The relationship between Financial Stability and transparency in social-environmental policies.

Claudio Oliveira de Moraes
Banco Central do Brasil
email: claudio.moraes@bcb.gov.br

André Guilherme Pinto Bandeira de Mello
Copppead
email: andre.guilherme.pinto@gmail.com

Abstract

Bank for International Settlements (BIS) alerts the possible impact of climate change on banks and states that the bank's disclosure (transparency) is relevant to financial stability. Based on these ideas, this study analyzes, through social-environmental reports, whether banks with higher transparency in social-environmental policies better safeguard financial stability in Brazil. For that, we developed a comprehensive approach through a Data Panel regression with over 40 Brazilian banks from 2011 to 2019. Our results suggest that Banks with higher transparency tend to be less risky regarding financial distress. Furthermore, the results indicate that policymakers encouraging banks to disclose sustainable policies may improve financial stability.

Keywords: Sustainability, financial stability, green finance, transparency, Basel III accord.

Resumo:

O Bank for International Settlements (BIS) alerta sobre o possível impacto das mudanças climáticas nos bancos e afirma que a divulgação do banco (transparência) é relevante para a estabilidade financeira. Com base nessas ideias, este estudo analisa, por meio de relatórios socioambientais, se os bancos com maior transparência nas políticas socioambientais salvaguardam melhor a estabilidade financeira no Brasil. Para isso, desenvolvemos uma abordagem abrangente por meio de uma regressão de Painel de Dados com mais de 40 bancos brasileiros de 2011 a 2019. Nossos resultados sugerem que Bancos com maior transparência tendem a ser menos arriscados em relação a dificuldades financeiras. Além disso, os resultados indicam que os formuladores de políticas que incentivam os bancos a divulgar políticas sustentáveis podem melhorar a estabilidade fina.

Palavras-chaves: Sustentabilidade, estabilidade financeira, finanças verdes, transparência, terceiro acordo de Basileia

Classificação JEL: G38. E58
Área ANPEC: Área 4 - Macroeconomia, Economia Monetária e Finanças

1. Introduction

The subprime crisis in 2008 roused concern regarding tail risks. These risks may be manufactured when unpredictable events come to reality. These events are called Black Swans, created by Nassim Taleb (2007). They should comprehend the following characteristic (Runde, 2009): it is an outlier with extreme impact and, after the occurrence, is predictable and explainable. Inspired by this rationale, the Bank of International Settlement coined the phenomenon of Green Swan (Bolton et al., 2020). They are nature-related events that may lead to more significant challenges since they are more problematic than Black swans. Thus, all actors involved know they should act against it; however, the risks are uncertain. This article aims to provide arguments and place climate risks and Green Swans in the spotlight for financial stability. With a panel data regression, the goal is to understand how transparency in social-environmental policies can mitigate financial distress.

According to NGFS (2022), banks can play a leading role in mitigating environmental changes that 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 to companies or industries intensive in devasting the environment (or carbon-intensive), those enterprises' activities would suffer a revamp to readjust their endeavors into a more social-environmental friendly 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 climates and social risks. On the other hand, 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 whole financial system should learn how to cope with events associated with climate change and how to mitigate it.

The 3rd pillar of the Basel III accord presents that market discipline can lead to a sound financial system. Nevertheless, financial institutions must be transparent with regularity and standardization in their reports (Basel Committee, 2004). Currently, Basel Committee (2022) believes that reporting risks related to climate is paramount to managing environmental issues. Additionally, according to BIS, supervisors expect disclosures from banks on risks and exposers related to environmental and social risks to prevent financial distress. By doing so, transparency in social-environmental policies gains a spotlight on enhancing the financial system. In other words, relevant players, among policymakers and other financial system actors, believes that the system might be more stable by disclosing climate and social risks and their policies.

Social-environmental policies should be a worldwide endeavor. Although, some countries, such as Brazil, have their potential for sustainable policies spotlighted due to their green territory and diverse natural ecosystem. According to the Brazilian Ministry of the Economy (2022), 12,2% of the earth's green area (natural or planted) are inside its territory. Besides its region and green potential, Brazil is a developing country with a well-developed financial system. Moreover, the Central Bank of Brazil demands financial institutions to have a social-environmental responsibility policy. These characteristics make Brazil one of the best labs for studying the relationship between transparency in social-environmental policies and financial stability.

Built on this impression, this study aims to analyze, in the Brazilian case by social-environmental reports, 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 specific to banks in Brazil, thus making this study unique. The results indicate a positive relationship between transparency in banking disclosure policies and financial stability with a panel data regression. In other words, transparency can enhance financial stability in a large emergent country with a green potential.

This article is divided into five sections (I) introduction, (II) Financial stability (III) Climate-related Banks' risks, social-environmental policies, and transparency, (IV) Other Variables (V) Data & Methodology, (VI) empirical results (VII) Robustness check, (VIII) Conclusion, and (IX) Appendix.

2.Financial stability

Since the subprime crisis, financial stability has gained attention in the literature and among policymakers. This attention reflects the number of studies devoted to understanding what enhances financial stability (De Mendonça and De Moraes, 2019; Caldas et al., 2021; De Moraes, Costa, 2022; Amidu and Wolf, 2013, Tabak et al., 2015). However, different approaches to defining Financial Stability emerged. This article uses the Central Bank of Brazil (CBB) definition of financial stability: It is the normalized operation of it, including a sound, efficient, and competitive financial system among different players (households, institutions, and government). In other words, financial stability is when the financial system fully functions without any crisis or difficulty honoring its obligations while fulfilling its social duty. Thus, to capture those differences that Financial Stability's proxies might have, this article has a comprehensive approach by diversifying the measurements of financial stability, all backed by the literature. These 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. There are different standards for Z-score, and we follow two of them in this study: Z-Score1 (01) (Lepetit and Strobel, 2013), which calculates with the regulatory capital (Car), Tabak et al. (2015) use this Z-score to evaluate financial stability in Brazil. While Fu et al. (2014), Cˇihák and Hesse (2010), and De Moraes and Costa (2022) calculate differently by using, instead of regulatory capital, a ratio between equity and total assets, in this work, this ratio is called Leverage (LEV). This manner will be represented by Z-score2(02). In both methods, ROA represents the return on assets, and the standard deviation, in both cases, is calculated accordingly by Boyd et al. (2006).

$$\boldsymbol{Z1}_{i,t} \equiv \frac{\boldsymbol{ROA_{i,t} + CAR_{i,t}}}{\boldsymbol{\sigma ROA_{i,t}}} \quad (01) \qquad \boldsymbol{Z2}_{i,t} \equiv \frac{\boldsymbol{ROA_{i,t} + LEV_{i,t}}}{\boldsymbol{\sigma ROA_{i,t}}} \quad (02)$$

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 and is related to financial stability. Caldas et al. (2020) present capital buffer behavior throughout countries, thus placing a high capital buffer as a source of banks being protected against economic downtrend. Further, De Mendonça and De Moraes (2019) argue that the higher the capital buffer more minor the solvency risks. Hence, banks with higher voluntary Buffer are less susceptible to a crisis once they possess more capital to resist under challenging times. The calculus is the ratio between the capital adequacy ratio kept by banks and the minimum required by regulation.

$$\boldsymbol{Buffer}_{i,t} \equiv \frac{\boldsymbol{CAR_{i,t}}}{\boldsymbol{minimum\ required_{i,t}}} \quad (03)$$

3.Climate-related Banks' risks, social-environmental policies, and transparency

Nowadays, all stakeholders on financial stability consider climate change's impact, for instance, NGFS (2020) suggests two possible types of banks' risks related to climate that can harm a country's 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 an impact of drought risk on the cost of borrowing for U.S firms. This relationship implies that banks are aware of those risks and even and even price those risks, the second stream of risks commented on is the transitional risk. It is the consequences related to transitioning to a greener economy. Following, Lee et al. (2022) suggest that climate risk may affect liquidity creation for banks, especially in developing countries like Brazil, thus enlarging the possibility of financial system distress.

As a result of this scenario, the relationship between the environment and banks entered the spotlight in the literature, and the academia enlarged the efforts to explain this relationship by producing studies with different countries, datasets, and objectives (Paltrineri et al., 2020; Murè et al., 2020; Miralles-Quirós, 2019; Weber, Scholz, and Michalik, 2010, Batae et al, 2022). Therefore, it is not hard to picture the importance that banks have in changing to a greener economy, as well as sizing and acting on these risks, and how much is at

stake due to climate changes. Consequently, those organizations tackling these problems are now not only relevant but essential.

Therefore, a third side stream of research emerged by compiling the idea of the Basell III accord's third pillar discussing how transparency can mitigate financial distress, as mentioned by Horváth and Vaško (2016), and sustainable banking policies, which is now in the spotlight of banking literature (Khan et al, 2020; Nobanee and Ellili, 2016; Buallay, 2019). Moreover, NFGS (2022) suggested that supervisors should enforce the importance of the bank's disclosure of those risks.

Measuring transparency is not straightforward. 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 and Grapiuna (2022), inspired by Horváth and Vaško (2016) and its transparency index, created the Social-environmental transparency index (SETI). The indicator has the lowest score of 0 and the highest score of 9 and was built around four different angles: The general framework, 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 ones thought by Global Reporting Indicators (GRI), Sustainability Accounting Standards Board (SASB), and Task Force on Climate-Related Financial Disclosures (TCFD). We use the SETI (De Moraes and Graupiuna, 2022) as our proxy for transparency in climate policies.

4.Other variables and financial stability.

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. (2015) suggests that the logarithm of the total assets (SIZE) proxying banks' size plays a relevant role in financial stability, where bigger banks tend to have fewer value on financial stability. Another variable often used when explaining financial stability, Return on Equity, gives insight about how financial stability reacts to a bank's profitability, is commonly used in the banking and in studies linking banks with sustainability Weber (2016), Szegedet at al. (2016), liked 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 its financial stability.

Trying to comprehend how the macroeconomic condition affects the financial stability Demirgüç-Kunt and Detragiache (1998) suggests that the economic momentum may interfere in the soundness of the banking system. Moreover, Jokipii and Milne (2008) suggests a 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 go accordingly to what was proposed by Hamilton (2008). Other macroeconomic variables are part of the equation. The monetary policy and its effects on the macroprudential environment are often subject of studies De Mendonca and De Moraes (2019) found evidence regarding how Brazilian's basic interest rate can interfere in risk measures. Equally to De Mendonca and de Moraes (2019) this study presents the Brazilian selic 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) suggests credit growth can reduce the bank's financial soundness, for this reason credit variation (credit) was added in the model.

5. Data & Methodology

To understand the relationship between transparency in social-environmental policies, and Financial Stability an Unbalanced Panel with 42 Brazilians banks from 2011 to 2019 with annual data, thus gathering more than 370 observations. The banks selected, together, sums for more than 90%b of the whole financial system of Brazil. We used a dynamic model as following:

$$\boldsymbol{FS_{i,t} = \beta_1 FS_{i,t-1} + \beta_2\, Transparency\ Index_{i,t} + \beta_2\, X_{i,t} + \beta_3\, Z_{i,t} + \varepsilon_{i,t}} \qquad (04)$$

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, although lagged one period

to comprehend the persistent effect in banks behavior. Transparency index is the transparency in social-environmental policies crafted by De Moraes and Grapiuna (2022) and X is a vector of banks' specifcs control variables previously explained in this study, Z is a vector of macroeconomics variables and ε is the stochastic error term.

This study uses two different approaches to a dynamic panel data analysis. According to Baltagi (2005), the usage of the dependent variable legged in all models could lead to a correlation problem with the error term. Arellano and Bond (1991) propose a solution for that, and it is the estimation of first difference GMM panel data (D-GMM), the method used in our estimations. Moreover, this method does not eliminate all possibilities of issues, as shown in Blundell and Bond (1998) who suggests that its usage of it implies bias for a large or small sample, low accuracy, and weak instruments. To deal with those issues a second methodology is used to corroborate with outcomes. As proposed by Arellano and Bover (1995) and Blundell and Bond (1998), to deal with those problems the system GMM panel data (S-GMM) should be applied as used by Caldas et al. (2021), Kasman dn Kasman (2015), Fu et al (2015), de Moraes and Costa (2022). According to Bond et al. (2001), the S-GMM enables a more robust outcome by aggregating regression equations on differences and levels into a system while it uses, as instruments, lagged differences, and lagged levels of the variables in the model.

6.Results

6.1 Z-score1 - Car

With the objective to understand the relationship between financial stability proxied by Z-score1 and transparency in social environmental policy we present our results from our model in Table 1. The positive and statistically significance of SETI represents that a bank with higher transparency in the index has less risk of suffering with bad functioning. This relationship may be explained since banks that understand, act, and especially are transparent against climate-related risks not only has more concern regarding them but accomplish to have a more stable endeavor in mitigate them and other possible risks to their soundness. This effort is constantly observed by all society that enforce this behavior due to social coordination.

In general, the positive and statistical significance of the lagged Z-score1 reveals a persistent effect on financial stability as founded in De Moraes and Costa (2022). In other words, financial stability has an inertia effect, thus banks without solvency issues tends to stay in this way. Moreover, the consistency in all outcomes suggest a strong relationship inside it.

All controls variables in some extent shared good insights over the literature on banks behavior relationship with financial stability. The negative and significant value of the bank's size show us that bigger banks tend to have a higher risks with financial stability 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. This finding is aligned with Fu et al. (2014), and its explanation can be founded in Kim et al. (2021) where moderated diversified banks tend to be more stable. The return on equity (ROE) with a positive and statistically significant sign may cause strangeness. Thus, a different explanation than the classical tradeoff between risk and return. Since the variable is at the same period than the Z-score, ROE has a more accountable meaning than a practical one. In other words, the return was not divided between equity holders, providing the bank a source of resource.

In relation to other banks' characteristics proposed as controls variables displays meaningful insights. Liquidity with positive and statistical significance suggests a straightforward understanding where banks with higher liquidity tends to reduce its solvency risk, since banks with more liquidity are, generally, more able to honor its obligations in the short term. The same result can be founded in De Moraes and de Mendonça (2019). Regarding macroeconomic variable in the model, Brazilian's basic interest rate displays some significance with a negative sign. Through economic lens we can understand this phenomenon as higher interest rate meaning higher risk to banks by enlarging the possibility of a default on debts. Generalizing, the higher the interest rate the higher the higher is the chance of a bank being insolvent. This is the same results founded on De Moraes and de Mendonça (2019). The positive and significant results of output gap exhibit that economic

growth interfere positively. Thus, reinforcing the thesis where banks will likely act in a procyclical fashion. Credit variation does not show significance. So, it is not possible to craft any source of analysis.

Table 01

Estimation of the relationship between social-environmental transparency and Financial Stability

Dependent Variable: Zscore1										
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	-41.812***	-37.345***	-37.063***	-30.494***	-21.726***	-32.518***	-33.158***	-29.677**	-29.279***	-30.565***
	(0.968)	(1.827)	(1.661)	(2.798)	(4.860)	(2.803)	(3.264)	(-2.469)	(2.978)	(3.251)
Return on Equity	39.578***	29.910***	29.515	24.326 ***	10.101***	35.963***	30.573**	16.793**	15.541*	12.293
	(12.079)	(6.033)	(7.809)	(9.428)	(3.117)	(8.610)	(11.813)	(7.180)	(9.051)	(10.0998)
Liquidity		25.980***	33.219	46.049***	30.066		12.444	33.617**	25.361***	33.240***
		(5.170)	(6.250)	(9.752)	(12.507)		(10.826)	(914.84)	(9.472)	(16.554)
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					-13.554					11.19
					(7.929)					(10.5773)
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	-0.360	-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	0.083	0.082	0.100	0.107	0.103
Prob	0.661	0.650	0.658	0.643	0.511	0.242	0.238	0.129	0.106	0.116

Notes: Marginal significance levels is (***) denotes 0,01, (**) denotes 0,05 and (*) denotes) 0,1 and standard errors are in parenthesis whiles. In consonance with Arellano and Bond (1995) two steps S-GMM was applied as well as the consistent covariance matrix of White's heteroskedastic. And, as suggested by Arellano and Bond (1991) D-GMM was applied.

6.2 Z-score2 – Lev

To analyze how transparency in social-environmental policies affect the financial system table 2 presents the output of estimations regarding z-score2 as a proxy for financial stability. Consistently with the results for Z-score1 Seti remained positive and with statistical significance. This reinforces the thesis of market discipline towards banks.

Further, the positive and statistical significance of the lagged Z-score2 displays a persistent effect on financial stability. Hence, banks with a higher soundness will likely remain in this way, but banks already suffering from insolvency has a higher chance of remind with the problem. The same results were funded by Tarik et al (2015).

By scrutinizing the results, it is possible to reinforce some of the findings. Bank's size shows the same negative sign with statistical significance, reinforcing the thesis that bigger banks be inclined to have a higher risk of insolvency than smaller one as shown in Z-score1, although this might have as explanation the fact that those banks have artifices as diversification to reduce the possibility of a turmoil. ROE despite losing part of its significance when comparing table 1 with table 2 disposes, in some models, positive and significant signal, despite the classical tradeoff between risk and return, banks with higher returns on equity has higher soundness. Since both are showing the same period, the returns might not be divided with equity holders, thus creating a financial resourceful bank.

Liquidity lost in most of those cases its significance. But when presenting a positive sign displays statistical significance. Thus, banks with higher liquidity tends to be more stable. That is, when Banks are conservative with liquidity, they are less risky than more aggressive banks towards liquidity. Those results

corroborate with what was founded in Fu et al. (2015), and Kasman and Kasman (2015). Moving into the next control variable, and the first one not bank's specific, the Brazilian's basic interest rate when has significance, presents negative signal one of the most likeable explanations for this relationship is that 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 of the financial system. Still in the macroeconomic landscape the positive and significant sign in output gap displays, once more, the procyclical behavior in banks' behavior. In other words, Banks expands 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 does not display statistical significance

Table 02

Estimation on the relationship between social-environmental transparency and Financial Stability

Dependent Variable: Zscore2										
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	-53.078***	-43.747***	-50.673***	-46.70***	-56.89***	-33.429***	-29.111***	-34.67***	-37.11***	-36.823***
	(14.7494)	(9.269739)	(13.598)	(13.587)	(13.7152)	(8.127)	(2.230)	(2.320)	(3.932)	(6.651)
ROE	-3.584684	-2.011659	6.404844	7.061676	-4.651361	4.325***	8.807*	6.384	3.674	19.718***
	(5.221)	(4.011)	(4.611)	(6.282)	(8.598)	(2.928)	(4.844)	(4.805)	(6.473)	(25.692)
Liquidity		52.489***	46.911	-7.1946	-33.945		19.942**	39.380***	19.566	37.791
		(15.274)	(50.698)	(61.200)	(50.490)		(8.708)	(12.909)	(13.137)	(25.692)
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					-6.170
					(25.096)					(13.713)
N. Obs	244	243	245	244	244	264	245	245	246	245
Inst./Cross	0.463	0.659	0.488	0.524	0.561	0.789	0.926	0.927	0.878	0.829
J-statistic	13.267	25.385	15.964	18.803	17.326	20.268	33.253	32.904	28.994	20.259
Prob.(Jstatistic)	0.582	0.279	0.316	0.223	0.300	0.779	0.454	0.423	0.465	0.779
AR(1)	-11.144	-2.077	-3.155	-2.638	-2.459	-0.479	-0.285	-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	0.759	0.208	-0.040	0.100	-1.514	0.075	0.082	0.074
Prob	0.967	0.077	0.307	0.835	0.968	0.121	0.189	0.219	0.168	0.226

Notes: Marginal significance level: (***) denotes 0,01, (**) denotes 0,05 and (*) denotes) 0,1 and standard errors are in parenthesis whiles. In consonance with Arellano and Bond (1995) two steps S-GMM was applied as well as the consistent covariance matrix of White's heteroskedastic. And, as suggested by Arellano and Bond (1991) D-GMM was applied.

6.3 Capital Buffer

As shown in table 3 regarding Capital Buffer, the third proxy for financial stability, presents the relationship with SETI. Since all equations shares the positive signal and statistical significance. This suggests that more transparent banks, especially due to market discipline, presents more stability. In other words, Banks that proposes and disclose their policies regarding social-environmental issues, suffer from a greater pressure from different parts of society to fulfill its promises, crafting a more stable financial system.

Moreover, the positive signal and statistical significance of the lagged Capital Buffer reinforces the thesis that financial stability ever last. It means that one can reinsure that a more conservative bank tends to remain in the same position, and banks with more chances to suffer with instability tends to remain in the same

path. Moreover, the consistency in all outcomes suggest a strong relationship inside it as well as reinforce 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 proxied by capital buffer. The banks' size, alongside with the return on equity, is the first control variable used, and the negative signal together with statistical significance ensures the thesis that bigger banks tend to mitigate the solvency risk with other measures than retaining more capital. Moreover, Return on Equity's variable with positive and statistical significance poses as the opposite of the classical risk and return dilemma, although the same accountable explanation founded in both previous models explains this, a priori, contradiction.

Furthermore, the others control variables, among macroeconomic and singular to banks, presented expected signals and statistical significance, reinforcing the findings in the transparency index. Liquidity presented positive signal and statistical. This has a simple justification indicating that banks with higher liquidity tends to suffer less risks. The first macroeconomic variable added to the model, Brazilian's basic Interest Rate, share the same negative signal with significance crafting more arguments concerning the view that high interest rate is likeable to be seen as a higher risk in the Brazilian landscape. A positive and statistically significant in the output gap might be explained by the non-lagged variable where the banks could not enlarge or reduce the credit portfolio in the same velocity that the economic growth or downtrend happens. Thus, enlarging its Capital Buffer. Worth noticing, during the time used in this database Brazil experienced crisis, fast growth, and slow growth, thus this lag might be banks waiting the economic trend to be consolidated. The credit variation presents negative signal with statistical significance, enforcing the findings made De Moraes and Costa (2020).

Table 03

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***	0.326***	0.463***	0.473***	0.604***	0.444***
	(0.0146)	(0.020)	(0.0291)	(0.027)	(0.025)	(0.014)	(0.025)	(0.022)	(0.047)	(0.024)
SETI	0.094***	0.063***	0.241***	0.143***	0.240***	0.094***	0.220***	0.230***	0.163***	0.243***
	(0.017)	(0.021)	(0.031)	(0.027)	(0.028)	(0.017)	(0.023)	(0.032)	(90.043)	(0.039)
Size	-0.826***	-0.820***	-0.185	-0.818***	-1.178***	-0.826***	-1.097***	-0.804***	-0.629***	-0.738***
	(0.045)	(0.094)	(0.146)	(0.108)	(0.108)	(0.045)	(0.100)	(0.12095)	(0.150)	(0.146)
ROE	-0.003	0.313*	-0.185	0.085	-0.061	-0.003	0.303**	0.654***	0.077	0.181***
	(0.048)	(0.169)	(0.146)	(0.168)	(0.091)	(0.048)	(0.154)	(0.158)	(0.056)	(0.050)
Liquidity		1.770***	1.385***	1.539***	1.757***		1.523***	1.899***	2.372***	1.890***
		(0.169)	(0.095)	(0.145)	(0.079)		(0.084)	(0.121)	(90.365)	(0.211)
IR			-0.0248**	-0.042***	-0.029***			-0.014*	-0.065***	-0.078***
			(0.010273)	-0.009834	(0.009)			(0.008047)	(0.01478)	(0.013)
Output gap				0.037***	0.023***				0.005	0.007
				(0.007)	(0.004)				(0.009)	(0.0105)
Credit Variation					0.0424					-0.697***
					(0.102)					(0.209)
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	-0.239	-0.383	-0.267	-0.241
Prob	0.026	0.000	0.016	0.000	0.014	0.001	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

Notes: Marginal significance level: (***) denotes 0,01, (**) denotes 0,05 and (*) denotes) 0,1 and standard errors are in parenthesis whiles. In consonance with Arellano and Bond (1995) two steps S-GMM was applied as well as the consistent covariance matrix of White's heteroskedastic. And, as suggested by Arellano and Bond (1991) D-GMM was applied.

7. Robustness analysis

By providing a robustness analysis it is possible to provide insights with more robustness. This means that if we can replicate the same outcome with different risk measures. In this case, Provisions (PROV) is the proxy for financial stability. As suggested by De Mendonca and De Moraes (2019) provisions is a measure of coverage for credit loss also used for measuring financial stability since banks with higher provisions are, normally has a more conservative behavior. All other aspects of the study remained the same,

Table 4 shows all outputs from the models and equations. The positive relationship between provisions and transparency index reinforces the hypothesis crafted on this article and tested within models. This relationship may seem as contradictory but enlarging banks' provisions is seen as an insurance for the bank. In other words, by growing the provisions number banks are preparing for a worst scenario of credit default. High number of provisions means that banks are being conservative in scenario planning. Moreover, the positive signal and statistical relevance of this model shows that banks with higher transparency in sustainability policies tends to have more conservative approach regarding losses, thus preparing for a higher number of nonpaid loan and enhancing financial stability. Worth noticing that all control variables remained with same signal, reenforcing all findings in this work.

Table 04

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***	0.413***	0.390***	0.186***	0.391***
	(0.035)	(0.038)	(0.034)	(0.015)	(0.034)	(0.048)	(0.048)	(0.070)	(0.032)	(0.0142)
SETI	0.002***	0.002***	0.002***	0.001***	0.0062***	0.005***	0.005***	0.005***	0.002***	0.004***
	(0.001)	(0.001)	(0.001)	(0.0003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size	-0.001	-0.001	-0.002	-0.013***	-0.014***	-0.012***	-0.012***	-0.012***	0.002	-0.0142***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)	(0.004)	(0.001)	(0.001)
ROE	-0.010***	-0.021***	-0.009***	-0.014***	-0.021***	-0.025***	-0.025***	-0.024***	-0.020	-0.022***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)
Liquidity		0.008*	0.009*	0.023***	-0.051***	0.413***		0.005467	0.011	0.001
		(0.004)	(0.004)	(0.005)	(0.011)	(0.048)		(0.0109)	(0.005)	(0.002)
IR			0.001	0.001***	0.001***	0.005***			0.001	0.001***
			(0.005)	(0.0003)	(0.001)	(0.001)			(0.001)	(0.0001)
Output gap				-0.003***	-0.001***	-0.012***				-0.002***
				(0.0002)	(0.0002)	(0.003)				(0.001)
Credit Variation					-0.041***					-0.029***
					(0.006)					(0.006)
N. Obs	287	287	287	246	246	246	246	246	246	246
Inst./Cross	0.732	0.732	0.780	0.878	0.927	0.659	0.659	0.659	0.756	0.756
J-statistic	29.233	28.207	28.220	28.235	30.339	24.679	24.679	25.331	28.202	25.678
Prob.(Jstatistic)	0.301	0.298	0.348	0.505	0.448	0.367	0.367	0.282	0.299	0.370
AR(1)	-3.052	-2.689	-2.376	-3.135	-3.451	-0.437	-0.437	-0.431	-0.645	-0.431
Prob	0.002	0.007	0.018	0.002	0.001	0.000	0.000	0.000	0.000	0.000
AR(2)	-0.329	-0.164	-0.506	-0.802	-0.823	-0.035	-0.035	-0.040	-0.022	-0.063
Prob	0.742	0.870	0.613	0.423	0.410	0.702	0.702	0.666	0.758	0.494

Notes Marginal significance levels: (***) denotes 0,01, (**) denotes 0,05 and (*) denotes) 0,1 and standard errors are in parenthesis whiles. In consonance with Arellano and Bond (1995) two steps S-GMM was applied as well as the consistent covariance matrix of White's heteroskedastic. And, as suggested by Arellano and Bond (1991) D-GMM was applied.

8. Conclusion

To investigate the impact of transparency in social-environmental policies in Brazilian financial stability we used a dynamic panel with different proxies for financial stability while using an index that measures transparency in those policies. The results found shows a positive relationship with statistical significance. In other words, the higher is the transparency in these types of policies less is the chance of a possible stress on financial stability of Brazilians banks. This study shed light on an important issue on how to prevent distresses in the financial system, especially does related to climate change. Moreover, all findings give to authorities and regulators good insights on how to enhance regulation. Another interesting insight is that the 3rd pillar of Basel III is correctly being expanded to climate issues, this study craft evidences that disclosing risks related to climate change and policies to mitigate them enhances financial stability.

9. Appendix

Table A - Banks

List of Banks

ABC-Brasil	Banco da Amazônia	Sumitomo Mitsui	Caixa Econômica Federal	Itau	Safra
Banco Alfa	Daycoval	BMG	CCB	John Deere	Santander
Bancoob	Banpará	BNP Paribas	Citibank	JP Morgan Chase	Sicred
Banestes	Banco do Nordeste	Bofa Merril Lynch	Credit Agricole	Mercantil	Societe Generale
Banrisul	Banco Fibra	Bradesco	Credit Suisse	Morgan Stanley	Votorantim
Banco do Brasil	*Mufg Brasil.*	*BRB*	*Deutsche*	Original	*XP*
Clássico	*Rabobank*	*BTG Pactual*	*ING*	*PAN*	

Table B – Descriptive Statistics

Variable	Description	Mean	Std Dev	Minimum	Maximum
SETI	Social-Environmental Transparency Index	1.71	2.23	0.00	7.5
Zscore1	Proxy for Financial Stability	29.320	30.723	-1.251	277.509
Zscore2	Proxy for financial stability	43.883	47.718	-1.124	397.005
Provisions	Bank's Provisions	0.041	0.032	0.000	0.146
Buffer	Spontaneous capital buffer	1.794	0.849	0.925	6.773
Liquidity	Liquid assets/total asset ratio	0.307	0.196	0.006	0.985
Size	Log of bank's total assets.	23.941	1.574	21.177	27.891
Roe	Net income (on the last quarter)/shareholder's equity ratio	0.133	0.212	-0.935	1.040
Roa	Net income (on the last quarter)/total asset ratio	0.015	0.027	-0.208	0.104
IR	Selic Rate	5.175	0.831	4.590	7.000
Output	Brazilian Business Cycle	0.687	1.980	-1.996	4.167
Credit variation	Bank's credit variation	0.050	7.305	-0.706	7.305

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