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El Impacto de las Reglas de Basilea III en la Estructura de Capital de los Principales Bancos Brasileños.

The Impact of the Basel III Rules on the Capital Structure of Major Brazilian Banks.

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RESUMEN

Propósito: Las instituciones financieras en Brasil deben seguir las determinaciones del Banco Central con respecto a las reglas que regulan el sistema financiero global. Desde esta perspectiva, el objetivo de este estudio es analizar la influencia del ratio de Basilea en el apalancamiento de los principales bancos.
Metodología: Así, se realizó una investigación de archivo, descriptiva y cuantitativa sobre Basilea III, utilizando una muestra de 09 bancos brasileños durante los años 2012 a 2016. Los datos fueron obtenidos a través de las bases de datos Thomson Reuters Eikon y Banco Central do Brasil, y un MCO (Mínimos Cuadrados Ordinarios) se aplicó la regresión a la variable dependiente apalancamiento.
Recomendaciones: Los resultados mostraron una relación positiva entre el Índice de Basilea y el tamaño de las instituciones financieras en Brasil. Este hallazgo sugiere que los bancos brasileños sufren impactos directos en su estructura de capital con respecto a la regulación y su tamaño, ya que la concentración del sector produce una estructura que busca la eficiencia de las actividades bancarias.
Originalidad/valor: El estudio contribuye a la literatura sobre el tema, en lo que se refiere a la estructura de capital y principalmente porque se relaciona con los factores de riesgo y patrimonio de referencia en este sector, ya que los hallazgos indican que aún existen factores no explorados en la estructura de capital del sector bancario. Estos factores también deben ser explorados.

Palabras Clave: Bancos Brasileños; Basilea III; Estructura Capital; Regresión MCO.

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Abstract

Purpose: Financial institutions in Brazil had to follow the Central Bank's determinations regarding the rules that regulate the global financial system. From this perspective, this study is aimed to analyzing the Basel Index influence on the main banks leverage.
Methodology: Thus, an archival, descriptive, and quantitative research on Basel III was carried out, using a sample of 09 Brazilian banks during the years 2012 through 2016. The data were obtained through the Thomson Reuters Eikon and Brazil Central Bank databases, and an OLS regression (Ordinary Least Squares) was applied to the dependent variable leverage.
Findings: The results showed a positive relation between the Basel Index and the size for financial institutions in Brazil. This finding suggests that Brazilian banks suffer direct impacts on the capital structure with regard to regulations and their size as the concentration of the sector produces a structure that seeks the efficiency of bank activities.
Originality/value: The study contributes to the literature on the subject, with respect to the capital structure and mainly because it is related to the risk factors and reference equity in this sector since, the findings indicate that there are factors that have not yet been explored in the capital structure of the banking sector. Such factors have to explored, as well.

Keywords: Brazilian Banks; Basel III; Capital Structure; OLS Regression.

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1. INTRODUCTION

In the last three decades, the Brazilian banking system has been transformed through the adoption of international regulations and through mergers and acquisitions. This whole scenario has led to a high concentration of the sector, strengthening the presence of large banks, and amplifying the role of federal public banks. However, these rules proved to be fragile in the face of the subprime crisis in 2008, highlighting the need to develop principles for international regulation of the financial system.

Definitely, the assumption of risk-taking by lending in risky assets can increase the rate of default in repayment and the return of banks, consequently, this affects the depositors and the bank's inadimplencly affects in general the economy (Siddika & Haron, 2020). In this case, after the subprime crisis conforming to the International Monetary Fund (2014) during the global financial crisis the factories guess excessive risks because the financial factories and the lapses in regulatory regulations were identified as the noteworthy causes of the crisis.

Thus, in 2010, Basel III is published which, in addition to a new concept of capital, it also includes the first tools related to macro-prudential regulation, such as the risk of systemic scope which affects the sector as a whole, as well as its amplification resulting from procyclicality (Pinheiro, Savóia & Securato, 2015). This agreement aimed to increase the banks' capacity to absorb shocks arising from financial and economic stress, whatever the causative source, optimize risk management and governance practices and strengthen transparency and the disclosure practices.

Even in the face of the global financial crisis in 2008, the Brazilian banking system remained firm, since, at that time, most of them were already operating according to the Basel rules and their risk exposure were within acceptable parameters. It is noteworthy in relation to the implementation of Agreement III, that the Central Bank of Brazil (BCB) applied international standards in Brazil, so that banks should have a minimum Basel Index in the range of 10.5% to 13,0%, or 15%, in the case of more relevant institutions (Anbima, 2013).

With the adoption of the new rule, it is necessary to verify how the rule affects the capital structure of domestic banks, so that one can predict, to some extent, the behavior of the banks exposed by this change. It appears that through the Basel Index analysis it is possible to analyze an important factor that influences the institutions capital structure. Furthermore, the index calculation considers the risks and the reference equity, which

may generate greater insights regarding the sector's peculiarities. That said, based on the above, this study presents the guiding question: what is the influence of the Basel Index on leverage? Thus, the research objective is to analyze the influence of the Basel Index on the leverage of Brazilian banks' capital structure.

The study proves to be useful and necessary since the institutions that compose the sample are located in a developing country that is strongly influenced by other economies, highlighting the importance of verifying the impact, mainly suit the new regulations. Moreover, financial institutions play an important role in the economy of countries, as they conduct monetary policy, operate the payment system, in addition to being a source of credit for families, companies and governments (Hordones & Sanvicente, 2020).

According to Wellink (2010), as from the measures of the Basel III Agreement, it is possible to obtain greater soundness in the banking system, with the pursuit of the institutions development and the reduction of credit supply in unfavorable situations. Additionally, according to the Central Bank of Brazil (2006), based on an international standardization, it is possible to observe the capitalization levels requirements and especially observe more accurately the risks to which financial institutions are exposed.

The contribution of this paper is linked to changes in the regiment implications of banking institutions in the capital structure. Furthermore, the study has important implications for the general regulation that enables different implications in different sized institutions. Additionally, it contributes to the research area in banking institutions by identifying new insights that assist and add knowledge regarding factors affecting the institutions management and performance, given the importance of these for the national scenario and professionals from the business area.

The paper is divided into five sections, including this introduction. The second section presents a literature review on banking systems in Brazil, Latin America, and Basel III. The third section presents the methodology used in the research construction. The fourth section is an analysis of the Basel Index influence on the capital structure. Finally, in the fifth and last section, our conclusions on the theme are presented.

2. THEORETICAL REFERENCE

Before discussing, what Basel III is and its importance, it is necessary to understand how the banking system is, not only in Brazil but also in some Latin American countries, in addition to the aspects of banks' capital structure.

2.1 The Banking System in Brazil

A bank is a financial institution or a financial intermediary that accepts deposits and forwards these deposits to lending/financing activities, directly or through capital markets. The basic proposal of a bank is to broker its customers who have capital deficits with customers who have capital surpluses (Veras, 2004). However, according to Hordones and Sanvicente (2020), competition seen as positive for transformation, especially in the banking sector, has been seen as a controversial issue.

The explanation above shows that banks are essential for the economy functioning and perform several social assignments, among them: issuing money (in some countries), clearing and settling payments, financial intermediation, credit activities, the bank multiplier (money creation), and others. These listed activities are essential for the economy development, in addition to affecting the State decisions regarding the way its economic grows, deserving therefore a differentiated and special attention (Andrezo & Lima, 2007). Not only are bank activities crucial, but bank concentration itself has an impact on the economy, since the relationship between competition and bank efficiency is positively associated with economic growth (Fohlin & Jaremski, 2020).

The banking sector of almost all Latin American countries has undergone numerous changes in the last decades, the conclusion of these changes led to financial liberalization and an international financial integration (Chortareas, Garza-García & Girardone, 2010). However, one of the main effects of these changes was the acceleration of the financial systems consolidation process, resulting in more concentrated banking systems.

Banking concentration is understood as the market composition in which few banks have the largest market share in relation to deposits, loans, and assets (Mato, Domínguez, Perea, Saca & Sánchez, 2011). Concentration, in most situations, implies the existence of market power in the sector, since there are few banks that dominate the market, this can lead to non-competitive prices (interest rates) due to an anti-competitive policy of the banks.

The banking system consolidation process in Brazil, which was strongly driven by the mid-90s, has two simultaneous elements that catalyzed the consolidation: the geographic concentration of bank branches and mergers, acquisitions, and liquidations (Almeida & Jayme Jr., 2008). In short, the concentration of the banking market in Brazil derives from some factors that influenced the sector restructuring: price stabilization through the "Plano Real", the privatization policy of state banks, openness to foreign investment and adaptation to standards of the Basel Agreements (Paula & Marques, 2006; Almeida & Jayme Jr., 2008; Oliveira & Soares, 2019).

Over the decades, the concentration of the Brazilian banking system has increased and has consolidated, creating huge barriers to the entry of new foreign competitors (Kremer, 2003). This sectorial protection in the understanding of Maciel, Ferraz, Biondini and Franco (2021) stems from the fact that the banking market is more concentrated and the economies of scale of banks reduce operating costs. According to the Banking Economics Report of the Central Bank of Brazil in 2019, referring to the year 2018, banking concentration in the country had a small drop, but it is still extremely high. Regarding the analysis, the five largest multiple banks in the country - Caixa Econômica Federal, Banco do Brasil, Itaú, Bradesco and Santander hold 84.68% of the credit market.

The report also points out that the five largest institutions are also responsible for most banking assets, controlling 81.20%, a rate lower than the 82.60% in 2017. It is worth noticing that among these major banks, two of them are state-owned banks. However, in the last 3 years, such state-owned banks have had a drop in their share compared to private banks. A complementary analysis of these banks in relation to the degree of concentration by the variables, total assets, total deposits and credit operations, showed an upward trajectory and pointed to a moderate concentration of the banking industry until 2017 (Oliveira & Soares, 2019).

This banking sector concentration is often associated with market concentration with anti-competitive practices. However, this correlation between concentration and competition is not as indirect as it appears to be. From the point of view of the authors Vieira, Queiroz, Jesus Barbosa & Souza Moura (2021) bank concentration can facilitate the reduction of competition in the sector, however, a market can be concentrated, and the behavior of banks be competitive.

In this regard, although banks in Brazil show great market power, it cannot be said that they operate as a cartel (Nakane, 2001). Even with the concentration process, the

work of Lima and Fátima Carvalho (2009) reports that the Brazilian banking market is not significantly concentrated, as the findings show a mostly competitive market. This finding supports the research by Gelos and Roldos (2002), where it was shown that even with the concentration increase, competition has not declined.

2.2 Latin American Banking System

A study by the authors Araújo, Brandão, Goldner and Oliveira (2007), shows that in general the global financial system usually moves towards a concentration of markets. This is characterized by organizations looking for opportunities in sectors where greater technological knowledge or expertise in processes and activities are present.

Although the competition is somewhat healthy, fees are charged for the benefits arising from the efficiency of the sector and the quality of services. However, it is worth recalling that the concentration has positive elements, such as the system soundness and stability (Dantas, Medeiros & Paulo, 2011). That is, banking concentration provides stability for the financial system, in addition to increasing the probability of profit for banks, resulting in a decrease in the fragility of the banking sector (Hac, 2021; Santos & Nunes, 2023).

Compared with other countries, Brazil had a late internationalization. It was not until the early 1990s that internationalization of the financial system began. Banking consolidation in Brazil, as in other Latin American countries (Argentina, Chile, Mexico and Uruguay), was initially of the consolidation type, in response to fragile banking structures, generating M&A *(*Mergers and Acquisitions*)* opportunities for foreign banks and national private banks (Paula & Marques, 2006). Although there was an active political program focused on the restructuring and implementation of banking privatization in Latin America, promoted by the States themselves, countries such as Brazil and Argentina still have large banks under state control (Hordones & Sanvicente, 2020).

According to Araújo, Neto and Ponce (2006), the foreign banks arrival was necessary in view of the low amount of capital and aiming at greater efficiency and ability to consolidate national institutions, to favor the banks capitalization in equity asymmetry and expand competition in the domestic banking sector. The study by Chortareas, Garza-García and Girardone (2010) confirm the evidence of the structure's efficiency, that is, mergers and acquisitions (market concentration) are motivated by efficiency issues

in some Latin American countries.

The research findings are robust for the largest banking markets in the region, such as Brazil, Argentina, and Chile. In short, bank consolidation in Latin America, in addition to modifying the performance and quality of services banks, changed the market structure, in order to allow the emergence of global systemically important banks in the financial system of the countries (Hordones & Sanvicente, 2020).

The work by Mato *et al.* (2011) using concentration indices, points out that Argentina shows a lower percentage of concentration than Brazil, Colombia, and Chile, but both (Argentina and Brazil) have an average concentration. Peru has an extremely high concentration index when compared to other countries, so it is classified as an extremely concentrated banking system (Apolinario, Quispe, Rodriguez & Gadea, 2022). The article by Torres and Castaño (2020) shows that through indicators that measure concentration, over the last few decades the Colombian banking market has become increasingly concentrated, however, there are no characteristics of an oligopoly structure.

Considering the explanation points for the banking sector concentration in Latin America, we have, therefore, a synthesis of another study, which shows, according to the competition structure, that Argentina, Brazil, Colombia, and Uruguay present a monopolistic competition. While Bolivia, Ecuador, Mexico, and Peru, on the other hand, showed the characteristic of monopoly, though the findings on Chile were not statistically significant (Sakamoto, 2017; Rafay, Franco & Gilani, 2019). In Belaish's (2003) view, the Brazilian banking system is highly profitable (high spread), but less competitive when compared to banks in other Latin American countries. However, the crisis of 2008 caused the increase of banking sector barriers motivated by competitive regulation, preventing new entrants in several countries, including in Latin America (Barth, Caprio & Levine, 2001; Sakamoto, 2017). And it was in this delicate scenario with the national banking system undergoing rapid transformation that globalization impacted directly, further increasing the flow complexity and the smooth running of the system. It is only by understanding the beginning of the banking system in Brazil that is possible to understand how it happened and what the relevance of such system internationalization is and thus, conceive the adoption of international standards, such as the Basel Agreement.

2.3 The Basel III Agreement in Brazil

Due to their importance within the countries' financial system and economy, the banks in most countries are highly regulated. Therefore, these institutions are generally subject to regulations that require a minimum of capital to be kept in the bank, the minimum required is derived from the Basel Agreements. Which are actually safeguards that seek to maintain financial stability, via liquidity and credit control in relation to banks (Cavalcanti, Gutierrez & Figueiredo, 2021).

Considering the need for transformation, regulatory bodies in most countries around the world began to change their policies and methods, thus focusing on the banks' risk management ability, as well as on the adequacy of capital needed to support such banks. Hence the need for the Central Bank of Brazil to begin modernizing its form of inspection in the 1990s, guided by the rules of the Basel Committee.

It was essential for the Central Bank of Brazil that all plans and proposals started to consider changes in the laws for accessing the financial system, as well as the regulation of compensation agreements, participation in studies related to the Basel Agreement, projects in the risk management area and the insertion of capital requirements to cover risks in the stock and commodities market.

In relation to the Basel III Agreement in 2017, and the new prudential rules laid down by the Basel Committee, they present the preliminary guidelines related to the rules implementation, with emphasis on the innovative concepts and definitions on capital quality, liquidity and leverage ratios, mechanisms to reduce procyclicality and the compliance with the new minimum regulatory arbitrage parameters (Oliveira & Ferreira, 2018). The proposal was based on the premise of preparing financial institutions for possible shocks arising from the financial system or from other sectors, minimizing the impacts of crises that spread to the real economy (Cavalcanti, Gutierrez & Figueiredo, 2021).

In short, Basel I was important for reducing public presence in the financial system, in addition to reducing the number of banks and expanding foreign operations (Moura Neto & Ribeiro, 2006). As for the Basel II Agreement, still according to the authors, the main obstacle was the building and adaptation of a robust information system, for the banks' risk assessment models. However, the implementation of these rules based on the Basel Agreements I and II, along with greater rigidity on the part of Brazil Central Bank, was positive with regard to the greater strength and liquidity of the National

Financial System.

As a highlight of the implemented measures, Basel III introduced two new liquidity control mechanisms: the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR), both as complementary objectives (Cardoso, Campos, Dantas & Medeiros, 2019).

Thus, the proposed set of changes was dedicated to eliminating the problems described in the Committee's diagnosis (low amount of capital and low quality, liquidity shortage and excessive leverage), so that the banking sector resilience could be increased whenever banks faced shocks of any kind.

In other words, the new capital structure of financial institutions will have a capital of better quality as well as limitations on the capital instruments of lower quality. In addition, prudential measures were adopted in relation to the institution's capital, in order to have a conservation buffer, which is the additional capital to cope with possible losses, as well as the countercyclical buffer, or countercyclical capital for times of economic instability (Pinheiro, Savóia & Securato, 2015; Cavalcanti, Gutierrez & Figueiredo, 2021).

A possible criticism in relation to Basel III is the issue of systemic risk, since the new measures do not address the problem of the shadow banking system and its real destabilizing capacity (Oliveira & Ferreira, 2018). Another weakness is making deposits less stable as banks compete for funding sources (Cardoso *et al.*, 2019). This could generate instability in emerging and developing markets, since in the vast majority of countries capital markets are less developed and depend on long-term financing.

In short, we have seen the need and importance of establishing international standards for maintaining the banking and financial system health. Due to globalization and the economic crises faced by countries around the world, it was essential to establish comprehensive rules that lead to the same target.

It is common knowledge that a bank needs to follow the Central Bank rules and, as this Central Bank has set that the rules of the Basel Agreements were to be followed, it is necessary to apply them, especially with regard to the creation of reserves and increased demand for capital. Nevertheless, to have a broad view of what the national banking and financial system will look like, it is important to check how banks have undergone these changes and what their impact is, especially, on their capital structure.

3. METHODOLOGY

In order to investigate the influence of the Basel Index on leverage, an archival, descriptive research with a quantitative data approach was carried out. The population comprised all financial institutions that operate in Brazil, but a selection was conducted for a sample considering the size of each one, as well as the disclosure of data and information in the statements. In addition, data were collected on the website of the Central Bank of Brazil and on the Thomson Reuters Eikon database.

The sample used was the non-probabilistic for convenience, since it was chosen nine national banks that had their data disclosed, thus the banks were classified by size: small, medium, and large. The scope of the study covers the years 2012 through 2016, and is justified because the implementation of some Basel III premises had already been started.

The period of the analysis is justified because, in Brazil, the Basel III agreement began to be implemented through resolutions and circular letters in Brazil in 2013 (Cavalcanti *et al.*, 2021). However, the present study chose to start the analysis in 2012, considering the longitudinal cut and also if the impact could be evidenced, a year before the implementation, when there were speculations, and from the year that the resolutions were implemented.

Based on the balance sheet of December 2016, the nine banks surveyed were ordered by total assets and segregated by sizes, as shown below. Thus, it was possible to analyze the institutions capital structure with the same risk profile. Therefore, Table 1 shows the classification of banks considering their size and assets. Thus, in Table 1 it is possible to check the banks name, the size, and the total assets.

Table 1 - Research Sample (in millions of R$)

Banks	Size	Total Assets
Banco Itaú	Large	1.425.639
Banco do Brasil	Large	1.401.377
Banco Bradesco	Large	1.293.559
Banco Santander	Medium	701.705
Banco PAN	Medium	27.506
Banco BMG	Medium	15.616
Banco Alfa	Medium	12.699
Banco Pine	Small	8,150
Banco Indusval	Small	4.119

Source: Prepared by the authors, 2022.

The research variables are shown in Chart 1, where the debt ratio (or capital index) and the banks size are the most important factors in explaining the banks' structure (Chortareas, Garza-García & Girardone, 2010). The natural logarithm of total assets is a proxy for the size of banks, besides using the return on assets (ROA) as a proxy of profitability (Tabak, Fazio & Cajueiro, 2011; Sidikka & Haron, 2020). And the Basel Index, which is an indicator that measures the degree of financial leverage of a financial institution, is composed by dividing the Reference Equity and the Risk Weighted Assets.

Table 2 - Variables used in the study

Variables/ Definition		Formula	Collecting
LEV	Leverage	$\frac{Total\ Liabilities}{Total\ Assets}$	Refinitiv Eikon®
BI	Basel Ratio	$\frac{Risk\ Weighted\ Assets}{Reference\ Equity}$	Brazil Central Bank
SZ	Size	Ln of Total Assets	Refinitiv Eikon®
ROA	Return on Assets	Net profit of t-1 divided by total assets of t-1. NT / TA	Refinitiv Eikon®
INDEB	Participation of third party resources in the capital structure	Total liabilities divided by the total net equity. (Current Liabilities + Non-current liabilities) / Net worth	Refinitiv Eikon®

KEY: MVE = Market Value of Equity; BVA = Book Value of Assets; BVE = Book Value of Equity.
Source: Prepared by the authors, 2022.

Regarding the leverage-dependent variable, the total liability was used over the total asset value. Regarding the independent variable, which refers to the Basel Index, it has been extracted from the organizations' financial statements through the Central Bank of Brazil website. Regarding the control variables, size was included in the model, calculated by the logarithm of total revenue, as well as the return on the asset, by dividing the net income by the total assets Finally, the indebtedness, calculated by dividing total liabilities by equity. The empirical model is presented in the Equation:

Equation 1

$$LEV_{it} = \beta_0 + \beta_1 BI_{it} + \beta_2 SZ_{it} + \beta_3 ROA_{it} + \beta_4 INDEB_{it} + industry\ fixed\ effects + year\ fixed\ effects + country\ fixed\ effects + \varepsilon$$

To control heteroscedasticity problems, OLS regression was performed, with robust standard errors and with year fixed effects control. Multicollinearity between variables was also tested by the Variance Inflation Factor (VIF) test, and the autocorrelation of the residuals by the Durbin Watson test. The results will be shown in the tables in the Results Analysis section.

3.1 Market Description

According to data from 2017, a report by Standard & Poor's Global Market (S&P), and released by Infomoney (2017), among the annual ranking of the 50 largest banks in Latin America and the Caribbean, 12 are in Brazil. The first place in the ranking is Banco Itaú, followed by Banco do Brasil, Banco Bradesco, Banco Santander, and others. However, according to information from Valor Econômico (2017), Banco do Brasil remained the largest financial institution in assets, and in December 2016, Banco do Brasil had R$ 1.401 trillion in assets, behind Itaú Unibanco, with R$ 1.425 trillion, followed by Bradesco, with R$ 1.179 billion. In terms of net equity, Bradesco was the second largest Brazilian bank in 2016. The list also includes Santander (R$ 701 billion).

Another important point to emphasize is that, currently, the country's financial institutions are world champions of profit. According to the 2017 report of the Bank for International Settlements (BIS), the net result of the largest Brazilian banks in 2016 was 1.99% of total assets, which placed Brazil in the leadership among 16 countries analyzed. In other words, talking about Latin America, the consolidation of the banks can be modified the performance and the quality of services, changing the structure of this market and possibly the development of global systemically important banks in the financial system of the countries (Hordones & Sanvicente, 2020).

4. RESULTS ANALYSIS

This section presents and discusses the research findings. Initially, the descriptive statistics of the variables are presented, in sequence, and the results of the multiple linear regression OLS (Ordinary Least Squares), which are the research focus. Descriptive analysis of the variables are set forth in Table 3.

Table 3 - Descriptive analysis of variables

Variables	Minimum	Maximum	Average	Standard Deviation
Leverage	0,0559607	0,1918806	0,1147864	0,0351941
Basel Index	-0,1042	0,2673	0,1609746	0,0497611
Size	21,69979	28,07108	25,14883	2,269034
Return on Assets	-0,0841792	0,0230243	0,0052506	0,0181862
Indebtedness	4,211574	16,8697	8,599901	3,126132

Source: Prepared by the authors, 2022.

As noticed in Table 3, the perceived value indices are not discrepant, and this may be linked to the fact that they are companies in the same sector and with similar financing

strategies, however, regarding indebtedness, the maximum can reach 16%, since the sample covers small, medium and large institutions. Regarding the independent variable, Basel Index, it appears that on average, the ratio between the reference equity institutions can reach 26%.

The relation between return on assets has a minimal negative and, in some institutions, greater indebtedness can be sought when greater leverage is pursued, since the average indebtedness and leverage can justify this relation. In addition, in order to maximize ROA, banks can receive concession criteria and seek to increase the volume of loans, having lower quality of subsidies and higher banking risk (Nikkita & Haron, 2020). Furthermore, the Basel Index is intended to guide institutions in regard to capital, liquidity, and leverage ratios, as proposed by the Basel Committee in 2013.

Then, the Kolmogorov-Smirnov normality test was performed, which was significant, indicating that the data distribution is non-normal. After this finding, it was carried out the Spearman's Correlation I order to analyze the association between the variables. Thus, it was sought to measure the intensity and the significance of the relation between the variables analyzed. The Spearman Correlation are presented in Table 4.

Table 4 - Spearman Correlation between variables

	LEV	BI	SZ	ROA	INDEB
LEV	1				
BI	-0,160	1			
SZ	-0,539***	0,328***	1		
ROA	-0,299***	0,316**	0,632***	1	
INDEB	-1,000***	0,160	0,539***	0,29***	1

Notes: * significant at the 10% level; ** 5%; *** 1%
Source: Prepared by the authors, 2022.

According to the data in Table 4, which refers to the correlation between variables, it is observed at a first assessment that there is no significant correlation between Leverage and the Basel Index. However, it points out that there is a negative relation. Among the control variables it stands out the high correlation among them. However, it is given prominence to the negative correlation at the 1% level between leverage and return on assets, which may be linked to the fact that organizations seek greater third-party funding to operationalize their activities. This is in consonance with the sectorial protection, as Maciel *et al.* (2021) referencing, the Brazilian Market is more concentrated and operational costs are lower.

It is noteworthy that there is a positive correlation between the size and the Basel Index which meets the perspective that the Basel Index may be higher for large banks. Moreover, the results indicate that the third-party capital participation is also correlated with the return on the asset, in which the banks choose to structure themselves with a higher percentage of third-party capital and also opt for a higher return on the asset. According to Oliveira and Soares (2019) a complementary analysis, the study shows a moderated concentrated in the bank sector and this is until 2017.

In short, with regard to these findings, it is assumed that Leverage is positively related to the Basel Index, as more leveraged companies are affected on a larger scale by impacts of the international economy, and it is precisely for this reason that the new regulatory measures aim to highlight their impact on the financial institutions health. Although bank concentration is able to provide stability of the financial system, it increases the profit of banks and less deficiencies in the banking system (Hac, 2021; Santos & Nunes, 2023).

That said, the regression model analysis was carried out to answer the research question, about the relation between Leverage and the Basel Index, and the control variables. The result of the equation is summarized in Table 5, shown below.

Table 5 - Basel Index III in the leverage

Variables	Dependent Variable: Leverage	
	Coefficient	Statistic *t*
CONSTANT	0,1479947	7,40
BI	0,0753432**	2,03
SZ	0,0021252**	2,33
ROA	-0,1999017*	-1,84
INDEB	-0,0113856***	-12,87
Significance of the model	0,0000	
R^2	0,9046	
Average VIF - Variance Inflation Factor	1,94	
Durbin Watson	1.939	
Year Fixed Effect	Yes	
N_O	63	

Keys: BI = Basel Index; SZ = Size; ROA = Return on Assets; INDEB = Indebtedness
VIF = Variance Inflation Factor; DW = *Durbin-Watson*; N_O = number of observations
Significance Level: *10%; ** 5%; *** 1%
Source: Prepared by the authors, 2022.

Regarding the result presented in Table 5, it is observed that there is a positive and statistically significant relation at the level of 5% in the relation between leverage and the

Basel Index; it can be seen that in relation to the optimization of risk management and governance practices, leverage is seen as a positive strategy. Moreover, one of the positive points in reference to this result does addendum to best practices and transparency of banks, especially regarding the practice of disclosure. Also, according to Wellink (2010), the Basel III Agreement provides greater soundness of the banking system.

That said, even when performing analysis in banks of different sizes, there is a positive and statistically significant relation with regard to leverage and size. This interaction is related to efficiency, a recent trend in consolidation, as banks are looking to increase their size in order to distance themselves from competitors, that is, increasing market concentration. This is with consonance with the precepts of Oliveira & Soares (2019).

Consequently, the return on assets is verified with a negative relation with regard to leverage, that is, taking into account that leverage is linked to bank concentration, it is clear that the increase in concentration is not producing an increase in profitability as expected. That, according to Vieira *et al.* (2021) bank concentration can be facility competition in the sector, but the market can be more concentrated and the banks be more competitive in this case.

Another important aspect is the indebtedness, which also presents a negative and statistically significant relation with leverage. These results point out the peculiarity for analyzing the banking sector specifically, and also by the perspective that the banks are governed by the Central Bank, and that a large part of the regulations are aimed at setting up reserves, but that requires greater capital. Thus, this study aims to demonstrate how the Basel Index is related to leverage, which directly impacts their capital structure.

Talking about the impact of the Basel Index, ceteris paribus the banks' incompliance affects the economy. That, the regulation and adequation of capital in addition to the behavior of assumption of risk possibly the guidelines for managing the bank capital using the Basel Committee (Nikkita & Haron, 2020). On the other hand, as Lundtofte and Nielsen (2018) with regulation, it is possible to increase the power of the bank system, and the evidence finding the negative regulatory pressure to incentivize the excessive assumption of risk in the bank sector.

5. CONCLUSION

This study aimed to analyze the influence of the Basel Index on leverage. To this end, a descriptive, archival research was carried out with a quantitative approach of the data. The sample comprised 09 Brazilian banks, separated between small, medium, and large. Therefore, for the analysis of the results, the OLS regression was operationalized, with robust standard errors and with the control of fixed year effects.

This result suggests that the regulation of the Central Bank to balance the supply of credit in unfavorable situations, as well as increasing the banks' capacity to absorb financial shocks, helps in liquidity and in the capital structure. In fact, higher leverage has a higher Basel Index.

As a result, the variable size has a positive relation with leverage, corroborating the findings of Tabak, Fazio and Cajueiro (2011), where this interpretation depicts that banks have been seeking to improve their efficiency, by increasing their size on the market. The variable return on assets has an inverse relation (negative) with leverage, so that the higher concentration of the Brazilian banking market would not lead to an increase in the profitability of financial institutions. This finding confirms the evidence of Dantas, Medeiros and Paulo (2011).

In view of the above, it is concluded, through the question of the study: what is the influence of the Basel Index on leverage? Banks classified as small, medium, and large size have a positive impact in relation to the Basel Index and the size. In other words, given the Brazilian scenario, of high instability regarding the macroeconomic factors, and also due to the fact that Brazil is an emerging country, they may be factors that are linked to these impacts on the capital structure.

The conclusion of the study is relevant to the literature on banking institutions, mainly because it refers to a factor that impacts the capital structure. Furthermore, it is an analysis as to the applicability of the Central Bank regulation to the National Financial System, which highlights the Index's main purpose in classifying organizations through the result of the relation between risk factors and reference equity. Moreover, the study seeks to add knowledge and identify new insights regarding the exploration of factors that impact the banks' capital structure.

However, by analyzing the impact of an index on leverage, it was chosen variables that relate to the banking institutions' capital structure, but are subject to limitations. Likewise, only a few banks were analyzed, as selected by their sizes. With regard to the

analyzed variables, it would be interesting, for future research, to insert variables related to the scenario in which the banks operate, and especially the comparison between scenarios, notably in economies with Latin American similarities.

Thus, as a suggestion for future research, there is an expansion of the study sample for the purpose of comparing the results and also applying different scenarios taking into account both economic and social factors in the countries. Finally, as the theme proposed in this research is somewhat early, it is urged that researchers seek greater contributions to the area, even more in the financial institution's sector, so that it is possible to expand knowledge and make it possible to compare the results found in the research carried out to date.

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