the entities under State control (and given the fact that there are questions about the degree of efficiency and profitability of the public banks), the following research hypothesis has been formulated:

H_{1A}: *The return on federal public banks for the National Treasury is lower than the cost of the debt burden for the controller, as represented by the Selic interest rate.*

Alternatively, since the Brazilian banking sector has high levels of profitability, as is stressed by Gregório (2005), there is a real chance that even when they show lower returns than the private banks, the profitability attained by the federal public banks would be enough to surpass the basic interest rates of the economy. In the view of Raza & Akram (2011), when comparing the performance of public and private banks in Pakistan, there is evidence to back this up. These assumptions give support to the following research hypothesis:

H_{1B}: *The return of the federal public banks to the National Treasury is higher than the cost of the debt burden for the controller, as represented by the Selic rate.*

These hypotheses are self-exclusionary, or in other words, support one meaning as a necessary means of rejecting another. It is also possible to reject both hypotheses.

3 Methodological Procedures

In this Section, the metrics for the return and opportunity cost of capital are employed to test the research hypotheses H_{1A} and H_{1B} empirically, as well as the parameters of the analysis for specifying the banks (which is the object of the study) and the method used for obtaining the data.

3.1 The Research Strategy and Methodology

When carrying out the empirical tests, the first stage involves measuring the economic return accrued by the National Treasury in the investments made in the public banks. Four return metrics are examined for this.

The first return metric is the *Return on Equity* (ROE), which measures the return on funds employed by shareholders/owners, by means of share purchases and capital contribution, since it is a classic return measurement that is included in assessing investments. Equation (3.1) shows the ROE that is adapted to the participation of the National Treasury:

$$ROEtes_{\ b,t} = \frac{LL_{b,t} * Ptes_{b,t}}{PLmed_{b,t} * \ Ptes_{b,t}} \qquad (3.1)$$

where:
$ROEtes_{b,t}$: is the *return on equity* of bank *b*, in the period *t* relative to the capital invested by the National Treasury.
$LL_{b,t}$: corresponds to the net profit of bank *b*, in the period *t*.
$PLmed_{b,t}$: represents the average net assets of bank *b* between the periods of *t and t-1*.
$Ptes_{b,t}$: is the involvement of the National Treasury in the capital of bank *b*, in the period *t*.

Although the ROE supplies the return on the net profit when compared with the capital employed, it does not take account of asset variations registered in Other Comprehensive Income, that are not carried over in the results of the period. Thus a second return measurement will be used to ascertain how far the return reflects the asset variations of the investments more appropriately, and this entails altering the ROE, by replacing the net profit with the comprehensive income, as shown in Equation (3.2):

$$ROEABRtes_{b,t} = \frac{LA_{b,t} * \ Ptes_{b,t}}{PLmed_{b,t} * \ Ptes_{b,t}} \qquad (3.2)$$

where:
$ROEABRtes_{b,t}$: is the return of bank *b* on the basis of the comprehensive income, in the period *t* relative to the capital invested by the National Treasury.
$LA_{b,t}$: Corresponds to the comprehensive income of bank *b*, in the period *t*.

The (3.1) and (3.2) indicators regard net equity as capital invested in the federal public banks. In the case of the financial institutions designed to fulfill the requirements of regulatory capital, debt instruments are admitted since they include subordination clauses. They are called eligible capital debt instruments, and have all the hallmarks of net equity.

Thus since the relationship between the National Treasury and the public banks is not based entirely on the net equity accounts and the eligible capital debt instruments have features that are the equivalent of equity capital, alternative measures are employed for the (3.1) and (3.2) indicators, and are adjusted to the outcome measures and capital equity for the controller, as expressed in Equations (3.3) and (3.4), respectively.

$$ROEAJtes_{b,t} = \frac{\left(LL_{b,t} * Ptes_{b,t}\right) + RDtes_{b,t}}{(PLmed_{b,t} * Ptes_{b,t}) + IDtes_{b,t}} \qquad (3.3)$$

$$ROEABRAtes_{b,t} = \frac{\left(LA_{b,t} * Ptes_{b,t}\right) + RDtes_{b,t}}{\left(PLmed_{b,t} * Ptes_{b,t}\right) + IDtes_{b,t}} \qquad (3.4)$$

where:

ROEAJtes$_{b\ t}$: is the *return on equity* of bank *b*, in the period *t,* relative to the capital invested by the National Treasury, plus the debt instruments eligible for capital which have the National Treasury as their creditor, as well as the remuneration of these instruments.

ROEABRAJtes$_{b,t}$: is the return of bank *b* on the basis of comprehensive income, in the period *t,* relative to the capital invested by the National Treasury, plus the debt instruments eligible for capital, which have the National Treasury as creditor, as well as the remuneration of these instruments.

RDtes$_{b,t}$: is the remuneration agreed with bank *b* for the granting of loans in the category of debt instruments eligible for capital on the part of the National Treasury.

IDtesmed$_{b,t}$: is the average of the amounts calculated by the National Treasury which are judged to be debt instruments eligible for capital.

3.2 The Opportunity Cost of the Capital invested by the National Treasury

After the return metrics have been defined for the National Treasury in the investments in federal public banks, the next stage is to establish the opportunity cost of the funds allocated by the federal public banks. As discussed in Section 2.3, this cost is defined as the cost of the federal public debt burden, represented for the interest rates of the economy (the Selic rate), as defined by Copom and which serves as a benchmark for the issuing of federal public securities. This rate is determined through the daily capitalization rates that are fixed in period t, and obtained from the headquarters of the Central Bank of Brazil (BCB).

3.3 Analysis of Descriptive and Inferential Statistics

After the return metrics and opportunity cost of the capital invested have been defined, an analysis is conducted of descriptive and inferential statistics. The analysis of the return metrics and opportunity cost will cover the descriptive statistics and allow the data to be summarized through measures of a centralizing tendency leading to dispersion and distribution.

As well as this, the inferential statistics allow the return measures to be compared with the aim of determining whether or not the accrued returns are higher than the cost of the federal public debt burden. This assessment combines tests that include: (i) the group of sample banks and each bank individually; and (ii) the return metrics and opportunity cost for each session (year) of the sampling period.

The mean difference test will be employed to test the research hypotheses of $\boldsymbol{H_{1A}}$ and $\boldsymbol{H_{1B}}$ statistically, by making use of the statistical Student T Test and the non-parametric Wilcoxon signed-rank test. In particular cases, the (3.1) to (3.4) return metrics will be compared with the cost of the public debt burden, defined by Selic.

3.4 Sample and Data Source

The balance sheets of five Brazilian federal public banks were used when carrying out this study – Banco do Brasil (BB), Caixa Econômica Federal (CEF), Banco Nacional do Desenvolvimento Econômico e Social [National Economic and Social Development Bank] (BNDES), Banco do Nordeste (BNB) e Banco da Amazônia (BASA) – in the period from 2002 to 2018.

All the data related to the return indicators were based on the balance sheets cited above, that were obtained directly from the headquaters of the institutions themselves or from the Securities and Exchange Commission. The information about the Selic rate was obtained from the headquarters of the BCB.

4 Analysis of the Results

Empirical tests, based on the methodological procedures defined in Section 3. Were carried out to test the research hypotheses of H_{1A} and H_{1B}, which sought to determine whether or not the returns accrued by the federal public banks remunerated the National Treasury to a sufficient degree to cover the opportunity cost of the capital invested.

The results of these tests are first shown by including the data from the group of banks and following this, for each bank individually.

4.1 The Group of Banks

The first stage of the tests involves determining whether or not the economic return measures reached by the group of five federal banks in the period from 2002 to 2018, offsets the capital cost invested by the National Treasury. Table 1 shows the descriptive statistics of each return metric for the set of entities and Selic interest rates – corresponding to the cost of the federal public debt burden.

Table 1:
Comparison of the economic returns of all banks with the Selic rate - 2002 to 2018

	ROEtes	***ROEABRtes***	***ROEAJtes***	***ROEABRAJtes***	***Selic***
N° observations	84	84	84	84	
Average	0,1750	0,1695	0,1588	0,1534	0,1302
Median	0,1484	0,1556	0,1375	0,1389	0,1204
Maximum	0,3638	0,8358	0,3313	0,6737	0,2347
Minimum	0,0139	-0,1695	0,0139	-0,1695	0,0640
Standard deviation	0,0822	0,1395	0,0730	0,1137	0,0434
Coef. Variation	0,4697	0,8229	0,4595	0,7411	0,3334
P-value	0,0000	0,0066	0,0005	0,0326	
Estatistics ***t***	4,5370	2,5334	3,3989	1,8685	

Where: ***ROEtes*** is the banks' return on equity, relative to the capital invested by the National Treasury; ***ROEABRtes*** corresponds to the banks' return based on comprehensive profit relative to the capital invested by the National Treasury; ***ROEAJtes*** is the banks' return on equity in relation to the capital invested by the National Treasury, plus the eligible capital instruments and their respective returns; ***ROEABRAJtes*** is the banks' return based on comprehensive profit relative to the capital invested by the National Treasury plus the eligible capital instruments and their respective returns; ***Selic*** represents the basic interest rate of the economy, effectively practiced in the analyzed period.

The first assessment criterion is based on the return of net equity. Its choice seeks to demonstrate the return on the allocation of the company shareholders, or in other words, it represents the degree of efficiency shown by the entity in its use of the investments of its owners based on the net profit accrued in the period. It can be noted from the descriptive statistics shown in Table 1, that the *ROEtes* registered by the five federal public banks are, on average, above the Selic interest rate. While the average return on net equity is around 17% p.a., the measures of central tendency of the basic interest rates were about 13% p.a., although the coefficient of variation shows that the *ROEtes* measurements of the banks are more stable over a period of time than the benchmark for remuneration.

Relatively similar results are found by using other return measures for net assets: these take account of the concept of comprehensive income (*ROEABRtes*) rather than net income and adjust the two initial measurements to the effects of the operations with debt instruments of

eligible capital though the federal financial institutions (*ROEAJtes* and *ROEABRAJtes*). In light of the measures of central tendency, it was found that, on average, all these indicators showed values higher than the cost of the federal public debt burden.

However, the coefficients of variation show that the returns based on the comprehensive result (*ROEABRtes* and *ROEABRAJtes*) are more volatile than the return based on net profit (*ROEtes* and *ROEAJtes*). Given the nature of the other comprehensive results – which involve adjusting the fair market value of the instruments classified as available for sale (based on the policy of following the requirements of the IFRS 9 [International Financial Reporting Standards], this classification has ceased to exist), they include the actuarial measures of post-employment benefits, the effects of cash flow hedge, and variations in the exchange rate of foreign investments with a functional currency that is different from a foreign exchange disclosure, among other factors. According to Dantas, Medeiros, Galdi and Costa (2013), among others, this pattern of volatility is, to some extent, natural, as well as proving to be compatible with the management of results based on the use of bonds and transferable securities.

With regard to the return indicators, together with the effects of the debt instruments on eligible capital, this can be explained as being an alternative means of the transfer of long-term treasury bonds to public banks with contract remuneration clauses. The results in Table 1 reveal that in general, the inclusion of the effect of these debt instruments reduces the original return measures – the descriptive statistics of the *ROEAJtes* are lower than those of the *ROEtes* and the *ROEABRAJtes* are lower than the *ROEABRtes*. This shows that the operations that are carried out between the National Treasury and the banks are contracted with lower rates of remuneration than the returns achieved by the banks.

The comparative analysis of these performance indicators with regard to the Selic interest rates, (including the group of federal public banks in the period under study) can be better understood with the aid of Figure 1.

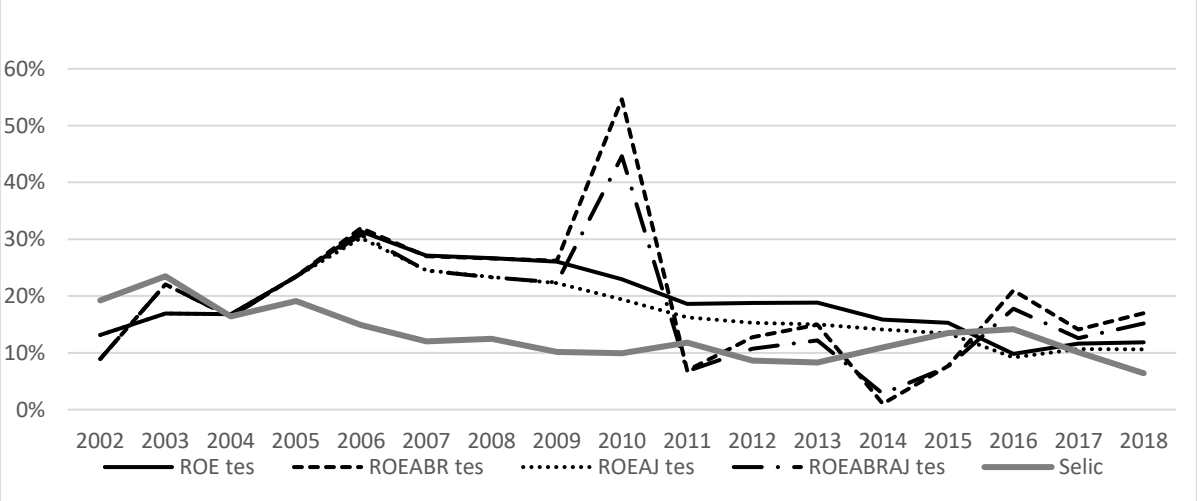

Figure 1: Comparison of economic returns for all banks with the Selic rate - 2002 to 2018

As demonstrated earlier, the *ROEtes* and *ROEAJtes* behaved in a relatively stable way throughout the time, and were generally above the Selic interest rate – it was only on certain occasions (2002, 2003 and 2016), - that were representative periods of political instability and when there was a significant rise in interest rates - that the returns were lower than the cost of the federal public debt burden. The returns which include the comprehensive income

(*ROEABRtes* and *ROEABRAJtes*), in turn proved to be more volatile but were generally above the Selic rate. Hence this pattern of behavior strengthened the evidence that was supplied by the descriptive statistics.

However, there are signs that the return measures of the group of banks are higher than the opportunity cost of the capital invested by the National Treasury. As shown in Table 1, the average difference using the t-test reveals that the return achieved by the federal public banks allows the National Treasury a remuneration that is higher than the cost of the public debt burden, and this difference is statistically significant, regardless of the indicator – *ROEtes*, *ROEABRtes*, *ROEAJtes* or *ROEABRAJtes* – with p-values ranging from 0,0000 to 0.0326. These results refute hypothesis $\boldsymbol{H_{1A}}$ and corroborate $\boldsymbol{H_{1B}}$, when based on the empirical evidence that the returns achieved by the federal public banks surpass the opportunity cost of the assets invested by the Treasury in these institutions – the cost of the federal public debt burden.

4.2 Analysis of Banks

After the tests regarding the group of federal public banks had been completed, additional exams were carried out to assess the returns achieved by each institution when compared with the Selic rate. It was notable, however, that there was a proportional reduction in the number of observations, which is a sign of a restriction with regard to the conclusions. In this case, as well as the average difference using the t-test, the non-parametric Wilcoxon signed-rank test was also conducted, since there were a small number of observations which could distort the condition of normality in the series.

4.2.1 The Banco do Brasil (BB)

The first bank that was analyzed was the Banco do Brasil which involved making a comparison of the descriptive statistics of the return measures with the Selic rate, as shown in the results in Table 2.

Table 2:
Comparison of BB's economic returns with the Selic rate - 2002 to 2018

	ROEtes	***ROEABRtes***	***ROEAJtes***	***ROEABRAJtes***	***Selic***
N° observations	17	17	17	17	
Average	0,2156	0,2033	0,2110	0,1998	0,1302
Median	0,2228	0,2247	0,2224	0,2165	0,1204
Maximum	0,3160	0,3481	0,3160	0,3481	0,2347
Minimum	0,0925	0,0134	0,0870	0,0210	0,0640
Standard deviation	0,0657	0,0976	0,0687	0,0975	0,0434
Coef. Variation	0,3049	0,4800	0,3255	0,4879	0,3334
P-value	0,0001	0,0040	0,0002	0,0048	
Estatistics ***t***	4,8653	3,0269	4,5818	2,9364	
Wilcoxon (crit. Val. 87)	126	96	122	90	

Where: ***ROEtes*** is the banks' return on equity, relative to the capital invested by the National Treasury; ***ROEABRtes*** corresponds to the banks' return based on comprehensive profit relative to the capital invested by the National Treasury; ***ROEAJtes*** is the banks' return on equity in relation to the capital invested by the National Treasury, plus the eligible capital instruments and their respective returns; ***ROEABRAJtes*** is the banks' return based on comprehensive profit relative to the capital invested by the National Treasury plus the eligible capital instruments and their respective returns; ***Selic*** represents the basic interest rate of the economy, effectively practiced in the analyzed period.

According to Table 2, between 2002 and 2018, on average the BB achieved higher economic returns than Selic, regardless of whether the return measure is taken into account. These results, which are the equivalent of those obtained for the group of banks examined in Section 4.1, are consistent with the pattern of behavior of BB, which adheres to the practices of private banks, and even to the condition of an open capital entity. Since the rates of return are higher than the cost of the debt burden, this proves to be statistically significant and corroborates hypothesis $\boldsymbol{H_{1B}}$, to the detriment of $\boldsymbol{H_{1A}}$.

The coefficient of variation, as well as the descriptive statistics regarding the standard of deviation (maximum and minimum), reveal that as in the case of the results for the group of banks, the comprehensive return measures (*ROEABRtes* and *ROEABRAJtes)* fluctuate more over a period of time than those of the *ROEtes* and *ROEAJtes*. This pattern of behavior can be largely attributed to the actuarial gains and losses in the period, recorded as Adjustments to Equity Evaluation.

With regard to the incorporation of the effects of the debt instruments of eligible capital, it was found that there was a reduction of the *ROEtes* and *ROEABRtes*, as determined in the group of banks, but that in the case of BB, this difference is less – whereas in the group it exceeded it by 1.5%; with BB, this effect was approximately 0.5% in the return measures. This shows that the returns achieved by BB are higher than the cost of debts contracted with the Treasury and that they are eligible capital.

4.2.2 Caixa Econômica Federal (CEF)

In a similar way to the analyses conducted of the Banco do Brasil, tests comparing the return measures with the cost of the federal public debt burden were carried out for the Caixa Econômica Federal, and the results are displayed in Table 3.

Table 3:
Comparison of CEF's economic returns with the Selic rate - 2002 to 2018

	ROEtes	***ROEABRtes***	***ROEAJtes***	***ROEABRAJtes***	***Selic***
N° observations	17	17	17	17	
Average	0,2233	0,2137	0,1891	0,1808	0,1302
Median	0,2336	0,2464	0,1712	0,1722	0,1204
Maximum	0,3335	0,3861	0,3108	0,3861	0,2347
Minimum	0,0655	0,0338	0,0655	0,0338	0,0640
Standard deviation	0,0754	0,0946	0,0662	0,0847	0,0434
Coef. Variation	0,3376	0,4426	0,3502	0,4683	0,3334
P-value	0,0001	0,0010	0,0001	0,0042	
Estatistics ***t***	4,9954	3,7047	4,8300	3,0084	
Wilcoxon (crit. Val. 87)	122	110	112	98	

Where: ***ROEtes*** is the banks' return on equity, relative to the capital invested by the National Treasury; ***ROEABRtes*** corresponds to the banks' return based on comprehensive profit relative to the capital invested by the National Treasury; ***ROEAJtes*** is the banks' return on equity in relation to the capital invested by the National Treasury, plus the eligible capital instruments and their respective returns; ***ROEABRAJtes*** is the banks' return based on comprehensive profit relative to the capital invested by the National Treasury plus the eligible capital instruments and their respective returns; ***Selic*** represents the basic interest rate of the economy, effectively practiced in the analyzed period.

It can be seen in Table 3 that the returns achieved by the CEF, (recognized as the leader of the real-estate financing market) are, on average, higher than the opportunity cost of capital for the controller (the National Treasury). Moreover, this difference is statistically significant, regardless of the return measure employed, and thus corroborates hypothesis H_{1B}, in the same way as that found with regard to the BB. There was also confirmation of previous evidence regarding the following: a greater volatility in the return measures which incorporate the other comprehensive results; and a reduction of return measures when the effects of the debt instruments of eligible capital are included.

However, despite the corroboration of hypothesis H_{1B}, it should be noted that the CEF was a few points below the Selic rate. These cases result from the reclassification (in 2014) of the hybrid instruments of liabilities for net assets, in accordance with the guidelines laid down by Resolution nº 4.192/13, of the National Monetary Council (NMC), which significantly increased the value of net equity.

4.2.3 National Bank of Social and Economic Development (BNDES)

Table 4 provides evidence of the individual results of BNDES relative to a comparison of the economic return measures with the Selic rate.

Table 4:
Comparison of BNDES's economic returns with the Selic rate - 2002 to 2018

	ROEtes	***ROEABRtes***	***ROEAJtes***	***ROEABRAJtes***	***Selic***
N° observations	17	17	17	17	
Average	0,1757	0,2075	0,1510	0,1714	0,1302
Median	0,1484	0,1907	0,1289	0,1453	0,1204
Maximum	0,3638	0,8358	0,3313	0,6737	0,2347
Minimum	0,0445	-0,1245	0,0445	-0,0556	0,0640
Standard deviation	0,0824	0,2298	0,0716	0,1711	0,0434
Coef. Variation	0,4692	1,1077	0,4744	0,9986	0,3334
P-value	0,0430	0,1068	0,1756	0,1880	
Estatistics ***t***	1,8302	1,2952	0,9604	0,9106	
Wilcoxon (crit. Val. 87)	76	36	52	24	

Where: ***ROEtes*** is the banks' return on equity, relative to the capital invested by the National Treasury; ***ROEABRtes*** corresponds to the banks' return based on comprehensive profit relative to the capital invested by the National Treasury; ***ROEAJtes*** is the banks' return on equity in relation to the capital invested by the National Treasury, plus the eligible capital instruments and their respective returns; ***ROEABRAJtes*** is the banks' return based on comprehensive profit relative to the capital invested by the National Treasury plus the eligible capital instruments and their respective returns; ***Selic*** represents the basic interest rate of the economy, effectively practiced in the analyzed period.

The main objective of BNDES, is to provide long-term financing of investments in various sectors of the economy and it shows results that are very different from those of the Banco do Brasil and the Caixa Econômica Federal. First of all, it was determined that there was a degree of volatility in the returns which incorporate the comprehensive results – *ROEABRtes* and *ROEABRAJtes* – with a coefficient of variation as high as 100%. This variation showed that the BNDES results fluctuated widely over a period of time, mainly owing to the adjustment of values in the market that were made in the portfolios of the shareholders involved, in particular in the shares of Petrobras, that were classified as available for sale. This variation

was a striking feature from 2010 onwards when the value of Petrobras shares began to experience sharp fluctuations.

Although, on average, it shows higher returns than the Selic rate, this difference is not statistically different in three of the four indicators examined – only *ROEtes* offers a return that is higher than Selic. Thus, unlike the tests carried out for the BB and CEF, when the results corroborated hypothesis H_{1B}, in the case of BNDES, the two alternative hypotheses H_{1A} and H_{1B} were refuted, or in other words, it could not be stated that the returns accrued by the institution were higher or lower than the cost of the federal public debt burden. This difference in profitability seems to be related to the suitable business model of these entities – while the BB and CEF are concerned with shares in the retail market and the BNDES is restricted to the financing of measures designed for economic development, which can result in lower profit margins.

4.2.4 Banco do Nordeste do Brasil (BNB)

The fourth public federal bank is the BNB, an entity of a much smaller size than the first three and with activities centered on fostering the regional development of the North-East of Brazil. The descriptive statistics relative to comparing the return metrics with the Selic rate, are displayed in Table 5.

Table 5:
Comparison of BNB's economic returns with the Selic rate - 2002 to 2018

	ROEtes	***ROEABRtes***	***ROEAJtes***	***ROEABRAJtes***	***Selic***
N° observations	17	17	17	17	
Average	0,1667	0,1513	0,1461	0,1386	0,1302
Median	0,1415	0,1389	0,1318	0,1266	0,1204
Maximum	0,3273	0,2666	0,2585	0,2666	0,2347
Minimum	0,0682	-0,0399	0,0682	0,0443	0,0640
Standard deviation	0,0636	0,0691	0,0503	0,0543	0,0434
Coef. Variation	0,3815	0,4564	0,3440	0,3920	0,3334
P-value	0,0713	0,1888	0,2172	0,3344	
Estatistics ***t***	1,2658	0,5596	0,6271	0,2084	
Wilcoxon (crit. Val. 87)	56	40	36	12	

Where: ***ROEtes*** is the banks' return on equity, relative to the capital invested by the National Treasury; ***ROEABRtes*** corresponds to the banks' return based on comprehensive profit relative to the capital invested by the National Treasury; ***ROEAJtes*** is the banks' return on equity in relation to the capital invested by the National Treasury, plus the eligible capital instruments and their respective returns; ***ROEABRAJtes*** is the banks' return based on comprehensive profit relative to the capital invested by the National Treasury plus the eligible capital instruments and their respective returns; ***Selic*** represents the basic interest rate of the economy, effectively practiced in the analyzed period.

The results show that the bank has average returns that are nominally higher than the Selic rate, but that these differences are not significant. Thus, it cannot be stated that, in light of the four measures employed in the study, the returns achieved by the BNB are statistically different from the cost of the federal public debt burden, which represents the opportunity cost of the National Treasury capital (the controller of the banks that are the object of this study) and means the hypotheses H_{1A} and H_{1B} are refuted. The results with regard to the BNB are, to some extent, compatible with those of the BNDES, and are a sign that there are lower rates of return from the development banks than from the activities of commercial banks.

Two other factors found in the first three banks were confirmed with regard to the BNB: i) the greater volatility of the returns which take account of the Other Comprehensive Income; and ii) the negative effect of the debt instruments on the eligible capital in the return measures. With regard to the volatility of the comprehensive results in particular, this can be related to the constant re-assessment that took place in the securities available for sale and the actuarial gains and losses relative to the plans for retirement benefits.

4.2.5 Banco da Amazônia (BASA)

The last bank (BASA), is also concerned with taking action to foster regional development but only in the north region of the country. Table 6 shows the descriptive statistics of the return measures, compared with the Selic rate.

Table 6:
Comparison of BASA's economic returns with the Selic rate - 2002 to 2018

	ROEtes	***ROEABRtes***	***ROEAJtes***	***ROEABRAJtes***	***Selic***
N° observations	17	17	17	17	
Average	0,0939	0,0719	0,0969	0,0766	0,1302
Median	0,0870	0,0742	0,0954	0,0767	0,1204
Maximum	0,2212	0,2212	0,2212	0,2212	0,2347
Minimum	0,0139	-0,1695	0,0139	-0,1695	0,0640
Standard deviation	0,0481	0,0829	0,0466	0,0799	0,0434
Coef. Variation	0,5121	1,1531	0,4807	1,0435	0,3334
P-value	0,0002	0,0007	0,0002	0,0009	
Estatistics ***t***	-4,5878	-3,8472	-4,4833	-3,7275	
Wilcoxon (crit. Val. 87)	-126	-136	-122	-136	

Where: ***ROEtes*** is the banks' return on equity, relative to the capital invested by the National Treasury; ***ROEABRtes*** corresponds to the banks' return based on comprehensive profit relative to the capital invested by the National Treasury; ***ROEAJtes*** is the banks' return on equity in relation to the capital invested by the National Treasury, plus the eligible capital instruments and their respective returns; ***ROEABRAJtes*** is the banks' return based on comprehensive profit relative to the capital invested by the National Treasury plus the eligible capital instruments and their respective returns; ***Selic*** represents the basic interest rate of the economy, effectively practiced in the analyzed period.

The data reveal that the BASA is the only institution that was investigated in which the average returns accrued are lower than the Selic rate, or in other words, the economic returns of the bank do not remunerate the cost incurred by the Treasury of raising funds in the market. These differences are statistically significant and result in the corroboration of H_{1A} and refutation of H_{1B}.

It was also confirmed that there were factors of greater volatility in the metrics that cover the comprehensive results with coefficients of variation as high as 100%, and a reduction of returns when including the effects of the debt instruments on eligible capital.

4.3 Summary of the Results

This stage is concerned with consolidating the results and attempting to reach a conclusion about whether or not the research hypotheses can be corroborated, by taking account of the results of the tests, examining the group of banks and conducting an analysis of each institution. Table 7 provides a summary of these results and highlights the fact that, in all the

cases, the non-parametric Wilcoxon signed-rank test confirmed the evidence obtained from the student t-tests for average difference.

Table 7:
Comparison of the economic returns of federal public banks with the Selic rate - 2002 to 2018

	Returns x Selic	***Statistical relevance of the difference***	***Test hypothesis***
Set of banks			
	Returns > Selic	Relevant	Corrobora H_{1B}
Analysis by bank			
BB	Returns > Selic	Relevant	Corrobora H_{1B}
CEF	Returns > Selic	Relevant	Corrobora H_{1B}
BNDES	Returns > Selic	No Relevant	Refute H_{1A} and H_{1B}
BNB	Returns > Selic	No Relevant	Refute H_{1A} and H_{1B}
BASA	Returns < Selic	Relevant	Corrobora H_{1A}

The results of the tests demonstrate that: (i) in general the public banks offer economic returns to the National Treasury above the cost of the debt burden, even when the debt instruments are added in the calculation of the indicators; (ii) this pattern of behavior is particularly important in the BB and CEF - the principal public banks which operate in the retail banking market and compete with the private entities; (iii) although they have average nominal returns higher than the cost of the debt burden, the development banks (BNDES and BNB), do not record any significant statistical differences, which suggests that these entities can operate with lower profit margins; and (iv) the BASA is the only public bank with a return lower than the Selic rate; this can be attributed to its lower capillarity which can affect its possible scale gains.

This set of results seems to corroborate research hypothesis H_{1B}, or in other words, from the standpoint of return, (and leaving aside other arguments of an economic, political or philosophical nature or the question of priority being given to the allocation of public funds), in general, the returns achieved by the public banks exceeded the opportunity cost of the National Treasury funds assigned to these entities.

5 Conclusion

The aim of this study was to determine whether the returns offered by federal public banks remunerate the National Treasury with regard to the debt burden, defined as the Selic interest rate. On the basis of information related to the period from 2002 to 2018 for the BB, CEF, BNDES, BNB and BASA, four different economic return metrics were used which combine policies for the measurement of profitability (net profit and comprehensive income) and the funds invested by the National Treasury (only the net assets or the added effects of the debt instruments).

The results of the t-test for average difference and non-parametric Wilcoxon signed-rank test, showed that collectively, the federal public banks offer economic returns that are higher than the Selic rate, whether or not the effects of the debt instruments are taken into account. However, when examined individually, it was noted that the BB and CEF, which are involved in the retail banking market and are in direct competition with private banks, offer returns that are consistently higher than the opportunity cost. In the cases of the BNDES and BNB, which are concerned with encouraging and financing development projects, these

differences are not statistically significant although they record nominal returns that are higher than Selic. Finally, it was found that the BASA offers returns that are statistically lower than Selic.

In summary, the tests show that the degree of profitability achieved, depends on the kind of activities undertaken by these entities. While the banks that are more active in the retail banking market achieve higher returns, the development banks have more modest or – in the case of the BASA - lower returns than the cost of raising funds from the National Treasury. This result can be attributed to the fact that the development banks foster applications with subsidized rates to provide an incentive for development projects, which adversely affects the rates of return.

Another piece of evidence that was ascertained is that the operations involving debt instruments of eligible capital that were carried out between the Treasury and the public banks, generally take place at rates below the returns achieved by these institutions. Even when these effects were negative, the tests show that, in general terms, the returns accrued by the National Treasury with regard to the federal public banks, are higher than the opportunity cost of raising these funds.

Hence the empirical tests, in general, corroborate the hypothesis $\boldsymbol{H_{1B}}$, by confirming that the federal public banks offer returns above the Selic rate. This result means that the funds allocated to the banks by the National Treasury provide a remuneration that is higher than the rate of raising these funds in the market.

It is hoped that the results of this study will lead to a better understanding of the relations between the National Treasury and the public financial institutions, notably with regard to the cost of funds that are allocated and the return provided, so long as it is restricted to economic/financial factors and does not include inferences or analyses of other dimensions – such as the degree of efficiency, the social return allowed by the public investment or priorities being given in the allocation of budgetary funds. These factors open up opportunities for future research, as well as making it possible to broaden the field of research to include State public banks.

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