The relationship between financial stability and transparency in social-environmental policies

Claudio De Moraes
Brazilian Central Bank, Rio de Janeiro, Brazil and COPPEAD Institute of Administration, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil, and
André Pinto Bandeira de Mello
COPPEAD Institute of Administration, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

Received 8 May 2023
Revised 14 September 2023
12 January 2024
Accepted 31 March 2024

Abstract

Purpose – This work analyzes, through social-environmental reports, whether banks with higher transparency in social-environmental policies better safeguard financial stability in Brazil.

Design/methodology/approach – The analysis is carried out through a panel database analysis of the 42 largest Brazilian banks, representing 98% of the Brazilian financial system. Seeking to avoid spurious results, we followed rigorous methodological standards. Hence, we conducted an empirical analysis using a dynamic panel data model, we used the difference generalized method of moments (D-GMM) and the system generalized method of moments (S-GMM).

Findings – The results show that the higher the transparency of social-environmental policies, the lower the chance of possible stress on the financial stability of Brazilian banks. In sum, this study builds evidence that disclosing risks related to policies about sustainability can enhance financial stability. It is essential to highlight that social-environmental transparency does not have as direct objective financial stability.

Originality/value – The manuscript submitted represents an original work that analyzes whether banks with higher transparency in social-environmental policies better safeguard financial stability. Some countries, such as Brazil, have their potential for sustainable policies spotlighted due to their green territory and diverse natural ecosystems. Besides having green potential, Brazil is a developing country with a well-developed financial system. These characteristics make Brazil one of the best laboratories for studying the relationship between transparency in social-environmental policies and financial stability.

Keywords Sustainability, Financial stability, Green finance, Transparency, Basel III accord

Paper type Research paper

1. Introduction

The subprime crisis in 2008 roused concern regarding tail risks, which happen when unpredictable events become reality. These events are called Black Swans by Nassim (2008). They should comprehend the following characteristics: it is an outlier with extreme impact and, after the occurrence, is predictable and explainable (Runde, 2009). Inspired by this rationale, the Bank of International Settlement coined the Green Swan phenomenon (Bolton, Després, Pereira da Silva, Samama, & Svartzman, 2020). They are nature-related events that may lead to more significant challenges since they are more problematic than Black swans. To provide further arguments and help the debate about whether climate risks and Green

EconomiA
Emerald Publishing Limited
e-ISSN: 2358-2820
p-ISSN: 1517-7580
DOI 10.1108/ECON-05-2023-0068

Swans represent potential issues for financial stability and whether being transparent toward those subjects might help prevent financial distress, this article uses panel data regression with the goal of understanding if transparency in social-environmental policies can mitigate financial distress.

According to Networking for Greening the Financial System – NGFS (2022), banks can play a leading role in mitigating environmental changes, which can be crafted by Green Swans and other types of risks related to climate change. For instance, if the financial system starts to neglect funding for companies or industries intensive on the environment (or carbon-intensive), those enterprises' activities would suffer a revamp to readjust their endeavors into a more social-environmental approach. In other words, banks should embrace sustainability in their workflow NGFS (2022). Consequently, these movements tend to modify and preserve the environment, crafting a meaningful change in climate and social risks. On the other hand, the United Nations Environment Program Finance Initiative – UNEPFI (2016) suggested that social and environmental risks pose new challenges for financial institutions and not pursuing paths to mitigation can lead the world to an unprecedented crisis propelled by events related to climate issues. Considering this landscape, banks, policymakers and the entire financial system should learn how to cope with events associated with climate change and how to mitigate them.

After the subprime crisis and the concerning financial distress it caused, the Basel III accord presented the idea of a market discipline that could lead to a sound financial system. However, for market discipline, financial institutions must be transparent with regularity and standardization in their reports (BIS – Basel Committee, 2004). Moreover, the BIS – Basel Committee (2022) shares the same beliefs for social-environmental issues and suggests that reporting risks related to climate is paramount to managing environmental issues. Additionally, according to BIS, supervisors expect disclosures from banks to their exposers on risks related to environmental and social risks to prevent financial distress. By doing so, transparency in social-environmental policies gains a spotlight in discussions concerning the financial system.

Social-environmental policies as well as greening the financial system should be a worldwide endeavor. Some countries, however, such as Brazil, have their potential for sustainable policies spotlighted due to their green territory and diverse natural ecosystems. According to the Convention on Biological Diversity, it is estimated that 15–20% of the world's biodiversity is currently in Brazilian territory. Besides having green potential, Brazil is a developing country with a well-developed financial system. Additionally, the Central Bank of Brazil demands financial institutions have a social-environmental responsibility policy. These characteristics make Brazil one of the best laboratories for studying the relationship between transparency in social-environmental policies and financial stability.

This study analyzes whether banks with higher transparency in social-environmental policies better safeguard financial stability in Brazil. To our knowledge, no previous work links financial stability with social-environmental transparency. Through panel data models with Brazilian banks that together have more than 95% of the total assets of the financial system from 2011 to 2019, the results indicate a positive relationship between transparency in banking disclosure policies and financial stability. In other words, transparency may enhance financial stability in a large emerging country with green potential.

This article is divided as follows: section 1 presents the introduction. Section 2 displays an in-depth analysis of financial stability, transparency and banking. Section 3 presents the empirical strategy and methodology as well as the data used in this article. Section 4 presents the empirical results through a data panel analysis regarding the transparency of social-environmental policy and financial stability. Section 5 discloses the robustness check and Section 6 presents this article's conclusions.

2. Financial stability and transparency

Financial stability has gained much more attention in the literature and among policymakers since the subprime crisis. This attention reflects the number of studies devoted to understanding what enhances financial stability (De Moraes & de Mendonça, 2019; Montes, Valladares, & de Moraes, 2021; De Moraes & Costa, 2022; Amidu & Wolfe, 2013; Tabak, Gomes, & da Silva Medeiros, 2015). Despite the different approaches to defining financial stability that have emerged, this work uses the definition offered by the Central Bank of Brazil – CBB (2022). Financial stability is when the financial institution fully functions without any crisis or difficulty in honoring its obligations while fulfilling its social duty. Thus, to capture this idea, we use a comprehensive approach by diversifying the measurements of financial stability, which are: Z-score with regulatory capital, Z-score using leverage and the voluntary capital buffer.

Z-score is often used in the banking literature to measure the risk of insolvency; it was first introduced as a risk measure by Roy (1952). According to Lepetit and Strobel (2013), the Z-score can reflect the insolvency probability of financial institutions. There are different standards for Z-score, and we follow two of them in this study: Lepetit and Strobel (2013) calculated it with the capital adequacy ratio (CAR), while Fazio, Tabak, and Cajueiro (2015) used this Z-score to evaluate financial stability in Brazil, which in this work will be represented as Z-Score1(1). Fu, Lin, and Molyneux (2014) and De Moraes and Costa (2022), however, calculated it differently by using, instead of CAR, a ratio between equity and total assets. In this work, this ratio is called leverage (LEV). This will be represented as Z-score2 (2) and it presents, under the assumption of a bank with stable returns, how many standard deviations the return must diminish to drain equity (Čihák & Hesse, 2010). Thus, despite having the similar formula and, in both proxies, we are desiring a higher value, they present different ideas. In both methods, ROA represents the return on assets, and the standard deviation is calculated in both cases, according to De Nicolo, Boyd, and Jalal (2006).

$$Z1 \equiv \frac{ROA + CAR}{\sigma ROA} \tag{1}$$

$$Z2 \equiv \frac{ROA + LEV}{\sigma ROA} \tag{2}$$

Another financial stability proxy used is the voluntary capital buffer (03), which is how much above the minimum required by regulators a bank maintains as additional capital to be used in stress periods (Bis, 2010). It is studied in many relationships with macroprudential tools as a proxy for financial stability. Montes *et al.* (2021) presented capital buffer behavior throughout countries, thus placing a high capital buffer as a source of banks being protected against economic downtrends. Further, De Moraes and de Mendonça (2019) argue that the higher the capital buffer, the lower the solvency risks. Hence, banks with higher voluntary buffers are less susceptible to crises once they possess more capital to resist challenging times, preventing banks from getting sanctioned by the regulatory agency. The calculation is the ratio between the capital adequacy ratio kept by banks and the minimum required by regulation.

$$Buffer \equiv \frac{CAR}{minimum\ required} \tag{3}$$

Nowadays, all stakeholders in financial stability consider climate change impacts. For instance, NGFS (2020) suggested two possible types of bank risks related to climate that can harm banks and countries' financial stability: Physical risks represent risks that occur due to climate-related events such as storms, hurricanes and other events that could be categorized as Green Swans. Javadi and Masum (2021) suggested a physical impact when presenting the relationship between drought risk and the cost of borrowing for US firms. This relationship implies that banks are aware of and price those risks. The second stream commented on is the transitional risk, which is the consequence of transitioning to a greener economy. Lee, Wang, Thinh, and Xu (2022) add to the literature that banks exposed to climate risks may be negatively affected by liquidity creation.

As a result of this scenario, the relationship between the environment and banks entered the spotlight in the literature, so the academia enlarged the efforts to understand it by producing studies with different countries, datasets and objectives (Murè Spallone, Mango, Marzioni, & Bittucci, 2021; Miralles-Quirós, Miralles-Quirós, & Redondo Hernández, 2019; Weber, Scholz, & Michalik, 2010); thus, the importance of banks in changing the current economy into a greener one as well as sizing, acting and mitigating these risks, due to how much is at stake when considering climate changes in the equation, is highly accepted. Consequently, those organizations tackling these problems are now not only relevant but essential. Hence, a new stream of research emerged by compiling the idea of the Basel III accord's third pillar that discusses how transparency can mitigate financial distress and the relevance of sustainable banking policies (Khan, Bose, Mollik, & Harun, 2020; Nobanee & Ellili, 2016; Buallay, 2018). Our work follows a new strand of literature studying the relationship between transparency in social-environmental policies and financial stability.

Measuring transparency is not a straightforward task. The literature, policymakers and society should be aware of how diverse transparency can be and how banks, as well as other enterprises, might craft ways of not establishing a meaningful policy. In this sense, De Moraes, Grapiuna, and Antunes (2022), inspired by Horváth and Vaško (2016), created the social-environmental transparency index (SETI). This index has the lowest score of 0 and the highest score of 9 and was built around four different angles: the general framework, which comprehends the corporate environmental conditions to develop social and environmental transparency, the report's standardization, what is being reported and what is shown on their website. By doing so, the index comprehends different parameters and ideas, including those comprehended in Global Reporting Indicators (GRI), the Sustainability Accounting Standards Board (SASB) and the Task Force on Climate-related Financial Disclosures (TCFD).

We use the SETI developed by De Moraes *et al.* (2022) as our proxy for banking transparency in climate policies. Table A.1 in the appendix presents the details about the build of SETI. SETI has nine different parameters and except for the GRI parameter, which has three possibilities (0, 0.5 and 1), all of them have a binary result of 0 or 1. In the general framework, the first category has the goal of measuring the corporate environment to craft social and environmental policies. It has three parameters, so its total goes from 0 to 3. The second one is a report, or, in other words, disclosure tools for those policies, with two parameters, so the score goes from 0 to 2. The third one is the reporting standards. Though it is important to disclose this information, well-accepted patterns of disclosure must be followed. This category has three different considerations, so the score goes from 0 to 3. Lastly is the website category, which indicates the company's willingness to have an exclusive communication channel for those policies, and it has only one parameter, the score goes from 0 to 1.

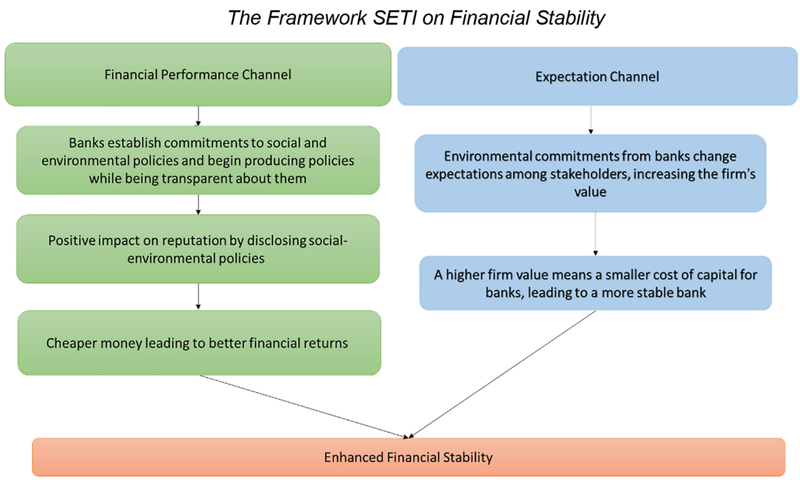
According to De Moraes *et al.* (2022), it is possible to understand some bank characteristics that explain greater transparency in social-environmental policies. For instance, larger banks present a higher score across all years observed. Another piece of evidence found is the causal relationship between SETI and the bank's risk measures. Finally, the results indicate the impact of the regulator on enforcing banks' transparency. Our study aims to amplify the analyses to understand if transparency towards social-environmental policies enhances Brazilian financial stability, which may indicate the best of the two worlds, compromising sustainability and financial stability.

3. Empirical strategy

Our empirical strategy aligns with previous research, exemplified by studies such as Guidara, Lai, Soumaré, and Tchana (2013) and Stolz and Wedow (2011), in which they analyzed the practical implications of the Basel Framework on banking behavior. The economic principles in the Basel Framework underscore the importance of international prudential regulation for preserving financial stability [1]. Since Basel II, transparency has held significant importance within this framework, as stakeholders armed with data can influence financial institutions' conduct. The market discipline highlighted by the Basel Committee in the working paper on Pillar 3 (BIS – Basel Committee, 2001) plays a pivotal role in fostering a resilient and stable banking system. Moreover, in the first semester of 2024, the Basel Consultive will publish a document about the worldwide disclosure of climate-related financial risks [2]. The focus is to analyze how the Pillar 3 disclosure framework for climate-related financial risks would further its mandate to strengthen banks' regulation, supervision and practices worldwide to enhance financial stability. In light of this economic and regulatory rationale, Lupu, Hurduzeu, and Lupu (2022), Gehrig *et al.* (2024), and our work develop methodologies to measure socio-environmental transparency and assess its effects on financial stability.

According to Bătae *et al.* (2021), there is a positive relationship between environmental commitments and financial performance through access to cheaper resources. Laguir *et al.* (2017) suggest that financial and environmental performance may be mutually reinforcing. Therefore, an increase in one aspect strengthens the other. Taking a different approach, Jacobs, Singhal, and Subramanian (2010) discuss how a bank's market value responds to commitments related to environmental causes. Considering that transparency and socio-environmental practices lead to commitments, it becomes possible to comprehend the channels through which this form of transparency impacts financial stability, as illustrated in Figure 1.

From the point of view of financial performance or expectation channels, it is conceivable that the social-environmental transparency of banks generates a positive reputation, increasing deposits or investments. Therefore, it enhances cash flows and reduces the likelihood of a banking crisis. Moreover, many funds and "green money" are directed toward social-environmental commitments. Those willing to invest/lend money at a discounted rate are often



Source(s): Authors' own work

Figure 1.
Financial performance channel and expectation channel

called green premiums (greenmium), reinforcing the theoretical notion of more accessible financing for these banks. After identifying the channels through which transparency impacts financial stability, it is necessary to build a specific socio-environmental transparency measure. For that, we chose the SETI constructed by De Moraes *et al.* (2022).

The framework SETI on financial stability.

To understand the relationship between transparency in social-environmental policies and financial stability, an unbalanced panel was prepared with over 40 Brazilian banks from 2011 to 2019 with annual data, thus gathering data from bank websites and the Central Bank of Brazil (CBB). This selection acquires more than 95% of the total assets of the financial system in Brazil and has as its theoretical foundation the Basel Committee for Banking Supervision's (BCBS) recognition of the proportionality of supervision [3]. For that, not all banks should have the same degree of importance in supervision. The CBB divides the Brazilian financial system into five segments, considering banks' significance and the risk posed to financial stability in Brazil. Consequently, this study only uses banks from segments one to three because segments four and five do not present disclosure of social-environmental policies and do not have considerable risks to the financial system.

The literature on banking and financial stability normally uses a set of variables to understand how to safeguard financial stability. Kasman and Kasman (2015) and Fu *et al.* (2014) suggested that the logarithm of total assets (SIZE) plays a relevant role in financial stability, where bigger banks tend to have a lower value for financial stability. Another variable often used when explaining financial stability is return on equity (ROE), which gives insight about how financial stability reacts to a bank's profitability. In studies linking banks with sustainability, Weber (2017) linked sustainability reports with profitability measures. In this sense, ROE will be placed as a control variable inside the baseline model. Moving further, Fazio *et al.* (2015) suggested that liquidity negatively affects a bank's financial stability.

Also trying to grasp how the macroeconomic condition affects financial stability, Demirgüç-Kunt and Detragiache (1998) suggested that the economic momentum may interfere with the soundness of the banking system. Moreover, Jokipii and Milne (2008) suggested procyclical behavior in banks. Thus, the output gap is one of the macroeconomic variables used in this study with the purpose of controlling the business cycle. Its calculations are according to what Hamilton (2018) proposed. Other macroeconomic variables are part of the equation. Monetary policy and its effects on the macroprudential environment are the subject of De Moraes and de Mendonça (2019), who have found evidence regarding how Brazil's basic interest rate can interfere with risk measures. Equally to De Moraes and de Mendonça (2019), this study presents the Brazilian monetary policy rate (IR) as a measure of how monetary policy may affect financial stability. The last control variable used in this model is credit variation, as De Moraes and Costa (2022) suggested credit growth can reduce a bank's financial soundness, so for this reason credit variation (credit) was added to the model. Table A.3 in the appendix presents all variables and their descriptive statistics.

It is important to highlight the usage of a dynamic model to allow using the dependent variable lagged as an explanatory variable since, as pointed out by De Mendonça and De Moraes (2018), financial stability might suffer persistent effects. Hence, it is expected that the lagged dependent variable may help explain financial stability. The model is represented as follows:

$$\boldsymbol{FS_{i,t}} = \boldsymbol{\beta_1 FS_{i,t-1}} + \boldsymbol{\beta_2\ Transparency\,Index_{i,t}} + \boldsymbol{\beta_2\, X_{i,t}} + \boldsymbol{\beta_3\, Z_t} + \varepsilon_{\mathrm{i,t}} \tag{4}$$

Where $FS_{i,t}$ represents all three measures of financial stability (Z-score1, Z-score2 and capital buffer) for a given bank in each period, $FS_{i,t-1}$ is the same three measures of financial stability (Z-score1, Z-score2 and capital buffer), although lagged by one period to include the persistent effect on bank behavior. Transparency Index is the transparency in social-environmental policies crafted by De Moraes and et at. (2022), X is a vector of specific banking control variables, Z is a vector of macroeconomic variables used in the model and ε is the stochastic error term.

3.1 Methodology

According to Baltagi (2005), using the dependent variable lagged in all models could lead to a correlation problem with the error term in OLS (ordinary least squares) models. To overcome this issue, this study uses the generalized moments method (GMM) with two different approaches, as used by de Deus and de Mendonça (2015). The first model is proposed by Arellano and Bond (1991) to solve the aforementioned problem, which estimates the first difference in GMM panel data (D-GMM) and is one of the methods used in our estimations. However, this method does not eliminate all possibilities of issues, as shown in Blundell and Bond (1998), who suggested that its usage implies bias for a large or small sample, low accuracy and weak instruments. To deal with those issues, a second methodology is used to strengthen the outcomes. As proposed by Arellano and Bover (1995) and Blundell and Bond (1998), the system GMM panel data (S-GMM) should be applied to deal with those problems, as used by Montes *et al.* (2021), Kasman and Kasman (2015), Fu *et al.* (2014) and De Moraes and Costa (2022). According to Bond, Hoeffler, and Temple (2001), the S-GMM enables a more robust outcome by aggregating regression equations on differences and levels into a system while using lagged differences and lagged levels of the variables as instruments in the model.

The transparency index and control variables may give rise to endogeneity concerns as a result of the reverse causality between financial stability measures. Banking stability can also enhance transparency, return on equity and liquidity. To address endogeneity, we employ the difference GMM (D-GMM) estimator developed by Arellano and Bond (1991). However, it is susceptible to weak instruments, mainly when the dependent variable exhibits high persistence, as is likely in our model. A more robust alternative is the system GMM (S-GMM) estimator, introduced by Arellano and Bover (1995), which proves advantageous in configurations with highly persistent dependent variables, using an extensive set of instruments to control for both endogeneity and reverse causality issues, similar to the D-GMM estimator.

In this work, we follow the Basel framework, as is common in much of the banking literature (Guidara *et al.*, 2013; Stolz & Wedow, 2011; De Moraes & Costa, 2022). However, the limitation lies in the absence of a robust theoretical foundation, which claims caution when analyzing causality. Moreover, not all explanatory variables are entirely known and measurable in the empirical model developed in this study. Nevertheless, in line with the insights of Arellano and Bond (1991), the application of the dynamic panel data method (GMM) offers a means to mitigate the influence of unobserved effects in the regressions, enhancing the reliability of estimates even when certain variables are omitted from the analysis. Additionally, using instrumental variables allows for more consistent parameter estimation, even in situations involving endogeneity in explanatory variables and the potential presence of measurement errors, as highlighted by Bond *et al.* (2001).

To check the validity of the outcome, some tests are run to identify problems and craft confidence in our model. As proposed by de Deus and de Mendonça (2015), to understand if the instruments used in the model are pertinent, the Sargan test (J-test) was applied as described by Arellano (2003) as well as tests for serial correlation of first and second order. The study presents AR(1) and AR(2), which give us an understanding of whether we have a negative first-order correlation and a noncorrelation of second-order, respectively. To assess the possibility of an over-fit of the instrument variable caused by using too many instruments that can create a bias (Roodman, 2009), the instrument/number ratio of cross-sections is always under 1, as applied by De Mendonça and Barcelos (2015) [4].

4. Results

With the objective of understanding the relationship between financial stability and transparency in social-environmental policy, we present empirical evidence on the relationship between financial stability and transparency in social-environmental policies. This section is divided into subsections for each financial stability proxy: Z-score1, Z-score2 and buffer. All estimations use the D-GMM and S-GMM frameworks. Sargan's J-test was performed for all models. The over-identifying restrictions are judged valid. AR (1) and AR (2) serial correlation tests were also performed. The AR (1) tests reject the null hypothesis in all cases. The AR (2) tests do not indicate the presence of serial correlation.

4.1 Z-score1 - CAR

Table 1 presents the relationship between financial stability, as measured by Z-score1 and transparency in social-environmental policies. The positive and statistical significance of the SETI represents that banks with higher transparency offer less risk to financial stability. This relationship may be explained since banks that understand and are especially transparent about climate-related risks not only have more concern regarding them but also tend to be safe and sound, embracing those policies. Being transparent about them brings accountability since it forces them to keep their promises. A common expression for it is "you do what you preach." Further, society constantly observes this effort, which enforces this behavior due to social coordination and market discipline.

In general, the positive and statistical significance of the lagged Z-score1 reveals a persistent effect on financial stability, as found by De Moraes and Costa (2022). In other words, financial stability has an inertia effect. Moreover, the consistency in all outcomes suggests a strong relationship among them.

All control variables, to some extent, shared good insights from the literature on bank behavior and its relationship with financial stability. The negative and significant value of the bank's size shows us that bigger banks tend to have a higher risk of financial instability than small banks. This movement might be explained by the bigger possibility of diversification inside its portfolio, another way to mitigate risks measured by the Z-score1, which craft a greater possibility to leverage itself, thus safeguarding its stability despite the lower value on some risk assessment variables. This finding is aligned with Fu *et al.* (2014), and its explanation can be found in Kim, Batten, and Ryu (2020), where moderately diversified banks tend to be more stable. The *return on equity* with a positive and statistically significant sign, since the variable is at the same period as the Z-score, means that the ROE variable has more of a book value than a practical one. In other words, the return was not divided among the equity holders, providing the bank with a resource. Despite the possible mechanical relationship between ROE and Z-score, it is understandable that ROE could explain a part of financial stability or a possible stress.

There are other bank characteristics proposed as control variables that display meaningful insights. *Liquidity* with positive and statistical significance suggests a straightforward understanding where banks with higher liquidity tend to reduce their risk since banks with more liquidity are generally more able to honor their obligations in the short term. The same result can be found in De Moraes and de Mendonça (2019). Regarding the macroeconomic variable in the model, the Brazilian basic interest rate (SELIC) displays some significance with a negative sign. Through an economic lens, we can understand this phenomenon as a higher interest rate *(IR)* meaning higher risks for banks by enlarging the possibility of a default on debts. Generalizing, the higher the interest rate, the higher the chance of a bank being insolvent. This is the same result found by De Moraes and de Mendonça (2019). The positive and significant results of the output gap exhibit that economic growth interferes positively, thus reinforcing the thesis that banks will likely act in a procyclical fashion. Credit variation does not show significance.

Table 1. Estimation of the relationship between social-environmental transparency and financial stability

Dependent variable: Z-score1										
Model	D-GMM	D-GMM	D-GMM	D-GMM	D-GMM	S-GMM	S-GMM	S-GMM	S-GMM	S-GMM
Equations	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagged Z-score1	0.226***	0.229***	0.228***	0.276***	0.287***	0.236***	0.235***	0.304***	0.299***	0.307***
	(0.011)	(0.004)	(0.004)	(0.006)	(0.007)	(0.0090)	(0.009)	(-0.007)	(0.009)	(0.012)
SETI	4.279**	2.539**	2.742***	4.178***	3.056***	3.971***	4.280***	3.771***	3.548***	5.244***
	(1.91)	(0.371)	(0.752)	(0.986)	(1.047)	(1.104)	(1.086)	(1.188)	(1.107)	(1.286)
Size	−4.181**	−3.734***	−3.706***	−3.049***	−2.172***	−3.251***	−3.315***	−2.967**	−2.927***	−3.056***
	(0.968)	(0.182)	(0.166)	(0.279)	(0.486)	(2.803)	(3.264)	(-2.469)	(2.978)	(0.325)
Return on equity	3.957***	2.991***	2.951	2.432 ***	1.010***	3.596***	3.057**	1.679**	1.554*	1.229
	(1.207)	(0.603)	(0.780)	(0.942)	(0.311)	(8.610)	(11.813)	(7.180)	(9.051)	(1.009)
Liquidity		2.598***	3.321	4.604***	3.006		1.244	3.361**	2.536***	3.324**
		(0.517)	(0.625)	(0.975)	(1.250)		(1.082)	(1.484)	(0.947)	(1.655)
IR			−0.791	−0.2	−1.099**			0.382	−0.103	0.361
			(0.339)	(0.480)	(0.403)			(0.542)	(0.480)	(0.567)
Output gap				0.510***	1.166***				1.100***	0.875***
				(0.194)	(0.386)				(0.231)	(0.247)
Credit variation					−1.355					1.119
					(0.792)					(1.057)
N. Obs	224	225	225	225	225	225	225	225	225	225
Inst./Cross	0.868	0.947	0.973	0.947	0.973	0.868	0.868	0.868	0.868	0.868
J-statistic	25.267	31.934	31.586	33.893	27.401	29.555	28.158	30.315	30.019	29.667
Prob.(Jstatistic)	0.664	0.470	0.436	0.243	0.907	0.436	0.456	0.300	0.267	0.237
AR(1)	−2.012	−1.905	−1.913	−1.799	−2.058	−0.359	−0.356	−0.387	−0.388	−0.382
Prob	0.044	0.056	0.055	0.071	0.039	0.000	0.000	0.000	0.000	0.000
AR(2)	0.483	0.453	0.442	0.458	0.656	0.082	0.082	0.100	0.107	0.103
Prob	0.661	0.650	0.658	0.643	0.511	0.241	0.238	0.129	0.106	0.116

Note(s): Marginal significance levels with (***) denotes 0.01, (**) denotes 0.05 and (*) denotes) 0.1, and standard errors are in parenthesis. In consonance with Arellano and Bover (1995), the two-step S-GMM was applied as well as the consistent covariance matrix of White's heteroskedasticity. And, as suggested by Arellano and Bond (1991), D-GMM was applied
Source(s): Authors' own work

4.2 Z-score2 – lev

To analyze how transparency in social-environmental policies affects the financial system, Table 2 presents the output of estimations regarding Z-score2 as a proxy for financial stability. With the results for Z-score1, SETI remained consistently positive and had statistical significance. This reinforces the idea that disclosure of social-environmental policies creates accountability and allows market discipline toward banks. Further, the positive and statistical significance of the lagged Z-score2 displays a persistent effect on financial stability. Hence, banks with higher soundness will likely remain this way, but banks already suffering from financial stress have a higher chance of remaining with the problem. The same results were funded by De Moraes and Costa (2022).

Bank size shows the same negative sign with statistical significance, suggesting that bigger banks are inclined to have a higher risk level than smaller ones, as shown in Z-score1, although this might have as an explanation the fact that those banks have artifices such as diversification to reduce the possibility of turmoil. ROE, despite losing part of its significance when comparing Table 1 with Table 2, disposes in some models of a positive and significant signal, so banks with higher returns on equity have higher soundness. Since both are presented in the same period, the returns might not be divided yet with equity holders, thus creating a financial resource for banks.

Liquidity, in most of those cases, has a positive sign and displays statistical significance. Thus, banks with higher liquidity tend to be more stable. That is, when banks are conservative with liquidity, they are less risky than more aggressive banks toward liquidity. Those results corroborate what was found in Fu *et al.* (2014) and Kasman and Kasman (2015). Moving into the next control variable and the first one that is not bank-specific, the Brazilian's basic interest rate, when it has significance, it presents a negative signal. One of the most likeable explanations for this relationship is that a higher interest rate presents more challenges for banks when talking about financial stability since higher interest rates may be seen as a proxy for higher risk in the financial system. Still in the macroeconomic landscape, the positive and significant sign in the output gap displays once again the procyclical behavior in bank behavior. In other words, as banks expand, they are willing to take more risks when the economy is booming, but when it is in a downtrend, banks have a more secure and defensive position. Credit variation remained without statistical significance.

4.3 Capital buffer

As shown in Table 3 regarding capital buffer, the third proxy for financial stability presents the relationship with SETI. Since all equations share a positive signal and statistical significance, this suggests that the more transparent banks are, especially due to market discipline, more capitalized and present more stability. In other words, banks that propose and disclose their policies regarding social-environmental issues suffer from control from different parts of society, crafting a more stable financial system.

Moreover, the positive signal and statistical significance of the lagged capital buffer reinforces the thesis that financial stability will last. It means that a more conservative bank tends to remain in the same position, and banks with more chances to suffer from instability tend to remain on the same path. Moreover, the consistency in all outcomes suggests a strong relationship inside it, which reinforces the findings regarding other variables since the persistent effect is controlled.

The first equation presents the outcome regarding the base line model for financial stability as measured by the capital buffer. The bank size and the return on equity are the first control variables used, and the negative signal together with statistical significance ensure the thesis that bigger banks tend to mitigate risk by other measures than retaining

Table 2. Estimation on the relationship between social-environmental transparency and financial stability

Dependent variable: Z-score2										
Model	D-GMM	D-GMM	D-GMM	D-GMM	D-GMM	S-GMM	S-GMM	S-GMM	S-GMM	S-GMM
Equations	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagged Z-score2	0.188***	0.211***	0.319***	0.302***	0.216***	0.368***	0.324***	0.317***	0.314***	0.359***
	(0.068)	(0.030)	(0.068)	(0.0546)	(0.053)	(0.019)	(0.006)	(0.010)	(0.006)	(0.030)
SETI	12.264***	7.093***	10.767***	10.968**	11.583***	6.823***	4.577***	5.771***	4.947***	14.010***
	(4.359)	(2.630)	(3.743)	(4.723)	(5.778)	(2.614)	(1.004)	(1.242)	(1.380)	(2.941)
Size	−5.307***	−4.374***	−5.067***	−4.670***	−5.689***	−3.342***	−2.911***	−3.467***	−3.711***	−3.682***
	(1.474)	(0.926)	(1.359)	(1.358)	(1.371)	(0.812)	(0.223)	(0.232)	(0.393)	(0.665)
ROE	−0.358	−2.011	0.640	7.061	−4.651	0.432***	0.808*	0.638	0.367	1.971***
	(0.522)	(4.011)	(0.461)	(0.628)	(8.598)	(0.292)	(0.484)	(0.480)	(0.647)	(2.569)
Liquidity		5.248***	4.691	−0.719	−3.394		1.994**	3.938***	1.956	3.779
		(1.527)	(5.069)	(6.120)	(5.049)		(0.870)	(1.290)	(1.313)	(2.569)
IR			1.169	0.675	3.395			−1.072***	−1.285***	−0.271
			(1.623)	(1.563)	(2.200)			(0.304)	(0.363)	(0.882)
Output gap				1.545	0.204				1.719***	1.858**
				(1.187)	(1.822)				(0.176)	(0.853)
Credit variation					−5.461					−0.617
					(25.096)					(1.371)
N. Obs	244	243	245	244	244	226	245	245	246	245
Inst./Cross	0.463	0.659	0.488	0.524	0.561	0.789	0.927	0.927	0.878	0.829
J-statistic	13.267	25.385	15.964	18.803	17.326	20.8117	33.253	32.904	28.994	20.259
Prob.(Jstatistic)	0.581	0.279	0.316	0.223	0.300	0.700	0.454	0.423	0.465	0.779
AR(1)	−11.144	−2.077	−3.155	−2.638	−2.459	−0.379	−0.377	−0.372	−0.385	−0.379
Prob	0.000	0.038	0.002	0.008	0.014	0.000	0.000	0.000	0.000	0.000
AR(2)	−0.041	0.161	0.306	0.208	−0.040	0.747	−1.514	0.075	0.082	0.074
Prob	0.967	0.871	0.759	0.835	0.968	0.226	0.189	0.219	0.168	0.226

Note(s): Marginal significance level with (***) denotes 0.01, (**) denotes 0.05 and (*) denotes) 0.1 and standard errors are in parenthesis. In consonance with Arellano and Bover (1995), the two-step S-GMM was applied as well as the consistent covariance matrix of White's heteroskedasticty. And, as suggested by Arellano and Bond (1991), D-GMM was applied
Source(s): Authors' own work

Table 3.
Estimation on the relationship between social-environmental transparency and financial stability

Dependent variable: Capital buffer										
Model	D-GMM	D-GMM	D-GMM	D-GMM	D-GMM	S-GMM	S-GMM	S-GMM	S-GMM	S-GMM
Equations	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagged buffer	0.326***	0.395***	0.275***	0.330***	0.360***	0.330***	0.463***	0.473***	0.604***	0.444***
	(0.0146)	(0.020)	(0.0291)	(0.027)	(0.025)	(0.012)	(0.025)	(0.022)	(0.047)	(0.024)
SETI	0.094***	0.063***	0.241***	0.143***	0.240***	0.239***	0.220***	0.230***	0.163***	0.243***
	(0.017)	(0.021)	(0.031)	(0.027)	(0.028)	(0.063)	(0.023)	(0.032)	(0.043)	(0.039)
Size	−0.082***	−0.082***	−0.018	−0.081***	−0.117***	−0.060	−0.109***	−0.080***	−0.062***	−0.073***
	(0.004)	(0.094)	(0.014)	(0.010)	(0.010)	(0.025)	(0.100)	(0.120)	(0.015)	(0.014)
ROE	−0.0003	0.031*	−0.001	0.085	−0.006	−0.017	0.030*	0.065***	0.007	0.189***
	(0.004)	(0.016)	(0.014)	(0.016)	(0.009)	(0.048)	(0.154)	(0.015)	(0.005)	(0.050)
Liquidity		0.177***	0.138***	0.153***	0.175***		0.152***	0.189***	0.237***	0.189***
		(0.016)	(0.009)	(0.014)	(0.007)		(0.008)	(0.012)	(0.036)	(0.021)
IR			−0.0248**	−0.042***	−0.029***			−0.014*	−0.065***	−0.078***
			(0.010)	(-0.009)	(0.009)			(0.008)	(0.01478)	(0.013)
Output gap				0.037***	0.023***				0.005	0.007
				(0.007)	(0.004)				(0.009)	(0.010)
Credit variation					0.0042					−0.069***
					(0.102)					(0.020)
N. Obs	244	244	285	244	244	244	244	285	244	243
Inst./Cross	0.756	0.707	0.707	0.780	0.878	0.439	0.756	0.732	0.634	0.780
J-statistic	34.124	27.106	31.288	30.185	32.975	16.560	29.541	25.530	20.110	27.042
Prob.(Jstatistic)	0.162	0.300	0.116	0.217	0.237	0.280	0.287	0.377	0.388	0.302
AR(1)	−2.232	−3.569	−2.414	−3.698	−2.463	−0.234	−0.234	−0.383	−0.267	−0.241
Prob	0.026	0.000	0.016	0.000	0.014	0.0005	0.000	0.000	0.000	0.000
AR(2)	−1.123	−0.641	−1.552	−0.702	−1.506	−0.093	−0.105	−0.079	−0.067	−0.102
Prob	0.261	0.521	0.121	0.483	0.132	0.248	0.169	0.197	0.369	0.207

Note(s): Marginal significance level (***) denotes 0.01, (**) denotes 0.05 and (*) denotes) 0.1 and standard errors are in parenthesis. In consonance with Arellano and Bover (1995), the two-step S-GMM was applied as well as the consistent covariance matrix of White's heteroskedasticity. And, as suggested by Arellano and Bond (1991), D-GMM was applied
Source(s): Authors' own work

more capital. Moreover, return on equity's variable with positive and statistical significance poses the opposite of the classical risk and return dilemma, although the same accountable explanation found in both previous models explains this, a priori, contradiction.

Furthermore, the other control variables, among them macroeconomic and singular to banks, presented expected signals and statistical significance, reinforcing the findings in the transparency index. Liquidity presented a positive signal and was statistical. This has a simple justification, indicating that banks with higher liquidity tend to suffer fewer risks. The first macroeconomic variable added to the model, the Brazilian's basic interest rate, shares the same negative signal with significance, crafting more arguments concerning the view that a high interest rate is likely to be seen as a higher risk in the Brazilian landscape. A positive and statistically significant result in the output gap might be explained by Brazilian fast growth and slow growth; thus, this lag might be banks waiting for the economic trend to be consolidated. The credit variation presents a negative signal with statistical significance, enforcing the findings made by De Moraes and Costa (2022).

5. Robustness analysis

By providing a robust analysis, we use Provisions (PROV) as a proxy for financial stability. As suggested by De Moraes and de Mendonça (2019), provisions are a measure of coverage for credit losses and are also used to measure financial stability since banks with higher provisions normally present more conservative behavior. Table 4 shows all the results from the models and equations. The positive relationship between the provisions and the transparency index corroborates the causal relationship between transparency in sustainability policies and financial stability. The high provision means that banks are being conservative in scenario planning. Moreover, this model's positive signal and statistical relevance show that banks with higher transparency in sustainability policies tend to have a more conservative approach regarding losses, thus preparing for a higher number of nonpaid loans and safeguarding financial stability. Concerning control variables, the results remain almost the same.

6. Conclusion

To investigate the impact of transparency on social-environmental policies in Brazilian financial stability, we used a Brazilian banking panel with different proxies for financial stability while using an index that measures transparency in those policies. The results show that the higher the transparency of social-environmental policies, the lower the chance of possible stress on the financial stability of Brazilian banks. In sum, this study builds evidence that disclosing risks related to policies about sustainability can enhance financial stability.

It is essential to highlight that social-environmental transparency does not have as direct objective financial stability. However, one should not neglect that bank transparency is a powerful tool because it creates a compromise between banks and society. Furthermore, the results of this work indicate that the principles of transparency presented in the third pillar of Basel III are being correctly extended to climate issues. These findings have several political implications, among which we highlight: first, policymakers are encouraged to incentivize greater transparency within the financial sector to mitigate potential risks and second, regulatory frameworks should continue to evolve to encompass climate and sustainability concerns, as demonstrated by the alignment of Basel III principles.

Table 4. Estimation on the relationship between social-environmental transparency and financial stability

Dependent variable: Prov										
Model	D-GMM	D-GMM	D-GMM	D-GMM	D-GMM	S-GMM	S-GMM	S-GMM	S-GMM	S-GMM
Equations	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagged Prov	0.181***	0.126***	0.148***	0.060***	0.116***	0.413***	0.390***	0.186***	0.391***	0.352***
	(0.035)	(0.038)	(0.034)	(0.015)	(0.034)	(0.048)	(0.070)	(0.032)	(0.014)	(0.023)
SETI	0.002***	0.002***	0.002***	0.001***	0.0062***	0.005***	0.005***	0.002***	0.004***	0.005***
	(0.001)	(0.001)	(0.001)	(0.0003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.0004)	(0.001)
Size	−0.0001	−0.0008	−0.0002	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.013***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0003)	(0.004)	(0.004)	(0.0001)	(0.0002)
ROE	−0.001***	−0.002***	−0.001***	−0.001***	−0.0021***	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***
	(0.0002)	(0.0002)	(0.002)	(0.0002)	(0.0002)	(0.0002)	(0.002)	(0.0003)	(0.0001)	(0.0002)
Liquidity		0.0008*	0.0009*	0.0023***	−0.0051***		0.0005	0.0001	0.0001	0.0002
		(0.0004)	(0.004)	(0.0005)	(0.0011)		(0.001)	(0.0006)	(0.0002)	(0.0006)
IR			0.0004	0.001***	0.001***				0.001***	0.0005
			(0.005)	(0.0003)	(0.001)				(0.0002)	(0.0003)
Output gap				−0.003***	−0.001***				−0.001***	−0.002***
				(0.0002)	(0.0002)				(0.0001)	(0.001)
Credit variation					−0.0041***					−0.002***
					(0.0006)					(0.0008)
N. Obs	287	287	287	246	246	246	246	287	244	244
Inst./Cross	0.732	0.732	0.780	0.878	0.927	0.659	0.659	0.707	0.951	0.853
J-statistic	29.233	28.207	28.220	28.235	30.339	24.679	25.330	27.443	32.620	27.542
Prob.(Jstatistic)	0.301	0.298	0.348	0.505	0.448	0.367	0.281	0.237	0.436	0.435
AR(1)	−3.052	−2.689	−2.376	−3.135	−3.451	−0.437	−0.431	−0.403	−0.431	−0.423
Prob	0.002	0.007	0.018	0.002	0.006	0.000	0.000	0.000	0.000	0.000
AR(2)	−0.329	−0.164	−0.506	−0.802	−0.823	−0.035	−0.039	−0.022	−0.0632	−0.089
Prob	0.742	0.870	0.613	0.410	0.410	0.702	0.665	0.758	0.494	0.3596

Note(s): Marginal significance levels (***) denote 0.01, (**) denotes 0.05 and (*) denotes) 0.1 and standard errors are in parenthesis. In consonance with Arellano and Bover (1995), the two-step S-GMM was applied as well as the consistent covariance matrix of White's heteroskedasticty. And, as suggested by Arellano and Bond (1991), D-GMM was applied

Source(s): Authors' own work

Notes

1. https://www.bis.org/basel_framework/
2. https://www.bis.org/bcbs/publ/d560.pdf
3. Table A.2 in the appendix presents the selected banks.
4. The instruments chosen follow Johnston (1984). In short, we use dates dated to the period t_(−1) or earlier to help predict contemporaneous variables unavailable at time t.

References

Amidu, M., & Wolfe, S. (2013). Does bank competition and diversification lead to greater stability? Evidence from emerging markets. *Review of Development Finance*, *3*, 152–166. doi: 10.1016/j.rdf.2013.08.002.

Arellano, M. (2003). *Panel data econometrics, advanced texts in econometrics*. Oxford: Oxford University Press.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 277–297. doi: 10.2307/2297968.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variables estimation of error-components models. *Journal of Economics*, *68*(1), 29–51. doi: 10.1016/0304-4076(94)01642-d.

Baltagi, B. H. (2005). *Econometric Analysis of Panel Data*, (3rd ed.), *4*.

Bătae, O. M., Dragomir, V. D., & Feleagă, L. (2021). The relationship between environmental, social, and financial performance in the banking sector: A European study. *Journal of Cleaner Production*, *290*, 125791. doi: 10.1016/j.jclepro.2021.125791.

BIS – Basel Committee (2001). Working paper on pillar 3 – market discipline. Basel.

BIS – Basel Committee (2004). International convergence of capital measurement and capital standards. Basel.

BIS – Basel Committee (2022). Principles for the effective management and supervision of climate-related financial risks. Basel.

BIS – Basel Committee (2010). Basel III: A global regulatory framework for more resilient banks and banking systems. Basel.

Blundell, R., & Bond, S. (1998). Initial conditions and moments restrictions in dynamic panel data models. *J. Econ.*, *86*(1), 115–143.

Bolton, P., Després, M., Pereira da Silva, L. A., Samama, F., & Svartzman, R. (2020). *The green swan (BIS Books)*. Bank for International Settlements.

Bond, S., Hoeffler, A., & Temple, J. (2001). *GMM estimation of empirical growth models. Economics papers W21, economics group, nuffield college*. University of Oxford.

Buallay, A. (2018). Is sustainability reporting (ESG) associated with performance? Evidence from the European banking sector. *Management of Environmental Quality: An International Journal*, *30*(1), 98–115. doi: 10.1108/meq-12-2017-0149.

CBB- Central Bank of Brazil (2022). Financial stability. Available from: https://www.bcb.gov.br/en/financialstability (accessed 27 August 2022).

Čihák, M., & Hesse, H. (2010). Islamic banks and financial stability: An empirical analysis. *J Finance Serv Res*, *38*(2-3), 95–113. doi: 10.1007/s10693-010-0089-0.

de Deus, J. D. B. V., & de Mendonça, H. F. (2015). Empirical evidence on fiscal forecasting in Eurozone countries. *Journal of Economic Studies*, *42*(5), 838–860. doi: 10.1108/jes-04-2014-0054.

De Mendonça, H. F., & Barcelos, V. F. (2015). Securitization and credit risk: Empirical evidence from an emerging economy. *The North American Journal of Economics and Finance*, *32*, 12–28. doi: 10.1016/j.najef.2015.01.002.

De Moraes, C. O., & Costa, Á. (2022). Credit behavior and financial stability in an emerging economy. *Economic Systems*, *47*(2), 100999. doi: 10.1016/j.ecosys.2022.100999.

De Mendonça, H. F., & De Moraes, C. O. (2018). Central bank disclosure as a macroprudential tool for financial stability. *Economic Systems*, *42*(4), 625–636. doi: 10.1016/j.ecosys.2018.07.001.

De Moraes, C. O., & de Mendonça, H. F. (2019). Bank's risk measures and monetary policy: Evidence from a large emerging economy. *The North American Journal of Economics and Finance*, *49*, 121–132. doi: 10.1016/j.najef.2019.04.002.

De Moraes, C. O., Grapiuna, L., & Antunes, J. A. P. (2022). Social-environmental transparency and bank risk. *Borsa Istanbul Review*, *23*(3), 736–747. doi:10.1016/j.bir.2023.01.013.

De Nicolo, M. G., Boyd, J. H., & Jalal, A. M. (2006). Bank risk-taking and competition revisited: New theory and new evidence. *IMF Working Papers*, *06*(297), 1. doi: 10.5089/9781451865578.001.

Demirgüç-Kunt, A., & Detragiache, E. (1998). The determinants of banking crises in developing and developed countries. *Staff Papers*, (International Monetary Fund), *45*(1), 81–109. doi: 10.2307/3867330.

Fazio, D. M., Tabak, B. M., & Cajueiro, D. M. (2015). Inflation targeting: Is IT to blame for banking system instability?. *Journal of Banking & Finance*, *59*, 76–97. doi: 10.1016/j.jbankfin.2015.05.016.

Fu, X. (M.), Lin, Y. (R.), & Molyneux, P. (2014). Bank competition and financial stability in Asia Pacific. *Journal of Banking & Finance*, *38*, 64–77. doi: 10.1016/j.jbankfin.2013.09.012.

Gehrig, T., Iannino, M. C., & Unger, S. (2024). Social responsibility and bank resiliency. *Journal of Financial Stability*, *70*, 101191. doi: 10.1016/j.jfs.2023.101191.

Guidara, A., Lai, V. S., Soumaré, I., & Tchana, F. T. (2013). Banks' capital buffer, risk and performance in the Canadian banking system: Impact of business cycles and regulatory changes. *Journal of Banking & Finance*, *37*(9), 3373–3387. doi: 10.1016/j.jbankfin.2013.05.012.

Hamilton, J. D. (2018). Why you should never use the Hodrick-Prescott filter. *The Review of Economics and Statistics*, *100*(5), 831–843. doi: 10.1162/rest_a_00706.

Horváth, R., & Vaško, D. (2016). Central bank transparency and financial stability. *Journal of Financial Stability, Elsevier*, *22*, 45–56. doi: 10.1016/j.jfs.2015.12.003.

Jacobs, B. W., Singhal, V. R., & Subramanian, R. (2010). An empirical investigation of environmental performance and the market value of the firm. *Journal of Operations Management*, *28*(5), 430–441. doi: 10.1016/j.jom.2010.01.001.

Javadi, S., & Masum, A.-A. (2021). The impact of climate change on the cost of bank loans. *Journal of Corporate Finance*, *69*, 102019. doi: 10.1016/j.jcorpfin.2021.102019.

Johnston, J. (1984). *Econometric methods* (3rd ed.). McGraw-Hill Book.

Jokipii, T., & Milne, A. (2008). The cyclical behaviour of European bank capital buffers. *Journal of Banking & Finance*, *32*(8), 1440–1451. doi: 10.1016/j.jbankfin.2007.12.001.

Kasman, S., & Kasman, A. (2015). Bank competition, concentration and financial stability in the Turkish banking industry. *Economic Systems*, *39*(3), 502–517. doi: 10.1016/j.ecosys.2014.12.003.

Khan, H. Z., Bose, S., Mollik, A. T., & Harun, H. (2020). "Green washing" or "authentic effort"? An empirical investigation of the quality of sustainability reporting by banks. *Accounting, Auditing & Accountability Journal*, *34*(2), 338–369. doi: 10.1108/aaaj-01-2018-3330.

Kim, H., Batten, J. A., & Ryu, D. (2020). Financial crisis, bank diversification, and financial stability: OECD countries. *International Review of Economics & Finance*, *65*, 94–104. doi: 10.1016/j.iref.2019.08.009.

Laguir, I., Marais, M., Elbaz, J., & Stekelorum, R. (2017). Reversing the business rationale for environmental commitment in banking: Does financial performance lead to higher environmental performance?. *Management Decision*, *56*(2), 358–375. doi: 10.1108/md-12-2016-0890.

Lee, C.-C., Wang, C.-W., Thinh, B. T., & Xu, Z.-T. (2022). Climate risk and bank liquidity creation: International evidence. *International Review of Financial Analysis*, *82*, 102198. doi: 10.1016/j.irfa.2022.102198.

Lepetit, L., & Strobel, F. (2013). Bank insolvency risk and time-varying Z-score measures. *Journal of International Financial Markets, Institutions and Money*, *25*, 73–87. doi: 10.1016/j.intfin.2013.01.004.

Lupu, I., Hurduzeu, G., & Lupu, R. (2022). How is the ESG reflected in European financial stability?. *Sustainability*, *14*(16), 1–14. doi: 10.3390/su141610287.

Miralles-Quirós, M. M., Miralles-Quirós, J. L., & Redondo Hernández, J. (2019). ESG performance and shareholder value creation in the banking industry: International differences. *Sustainability*, *11*(5), 1404. doi: 10.3390/su11051404.

Montes, G. C., Valladares, M., & de Moraes, C. O. (2021). Impacts of the sovereign risk perception on financial stability: Evidence from Brazil. *The Quarterly Review of Economics and Finance*, *81*, 358–369. doi: 10.1016/j.qref.2021.06.010.

Murè, P., Spallone, M., Mango, F., Marzioni, S., & Bittucci, L. (2021). ESG and reputation: The case of sanctioned Italian banks. *Corporate Social Responsibility and Environmental Management*, *28*(1), 265–277. doi: 10.1002/csr.2047.

Nassim, N. T. (2007). *The Black swan: The impact of the highly improbable*. New York: Random House.

NGFS - Network for Greening the Financial System (2022). Statement on nature-related financial risks.

NGFS – Network for Greening the Financial System (2020). Guide for Supervisors Integrating climate-related and environmental risks into prudential supervision.

Nobanee, H., & Ellili, N. (2016). Corporate sustainability disclosure in annual reports: Evidence from UAE banks: Islamic versus conventional. *Renewable and Sustainable Energy Reviews*, *55*, 1336–1341. doi: 10.1016/j.rser.2015.07.084.

Roodman, D. M. (2009). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, *71*(1), 135–158. doi: 10.1111/j.1468-0084.2008.00542.x.

Roy, A. D. (1952). Safety Örst and the holding of assets. *Econometrica*, *20*(3), 431–449. doi: 10.2307/1907413.

Runde, J. (2009). Dissecting the Black swan. *Critical Review*, *21*(4), 491–505. doi: 10.1080/08913810903441427.

Stolz, S., & Wedow, M. (2011). Banks' regulatory capital buffer and the business cycle: Evidence for Germany. *Journal of Financial Stability*, *7*(2), 98–110. doi: 10.1016/j.jfs.2009.09.001.

Tabak, B., Gomes, G. M. R., & da Silva Medeiros, M. (2015). The impact of market power at bank level in risk-taking: The Brazilian case. *International Review of Financial Analysis*, *40*, 154–165. doi: 10.1016/j.irfa.2015.05.014.

UNEPFI – United Nations Environment Programme Finance Initiative. (2016). *Guide to banking and sustainability* (2nd Ed). UNEPFI – United Nations Environment Programme Finance Initiative.

Weber, O. (2017). Corporate sustainability and financial performance of Chinese banks. *Sustainability Accounting, Management and Policy Journal*, *8*(3), 358–385. doi: 10.1108/sampj-09-2016-0066.

Weber, O., Scholz, R. W., & Michalik, G. (2010). Incorporating sustainability criteria into credit risk management. *Business Strategy and the Environment*, *19*(3), 358–385. doi: 10.1002/bse.636.

Appendix

The supplementary material for this article can be found online.

Corresponding author
Claudio De Moraes can be contacted at: claudio.moraes@bcb.gov.br