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## THE PERFORMANCE OF BRAZILIAN BANKS POST-BASEL III ACCORD

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## INTRODUCTION

The Basel III Accord<sup>1</sup> comprised a set of regulations proposed by the Basel Committee in 2010. It represented a response to the 2008 financial crisis, the outbreak of which revealed the weaknesses of the international financial system and highlighted the need to adopt criteria that increased the resilience and solidity of banks. In this sense, the main causes of this crisis were identified as: the excessive leverage of institutions, the erosion of the quality of the capital base and insufficient liquidity levels. Thus, the main changes introduced were related to the capital structure of the institutions (Anbima, 2013).

In 2013, Brazil adopted the Basel III recommendations<sup>2</sup>. From this period onwards, until 2021, the banking sector faced several challenges, such as the emergence of digital banks and “fintechs”<sup>3</sup>, the slowdown in the Brazilian economy from 2016 onwards and the emergence of the COVID-19 pandemic from 2020 onwards. Many academic studies have sought to identify which variables would determine the performance of the national banking system. Andrade, Sabino and Sabino (2019) highlighted that the profitability and

profitability of the five largest Brazilian banks are increasing<sup>4</sup>, even in adverse economic conditions. These authors tested accounting, operational, regulatory and macroeconomic variables<sup>5</sup> as determinants of the profitability of this sector, measured by Return on Assets [ROA], whereas the size of the institution would have been measured by total assets, however, this study indicates that this variable was not significant.

They also concluded that the prudential adjustments brought about by Basel III reduced banks’ ability to expose themselves to risks, reducing their profitability. Primo et al. (2013) tested macroeconomic, accounting and operational variables as determinants of bank profitability, represented by Return on Net Equity [ROE] and Return on Assets [ROA]. They also included hypotheses to test the origin of capital and the type of control<sup>6</sup>, and concluded that there was a statistically relevant and positive relationship with the participation of national banks, providing evidence that they presented a higher rate of return than foreign banks. However, this was not observed in relation to private or state banks.

1. These recommendations are guided by 25 principles that can be consulted in: ``BANCO CENTRAL DO BRASIL`` [BCB] (2006) Fundamental Principles for Effective Banking Supervision, Oct.2006. Available at: <[https://www.bcb.gov.br/fis/supervisao/docs/core\\_principles\\_traducao2006.pdf](https://www.bcb.gov.br/fis/supervisao/docs/core_principles_traducao2006.pdf)>. Accessed on: July 30, 2022;

2. See Resolutions No. 4,192 to 4,195 of the National Monetary Council [CMN] and Circulars 3,634 to 3,648 of BANCO CENTRAL DO BRASIL [BCB], all dated March 2013. See Banco Central do Brasil [BCB]. 2022. Financial Stability – Standards: Search for Standards: Resolutions and Circulars. Available at: <<https://www.bcb.gov.br/estabilidadefinanceira/buscanormas>>. Accessed on: 16 Oct. 2022;

3. The authorization for the operation of “fintechs” and other financial operations through an electronic platform was regulated by Resolution 4,656, dated April 26, 2018. See BCB. Normative. Resolution 4,656, of April 26, 2018. Provides for direct credit companies and peer-to-peer loan companies, regulates the carrying out of loan and financing operations between people through an electronic platform and establishes the requirements and procedures for authorization for operation, transfer of corporate control, corporate reorganization and cancellation of authorization of these institutions. Brasília, 26 April 2018. Available at: <[https://normativos.bcb.gov.br/Lists/Normativos/Attachments/50579/Res\\_4656\\_v1\\_O.pdf](https://normativos.bcb.gov.br/Lists/Normativos/Attachments/50579/Res_4656_v1_O.pdf)>. Accessed on: February 3, 2023;

4. In 2003, the IMF published a study that suggested that Brazilian banks behave like an oligopoly. He also highlighted that the existence of large banks would be detrimental to financial stability and low competitiveness would generate high tariffs for consumers. (BELAISCH, A. (2003) Do Brazilian Banks Compete? IMF Working Paper, WP-03/113. May.2003. Available at: <<https://www.imf.org/external/pubs/ft/wp/2003/wp03113.pdf>>. Accessed on: February 3, 2023;

5. The variables chosen were: institution size, credit risk, capitalization, financing, Basel index, SELIC rate and used a dummy variable to separate prudential and financial conglomerates.

6. PRIMO et al (2013) used dummy variables to identify the nationality of the capital (national or foreign) and the type of control (public or private).

In turn, Oliveira and Ferreira (2018), analyzing the implementation process of the Basel III Agreement, highlighted that the high banking concentration and the proposed new capital requirements made the granting of credit more selective. The authors highlighted that this process began before the finalization of the schedule defined for the adoption of Basel II<sup>7</sup>. They also found that private banks adapted more flexibly than public banks to the proposed new capital requirements, probably because they have a liquidity cushion represented by compulsory deposits and the public securities portfolio.

Pinheiro et al. (2015) verified the possible effects of the increase in banks' need for equity capital resulting from the changes brought about by Basel III. They concluded that, from a sample of 58 banks, 23 would have difficulties in meeting regulatory capital, and of this sample, 39 would have an average ROE lower than the cost of equity capital. Magalhães et al. (2021) studied Brazilian banking performance in the period 2012-2019, focusing on the recessive phase, 2015-2016. The authors' expectation was that the capital requirements promoted by Basel III would mitigate the effects of the crisis on profitability and other performance indicators, however, the results obtained demonstrated that it was favored during periods of crisis, and no evidence that the profitability perceived in the period could be attributed to these new recommendations. Likewise, Iurovski et al. (2022) analyzed the impact of crises on the financial indicators of 241 Brazilian banks. They chose the indicators respecting the "Capital, Assets, Management, Earnings and Liquidity [CAMEL]" methodology<sup>8</sup>. Despite the period studied,

7. In this work, OLIVEIRA and FERREIRA (2018) also analyzed previous agreements: Basel I and II, implemented, respectively, in 1988 and 2004;

8. The CAMEL methodology covers a set of indices that allow evaluating the economic-financial situation of institutions. It is made up of the following indicators: Capital Adequacy (C), Asset Quality (A), Management Quality (M = Management), Results (E = Earnings, in English) and Liquidity (L).

9. Until the closing date of this study, data for the 4th quarter of 2021 had not yet been published on the IF. Data portal of the Central Bank of Brazil.

2000-2019, comprising the phase of adoption of the changes promoted by Basel III, the authors did not make any mention of this fact.

They concluded that during periods of crisis, the institutions analyzed showed a worsening in profitability indicators, increased the share of social capital over total assets and over risk assets in their credit portfolio, but achieved lower profitability. In relation to liquidity, there was an improvement, which could be related to a possible decision regarding cash reinforcement, necessary in more turbulent times.

That said, there is no consensus in the literature on whether the size of the banks (in terms of volume of assets), the type of shareholding control and even which variables would be most relevant in determining the banks' performance. This work, whose objective is to study the performance of Brazilian banks, after the adoption of the guidelines of the Basel III Agreement, that is, between the 1st quarter of 2010 and the 3rd quarter of 2021<sup>9</sup>, is justified by analyzing in a comparative way, a group formed by the largest Brazilian banks, in terms of total assets, with another formed by smaller banks, however, more diversified, through a wide range of accounting indicators that allow the evaluation of different aspects necessary to understand whether the institutions presented a healthy situation, given the changes represented by the Basel III recommendations.

## MATERIAL AND METHODS

The sample is made up of ten publicly traded banks, classified in the B1 segment- Commercial Bank, Multiple Bank with Commercial Portfolio or Caixa Econômica, whose shares are traded on B3 (Brazil, Stock Exchange, Over the Counter), and were divided into two groups: Big and Small. The first comprises: Banco do Brasil, Itaú-Unibanco, Bradesco and Santander<sup>10</sup>. ``Caixa Econômica Federal``, despite being among the five largest Brazilian banks, does not have shares traded on the stock exchange<sup>11</sup>, so it was not included in the sample. The second group is made up of: Banco ABC-Brasil, Banrisul, Banco BTG-Pactual, Bank BMG, Banco Inter and Banco Modal. Table 1 presents a brief characterization of each institution studied. It can be seen that the minor's group is made up of very heterogeneous institutions in relation to the focus of their business and the volume of their assets.

### THE DATA FROM THE FINANCIAL STATEMENTS WERE COLLECTED IN IF

Data, from the Central Bank of Brazil [BCB], whose presentation follows a quarterly frequency. The period analyzed covers the 1st quarter of 2010 to the 3rd quarter of 2021. The methodology for calculating the accounting and financial indicators studied followed that available on the Assaf Institute Portal. Table 2 describes the indicators analyzed:

This study is an empirical-analytical research, as it uses techniques for collecting, processing and analyzing quantitative data. A mean difference test was used to verify whether there was a significant statistical difference

between the performances of the two groups. The null and alternative hypotheses to be tested, respectively, were:

- $H_0$  = the average performance of the Large group = average performance of the Small group;
- $H_a$  = the average performance of the Large group  $\neq$  average performance of the Small group;
- $H_0$ , the null hypothesis, is rejected, with a significance level  $\alpha = 5\%$ , if the  $p$ -value  $< 0.05$

Initially, to define whether the test to be used would be parametric or non-parametric, it was necessary to check whether the following hypotheses were satisfied (Fávero and Belfiore, 2022):

- Sample observations must be independent;
- Samples must be taken from populations with normal distribution;
- Populations must have equal variances (homogeneity of variances);
- The variables must be measured on an interval or ratio scale, so that it is possible to use mathematical operations between them (that is, there must be no "outliers");

A parametric test is used if the hypotheses have been met, otherwise a non-parametric test. As the samples from the Large and Minor banks are independent, it was necessary to test the normality of the data and the homogeneity of the sample variances. To this end, the Shapiro-Wilk and Levene Tests were used, respectively. Only the sample of data referring to the Leverage indicator met all

10. It must be remembered that the Brazilian banking sector is quite concentrated, and the sum of the total assets of these four institutions, in the 3rd half of 2021, represented 62.15% of the total of the B1 segment analyzed.

11. Only ``Caixa Seguridade`` went public, carrying out its initial public offering ("IPO - initial public offering") on April 29, 2021. Source: PORTAL G1 (2021). ``Caixa Seguridade`` debuts on the stock market after IPO. G1. April 29, 2021. (Available at: <<https://g1.globo.com/economia/noticia/2021/04/29/caixa-seguridade-estrela-em-alta-na-b3-apos-ipo.ghtml>>. Accessed on: August 8, 2022);

Institution	Shareholding Control a) Total Assets in Sept. 2021 (R\$ thousand) b)	Corporate Characteristics a)
BIG ONES		
Bank of Brazil	Mixed economy, in which the federal government holds 50% of the shares; R\$ 1,960,241,747	Founded in 1808; It is headquartered in Brasília-DF. It currently has 56,082 service points, present in 96.8% of Brazilian municipalities. 1st banking institution operating in the country;
Bradesco	Private publicly traded company; R\$ 1,471,643,155	Founded in 1943, in Marília-SP, its headquarters are currently in Osasco, Greater São Paulo. Pioneer in encouraging the use of checks by its account holders, in the adoption of IT resources and in the implementation of credit cards;
Itaú-Unibanco	Private publicly traded company; R\$ 1,973,726,134	In 1924, Casa Moreira Salles was founded, in Poços de Caldas-MG (predecessor of Unibanco). In 1943, the Central Credit Bank was founded in São Paulo-SP. In 1964, this institution merged with Banco Itaú, from the city of Itaú de Minas-MG. The merger of Itaú with Unibanco in 2008, created the largest private bank in Brazil;
Santander	Private publicly traded company; R\$ 989,212,960	It began operations in 1982. Headquartered in São Paulo-SP, it is the third largest private bank in the country in terms of total assets. It is part of the Santander Group, of Spanish origin, with a large presence in Latin America. It is also the main financial conglomerate in the eurozone;
MINORS		
ABC-Brazil	Private publicly traded company; R\$ 48,847,133	In 1989, Arab Banking Corporation and Group Roberto Marinho started Banco ABC Roma SA. In 1997, the Arab group acquired the shares of Grupo Roberto Marinho and changed the name for ABC-Brasil SA Its focus is credit for medium and large companies.
Banrisul	Mixed economy; whose government of the state of Rio Grande do Sul holds 49.39% of the shares; R\$ 101,292,345	Founded in 1928, in Porto Alegre-RS, it acts as the main financial agent of the State of Rio Grande do Sul in promoting its economic and social development;
BMG Bank	Private publicly traded company; R\$ 33,947,369	In 1930, Banco de Crédito Predial was founded. In 1989, the name was changed to Banco BMG. Its headquarters are in São Paulo-SP. Its focus is consumer financing and payroll loans <sup>1</sup> , being a pioneer in granting this modality;
BTG Pactual Bank	Private publicly traded company; R\$ 395,158,744	In 1983, Pactual DTVM was founded in Rio de Janeiro-RJ. In 1989, it began operations as a bank. It is the largest investment bank in Latin America. It is also a reference in asset and wealth management for high-income segments;
Banco Inter	Private publicly traded company; R\$ 33,357,083	Founded in 1994, in Belo Horizonte-MG, as `` <i>Intermedium Financeira</i> ``. In 2008, the license to operate as a multiple bank was granted. It was the first 100% digital bank from the country. In 2017, it changed its name to Banco Inter;
Modal Bank	Private publicly traded company; R\$ 6,644,544	It was founded in 1995, by former partners of Banco Garantia, in Rio de Janeiro-RJ. It is an investment bank focused on structuring, coordinating large operations in the national market and strategic partnerships with the main agents and international leaders.

Table 1: Sample characteristics

Source: Original research data

1. Payroll loans were regulated by Law 10,820, dated December 17, 2003. See HOUSE OF DEPUTIES. Law no. 10820, of December 17, 2003. Provides for authorization to deduct Installments from payroll, and provides other measures. Brasília, 17 Dec. 2003. Available at: <<https://www2.camara.leg.br/legin/fed/lei/2003/lei-10820-17-dezembro-2003-497441-norma-actualizada-pl.pdf>>. Accessed on: February 3, 2023;

Indicator	Formula	Description
<b>Cash Generation and Financial Balance</b>		
Voluntary Fitting [EV]	$= \frac{\text{"Availability"}}{\text{"Sight Deposits"}}$	It shows how much "cash" the bank keeps to meet its customers' demand deposit obligations;
Immediate Liquidity [LI]	$= \frac{\text{"Disponib.+ Interfin.Application and Liquidity"}}{\text{"Sight Deposits"}}$	It also demonstrates how much the bank maintains resources to meet its customers' demand deposit obligations, however, on a broader basis;
Loan/Deposit Index [FDI]	$= \frac{\text{"Credit Operation+Mercantile Leasing"}}{\text{"Total Deposits"}}$	Indicates the percentage of loans made compared to total deposits;
<b>Profitability and Profitability</b>		
Return on Equity [ROE]	$= \frac{\text{"Net profit"}}{\text{"Average Net Worth"}}$	Indicates the rate of return on equity;
Return on Total Assets [ROA]	$= \frac{\text{Net profit}}{\text{Total assets}}$	Indicates the rate of return on the total capital (asset) invested;
<b>Capital Structure and Leverage</b>		
Average Financial Independence [IFM]	$= \frac{\text{"Average Net Worth"}}{\text{"Average Total Assets"}}$	Shows the relationship between Net Equity and Total Assets;
Leverage [LV]	$= \frac{\text{"Total Assets"}}{\text{"Net worth"}}$	Expresses how many times the asset is greater than the invested equity capital;
Capital/Depositors Ratio [RCD]	$= \frac{\text{"Net worth"}}{\text{"Total Deposits"}}$	It demonstrates the proportion between its own capital and the deposits made by its account holders;
<b>Capitalization and Regulatory Requirement</b>		
Basel Index [IB]	$= \frac{\text{"Reference Net Equity"}^{14}}{\text{"Risk-Weighted Assets"}}$	Indicates the relationship between Own Capital and Third-Party Capital (funding) that will be exposed to risk. Measures the bank's solvency level.
Immobilization Index [IIM]	$= \frac{\text{"Active permanent"}}{\text{"Adjusted PR"}}$	It shows how much of the equity is invested in fixed assets. The maximum tolerated value is 50% (BCB, 2004);

Table 2: Economic-financial indicators

Source: Original research data

14. According to FORTUNA (2005), the concept of Reference Net Worth replaced that of Adjusted Net Worth [PLA].

the previously listed hypotheses, therefore, it was possible to perform the "t" Test, while the non-parametric Mann-Whitney Test was used for the others. Statistical analyzes were carried out using the Microsoft Excel "Real-Statistics" add-in.

## RESULTS AND DISCUSSION

As it was shown in Table 2 above, the accounting ratios were grouped into four groups: cash generation and financial balance, profitability and profitability, capital structure and leverage and, finally, capitalization and regulatory requirements.

Table 3 below summarizes the descriptive statistics of the calculated indices:

Table 4 shows the results of the mean difference tests. With the exception of the Leverage Index, in which it was possible to apply the "t" Test, given that the sample met the necessary hypotheses, the Mann-Whitney Test was used in the others.

Indicator	Average		Median		Standard deviation		Maximum		Minimum		Variation Coefficient	
	Big ones	Minors	Big ones	Minors	Big ones	Minors	Big ones	Minors	Big ones	Minors	Big ones	Minors
<u>Cash Generation and Financial Balance</u>												
EV	0.35	1.10	0.34	0.96	0.062	0.795	0.55	3.96	0.25	0.10	17.71%	72.27%
LI	2.87	31.37	2.82	25.28	0.649	21,029	4.01	90.50	1.59	4.96	22.61%	67.04%
FDI	116.46%	109.82%	122.96%	107.48%	0.192	0.195	142.06%	153.13%	79.27%	73.73%	16.49%	17.76%
<u>Profitability and Profitability</u>												
ROE	5.91%	4.09%	4.99%	3.92%	0.022	0.022	10.11%	10.70%	3.10%	0.47%	37.97%	53.52%
ROA	0.50%	0.52%	0.42%	0.48%	0.002	0.004	0.86%	1.70%	0.26%	0.07%	38.80%	67.69%
<u>Capital Structure and Leverage</u>												
IFM	9.04%	13.73%	8.92%	13.40%	0.008	0.018	10.82%	18.40%	7.88%	11.66%	8.37%	13.06%
LV	11.93	8.03	11.88	8.16	0.669	0.817	13.27	9.67	10.88	6.51	5.61%	10.17%
RCD	30.19%	41.91%	31.49%	42.45%	0.043	0.053	38.17%	53.98%	20.85%	29.33%	14.27%	12.53%
<u>Capitalization and Regulatory Requirement</u>												
IB	17.12%	17.57%	17.18%	17.20%	0.010	0.014	20.09%	21.84%	14.72%	14.69%	5.98%	7.80%
I IM	29.38%	12.85%	25.81%	13.49%	0.073	0.046	39.60%	20.35%	19.27%	3.83%	24.68%	35.57%

Table 3: Descriptive Statistics  
Source: Original survey results

Indicator	5% significance level		
	U	Z-score	p-value
<u>Cash Generation and Financial Balance</u>			
Voluntary Fitting [EV]	427.00	5.1211	3.037E-07
Immediate Liquidity Index [LI]	0.00	8.3485	0.0000
Loan/Deposit Index [FDI]	864.00	1.8149	0.0695
<u>Profitability and Profitability</u>			
Return on Equity [ROE]	611.00	3.7281	1.929E-04
Return on AT [ROA]	980.50	0.9341	0.3503
<u>Capital Structure and Leverage</u>			
Average Financial Independence [IFM]	0.00	8.3487	0.00
Capital/Depositors Ratio [RCD]	111.00	7.5091	5.951E-14
<u>"t" test</u>			
Leverage [LV]	t-test	gl	p-value
	25.36	92.00	2.646E-43
<u>Capitalization and Regulatory Requirement</u>			
Basel Index [IB]	898.50	1.5542	0.1201
Immobilization Index [IM]	8.00	8.2880	0.00

Table 4: Difference of Means Test  
Source: Original survey results

## CASH GENERATION AND FINANCIAL BALANCE INDEXES

Also known as Liquidity and Solvency Indices, these indicators demonstrate the institution's ability to maintain cash availability to meet both the demands for redemptions and loans from its customers, as well as the flow of payments for its operating expenses and other expenses (Assaf Neto, 2015).

The Voluntary Fund [EV] indicates the institution's ability to cover withdrawals against demand deposits. Therefore, the higher this index, the more capable it would be of meeting its customers' withdrawals. It is observed that, on average, Large banks presented an index well below that exposed by Smaller banks, 0.35 compared to 1.10, however, the mean and median of the former presented very close values.

According to Fávero and Belfiore (2022), the smaller the coefficient of variation [CV], the more homogeneous the data will be and the smaller the dispersion around the mean will be, with a value below 30% indicating a sample with data more homogeneous. In turn, values above would denote a much more dispersed data set. In this sense, it was observed that the Minor group has a very high coefficient of variation (72.27%) showing a large dispersion around the average, that is, a heterogeneous sample, while the Large group has a much lower coefficient, 17.71%, indicating a more homogeneous sample. The mean difference test also confirmed that the groups' performance was statistically different. Therefore, these results suggest that the capacity of Large banks to cover their customers' deposit withdrawals is lower than that of the Smaller group.

Andrade et al. (2019a), analyzing the performance of public and private banks that are part of the B3 Corporate Sustainability Index, observed that, in the case of voluntary

funding, the averages of the former were lower than those of the latter. However, it was observed that the sample considered in this work included the same institutions belonging to the Large group of our study, with Banco do Brasil being the only public bank considered and the others were grouped as private. Therefore, analyzing the sample data, it can be stated that the result of our study differs from this, since the participation of private banks in the Large group exceeds that of the public. Given that the Minors group consists of a single public bank, Banrisul, and five private banks, the greater participation of private banks with higher average values would explain the behavior of the descriptive statistics. Both in the case of the study by Andrade et al. (op. Cit.) as in ours, we can see the weight of the participation of private banks in the results.

The Immediate Liquidity Index [LI] above 1 reveals that the institution has resources available to cover both demand deposits and part of time deposits. Smaller banks had an average of 31.37 in the period, while that of Large banks was much lower, equal to 2.87. The medians of both groups also presented very discrepant values between them, respectively, 25.28 and 2.82. The mean difference test also showed that the performance of the groups, measured by this index, was statistically different. The coefficient of variation also demonstrated that the sample from the Minor group showed a large dispersion around the mean, while the Large group demonstrated low dispersion (Fávero and Belfiore, 2022).

Iurovski et al. (2022), analyzing the performance of banks using the CAMEL methodology, observed that liquidity indicators in times of crisis presented higher values as a response to a possible cash reinforcement strategy to face these moments, however, in the case of our study, observing the data made it clear that there was an



increase in interbank liquidity applications<sup>12</sup> In both groups studied, however, the results of the Smaller banks were influenced by the extreme values generated by the ABC-Brasil and BTG-Pactual banks.

The Loan/Deposit Index [FDI] shows how much was lent by the institution for every \$1.00 of deposit it raised. On average, for the period analyzed, the Large banks granted credit, 116.46% of the deposits raised, while the Smaller banks lent 109.82% of what they raised. In this case, the mean difference test indicated that the groups' performance was not statistically different. The coefficients of variation, below 30, confirmed that the data from both samples showed less dispersion around the mean (Fávero and Belfiore, 2022). In turn, Andrade et al. (2019a) found that this indicator was higher for private banks. In relation to our study, it must be noted that the sample is made up of ten banks, only two of which are public and the rest private. However, analyzing the data from our sample in more detail, it appears that only Banrisul and BMG offered leasing operations, while the others in the Minors group (ABC-Brasil, BTG-Pactual, Inter and Modal) did not do so, contributing to the results obtained.

In short, in the period studied, the Smaller banks presented better indicators of cash generation and financial balance than the Large ones, which, in turn, presented a better Loans/Deposits ratio. The data from the Large banks sample showed a low dispersion for the indicators studied, suggesting a convergence in relation to the business strategies adopted. The Minors group presented a large dispersion of data for the analyzed indicators, with the exception of the Loan/Deposit Index.

This index, in fact, deserves a more detailed comment. Considering the period analyzed, the average share of credit operations over total assets was more significant in Large banks than in Smaller ones, 33.81% compared

12. Interbank liquidity applications refer to transactions with securities carried out between institutions.

to 26.94%. The average share of securities and monetary values [TVM] was more representative for the latter, 30.75%, than for the former, 17.96%.

Analyzing the liability accounts, it was also observed that the average share of demand deposits of the Grandes group, in the period studied, corresponded to approximately 15.17% of total deposits, while time and savings deposits, amounted to approximately 81.26% of total deposits. The Minors group, in turn, presented, respectively, an average share of these same accounts, amounting to approximately 3.99% and 41.6% of total deposits.

## PROFITABILITY AND PROFITABILITY INDICES

Profitability and Profitability Indices seek to measure the remuneration of banks' capital and the profitability of their assets. Like any company, banks must generate wealth for their shareholders and owners, however, risk and return are part of the nature of their business (Assaf Neto, 2015).

The Return on Net Equity [ROE] indicates the owners' net income for every \$1.00 invested, that is, it indicates how much the institution remunerates its own capital (Assaf Neto, 2015). This indicator can be analyzed from the perspective of "the bigger the better". Descriptive statistics showed that Large banks had a better average ROE than Smaller banks, 5.91% and 4.09%, respectively. The same pattern can be observed in the medians, 4.99% and 3.92%. However, the Mann-Whitney test identified that the average performance of the groups was statistically different. The coefficients of variation demonstrated that, in both groups, especially in the case of the Minor group, the data showed a high dispersion around the mean (Fávero and Belfiore, 2022).

This result conflicted with that of Iurovski

et al. (2022), who compared the performance of institutions in the period 2000-2019, in moments “with” and “without crisis”<sup>13</sup>. They performed the same non-parametric test adopted by this study, but did not identify statistical significance in the values of the groups “with” and “without crisis” Andrade et al. (2019) explained the positive fluctuations in this indicator by the increase in profit in the private sector, however, observing the behavior of the data in our study, we found that in the Grandes Group, the profitability of institutions presented very similar numbers, with the exception of Santander, which was well below the average between Jan.2010 and Mar.2015, but after this period it managed to keep up with the others.

Observing Figures 1 and 2, there is stationary behavior in the data from both groups:

As for Minors, it was identified in Figure 2 that data from banks BTG-Pactual, BMG and Modal presented extreme values within the period studied. BTG-Pactual displayed values above 10% between Dec.2011 and Dec.2015. Meanwhile, BMG displayed values above 15% in Jun.2010, in Dec.2011 and negative values between Mar.2012 and Dec.2012. In turn, Banco Modal noticed negative values between Jun.2013 and Dec.2014, between Mar.2016 and Sept.2016, and between Sept.2017 and Dec.2018. These negative values are due to the occurrence of losses in the period.

In relation to Return on Total Assets [ROA], this indicator measures the capacity of assets to generate results (Magalhães et al., 2021), that is, it measures the profitability of the institution and therefore, it can also be evaluated under the “the bigger the better” approach. The average of the Minor group was higher than that of the Large group, 0.52% compared to 0.50%. The medians of both groups followed the same trend, in the sense

of being very close to the average, however, that of the Minor Group was higher than that of the Large Group, 0.48% and 0.42%. Thus, as we observed in the previous indicator, the coefficients of variation of the two groups denoted that the data expose a high dispersion around the average (Fávero and Belfiore, 2022), especially in the case of the Minors group. The mean difference test indicated that the groups’ performance was not statistically different.

Likewise, Figures 3 and 4 also show stationary behavior in the data from both groups:

In Figure 4, it is observed, again, that BMG exhibited negative values between Mar.2012 and Dec.2012. Meanwhile, Banco Modal also noticed negative values between Jun.2013 and Dec.2014, between Mar.2016 and Sept.2016, and between Sept.2017 and Dec.2018. As seen in ROA, these negative values are also due to the occurrence of losses in the period.

Andrade et al. (2019a) noticed in their study that ROA was higher in private banks, but both public and private banks showed fluctuations in the period 2014-2018. Iurovski et al. (2022), comparing institutions in periods “with” and “without crisis”, stated that the groups also showed significant differences, however, our study, which also used the Mann-Whitney test, presented a result opposite to this.

In short, profitability and profitability indicators demonstrated different behavior between the two groups: The Large Group showed better profitability, while the Smaller Group showed better profitability. In a more detailed observation of the evolution of revenues from financial intermediation, it can be highlighted that income from credit operations has a greater average share in these revenues for Large Companies, 60.54%, compared to Smaller Companies, 52.55%.

13. IUROVSKI, NASCIMENTO and CARVALHO (2022) considered the following periods of crisis suffered by Brazil: i) Jun.2001 to Feb.2002: energy supply crisis; ii) 2008: “subprime” crisis; iii) 2015-2016: recession; iv) 2020: COVID-19 pandemic.

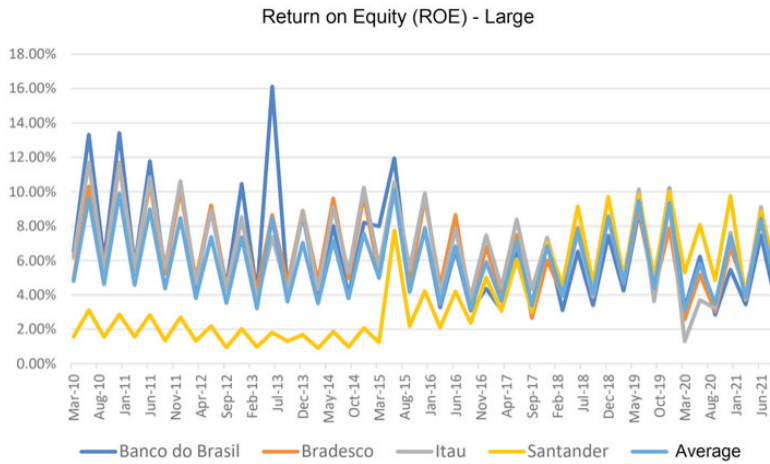


Figure 1: Behavior of Grupo Grandes' ROE, in the period Jan.2010 to Sept.2021

Source: Original survey results

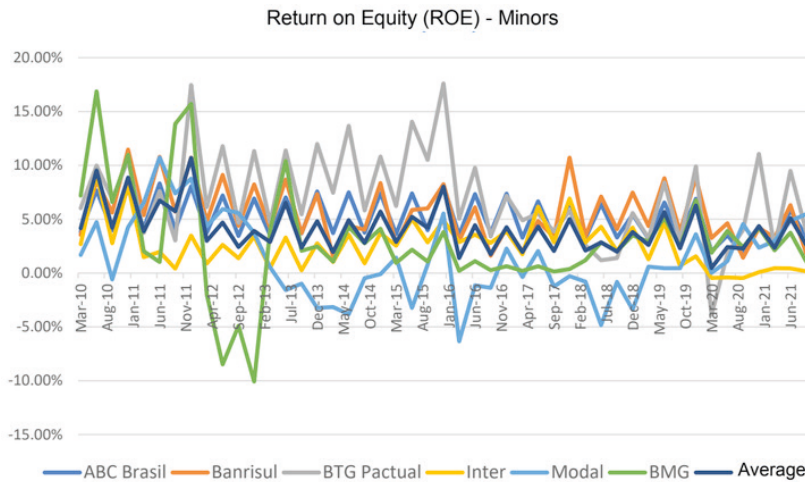


Figure 2. Behavior of the ROE of the Minors Group, in the period Jan.2010 to Sept.2021

Source: Original survey results

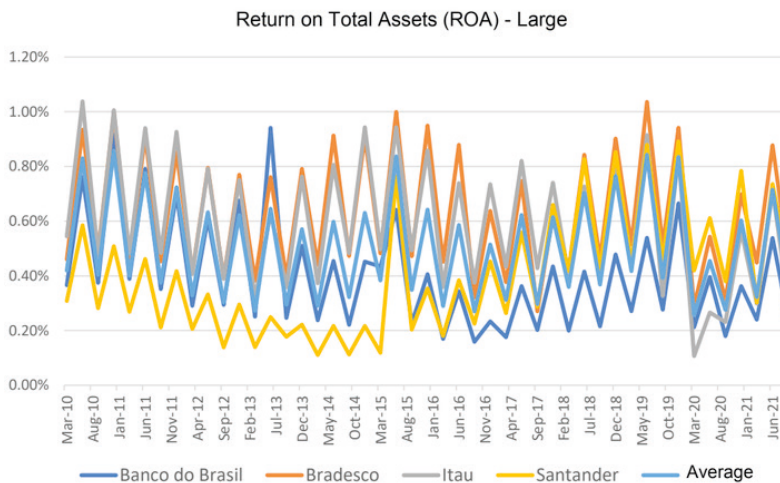


Figure 3: ROA behavior of Grupo Grandes, in the period Jan.2010 to Sept.2021

Source: Original survey results

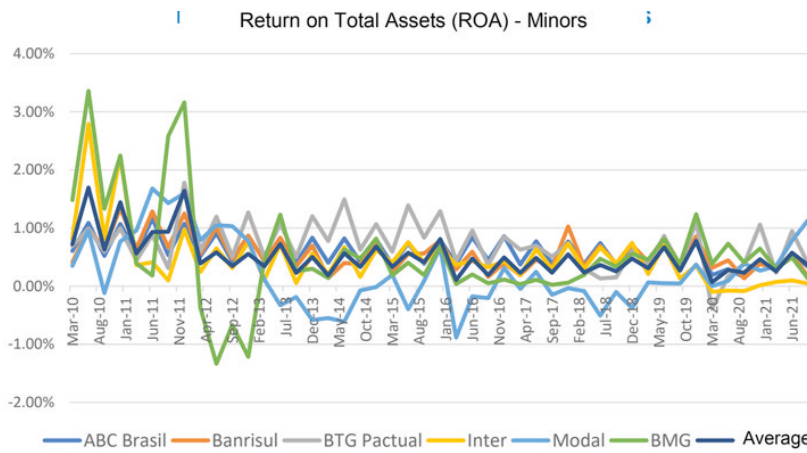


Figure 4: Behavior of Grupo Grandes' ROA, in the period Jan.2010 to Sept.2021  
Source: Original survey results

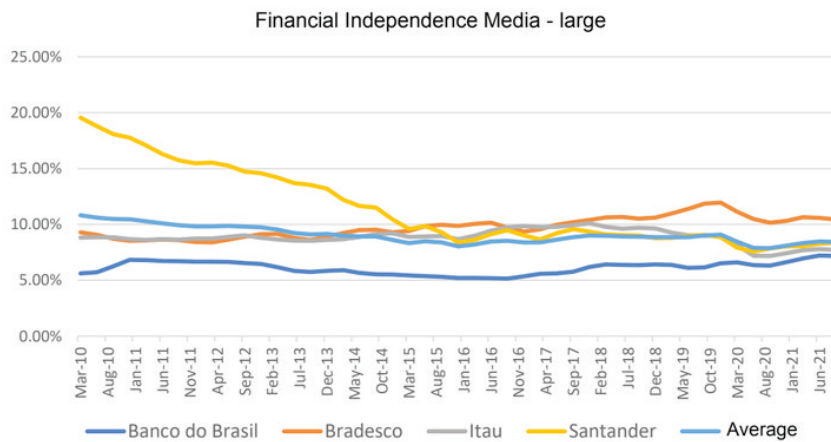


Figure 5: Average Financial Independence Behavior of Grupo Grandes, in the period Jan.2010 to Sept.2021  
Source: Original survey results

Meanwhile, income from securities [TVM] shows a higher average share of these income in the Minors Group, 39.13%, compared to the Grandes, 28.66%. These data are in line with the analysis of the composition of total assets, in which the average share of credit operations in the Large Groups corresponds to 33.81%, while in the Minors, securities [TVM] and financial instruments represent 30.75% of this item.

## CAPITAL STRUCTURE AND LEVERAGE INDICES

The Capital Structure and Leverage Indices measure the ability of institutions to take risks. According to Assaf Neto (2015), banks are subject to two categories of risk: operational and financial. Operational risk is related to the nature of the company's activity and can be affected by the country's economic and political situation. Financial risk is related to the company's debt, that is, with the greater use of third-party capital in relation to its own capital<sup>14</sup>. In the case of banks, the latter refers to passive obligations, made up, in part, of customer deposits.

14. Remembering that, in the balance sheet, third-party capital is represented by Liabilities, while own capital is represented by Shareholders' Equity.

The Average Financial Independence Index [IFM] measures the institution's ability to finance its assets with its own capital, however, Assaf Neto (2015) reminds us that the risks assumed by each institution may be different, even if the calculated values are identical, as this will depend on the nature and quality of the assets owned. In this study, Large banks, on average, presented lower values than the Smaller group, respectively, 9.04% and 13.73%. The medians of the two groups also indicated values similar to the averages, 8.92% and 13.40%. The coefficients of variation for both groups are below 30%, indicating a reduced dispersion of the data around the mean. The Mann-Whitney test demonstrated that the groups' performance was statistically different.

Andrade et al. (2019a) attested that private banks showed greater financial independence than public banks, that is, they used more of their own capital than third parties to finance their assets. However, the sample in this study is made up of the same institutions that make up the one called Large. Analyzing the data from our study, it is observed that Banco do Brasil was the one that presented the lowest indexes, including values below the group average, confirming the findings of these authors.

Figure 5 shows us that this Santander indicator between March 2010 and March 2015 showed a downward movement converging towards the group average:

The Leverage Index [LV] demonstrates how leveraged the institution is, that is, how much it is financing itself with third-party capital. Andrade et al. (2019) warns us that a high value indicates that the institution is incurring a greater risk, but at the same time it can become an advantage for the bank, if the return on equity exceeds the return on assets. The Large group presented a higher average than the Smaller ones, 11.93 compared to 8.03, that is, on average, the first would be

more leveraged than the second. The medians of these groups also presented values very similar to the average, 11.88 and 8.16. The coefficients of variation of both groups also express a low dispersion of the data around the mean. In the case of this indicator, it was possible to use the "t" test and it showed that the average performance of the groups was not statistically different.

Andrade et al. (2019a), in their study, highlighted that, because this indicator is a ratio opposite to the previous one, the average of public banks surpassed that of private banks. As highlighted in the comment on the previous index, the sample of this study is made up of the same institutions that make up what was called Large, thus, this relationship was also observed in our study between Large and Smaller banks.

The Capital/Depositor Ratio [RCD] indicates how much of what was deposited was invested in the institutions' assets. In the case of Larges, the calculated group average revealed that for every \$1.00 deposited, \$0.30 was invested, while, for Minors, \$0.42 was applied. Andrade et al. (2019) stated that the higher this indicator, the lower the risk of the deposit being uncovered, so it can be said that the Smaller group presented a more comfortable position than the Larger ones. Thus, as in the previous indicators, which express the capital structure, the coefficients of variation of both groups showed a reduced dispersion of data around the mean and the Mann-Whitney test also demonstrated that the performance of the groups was statistically different.

Andrade et al. (2019), again, proved that private banks have higher rates than public banks. However, as the public banks, Banco do Brasil and Banrisul, participate, respectively, with 30.65% and 16.36% of the assets of their respective groups, it can be stated that there is no contradiction between the studies analyzed, a since the weight of these

institutions in the composition of the average of this indicator would be small compared to private institutions.

In short, the results suggest that Large banks depend more on third-party capital to finance their assets, and are more leveraged and more exposed to risks than Smaller banks. Therefore, the risk of deposits from customers in the first group being overdrawn would be greater than in the case of the second. Analyzing the data in more detail, it appears that the average share of demand deposits of the Grandes group, in the period studied, corresponds to approximately 15.17% of total deposits, while time and savings deposits, amount to approximately 81.26% of total deposits. The Minors group, in turn, presented, respectively, an average share of these same accounts, amounting to approximately 3.99% and 41.6% of total deposits.

The low dispersion of both samples, around the average, could suggest a certain convergence in relation to the strategies adopted by the institutions, in relation to their respective groups.

## CAPITALIZATION AND REGULATORY REQUIREMENT INDICES

The indices that reflect the capital requirements defined by Basel III, necessary for prudential regulation, are calculated using information from the financial statements of prudential conglomerates<sup>15</sup> that was published. Among these indices, the calculation and

15. Prudential conglomerates are made up of the following institutions: i) those of the financial conglomerate; ii) consortium administrators; iii) payment institutions; iv) companies that carry out the acquisition of credit operations, as well as real estate or credit rights; v) other legal entities based in the country that have, as their exclusive corporate purpose, equity participation in the aforementioned corporations; vi) investment funds in which the companies forming part of the prudential conglomerate assume or retain considerable risks and benefits. (BCB. Data Clarifications and Methodology. s/d. Available at: <[https://www3.bcb.gov.br/efddata/#~:text=Os%20conglomerados%20prudenciais%20incluem%2C%20al%C3%A9m,credit%C3%B3rios%2C%20iv\)%20outras%20pessoas%20jur%C3%ADlicas](https://www3.bcb.gov.br/efddata/#~:text=Os%20conglomerados%20prudenciais%20incluem%2C%20al%C3%A9m,credit%C3%B3rios%2C%20iv)%20outras%20pessoas%20jur%C3%ADlicas)>. Accessed on: August 13, 2022.

16. The IB was created in the Basel I Agreement, dated 1988. Brazil began implementing the recommendations of this agreement with Resolution 2,099, of August 17, 1994. According to ONO (2002), the IIM was not foreseen by the Basel Accord, however, it represents a measure of liquidity that is related to the institution's solvency and its capital structure.

17. For more detailed knowledge of what was proposed in this Agreement, see: LEITE and REIS (2013); ANBIMA (2013), OLIVEIRA and FERREIRA (2018).

disclosure period that coincided with the one studied was adopted as a criterion for choice, that is, those indicators that covered the entire period of analysis were selected. Only the Basel Index [IB] and the Fixed Asset Index [IIM] met this criterion<sup>16</sup>.

The reforms proposed in the Basel III Agreement, dated 2010, aimed to expand the resilience of the banking sector and strengthen the capacity of financial institutions to absorb shocks originating from the financial system itself or from other sectors of the economy, reducing the risk of crises spreading. financial resources for the real economy (BCB, s/d). In this sense, the main changes introduced were those related to the institutions' capital structure (Anbima, 2013).

Brazil began implementing the new recommendations of the Basel III Agreement<sup>17</sup> in 2013, through several Resolutions and Circulars issued by the National Monetary Council [CNM] and the Central Bank of Brazil [BCB]. It must be noted that this occurred before finalizing the schedule for implementing the Basel II recommendations, which was scheduled for the end of 2012. Table 5 below presents the schedule defined by the BCB for the implementation of the respective capital requirements in Brazil, as well as their respective values to be met by the institutions:

According to Andrade et al. (2019), the Basel Index aims to measure the institution's level of solvency, indicating that banks have sufficient capital to withstand the risks of their activity. Thus, the means of the Large and Small

groups presented very approximate values, respectively, 17.12% and 17.57%. The medians also presented very similar values, 17.18% and 17.20%, in that order. The coefficients of variation denoted that the samples from both groups are homogeneous, that is, there is a very low dispersion of data around the mean. The mean difference test confirmed that the performance of the groups was not statistically different. In this aspect, these results also confirmed the assertion by Oliveira and Ferreira (2018) about the Brazilian banking system presenting a BI greater than 15%, between Dec.2013 and Apr.2018.

The Fixed Asset Index [IIM] indicates how much of the institution's adjusted equity is invested in low-liquidity permanent assets, such as real estate, vehicles, etc. Brina (2012) highlights that this indicator demonstrates the commitment of assets in the face of the risks assumed. Ávila (2022) highlights that the smaller it is, the more agility the institution would have in disposing of its assets to honor its commitments. The BCB (2008) highlighted that the objective of this index is to prevent third-party capital from being invested in fixed assets, encouraging institutions to act with a minimum percentage of their own capital.

Descriptive statistics revealed that the Minor Group showed lower values, 12.85% and, therefore, better compared to the Large Group, 29.38%, with both the mean and median of the former being almost half

that of the latter. The mean difference test confirmed that the difference between the two groups is statistically significant. The coefficients of variation showed that only the Minor group sample presented a certain dispersion of data around the mean. These values are in accordance with the Financial Stability Report of September 2010, which stated that large banks have an IIM greater than 30%, while smaller banks have an IIM of around 10%, therefore, this may suggest that they maintained the same strategy during the period studied in this work. It is also in compliance with the maximum limit of 50% defined by the BCB (2004). Therefore, it can be stated that, on average, both Large and Small banks have the flexibility to use their assets, demonstrating low exposure to risks.

In short, the results suggest that both Large and Small banks presented satisfactory capitalization and regulatory requirement indicators, as they met the minimum requirements defined by both the Basel III Agreement and the BCB. Therefore, according to these criteria, these institutions demonstrated that they are solvent and capable of withstanding the risks inherent to their business. The large dispersion observed in the immobilization rate of the Minors group could be explained by the heterogeneity of the sample itself.

Table 6 summarizes the results found in this work in comparison with other studies:

	2013	2014	2015	2016	2017	2018	2019
Main Capital	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Tier I Capital	5.5%	5.5%	6.0%	6.0%	6.0%	6.0%	6.0%
For)	11.0%	11.0%	11.0%	9.875%	9.25%	8.625%	8.0%
ACP b) Conservation	0	0	0	0.625%	1.25%	1.875%	2.5%
Countercyclical ACP	0	Up to 0.625%	Up to 1.25%	Up to 1.25%	Up to 2.5%	Up to 3.75%	Up to 5.0%
PR + ACP Conservation	11.0%	11.0%	11.0%	10.5%	10.5%	10.5%	10.5%
PR + maximum total ACP	11.0%	11.625%	12.25%	12.375%	13.0%	13.0%	13.0%

Table 5: Implementation schedule of capital requirements in Brazil

Source: PWC/ABBC (2011)

Note: a) Reference Equity [PR]; b) Additional Principal Capital [ACP]

	Search results	Other authors	Sample	Period	Methodology	Result
<b>Cash Generation and Financial Balance</b>						
Voluntary Fitting [EV]	We reject H0, the average performance is different	ANDRADE et al(2019a)	public banks (Banco do Brasil) and private banks (Bradesco, Itaú-Unibanco and Santander)	2014-2018	Calculation of economic-financial indicators; descriptive statistics (measures of central tendency and variability);	average of public banks < average of private banks
Immediate Liquidity Index [LI]	We reject H0, the average performance is different	IUROVSGHI, NASCIMENTO and CARVALHO (2022)	"with" and "without crisis"	2000-2019	Calculation of economic-financial indicators (CAMEL); descriptive statistics (measures of central tendency) and Mann-Whitney Test	median of "with" indicators > median of "without crisis" indicators
Loan/Deposit Index [FDI]	We accept H0, the average performance is equal	ANDRADE et al(2019a)	public banks (Banco do Brasil) and private banks (Bradesco, Itaú-Unibanco and Santander)	2014-2018	Calculation of economic-financial indicators; descriptive statistics (measures of central tendency and variability);	average of public banks < average of private banks
<b>Profitability and Profitability</b>						
Return on PL [ROE]	We reject H0, the average performance is different	IUROVSGHI, NASCIMENTO and CARVALHO (2022)	"with" and "without crisis"		Calculation of economic-financial indicators (CAMEL); descriptive statistics (measures of central tendency) and Mann-Whitney Test	median of "with" indicators < median of "without crisis" indicators, Mann-Whitney test did not show statistical significance;
Return on the AT [ROA]	We accept H0, the average performance is equal	ANDRADE et al(2019a)	public banks (Banco do Brasil) and private banks (Bradesco, Itaú-Unibanco and Santander)	2014-2018	Calculation of economic-financial indicators; descriptive statistics (measures of central tendency and variability);	average of public banks < average of private banks
<b>Capital Structure and Leverage</b>						
Average Financial Independence [IFM]	We reject H0, the average performance is different	ANDRADE et al(2019a)	public banks (Banco do Brasil) and private banks (Bradesco, Itaú-Unibanco and Santander)	2014-2018	Calculation of economic-financial indicators; descriptive statistics (measures of central tendency and variability);	average of public banks < average of private banks
Leverage [LV]	We accept H0, the average performance is equal	ANDRADE et al(2019a)				
Capital/Depositors Ratio [RCD]	We reject H0, the average performance is different	ANDRADE et al(2019a)				
<b>Capitalization and Regulatory Requirement</b>						
Basel Index [IB]	We accept H0, the average performance is equal	OLIVEIRA and FERREIRA (2018)		Dec. 2013 to Apr. 2018	analyze the adequacy of the banking system and the possible effects on credit conditions;	above 15%
Immobilization Index [IMM]	We reject H0, the average performance is different	BCB (2004)				Large Banks: IMM > 30%; Small Banks: IMM close to 10%

Table 6: Summary of Research Results

Source: Original survey results



## FINAL CONSIDERATIONS

The results obtained demonstrated that the groups' performances were statistically different in the case of the following indicators: voluntary cash flow, immediate liquidity, return on equity, average financial independence, capital/depositors' ratio and fixed assets index. Meanwhile, the performance was not statistically different in the case of loan/deposit ratios, return on total assets, leverage and Basel Index. With the exception of profitability and profitability indices, in the others, the Large group demonstrated low dispersion of data around the average, suggesting convergent strategies among its members. These banks also concentrated a greater volume of deposits, both demand and term, with credit operations being more significant among their asset accounts, while smaller banks focused more on the acquisition of bonds and securities. The results also suggest that the Basel III recommendations did not represent a major impact on both groups, since the BCB already required banks to maintain minimum capital requirements above those specified in that agreement. Thus, the present work concluded

that the performance of banks in the period from the 1st quarter of 2010 to the 3rd quarter of 2021 was satisfactory and the institutions analyzed presented low leverage, an adequate capital structure that guarantees solvency and the capacity to withstand the risks of the business. One of the limitations of the present study is the heterogeneity of the sample, especially in the Minors group, which may have generated a significant dispersion of data around the average. The data relating to the calculation of ROE and ROA for both groups presented a stationary behavior indicating the need to use a more appropriate econometric model. As a suggestion for other studies, it is recommended to compare the performance of Large banks with groups of institutions that have affinity in their business, for example, with development banks, with digital banks, with banks focused on consumer credit, etc.

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