


Evaluation of the behavior of Brazilian banks in merger and acquisition transactions

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ABSTRACT

This study aims to determine the impact of an M&A on the performance of the consolidating bank in relation to its competitors in both the intermediation and profitability approaches, in addition to proposing an M&A ranking metric for a more accurate performance analysis. Although some studies assess the performance of banks in M&As, the explanation of their impact on institutions in the market can be better explored by proposing a financial-operational metric, different from valuations by the stock market, complemented with the point of view of organizational strategies that appear in the literature as essential for the continuity of the resourcefulness of the topic. Assessing the consequences of bank M&As and understanding their intentions provides better management of both institutions and the country's socioeconomic aspects. It also provides guidelines and new tools for performance evaluation for academics, managers, and government officials on M&A processes. The research method is quantitative-qualitative. In the quantitative approach, the data envelopment analysis (DEA) technique with a second stage of multiple linear regression was used. The database was formed by information from the banks' financial statements from 2000 to 2018 (representing the CAMELS), supplemented with macroeconomic and market structure information. In the qualitative approach, the impact of these regressed variables was determined in the quantitative stage for four case studies, which are the Big4 banks that represent approximately 87% of the Brazilian financial market. Although some studies deal with the topic of the relationship between efficiency and M&As, this study shows that there is no clear and direct relationship between M&As and the performance (efficiency) of banks in the market. The results suggest that banks carry out M&As for reasons other than the search for efficiency, leaving efficiency as a consequence of the operation. This article contributes to the proposal of a new metric for measuring the efficiency of M&As, whose function is to establish a ranking and relativize the analysis of banks' performance in relation to the market as a whole, allowing the visualization of the relative effect vis-à-vis competitors.

Keywords: banking, mergers and acquisitions, performance metrics, efficiency, DEA.

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Avaliação do comportamento dos bancos brasileiros em transações de fusão e aquisição

RESUMO

Este estudo tem como objetivo determinar o impacto de uma fusão e aquisição (F&A) no desempenho do banco consolidador em relação a seus concorrentes, tanto na abordagem de intermediação quanto na de rentabilidade, além de propor uma métrica de ranking de F&A para uma análise de desempenho mais precisa. Embora alguns estudos avaliem o desempenho dos bancos em F&As, a explicação de seu impacto sobre as instituições no mercado pode ser mais bem explorada com a proposição de uma métrica financeira-operacional, diferente das avaliações pelo mercado acionário, complementada com o ponto de vista das estratégias organizacionais que aparecem na literatura como essenciais para a continuidade da desenvoltura do tema. Avaliar as consequências das F&As de bancos e entender suas intenções proporciona uma melhor gestão tanto das instituições quanto dos aspectos socioeconômicos do país. Também fornece diretrizes e novas ferramentas de avaliação de desempenho para acadêmicos, gerentes e funcionários do governo nos processos de F&A. O método de pesquisa é quantitativo-qualitativo. Na abordagem quantitativa, foi utilizada a técnica de análise por envoltória de dados (DEA, do inglês data envelopment analysis) com um segundo estágio de regressão linear múltipla. O banco de dados foi formado por informações das demonstrações financeiras dos bancos de 2000 a 2018 (representando o CAMELS), complementadas com informações macroeconômicas e de estrutura de mercado. Na abordagem qualitativa, o impacto dessas variáveis regredidas foi determinado no estágio quantitativo para quatro estudos de caso, que são os “Quatro Grandes” bancos que representam aproximadamente 87% do mercado financeiro brasileiro. Embora alguns estudos abordem o tema da relação entre a eficiência e as F&As, este estudo mostra que não há uma relação clara e direta entre as F&As e o desempenho (a eficiência) dos bancos no mercado. Os resultados sugerem que os bancos realizam as F&As por outros motivos além da busca por eficiência, deixando a eficiência como consequência da operação. Este artigo contribui para a proposição de uma nova métrica de mensuração da eficiência das F&As, cuja função é estabelecer um ranking e relativizar a análise do desempenho dos bancos em relação ao mercado como um todo, permitindo a visualização do feito relativo em relação aos concorrentes.

Palavras-chave: bancos, fusões e aquisições, métricas de desempenho, eficiência, DEA.

1. INTRODUCTION

Banks play a central role in the economy, especially in developing countries, where they act as the main conduits for capital flows. The increasing globalization of financial markets and institutions over the past three decades, accompanied by government deregulation, financial and technological innovations, and major crises (such as the restructuring of the Brazilian economy in the 1990s, the 2007-2008 subprime crisis, and COVID-19), has created a competitive scenario and brought about changes in the economic system. These changes require banks to adapt so that they can efficiently perform their traditional function of financial intermediation and have sufficient profitability for their survival. This leads to some effects, such as the increased search by banks to operate more efficiently in order to be competitive (Otero et al., 2020) and the triggering of mergers and acquisitions (M&As), which are an important part of the changes in the banking industry (Amin & Ibn Boamah, 2021).

There are important contributions on this topic in the literature covering the Brazilian market (Azevedo & Gartner, 2020; Barbosa et al., 2011; Bergmann et

al., 2015; Faria et al., 2006; Sales & Carvalho, 2018; Souza & Gartner, 2019), and other emerging countries (Du & Sim, 2016; Shanmugam & Nair, 2004; P. Wanke et al., 2017), with different methods and views: using inverse DEA to highlight the potential financial gains for improving efficiency in M&As (Amin & Ibn Boamah, 2021), using DEA in eight countries during a period of global crisis (Galariotis et al., 2020), using difference-in-differences (DID) analysis to explore how acquisitions affect employment and labor productivity (Fukuda, 2020), and others.

However, there is a lack of studies on the financial-operational performance of banks in relation to the market as a whole. A bank can improve its efficiency after an M&A and this may not be reflected in relation to its competitors. Thus, this study aims not only to identify the variables that affect the performance of individual banks as a result of M&As, but also to carry out an integrated analysis of performance in relation to the market (by proposing ranking metrics) and of organizational strategies. In the evaluation, DEA will

be used to generate efficiency scores, in addition to CAMELS, insolvency, and macroeconomic indicators selected from the DEA second-stage regression analysis.

The analysis will focus on four selected M&A cases. The study aims to contribute to understanding the causes and consequences of M&As in the financial market.

2. THEORETICAL FRAMEWORK

According to Schlottfeldt and Galli (2004), as shown by the historical process, a country's economic stability is intrinsically related to a sound financial system, and such soundness is perceived when the components of the system perform their traditional financial intermediation functions and meet their customers' expectations, maintaining an acceptable standard in the market. Banks play a very important role in society, occupying a central position in the process of promoting economic growth (P. Wanke et al., 2015). They maintain the public's savings and finance business and trade development. Numerous studies argue that the efficiency of financial intermediation affects economic growth, while others indicate that bank insolvency can result in systemic crises with adverse consequences for the economy (Fethi & Pasiouras, 2010).

In a competitive business environment, companies seek to survive by acting in new ways to create a competitive advantage and develop (Skordoulis et al., 2017). In this context, M&As present themselves as a means to increase competitiveness, take advantage of opportunities of market discontinuities, increase the scale of operations, increase non-financial revenues, diversify business beyond financial intermediation, and diversify risks (Faria et al., 2006).

Decisions on M&A strategies are influenced by different motivations, which may stem from the characteristics of managers or their interaction with external forces, or even a combination of these two factors (Málaga, 2007). DePamphilis (2014) and Gaughan (2015) explained that M&As may occur for several reasons, motivated by factors that change over time and by the context of each company, listing ten points that are often found in the theory. Among these reasons, the following stand out: operational synergies (economies of scale and scope); strategic realignment (adaptation to the environment); market power (monopoly – price control and “too big to fail”); and accelerated growth (competitive advantage).

The effects of consolidation and concentration over the last three decades and of M&A transactions on bank performance have been reported in the literature from different points of view. Hassen et al. (2018) analyzed the dynamic effects of mergers on the performance of 60 acquiring banks in 17 European countries from 2005 to 2013. The authors posited that banks obtained efficiency

gains after an M&A transaction. Galariotis et al. (2020) examined the effects of M&As on bank efficiency levels, also for European banks, with a second-stage analysis under two different models adjusted for credit risk factors. The study shows that banks' market share positively affects efficiency scores, and that the positive effect of market concentration depends on its specific level. Sarmiento and Galán (2017) used a stochastic frontier model with random inefficiency parameters for a sample of Colombian banks and suggested that large and foreign banks benefit more from higher exposure to credit and market risk, while domestic and small banks are more capitalized.

Du and Sim (2016) conducted a study using DEA for banks in emerging countries in Asia and found that the effect of M&As is seen in acquired banks, but it is non-existent for acquirers. Amin and Ibn Boamah (2021) developed two-stage inverse DEA models to estimate the potential gains from bank mergers for major commercial banks in the United States. The authors found that there are financial gains from improved technical efficiency as the merged bank improves its optimal combination of inputs at higher efficiency levels.

Studies on this topic can be found for the Brazilian market. Staub et al. (2010) used DEA to calculate the efficiency scores of Brazilian banks from 2000 to 2007, finding that their economic inefficiency can be mainly attributed to technical rather than allocative inefficiency. Furthermore, state-owned banks are more cost efficient, and there is no evidence of size-related differences in economic efficiency. Wanke and Barros (2014) used a Bayesian dynamic frontier model to analyze the efficiency of Brazilian banks between 1998 and 2010, finding that M&As, size, and deregulation contribute to bank efficiency.

Wanke et al. (2015) used the dynamic slacks-based model (DSBM) in major Brazilian banks from 1996 to 2011. The results indicated higher levels of inefficiency and slack in small public and national banks. Henriques et al. (2018) used DEA on 37 banks between 2012 and 2016 and found that the inefficiency of Brazilian banks is somewhat more related to technical and administrative issues than to the scale of operations, although larger banks have more opportunities for improvement in the latter aspect.

Faria et al. (2006) used the DEA technique and found an improvement in intermediation efficiency after M&As for the banks analyzed; the authors suggest a macroeconomic scope for future studies. Sales and Carvalho (2018) investigated whether incorporations led to improvements in bank efficiency and found that mergers were positive for the banks analyzed, possibly due to cost reductions, elimination of operating expenses, and exclusion of redundant routines; however, this did not apply to all banks.

Souza and Gartner (2019) state that the possible reason for bank M&As is a market tendency mechanism. It is shown that bank M&As are generated by heated markets. This mechanism tends to generate short term inefficiency, since the impact of M&As is not evaluated, but rather the managers' concern that their banks will lose market. Azevedo and Gartner (2020) show that there is evidence that the merger between Itaú and Unibanco is explained by Unibanco's financial vulnerability, which contributes to merging with a solid organization.

Barbosa et al. (2011) suggest that the concentration observed in the Brazilian banking market is more of a movement towards rapid gains, which reinforces the position of the strongest firms, rather than enabling

these firms to realize gains through increased efficiency. However, this does not seem to be the main objective, as efficiency can also be an inducer of market power. Therefore, there is no consensus on the underlying rationale behind the movement to consolidate the system. The authors called for studies with the potential to signal trends (horizontal-temporal) and assess concentration, level of competition (intensity of rivalry), and synergies obtained with M&A operations in order to provide a better overview of the nature of decisions and the influence of M&As in the sector.

In view of the gaps left by the diversity of points of view and results, and given the need exposed by the literature, mainly applied to the Brazilian market, for an integrated analysis of the individual performance of banks after M&As, performance in relation to the market, and organizational strategies in relation to macroeconomics, this study aims to determine the impact of an M&A on the consolidator bank's performance in relation to its competitors; whether there are common characteristics among successful institutions; whether there is a set of indicators for controlling efficiency; and what strategies and behaviors banks can adopt when carrying out an M&A.

3. METHODOLOGICAL PROCEDURES

This study was developed using data from type B1 financial institutions – commercial and multi-banks and conglomerates with such characteristics (BACEN, 2019b). This group accounts for nearly 84% of total assets (December 2018) and 92.5% of the B1 banks and it concentrates the largest institutions in the country in terms of assets and relevance. They have comparable and closer funding, investment, and operating strategies, favoring the possibility of a more assertive analysis. The greater the homogeneity of the data group, the more feasible the analysis with the DEA tool becomes. The sample consists of 3,534 observations of the decision making units (DMUs) and 22 variables (indicators) for both the intermediation and profitability approaches.

Consolidated financial information for the period from 2000 to 2018 was collected using a semi-annual interval, with the purpose of capturing possible variations within the same year, extracted from the website of the Central Bank of Brazil (BACEN), in the "IF.data" report (BACEN, 2019b). It is noteworthy that the data with the new BACEN standardization are available from the year 2000, which means that this study used the whole temporal extension available for the same standardization until the moment of collection. Moreover, the period

was marked by the intensification of M&A transactions (KPMG, 2019).

Considering the 19-year period covered in this study, it was necessary to update the values using the Broad National Consumer Price Index (IPCA), provided by the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – IBGE) – Research Directorate, Price Index Coordination. The values were updated for December 2018, which is the base date.

3.1 Data Envelopment Analysis (DEA)

First introduced by Charnes et al. (1978), DEA is a non-parametric efficiency frontier technique that calculates comparative ratios of multiple inputs to multiple outputs, without any requirement such as setting pre-specified weights for each variable – which makes it more flexible (Partovi & Matousek, 2019) – using linear programming for each decision making unit (DMU), thus obtaining a comparative efficiency standard of a DMU with the others under best practice analysis. This study uses output-oriented BCC data envelopment analysis (DEA) (Banker et al., 1984).

The use of DEA allows the estimation of bank efficiency based on a production function with an unknown form,

making it suitable for this study, since the way to specify the production process for banks can be challenging, as they operate in a heterogeneous way that is not easy to capture parametrically (Du & Sim, 2016).

This study uses DEA to analyze bank efficiency in segmentations by approach: in the intermediation approach, financial institutions are considered as acting as intermediaries between depositors and borrowers, raising and lending funds in a supply mechanism that goes from surplus funds to deficit funds (Sealey & Lindley, 1977); the profitability approach measures the financial institution's ability to generate revenue in terms of the costs incurred in its generation, such as labor, assets, and current capital reserves (Liu, 2011).

Comparing efficiency across different approaches with different inputs and outputs, and differentiating strategic

approaches and evaluation interests, underscores the importance of understanding such segmentation (Barros et al., 2020). Therefore, each institution in each half-year period of the study (DMU) will have its DEA score for each approach.

The approaches for evaluating DEA started with Macoris et al. (2016), who conducted an extensive literature review of the international literature on the use of DEA in bank analysis. With a view to best representing operational efficiency, a review and re-selection of the variables analyzed for each approach was carried out, with the reference inputs and outputs chosen based on the meta-analysis performed by Macoris et al. (2016) as the starting point, now complemented by a literature review and recent analyses and reflections, thus resulting in the variables per approach described in Table 1.

Table 1
Bank efficiency model variables

Approach	Input(s)	Output(s)	Description
Intermediation	Fundraising	Interbank investments	Ability to raise and transfer financial resources.
	Expenses (staff + admin)	Credit and leasing operations	
Profitability	Total assets	Revenues	Ability to maximize return on investments, minimizing expenses and increasing profits.
	Expenditure		

Source: Adapted from Macoris et al. (2016).

3.2 Multiple Linear Regression

After obtaining the efficiency scores for each DMU with the DEA in the first step, the multiple linear regression model was used in the second step as a way to identify the indicators that best explain the efficiency of institutions over time. According to Wanke (2012), this two-stage work method stems from the observation that the variables included in the context and environment of institutions can significantly influence the efficiency scores obtained. Moreover, the second-stage regression performs as well as the best parametric methods when it comes to estimating the impact of contextual variables on productivity.

The verification process was carried out before performing the multiple linear regression of the correlation between the independent variables, with the intention of detecting a correlation between them and their influence, with the ideal being a high correlation between the independent and dependent variables, but with low correlation between each other (Hair et al., 2009). The multicollinearity test was performed, which may affect the estimation of the regression coefficients and their statistical significance (P. Wanke & Barros, 2014). For the regressions in both approaches, fixed effects and random

effects estimations were carried out using the STATA software in order to determine which model to use.

The dependent variable is the DEA score generated. The independent variables (indicators) to be used in the regression were pre-selected considering the available database and making sure that there was some direct relationship with the institutions studied in terms of their reports and context, the inputs and outputs used, and the occurrence of M&As.

The first group of indicators aims to provide information on the company's historical performance for the decision-making process of financial accounting information users, making it possible to draw conclusions about its future prospects. Among several indicators that are used in the banking sector, the working paper "Supervisory Risk Assessment and Early Warning Systems" points to the CAMELS rating as the most widely used by U.S. regulators for the annual assessment of banks (Sahajwala & Bergh, 2000). CAMELS is an acronym for categories of financial indicators found in the financial literature and refers to capital adequacy (C), asset quality (A), management efficiency (M), earnings (E), liquidity (L), and sensitivity to market risk (S). The set plays an important role in detecting and warning about disturbances and has therefore been

adopted in several studies (Männasoo & Mayes, 2009; P. Wanke et al., 2016). A literature review of studies found several forms of CAMELS indicators (Avkiran, 2011; Bitar et al., 2019; Christopoulos et al., 2011; Dal Magro et al., 2017; Delis et al., 2020; Dincer et al., 2011; Djalilov & Piesse, 2019; FMI, 2006; Korontai, 2016; Málaga, 2007; Othman et al., 2017; Pereira & Martins, 2016; Phan et al., 2019; Roman & Şargu, 2014; Rosa & Gartner, 2018; Rosman et al., 2014; Saeed et al., 2020; Sarmiento & Galán, 2017; Sufian, 2009).

In addition to the CAMELS indicators, a specific insolvency prediction model was selected, since the reasons for M&As may be to minimize potential bankruptcies (Halkos & Tzeremes, 2013), managers' search for synergies that avoid bankruptcy (Shrieves & Stevens, 1979), to prolong the institution's existence (Fukuda, 2020), or even government pressures and incentives (Djankov et al., 2005). Ooghe and Balcaen (2002) explain that not all models of this kind can be used in other countries without losing their efficiency. Therefore, from the literature reviewed (Altman, 1968; Andrade & Lucena, 2018; Espahbodi, 1991; Kolari et al., 2002; Martin, 1977; Matias & Siqueira, 1996; Pereira & Martins, 2016), models were selected from studies focused on Brazilian institutions. Moreover, among the national models, many do not fit the content of the database in this study. In the end, the formula of Matias and Siqueira (1996) proved to be a solution for the specific insolvency indicators in this study.

The use of macroeconomic indicators as influencers of financial stability is common in studies (Shaddady & Moore, 2019). The Herfindahl-Hirschman Index (HHI)

is a measure of market concentration and the industry competition threshold, which can affect the outcome of M&As differently depending on its level (Galarotis et al., 2020). It is calculated by squaring each participant's share and adding it to the result (it was calculated per six-month period, with total assets as the base data). The Selic is the economy's basic interest rate and the main monetary policy instrument used by the Central Bank of Brazil to control inflation, influencing all interest rates in the country (BACEN, 2021). Inflation can affect both the efficiency of a bank (Sufian & Habibullah, 2012) and its stability (Phan et al., 2019).

Size, a factor that can affect a bank's solvency (Saeed et al., 2020), influence its profitability (Kumar et al., 2021), and generate economies of scale (Hassen et al., 2018), among other things, will be classified according to the last record of each bank's total assets in the database used. The classification of capital origin, on the other hand, will be based on that proposed by BACEN, which divides financial institutions (FIs) into three types of control or capital origin: public, domestic private, and private with foreign control (BACEN, 2019b). Sufian (2009) and Sarmiento and Galán (2017) note that banks with different forms of ownership may react differently to the same efficiency determinants.

As a result of the literature review of indicators and by selecting the indicators according to the compatibility and appropriateness to the database and the institutions in this study (e.g. "inventories" is not applicable), a set of indicators was formed to perform the multiple regression analysis, as seen in Table 2.

Table 2

The 22 performance indicators

Category	Acronym	Indicator	Equation
C	C	Leverage	Equity / Total Assets
	A1	Portfolio Credit Risk	(Provisions for Credit Operations* ⁻¹) / Total Portfolio
A	A2	Share of Credit Operations	Credit Operations / Total Assets
	M	Management Efficiency	(Result of Financial Intermediation + Revenue from Services) / ((Personnel Expenses + Administrative Expenses)* ⁻¹)
E	E1	Return on Assets (ROA)	Net Income / Total Assets
	E2	Return on Equity (ROE)	Net Income / Equity
	E3	Operating Profitability	Operating Income / Total Assets
	E4	Operating Margin	EBITDA / Gross Revenue
	E5	Asset Turnover	Total Revenue / Total Assets
L	L1	Liquidity Risk	Total Credit Operations / Total Deposits
	L2	Immediate Liquidity	Current Assets (Available) / Total Assets
S	S1	Concentration in TVM	Securities in Portfolio / Total Assets
	S2	Investment Decisions	Securities in Portfolio / Credit Operations

Table 2
Cont.

Category	Acronym	Indicator	Equation
Insolvency	ICADM	Administrative Cost	Administrative Expenses / Total Funding
	ICOMP	Equity Commitment	Credit Transaction for Doubtful Settlement / Shareholders' Equity
	IEVOL	Evolution of Fundraising	Total funding for the last period / Total funding for the previous period
	Z	Insolvency Model	$Z = -7.4506 + 0.5663 * \text{Adm Cost} + 0.3842 * \text{Comprom} + 0.0356 * \text{EvolFund}$
Classif.	IPROB	Insolvency Forecast	$\text{Pr (insolvency)} = 1 / (1 + e^{(-z)})$
	MSIZE	Size	Total Assets
	MORCA	Origin of Capital	Public, domestic private, foreign private
Macroeconomic	SELIC	Basic Interest Rate	SELIC
	HHI	Sectoral Concentration	$\sum_1^n \left(\frac{\text{Total Bank Assets } (n)}{\text{Sum of Assets for the Period}} \right)^2$

Source: Elaborated by the authors.

3.3 An Integrated Analysis of the Four Major M&A Cases

In order to study the M&A cases of financial institutions, several sources were searched: (i) the Securities and Exchange Commission of Brazil (Comissão de Valores Mobiliários – CVM) database, which contains OPA (Public Takeover Bids) public notices and appraisal reports,

searching for those already registered (CVM, 2019); (ii) BACEN annual reports (BACEN, 2019a); (iii) major newspapers in the country; (iv) published articles, such as those of Bergmann et al. (2015) and Pessanha et al. (2012). As a result of the analysis, Table 3 was prepared with the consolidator (acquirer/incorporator) and consolidated (acquired/ incorporated) FIs.

Table 3
Summary of M&A events

Year	Source	Consolidated	Consolidator
1995	News	NACIONAL	UNIBANCO
1997	News	BANERJ	BANCO ITAÚ S.A.
1997	BACEN + News	BCN	BANCO BRADESCO S.A.
1997	News	BAMERINDUS	HSBC
1998	News	BANCO REAL	ABN AMRO
1998	News	EXCEL ECONÔMICO	BBVA
2000	BACEN + News	BANESPA	BANCO SANTANDER
2000	News	BANCO BANDEIRANTES	UNIBANCO
2000	Articles	CREDIBANCO	UNIBANCO
2000	BACEN + Articles	BOA VISTA	BANCO BRADESCO S.A.
2000	Articles	FININVEST	UNIBANCO
2000	BACEN + Articles	BOA VISTA INTERATLÂNTICO	BANCO BRADESCO S.A.
2000	BACEN + Articles	MERIDIONAL (BOZANO SIMONSEN)	BANCO SANTANDER
2001	Articles	INVESTCRED	UNIBANCO
2002	OPAs + BACEN	BANCO BEA S.A.	BANCO BRADESCO S.A.
2002	OPAs + BACEN	BANCO BEG S.A.	BANCO ITAÚ S.A.
2002	OPAs + News + BACEN	BANCO MERCANTIL DE SÃO PAULO S.A.	BANCO BRADESCO S.A.
2002	BACEN + Articles	BANCO CIDADE (CID)	BANCO BRADESCO S.A.

Table 3*Cont.*

Year	Source	Consolidated	Consolidator
2002	BACEN + Articles	DEUTSCH BANK	BANCO BRADESCO S.A.
2002	BACEN + Articles	BBA CREDITANSTALT	BANCO ITAÚ S.A.
2002	Articles	FIAT	BANCO ITAÚ S.A.
2003	OPAs + BACEN	BANCO BANESTADO S.A.	BANCO ITAÚ S.A.
2003	OPAs + BACEN	BANCO BEG S.A.	BANCO ITAÚ S.A.
2003	OPAs	BANCO BEMGE S.A. (BEM)	BANCO ITAÚ S.A.
2003	OPAs	BANCO DE PERNAMBUCO S.A.	ABN AMRO REAL S.A.
2003	News	BANCO SUDAMERIS BRASIL S.A.	ABN AMRO REAL S.A.
2003	BACEN + News	BBVA	BANCO BRADESCO S.A.
2003	News	LLOYDS (FILIAL)	HSBC
2003	News	BANCO ZOGBI	BANCO BRADESCO S.A.
2003	Articles	BANCO AGF	BANCO ITAÚ S.A.
2003	Articles	CREDITEC FINANCEIRA	UNIBANCO
2004	OPAs + BACEN	BANCO BEM S.A.	BANCO BRADESCO S.A.
2004	OPAs	BANCO SUDAMERIS BRASIL S.A.	ABN AMRO REAL S.A.
2004	Articles	BNL DO BRASIL SA	UNIBANCO
2004	Articles	BANCO INTERCAP (INT)	BANCO ITAÚ S.A.
2005	Articles	BANCO MORADA (MOR)	BANCO BRADESCO S.A.
2005	Articles	DIBENS	UNIBANCO
2006	OPAs + BACEN	BANCO BEC S.A.	BANCO BRADESCO S.A.
2006	News	BANKBOSTON	BANCO ITAÚ S.A.
2006	BACEN + Articles	AMEX (AME)	BANCO BRADESCO S.A.
2007	Articles	BMC	BANCO BRADESCO S.A.
2008	BACEN + News	UNIBANCO	BANCO ITAÚ S.A.
2008	BACEN + News	ABN AMRO REAL S.A.	BANCO SANTANDER
2008	BACEN + Articles	AGORA	BANCO BRADESCO S.A.
2008	Articles	BESC	BBVA
2008	Articles	BEP	BANCO DO BRASIL S/A
2008	Articles	BANCREC	BANCO ITAÚ S.A.
2009	OPAs + News	BANCO NOSSA CAIXA S/A	BANCO DO BRASIL S/A
2009	Articles	VOTORANTIM	BANCO DO BRASIL S/A
2009	Articles	IBI	BANCO BRADESCO S.A.
2009	BACEN	BESC	BANCO DO BRASIL S/A
2010	Articles	CIELO	BANCO BRADESCO S.A.
2011	OPAs	BANCO PANAMERICANO S.A.	BANCO BTG PACTUAL S.A.
2012	OPAs	BANCO BERJ S.A.	BANCO BRADESCO S.A.
2012	OPAs	REDECARD S.A.	BANCO ITAÚ S.A.
2015	News	HSBC	BANCO BRADESCO S.A.

Source: *Elaborated by the authors.*

In the “Consolidator” column of Table 3, it can be seen that some institutions appear with significant frequency. It can be noted that there is a concentration of four large institutions that are still in operation and that predominate

in the execution of M&As in the country: Banco do Brasil (BB), Bradesco, Banco Itaú, and Santander (the “Big4”). The four institutions in question are large in size, their total assets represent more than 60% of the sample group,

and they have notable national influence, in addition to being still active in the market and therefore able to carry out more M&As.

Because of this significance, this study selected the biggest M&A moments of each of these four banks (Big Four) in terms of size and relevance. BB incorporated three banks – BESC, BEP, and Nossa Caixa – in less than a year; together, the banks had approximately 16%

of BB's assets. Bradesco acquired HSBC Brasil in 2015, which had 20% of the former's assets. Unibanco's size was close to 50% of Itaú's assets when the merger occurred. In contrast, Santander Brasil was approximately 22% smaller than Banco Real (ABN AMRO) in terms of total assets when it was acquired. Finally, a three-year window was defined prior to and four years after each consolidation to analyze the behavior of the indicators.

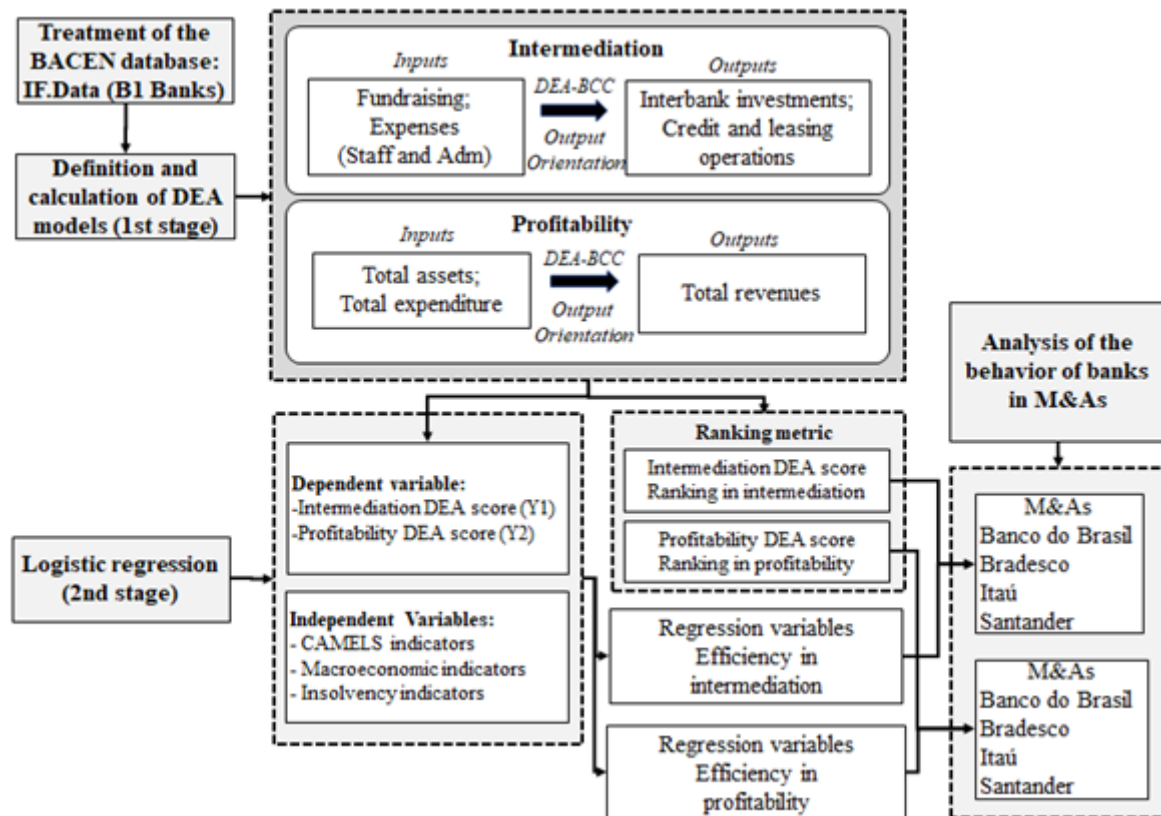


Figure 1 Work process diagram

Source: Elaborated by the authors.

4. RESULTS

This section will reflect on the results obtained, going through the efficiency evaluation metrics, the explanatory indicators, and an integrated analysis of four major M&A cases.

4.1 Creating Efficiency Metrics in M&As: Proposed Ranking

In each approach, scores were generated by DEA for each DMU (bank-semester). To create the ranking, the bank with the highest score within a semester was

ranked first in each approach, and so on. The objective of the method is to position the bank relative to the market and also to try to mitigate possible external effects that are common to banks due to the context of the time. It may happen that a bank increases its DEA score from one semester to another, but still drops in the ranking due to competitors that have even better performance development. Table 4 shows the positions of the consolidating banks (Big Four), taking the moment of consolidation of each case as the central reference.

Table 4
Ranking variation in M&A cases

Approach	Ranking	Santander – Banco Real (ABN Amro)	BB – BESC/BEP/ Nossa Caixa	Itaú – Unibanco	Bradesco – HSBC
Intermediation	Median – 3 years before	18th	10th	7th	13th
	Median – 4 years after	8th	7th	14th	24th
	Variation in the window	+10	+3	-7	-11
	Year before	6th	10th	14th	13th
	Year after	7th	5th	16th	20th
	Immediate variation	-1	+5	-2	-7
Profitability	Median – 3 years before	10th	2nd	2nd	4th
	Median – 4 years after	9th	2nd	2nd	3th
	Variation in the window	+1	0	0	+1
	Year before	12th	2nd	3rd	4th
	Year after	9th	3rd	5th	3th
	Immediate variation	+3	-1	-2	+1

Source: Elaborated by the authors.

It can be observed that the variation in the bank ranking was higher in intermediation than in profitability. This may indicate that these big players are more interested and competitive in the market in terms of profitability efficiency than in intermediation efficiency. From another point of view, it may suggest that it is more difficult for the other banks to overcome the Big Four in terms of profitability efficiency than in terms of intermediation efficiency. It should be noted that the Big Four were already closer to the top in the profitability approach, with a smaller margin for growth.

The banks that rose in the profitability ranking, Santander and Bradesco, were those in which consolidation was due to international events and not due to internal operational problems in Brazil. On the other hand, BB and Itaú consolidated with banks that already had internal operational problems and/or no long-term prospects of survival in the country.

4.2 Explanatory Factors of Bank Efficiency in the Different Approaches

The regression results for the sample consist of 3,534 DMUs (observations) and 22 initial variables (indicators) for both the intermediation and profitability approaches. For both approaches, the Chow test showed a p-value of

zero ($\text{Prob}>F = 0$), indicating a prevalence of fixed effects over pooled ones, while the Breusch-Pagan LM test for random effects indicated a prevalence of random effects over pooled ones ($\text{Prob}>\chi^2 = 0$). The Hausman test proved to be undefined because the difference in covariance matrices between the estimators of the random and fixed models was not positively defined.

The study shows contexts over time to which all banks are subject (such as the Selic variation), giving rise to fixed effects. Although all banks belonged to the B1 classification, there were considerable differences in some characteristics among banks (for example, size), giving rise to random effects. Thus, after the quantitative and theoretical statistical evaluation, the mixed effects model was selected. The indicators that correlated with efficiency in each approach are listed in tables 5 and 6. Any indicator with $P >$ greater than 5% was disregarded.

Table 5 presents the variables that influence the efficiency of banks in the intermediation approach. It is possible to observe that the level of banks' leverage, asset turnover, and the degree of concentration of securities negatively influence efficiency. On the other hand, the share of credit operations, management efficiency, operating margin, immediate liquidity, insolvency rate, size, origin of capital, and degree of sectoral concentration have a positive influence.

Table 5*Multiple linear regression variables for intermediation approach*

	Indicator	Coef. (β)	Std. Err.	z	P> z 	[95% Conf. Interval]	
V1	C – Leverage	-5.6290	1.9844	-2.840	0.005	-9.5183	-1.7397
V3	A2 – Share of Credit Operations	68.9538	1.9285	35.760	0.000	65.1741	72.7335
V4	M – Management Efficiency	0.3994	0.0582	6.870	0.000	0.2854	0.5134
V18	E3 – Operating Profitability	49.2711	9.9188	4.970	0.000	29.8306	68.7116
V19	E5 – Asset Turnover	-52.1333	3.7077	-14.060	0.000	-59.4002	-44.8663
V21	L2 – Immediate Liquidity	47.6645	2.0063	23.760	0.000	43.7322	51.5969
V8	S1 – Securities Concentration	-19.0167	1.8285	-10.400	0.000	-22.6005	-15.4328
V14	PI – Insolvency Prediction	25.3839	3.0332	8.370	0.000	19.4389	31.3289
V16	Size	13.0474	0.9347	13.960	0.000	11.2154	14.8793
V15	OC – Capital Origin	5.1735	1.0181	5.080	0.000	3.1781	7.1689
V23	HHI – Sectoral Concentration	65.2374	9.2351	7.060	0.000	47.1370	83.3377
_cons	Constant	-25.7455	3.8866	-6.620	0.000	-33.3631	-18.1278

Source: *Elaborated by the authors.***Table 6***Result of multiple linear regression for profitability approach*

	Indicator	Coef. (β)	Std. Err.	z	P> z 	[95% Conf. Interval]	
V1	C – Leverage	-6.5954	1.2365	-5.330	0.000	-9.0189	-4.1718
V3	A2 – Share of Credit Operations	3.6334	1.2016	3.020	0.002	1.2783	5.9886
V4	M – Management Efficiency	0.5473	0.0362	15.110	0.000	0.4763	0.6183
V5	E1 – ROA	-41.1603	7.2692	-5.660	0.000	-55.4077	-26.9130
V6	E2 – ROE	4.2271	0.6164	6.860	0.000	3.0190	5.4351
V18	E3 – Operating Profitability	144.0673	6.1352	23.480	0.000	132.0425	156.0922
V17	E4 – Operating Margin	2.1208	0.2689	7.890	0.000	1.5939	2.6478
V19	E5 – Asset Turnover	101.1321	2.3001	43.970	0.000	96.6241	105.6402
V7	L1 – Liquidity Risk	-0.0004	0.0002	-2.300	0.021	-0.0007	-0.0001
V10	CA – Administrative Cost	-0.1677	0.0654	-2.560	0.010	-0.2958	-0.0395
V12	ECR – Resource Raising Development	0.1271	0.0564	2.250	0.024	0.0166	0.2377
V14	PI – Insolvency Forecast	9.9830	1.8839	5.300	0.000	6.2906	13.6753
V16	Size	10.7027	0.6278	17.050	0.000	9.4723	11.9332
V22	Selic	-0.1046	0.0298	-3.510	0.000	-0.1630	-0.0462
V23	HHI – Sectoral Concentration	40.7757	5.7188	7.130	0.000	29.5671	51.9842
_cons	Constant	8.0112	2.5239	3.170	0.002	3.0645	12.9579

Source: *Elaborated by the authors.*

For the profitability model, the regression discriminated the variables that influence the efficiency of banks: those with a negative influence are more related to capital and liquidity, namely leverage level, asset profitability, liquidity risk, administrative cost, and interest rate (Selic). Other variables have a positive influence on efficiency, such as: share of credit operations, management efficiency, return on equity, operating margin, operating profitability, asset turnover, resource development, insolvency forecast,

sector size, and degree of concentration. Indicators A1, L1, S2, and ECR did not correlate with efficiency in any of the approaches, so these will not be included in future analysis. There is a different set of indicators that influence intermediation and profitability efficiency. However, the indicators C, A2, M, E3, PI, size, and HHI showed a correlation in the same direction as that of beta in both approaches, suggesting that it is a strong set in the relationship with bank efficiency.

5. DISCUSSION

The indicators resulting from the two multiple linear regressions are evaluated according to the variation in the ranking position of each of the four case studies. For each indicator, the variation of the median post-M&A (four years after) and the median pre-M&A (three years before) is calculated. The “ranking variation” shows the variation of the median ranking position in the three years before and four years after the M&As. When the variation has the same direction (positive or negative) as the coefficient (β) in the second-stage regression analysis, the number is highlighted in bold. The columns show each case considered in this study.

Tables 7 and 8 show a crossover of the data (efficiency ranking, financial indicators, and M&A events) in order to visualize the behavior of the consolidating banks through the indicators in each case of M&A. Thus, it is possible to see which indicators oscillate in the same direction regardless of the variation in the efficiency ranking – which may indicate an effect of the M&A with no or little direct impact on the bank's efficiency, suggesting other purposes for the M&A rather than the pursuit of efficiency (*); and which ones differ depending on the rise/fall of banks in the efficiency ranking (and their relationship with the coefficient β) – which may indicate a stronger relationship with the search for efficiency through an M&A (**).

Table 7

Variation of the regression indicators for each case after M&A and the respective variation in ranking (intermediation approach)

Intermediation Approach	Santander – Banco Real (ABN)	BB – BESC/BEP/ Nossa Caixa	Itaú – Unibanco	Bradesco – HSBC	Coef. (β)
Ranking Variation	+10	+3	-7	-11	
C – Leverage	0.0838	-0.0051	-0.0335	0.0132	-5.6290
A2 – Share of Credit Operations	0.0297	0.0085	0.0200	-0.0599	68.9538
M – Management Efficiency	-0.5728	-0.1572	-0.2516	0.4574	0.3994
E3 – Operating Profitability*	-0.0112	-0.0015	-0.0062	-0.0002	49.2711
E5 – Asset Turnover*	-0.0138	-0.0124	-0.0182	-0.0116	-52.1333
L2 – Immediate Liquidity	-0.0513	0.0565	0.0115	-0.0295	47.6645
S1 – Securities Concentration**	-0.1603	-0.0872	0.0226	0.0727	-19.0167
PI – Insolvency Prediction**	-0.0009	-0.0016	0.0027	0.0008	25.3839
MSIZE – Size*	203%	86%	183%	11%	13.0474
MORCA – Capital Origin	Private	Public	Private	Private	5.1735
HHI – Sectoral Concentration*	0.0438	0.0431	0.0438	0.0070	65.2374

Source: Elaborated by the authors.

It can also be observed that there are four indicators – E3, E5, size, and HHI – that move in the same direction (+/-) regardless of the bank's evolution in the ranking for the four cases (*), suggesting a stronger influence of M&As in the scope of these indicators and

no/little direct impact of M&As on efficiency. The S1 and insolvency indicators, on the other hand, show differences according to the variation in efficiency, i.e. between the banks that rise and those that fall in the ranking (**).

Table 8

Variation of the regression indicators for each case after M&A and the respective variation in ranking (profitability approach)

Profitability Approach	Santander – Banco Real (ABN)	Bradesco – HSBC	BB – BESC/BEP/ Nossa Caixa	Itaú – Unibanco	Coef. (β)
Ranking Variation	+2	+1	0	0	
C – Leverage**	0.0838	0.0132	-0.0051	-0.0335	-6.5954
A2 – Share of Credit Operations	0.0297	-0.0599	0.0085	0.0200	3.6334
M – Management Efficiency	-0.5728	0.4574	-0.1572	-0.2516	0.5473
E1 – ROA*	-0.0043	-0.0026	-0.0028	-0.0072	-41.1603
E2 – ROE*	-0.0740	-0.0295	-0.0349	-0.0411	4.2271

Table 8

Cont.

Profitability Approach	Santander – Banco Real (ABN)	Bradesco – HSBC	BB – BESC/BEP/ Nossa Caixa	Itaú – Unibanco	Coef.(β)
E3 – Operating Profitability*	-0.0112	-0.0002	-0.0015	-0.0062	144.0673
E4 – Operating Margin	-0.0555	-0.0014	0.0130	-0.0796	2.1208
E5 – Asset Turnover*	-0.0138	-0.0116	-0.0124	-0.0182	101.1321
L1 – Liquidity Risk	0.1142	-0.2694	0.0412	0.0553	-0.0004
CA – Administrative Cost**	0.0018	0.0010	-0.0013	-0.0152	-0.1677
ECR – Resource Raising Development	-0.1789	0.0689	-0.0303	-0.0959	0.1271
PI – Insolvency Forecast	-0.0009	0.0008	-0.0016	0.0027	9.9830
MSIZE – Size	203%	11%	86%	183%	10.7027
Selic*	-0.9350	-5.4700	-2.4450	-0.9350	-0.1046
HHI – Sectoral Concentration*	0.0438	0.0070	0.0431	0.0438	40.7757

Source: Elaborated by the authors.

Similarly, in the profitability approach, seven indicators – E1, E2, E3, E5, size, Selic, and HHI – evolve in the same direction for the four cases, regardless of the bank's performance in the ranking (*). The indicators C and CA, on the other hand, show differences between the banks that rise in the ranking and those that do not show any variation in the window (**).

These findings show that there is no clear and direct relationship between M&As and banks' performance in the market, and it is possible that other reasons drive M&As. The discussion will proceed with the objective of showing this lack of clarity and speculating about the possible reasons that drive M&As by crossing indicators that influence efficiency with the performance of banks in the market and the literature.

First, among the indicators that behave uniformly according to the variation in the ranking of the banks (** in tables 7 and 8), the leverage indicator of the banks that rose in the profitability ranking (Santander and Bradesco), in the approach of profitability, should show a reduction, consistent with the efficiency correlation coefficient (β) and with the financial doctrine that maintains that equity capital is more costly (less efficient) for an institution than debt capital. However, the result was different, following Sufian and Habibullah (2012), who argue that the strategy of allocating more resources to capital is essential for banks in emerging economies (such as Brazil), as it provides additional strength to withstand financial crises and greater security for depositors in unstable macroeconomic conditions. This may indicate that banks may be more concerned with the factors mentioned by the authors cited than with improving efficiency when engaging in M&As.

Along the same lines, the administrative cost indicator showed an increase in the banks that rose in the efficiency

ranking, also contradicting the direction of efficiency represented by the coefficient (β). Perhaps the calculation period had an influence, since the consolidating bank may take longer to complete the internalization of the consolidated bank, which initially increases costs; however, the revenue gain is more immediate, which improves profitability efficiency. Or perhaps the cost of personnel was replaced by the more efficient administrative cost (e.g., technology). A study on the subject would be necessary to test some hypotheses.

Under the intermediation approach (Table 7), the banks that rose in the ranking showed a reduction in the securities concentration indicator, following the coefficient (β) for both cases of M&As – this is the only case in which this happens, suggesting that, with regard to this indicator, banks use M&As to increase their efficiency. This fact suggests that less effort in securities and greater priority of opportunities generated by M&As in credit operations could be an important factor to increase intermediation efficiency. The banks that rose in the ranking after the M&A showed that they reduced their securities indicators, focusing more on credit operations.

Analyzing the other group of indicators (i.e., *), it can be seen that, although the regression showed that the profitability, size, HHI, and interest rate indicators influence a bank's efficiency, tables 7 and 8 showed that they behave independently in relation to the variation in the efficiency ranking, suggesting once again that banks carry out M&As primarily for reasons other than the search for greater efficiency, which takes a back seat.

Almost all banks showed declines in all their profitability indicators, suggesting that M&As do not seem to help banks' performance from an earnings perspective.

Banks have struggled to increase their marginal revenues and marginal profits. Despite this, there is also no differentiation between banks that rose or fell in the efficiency ranking in relation to changes in profitability indicators. This relationship should be clear and direct in the sense that, as Sufian (2009) mentions, customers generally prefer banks with higher profitability rates, which would attract more deposits and better borrowers to these banks, thus contributing to the efficiency of intermediation banking. Fernandes et al. (2018) add that higher profit levels increase the ability of banks to be more efficient; and Otero et al. (2020) postulate that banks with higher profitability may have more resources to invest in technology, processes, and human resources to increase their cost efficiency.

Despite the declines in these profitability indicators, the Big Four remained at the top of the profitability efficiency ranking over the period studied, thus showing that they remain at the top even when marginal profitability declines after M&As. This suggests that there are other reasons besides efficiency that should drive banks to carry out M&As. M&As provide the Big Four with greater absolute amounts of revenue and profit, which can increase their power to acquire and maneuver resources. This characteristic is in line with the new theory of the firm, in which the predominant interests are the expansion of market power, the control of consumers and governments, and the search for technological innovation at the expense of profit maximization, which is “only” stabilized at levels acceptable to shareholders.

Regarding the size indicator, some studies support the findings of a positive relationship between size and efficiency. Sarmiento and Galán (2017) noted that lenders consider themselves too big to fail, which allows them to access cheaper funding sources, and interest costs tend to decrease, resulting in higher levels of cost efficiency. In addition, they are less sensitive to environmental conditions, as are the main public debt negotiators, which facilitates intermediation. Othman et al. (2017), Djalilov and Piesse (2019), Sufian and Habibullah (2012), Fernandes et al. (2018), and Kumar et al. (2021), in addition to Cava et al. (2016) and Carneiro et al. (2016) – the latter two in a study in the Brazilian market – also found the same result.

However, although the increase in size resulting from an M&A contributes to efficiency, this does not always translate into results for the bank in the market, as we can see in the cases of Itaú and Bradesco in Table 7 and Itaú and BB in Table 8. In this case, it is also worth asking whether the banks seek efficiency by increasing their size. The history of the cases studied suggests that a bank's

M&A operation is focused on maintaining its market power and responding to the use of the same strategy by its competitor, with the consequences for efficiency taking a back seat.

Along similar lines, bank concentration (HHI), despite having increased during the four M&A moments analyzed, did not always converge to improve the consolidator bank's efficiency ranking, as shown in tables 7 and 8. There are some paths that the concentration and efficiency process might follow. Competition can lead banks to increase their efficiency to survive in the market, and then the most efficient banks take advantage of a less efficient counterparty's weakness to engage in an M&A (see Azevedo & Gartner, 2020), thus increasing their size, increasing the efficiency of the acquired bank, and concentrating the market. Alternatively, banks may anticipate an M&A as a way to gain market power, responding to a similar action by a competitor with the intention of making quick gains and strengthening their dominance, and only then, as a beneficial side effect, leading to efficiency leaders (Barbosa et al., 2011). The consequences of bank concentration through M&A are still controversial (Blanco-Oliver (2021) and Angine et al. (2014), in contrast to Henriques et al. (2018) and Barbosa et al. (2011)), leaving to future studies the detailing of the issue and the search for an ideal level of sectoral concentration to stimulate efficiency.

It is worth noting that the Selic was negatively correlated with the focus on profitability, which contradicts part of the public opinion that a higher interest rate is better for the bank's profitability. Mergers and acquisitions occurred at Selic peaks, suggesting that the rise in interest rates was indicative of a favorable scenario for M&As.

Finally, it is important to emphasize the important role of the ranking designed to validate the efficiency gains of each bank, since by weighting the entire market, the ranking mitigates the error of evaluating an individual performance after an M&A as positive/negative, and the market would have achieved an even better/worse result without the use of an M&A. This is intended to fill the gap in the literature that does not capture the effects in relation to other competitors in the market (Halkos & Tzeremes, 2013).

The ranking also highlights the importance of differentiating approaches in evaluating performance, as it shows a tendency for consolidators to be more interested and careful in maintaining market leadership in terms of profitability than in terms of intermediation (Table 4). The performance of the consolidators is more solid in terms of profitability, while intermediation efficiency seems to be “at the discretion” of other intentions.

6. CONCLUSIONS

Although some studies deal with the issue of the relationship between efficiency and M&As, this study shows that there is no clear and direct relationship between M&As and the performance (in terms of efficiency) of banks in the market.

The results suggest that banks carry out M&As for reasons other than the search for efficiency, leaving efficiency only as a consequence and without clear effectiveness. The indicators that show, over time, a strong and clear influence on the efficiency of the banks, do not show, in M&A cases, clear relationships with this operation. Therefore, with the results obtained and the current literature, it is speculated that other reasons for carrying out M&As, such as the search for market power, the too-big-to-fail status, the follow-up of the new theory of the firm, the response to a direct competitor that carried out the same operation, among others, deserve future studies. The subject deserves other forms of study, in addition to the question of whether efficiency is the real intention in this type of operation.

The efficiency ranking, a new metric for this type of study, was successful in weighing the analysis of banks' performance after an M&A in relation to the market as a whole, making it possible to visualize the relative effect vis-à-vis competitors. In addition, with the ranking, it

was possible to differentiate the behavior of banks in the market in each approach, showing that banks prioritize the profitability approach more than the intermediation approach, which can be a warning for government entities, since the social and economic role of banks in society is that of intermediation.

Finally, for other bank efficiency studies, the results suggest the use of seven indicators: leverage, share of credit operations, management efficiency, insolvency, size, sectoral concentration, and operational profitability; which presented themselves as a strong set in relation to the efficiency of the bank, and having an influence on both approaches.

It is appropriate to point out that financial indicators are guidelines. They point to evidence and signal possible further investigation. Furthermore, this study is limited to four M&A events over a seven-year period. This is a complex topic that allows for several approaches, and additional studies could be conducted due to the differences between the banks' real intentions and the country's socioeconomic needs, as well as their performance intentions between the short and long terms; also, the analysis could be extended to other M&A cases or to countries with different socioeconomic structures.

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