Available online at
http://myjms.mohe.gov.my/index.php/JEEIR

e-ISSN: 2289-2559

Journal of Emerging Economies & Islamic Research 11(3) 2023, 109 – 122.

Journal of Emerging Economies and Islamic Research

The impact of climate change and green financing on bank stability in Malaysia

Mohd Razuan Abd Hishamuddin[a*], Imbarine Bujang[b], Flicia Rimin[c], Jamaliah Said[d], Dwi Astuti Rosmianingrum Nainggolan[e]
(Please do not type or edit anything here, our editors will do the work for you)

[a,b,c]*Faculty of Business and Management, Universiti Technology MARA Sabah Branch, Kota Kinabalu*
[d,e]*Accounting Research Institute, UiTM Shah Alam*

ARTICLE INFO

Article history:
Received 2 July 2023
Accepted 25 August 2023
Published 30 September 2023

Keywords:
Climate change
Green financing
Bank stability
Z-score

DOI:
10.24191/jeeir.v11i3.25208

ABSTRACT

Banking stability is paramount for economic growth. A sound financial intermediation process leads to the creation of loans from depositors to borrowers, guaranteeing the nation's development. However, banking businesses through credit facilities could severely cause environmental degradation and economic development. The non-green financing facilities have influenced climate change to rise and be uncontrollable, leading to inconclusive and unclear findings among scholars. The aim of this paper is to examine the impact of climate change and green financing on bank stability in Malaysia. The sample consists of eight commercial banks in Malaysia, using data stretching from 2012 until 2021 and tested using Panel Autoregressive Distributed Lag (ARDL). The general findings suggest that a commercial bank remains stable in the long run with an injection of green financing. The implications of this paper recommend that green finance can be classified as a source of alternative financing tools to mitigate the destabilising impacts of climate change on the bank's operating business and contribute to the stability of the bank.

1. Introduction

A sound financial system is crucial for economic sustainability. It facilitates the effectiveness of the cash flow distribution between depositors and borrowers. The financial system performance of the banking sector can be measured via bank stability. Bank stability is a condition where the financial intermediation process functions smoothly with high confidence in the circle of the economy. Conversely, bank instability could also harm the economy's performance and be costly due to its contagion or spillover effects on the

* Corresponding author. *E-mail address*: imbar074@uitm.edu.my

volatility of profit, collapse in market liquidity, default payments, and high macroeconomic costs. It may also result in a financial crisis with adverse economic consequences. Therefore, having a solid, stable, and healthy financial system is critical for the effective allocation of resources and risk distribution across the economy. Hence, the primary purpose of a central bank is to promote and maintain monetary and bank stability, as it provides sustainable economic growth. However, the activities involving bank funding have led to economic issues such as the increasing temperature and rises in the value of carbon dioxide emissions, which automatically lead to exposure to climate change. A study by Stern and Taylor (2007) found that climate change exacerbates the risk of financial transactions and threatens bank stability. Noth and Schuwer (2017) discovered the effect of climate-related natural disasters on bank risk and found that natural disasters significantly increase banks' operational risk in affected areas. According to Bank Negara Malaysia (BNM), 10.3% of banks' total assets and 24.4% of insurance companies and takaful operators' total assets are affected by climate change. It represents 11.7% of total exposure for financial institutions. In quantitative terms, RM8 billion in damages have been sustained due to over 50 natural disasters with increased frequency and severity over the last 20 years. The gravity of climate change's risks to our economy is apparent. Previous studies have still debated the ability of climate disaster losses or climate change to influence financial stability. Mostly, they argue that the impact of climate-related natural disasters on industrialised countries' economic development and financial stability is relatively inconclusive.

In due course, there is a need for the banking sector to implement green financing in order to solve the climate change issue. Green funding, or green financing, is considered one of the financial development tools that the banking sector should implement to provide more environmentally friendly projects. Based on the Joint Committee on Climate Change's (JC3) report on Malaysia's sustainable finance landscape, 91% of the banking sector has at least one or more green products or services offered. Figure 1 shows Malaysia's banking sector's general trend towards green products. It explains that the concentration of green financing in the banking sector is low compared to the insurance industry; 80% of products and services are green (JCE3, page 18).

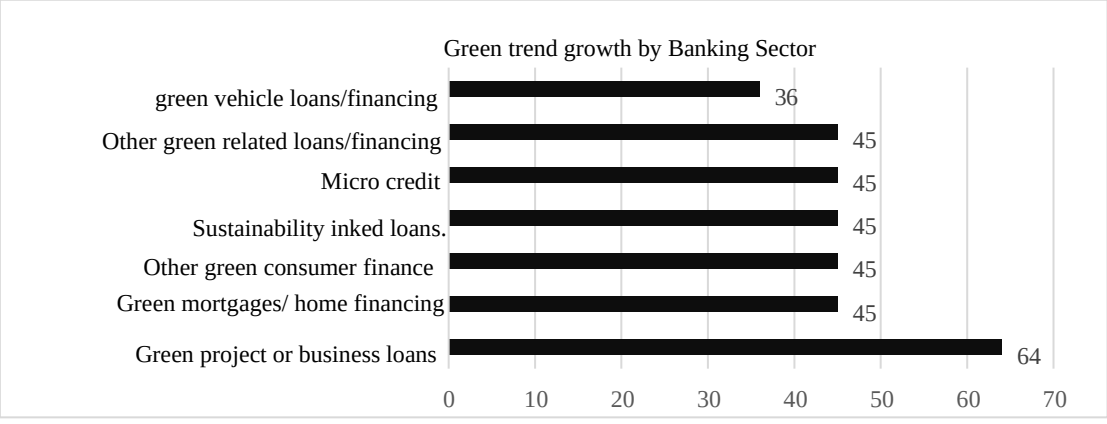

Figure 1. Tapping into the local finance market, Sources: An Assessment of Sustainability Practices and Product Offering in the Financial Sector, Joint Committee on Climate Change (JC3) Report on the Sustainable Finance Landscape in Malaysia, page 18, April 2022

According to Wang and Zhi (2016), green financing has the potential to reduce the impact of climate change on sustainable development while also benefiting the banking sector. In addition, Li, Ding, and Zhu (2014) believe that green credit is a part of green financing that can contribute to fostering sustainable growth. Therefore, most organisations, particularly those in the banking sector, have begun to push green financing in their projects to increase the use of environmentally friendly projects. Green finance is a

https://doi.org/10.24191/jeeir.v11i3.25208

proponent that combines money and business with environmentally friendly behavior. It is a regional, individual, and business consumer, producer, investor, and financial lender for participants.

Moreover, Hoshen et al. (2017) highlighted three primary reasons for implementing green financing in countries. First, green financing can contribute to transistors for efficient and low-carbon industries, such as green industry and green economics. Second, environmental protection and economic development are the primary goals of sustainable development, and it is a global focus to develop an environmentally friendly environment. Lastly, market-based methods and financial products in a green finance market can control pollution and emissions, realise the interconnected system, and avoid unexpected changes.

In a nutshell, the relationship between climate change and bank stability does not shed light on a clear direction, which adds to the role of green financing in promoting bank stability. The previous study by Kamran, Hasseb, and Ngyugen (2020) highlights that the moderation effect of green financing significantly enhances bank stability in Malaysia and Thailand. At the same time, Defermos and Nikolaidi (2021) show that green support can reduce the physical risks since they were able to lower carbon emissions by increasing the credit availability for green investment and reducing the credit availability for carbon-intensive investment even though the impact is quantitatively small. However, it is reinforced when the green supporting factors are implemented simultaneously. Apart from that, Defermos (2018) found that green quantitative easing cannot prevent a substantial reduction in atmospheric temperature. The next section of this paper explains the literature review, methodology, analysis of findings, and conclusion.

2. Literature review

The underpinning theory, associated with this paper is the Kuznets theory developed by Simon Kuznets. The fundamental aspect of this theory emphasises a hypothesis on environmental degradation and economic growth. In the early stages of economic growth, pollution emissions increase and environmental quality declines. However, beyond some level of per capita income, the trend moves in a different direction so that a high-income level leads the curve to reach an environmental turning point affected by climate change at the maximum threshold; as a result, economic growth drops. Nasir et al. (2019) revealed that the EKC implies both the short and long run. The notion is that, despite environmental degradation in the short run, economic growth can improve environmental quality in the long run. The environmental impacts, or emissions per capita, are an inverted U-shaped function of per capita income, as shown in Figure 2.

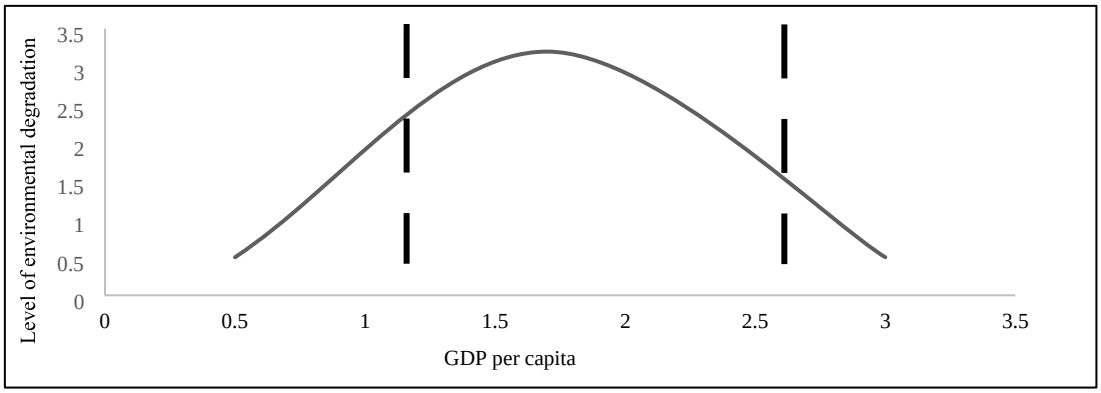

Figure 2. Environmental Kuznets Curve

Furthermore, in 2018, an ecological macroeconomic model shed light on the physical effects of climate change on financial stability to overcome the lack of the IAM model. The model's name is the Dynamic Ecosystem Finance Economy, or DEFINE model. This model paid attention to two key channels. First, the

https://doi.org/10.24191/jeeir.v11i3.25208

temperature increases and the economic catastrophes caused by climate change could reduce firms' profitability and automatically deteriorate the company's financial position. This situation could cause several debt defaults, leading to systemic bank losses. The second key channel of this model is lower firm profitability combined with global warming-related damages, which affected investors' confidence, causing an increase in liquidity preference for the financial instruments issued by the corporate sector. Another contribution of the DEFINE model is that it examines how monetary policy could lower the risks imposed on the financial system due to increased climate change. Therefore, the model approach recommended that the bank sector provide credit for green projects, and a higher demand for green bonds by households boosts innovative green investment. At the same time, higher green investment can reduce the physical risks for the financial system, as will be explained in detail below. The model allows us to investigate the finance-green innovation nexus. In addition, Ji, Tang, and Huang (2022) highlighted that in order to reduce low carbon production in the country, the government should adopt financial subsidies by encouraging banks to provide green financing products with a discounted interest rate to suppliers or borrowers, which can motivate the supplier to increase their emissions reduction rate in their production. Additionally, Li, Lu, and Lin (2022) emphasised that any firm's board and the CEO need to be concerned about lending from the bank that provided the carbon emission reduction borrowing to achieve environmental protection and sustainable growth.

2.1 Climate change and bank stability

Previous empirical studies on the impact of climate change on bank stability provide the basis for this argument. A previous study by Dafermos, Nikolaidi, and Galanis (2018) used a stock-flow-fund ecological macroeconomic model to examine the effects of climate change on financial stability. According to the study, climate change will gradually deteriorate firms' liquidity, resulting in a higher default rate that could harm the financial and non-financial corporate sectors. Furthermore, Fabris (2020) agreed that climate change has a negative impact on the country's financial stability, stating that climate change may cause a drop-in lending activity due to an increase in bad loans, resulting in slower economic development, decreased employment, and a negative impact on welfare. Furthermore, Liu, Sun, and Tang (2021) investigated the impact of climate change on Chinese financial stability using the NARL model and monthly data from 2002 to 2018. They also discovered that climate change would have a long-term negative impact on financial stability. Furthermore, Pankratz, Bauer, and Derwall (2023) studied firm performance, equity analyst forecast errors, and stock returns around earnings announcements as firm-specific measures of heat exposure using samples from more than 17,000 firms in 93 countries from 1995 to 2019 and found that climate change has a negative effect on firm revenues and operating profit, implying that capital market players underestimate the economic ramifications of hedging.

However, not all studies on climate change and bank stability came to the same conclusion. Burke and Emerick (2016) point out that different industries and sectors have different degrees of sensitivity to the influence of climate change. They also pointed out that the agriculture and tourism sectors are the ones most affected compared to the banking sector due to the expected tightening of standards and the introduction of the carbon tax. Furthermore, Furukawa, Ichiue, and Shiraki (2020) conclude that banking performance will be less affected by the rise of climate change. They found that real estate and stock prices do not fully reflect physical climate risk. They conclude that pricing today does not reflect climate-related risks. In addition, Din, Nazar, and Shahzad (2021) studied the impact of climate change on banking firms in Canadian countries with sampling data from 1988 until 2019 and used weather catastrophes to represent climate change. The analyses of the study do not find a significant impact of weather catastrophes on the performance of Canadian banks. Climate change and bank stability have contradictory outcomes, which can be divided into two parts. First, climate change can significantly negatively affect the stability of banks. Second, climate change can only have a short-term effect on bank stability due to several factors, including the fact that the banking sector is less affected by climate change than other sectors. For instance, comparing long-term and short-term analyses has not established a conclusive result regarding the long-term and short-

https://doi.org/10.24191/jeeir.v11i3.25208

term relationship between climate change and bank stability. This paper will estimate the impact of climate change on bank stability in Malaysia using the following hypothesis:

H_0: Climate change has no impact on bank stability.
H_1: Climate change has an impact on bank stability.

2.2 Green financing and bank stability

Instead of explaining the impact of climate change on banking stability, numerous studies have also attempted to investigate the influence of green financing on banking stability. Nikolaidi, and Galanis (2018) have defined Green Finance as a proponent combining money and business with environmentally friendly behaviour. It is a regional, individual, and business consumer, producer, investor, and financial lender for many participants. Muganyi, Linnan, and Sun (2020) studied the impact of green financing-related policies in China and employed the semi-parametric difference-in-differences (SDID), which shows that China's green finance-related policies have led to a significant reduction in industrial gas emissions in the review period, which can lead to increasing the economic growth of the countries and the banking sector's performance. In addition, Ning, Guo, and Chang (2022) found a similar analysis of the impact of green financing on China's banking stability. The empirical findings from the wavelet power spectrum reveal that green finance and banking stability are vulnerable in the short-run and long-run analysis. Moreover, Mei, Shahzad, Liu, Long, and Zhang (2020) analysed 48 effect sizes from 30 previous studies by implementing the meta-analysis and found that the effect of green finance can positively influence the enterprise's green performance. In addition, Yang and Masron (2022) also agreed that green financing must be implemented with a solid information exchange system to achieve the goal of economic growth and development. The existing scholar also pointed out that green financing does not always influence banks' financial risk management, particularly state-owned banks.

However, some studies also found that green financing does not have predictive power for increasing bank stability in countries. In three selected ASEAN countries, Kamran, Haseeb, and Nguyen (2020) investigated green financing and bank stability in Malaysia, Indonesia, and Thailand. The finding shows that not all countries indicate the benefit of green financing to improve bank stability. Only Malaysia and Thailand showed positive signs of green financing towards bank stability. Additionally, Sharmeen and Yeaman (2020) identify that the effect of green financing is significantly higher for Islamic banks. At this exact time, there is no significant possible benefit from the effect of green financing on conventional banks.

Additionally, green financing can impact firm or industry value, but different stages of enterprise life cycles have different degrees and mechanisms that impact green financing. Therefore, there is a strong argument about the influence of green financing on bank institutions. Thus, the measurement of green financing in this study is similar to the earlier study conducted by Kamran, Haseeb, and Nguyen (2020). In this study, the researcher employs a dummy variable to represent the green financing variable. When a bank in that country uses or implements green financing in a given year, the value is 1; otherwise, the value is 0. So, this paper would also like to estimate the impact of green financing on bank stability in Malaysia with the hypothesis as follows:

H_0: Green financing has no impact on bank stability.
H_1: Green financing has an impact on bank stability.

2.3 Control variables related to bank stability

The significance of organisational quality on financial development and bank stability has received much attention from several scholars in this field. Ahamed and Mallick (2019) suggest that institutional quality, represented by expression, political stability, and regulatory quality, enhances the positive relationship

https://doi.org/10.24191/jeeir.v11i3.25208

between financial inclusion and bank stability. Additionally, Canh, Schinckus, Su, and Chan (2021) studied the impact of institutional quality on banking system risk. The study confirms that improving institutional quality is crucial to reducing banking system risk and automatically ensuring the banking sector has better banking stability. Furthermore, most researchers have stated that increasing bank size can improve stability. Adusei (2015), who investigated variations in bank stability, highlighted the importance of bank size for bank stability. The analysis test results reported that bank size and risk impact bank stability.

Moreover, Louati and Boujelbene (2015) estimated bank stability using conventional and Islamic bank data from 12 MENA and Southeast Asian countries. They used a stochastic frontier approach (SFA) to measure bank stability. They found that the size of Islamic banks has improved the financial stability of the banking sector for MENA and Southeast Asian countries compared to conventional banks. Furthermore, Ibrahim and Rizvi (2017) stated that large banks have tremendous potential to achieve economies of scale due to the positive association between bank size and the financial stability of the banking sector. Large banks have tremendous potential to achieve economies of scale because they have the resources to conduct intermediation, pricing, and diversification strategies reasonably. In addition, Chand, Kumar, and Staverman (2021) stated that savings and lending, high capital-to-asset ratios, and low volatility in the financial performance of banks characterize the positive association influenced by the banking operations' essential nature. Based on the finding by Sari et al. (2022) found that bank size does not impact bank efficiency. However, it did not point out that banks should not increase their operation size but should highlight the efficiency matter first, which will automatically become a bonus to increasing their size of operation. The result was similar to Gazi et al. (2022), who found that holding more liquid assets and the wrong bank size can lower commercial banks' profitability, especially during the COVID-19 crisis.

Instead of explaining the impact of climate change on banking stability, numerous studies have also attempted to investigate the impact of credit risk on bank stability. Rajhi and Hassairi's (2013) analysis of the stability of banks in the MENA region during the period starting from 2006 until 2009 found that credit risk and income diversity are the most significant causes of insolvency for the banks in the MENA region. Furthermore, Li and Zou (2014) studied the impact of credit risk measured by the non-performing loan ratio on bank stability using data from 47 European commercial banks from 2007 until 2012. They found that credit risk significantly decreases bank performance, as represented by return on equity (ROE) and return on assets (ROA). Furthermore, Djebali and Zaghdoudi (2020) stated that the negative effect of credit risk could be affected by the difficulties or even the inability of banks to return the granted credits, which are colossal and more profitable activities that can ensure bank stability. Furthermore, poor risk management may jeopardise the financial performance of the banks.

3. Methodology

The sample data utilised in this paper pertains to financial and banking institutions that have incorporated green financing into their products or services. The study aimed to utilise a comprehensive sample analysis of all 27 commercial banks in Malaysia, encompassing both local and foreign banks. Nevertheless, the limited data availability necessitated the utilisation of a study sample comprising solely of the eight commercial banks operating in Malaysia, namely Alliance Bank, Affin Bank, AmBank, CIMB Bank, Hong Leong Bank, Maybank, Public Bank, and RHB Bank. Hence, this study utilised a limited dataset comprising sample data from eight commercial banks in Malaysia, spanning 2012 to 2021. This selection was made since a majority of banking institutions initiated the adoption of green financing practices in 2012. Incorporating the COVID-19 timeframe in this investigation based on the overall funding received during this period does not demonstrate any noteworthy disparity, as indicated by the Bank Negara report for the second quarter of 2022 (BNM, 2022). The data was collected on climate change, green financing, organisational quality, bank size, credit risk, and Z-score return on assets through data stretching techniques. The variables were sourced from the Fitch Connect website.

https://doi.org/10.24191/jeeir.v11i3.25208

Table 1. The variables and proxies used in this study.

Variables	Proxies	Impact
Bank Stability	Z-score Return on Asset	
Climate Change	Carbon Dioxide Emission (C02)	Negative Impact (Fabris, 2020)
Green Financing	Dummy Variable, When a bank in that country uses or implements green financing in a given year, the value is 1; otherwise, the value is 0.	Positive Impact (Ning, Guo, and Chang, 2022)
Organizational Quality	The sum of governance effectiveness, political stability, regulatory quality, the rule of law, and voice and accountability values	Positive Impact (Ahmed and Mallick, 2019)
Bank Size	Total Asset	Positive Impact (Adusei, 2015)
Credit Risk	Total Loan / Total Equity	Negative Impact (Li and Zou, 2014)

As an initial statistical requirement, a descriptive statistical analysis is to understand the data's characteristics before proceeding with the other statistical requirement. Besides, the kurtosis and skewness show whether the data is standard. In the meantime, if the data is not standard, the data will go for logarithms (ln). As per the standard procedure, all variables have been tested for the presence of a unit root using Levin, Lin, and Chu (2002), Breitung (2000), and Im Pesaran and Shin (2003). The general findings suggest that the rule of the unit root test for the panel ARDL analysis is that the variable must only be significant at the level of the first-order difference stage. After that, this paper uses the unrestricted model and an information criterion to decide the lags for each bank variable and then choose the most common lag for each variable to represent the lags of the model. Next, this paper runs the Pooled Mean Group (PMG), Mean Group (MG), and Dynamic Fixed Effect (DFE) estimator to analyse the long-run and short-run relationship between the dependent variable and independent variables. In order to identify which types of estimators to refer to in the study's analysis, the researcher needs to undergo two Hausman tests. The first Hausman test is between the PMG and MG estimators. The null hypothesis of this test is that if the p-value is greater than the significance value, then PMG is more efficient. The second Hausman test is between PMG and DFE. If the p-value for the second Hausman test shows the value is still more extensive than the significance value, the PMG estimator result is more efficient.

4. Findings

The summarised results of the data used in the current empirical investigation are the means, standard deviation, minimum, maximum, skewness, and kurtosis value of the variables used in this paper (Table 2). The Z-score indicated by ROA shows that the average value is 5.61594, with a maximum value of 14.2266. On the other hand, climate change (CO2) shows the average value in Malaysia is 7.40069, and the maximum value is equal to 7.8. The average value of green financing (GF) is approximately 0.7, where the maximum value is 1. The mean bank size (BS) value equals 269503, with a maximum value of 888172.4. Finally, the mean value of credit risk (CR) is 7.2429036, with a maximum ratio of 10.47379. In addition, the skewness of Z-score ROA, CO2, GF, BS, and CR shows that it is not in the range normality (-/+2). Besides, the kurtosis Z-scores ROA, CO2, and GF show that they are not in the normality range, which is more than two but less than 3. Meanwhile, the kurtosis for BS and CR is in the normal range. All variables show abnormality and should be logged (ln) as standard data.

https://doi.org/10.24191/jeeir.v11i3.25208

Table 2. Descriptive statistic

Variables	Means	SD	Min	Max	Skewness	Kurtosis
Z-score ROA	5.61594	4.093651	-1.7086	14.2266	0.6313589	2.453302
CO2	7.40069	0.2986559	6.9932	7.8	-0.1087331	1.429643
OQ	0.20764	0.1262792	0.0295	.4113	0.0391722	1.66276
BS	269503	224427.1	39685.5	888172.4	1.126975	3.491094
CR	7.242903	1.143921	4.720601	10.47379	0.1146431	3.518867

Table 3 indicates the correlation coefficient values of the data used in this paper investigation. The table shows that climate change, green finance, and organisation quality are negatively associated and have significant coefficients towards Z-score ROA. It further indicates that bank size and credit risk are positively associated with bank stability measures stated above the probability values of correlation coefficients in parentheses.

Table 3. Correlation matrix

	Z-score ROA	CO2	GF	OQ	BS	CR
Z-score ROA	1.0000					
CO2	-0.1186	1.0000				
GF	-0.0233	0.4163	1.0000			
OQ	-0.0897	0.6718	0.2535	1.0000		
BS	0.4356	0.1345	0.1451	0.0595	1.0000	
CR	0.2475	-0.4338	-0.2669	-0.1491	-0.1629	1.0000

Table 4 represents the result of each variable's unit root test using three-unit root tests such as the Levin-Lin Chu (LLC), Im Pesaran Shin (IPS), and Breitung test. According to Levin, Lin Chu, Breitung (2002), and Im Pesaran and Shin (2003), the p-value of the variable must be less than 0.005 to ensure the data is significant. Therefore, table 4.2 postulates that GF and OQ data are significant at this level. However, z-score ROA, CO2, BS, and CR are not significant at this level and hence need to proceed with the first-order difference. After that, it shows that all of those variables are already significant enough to be used for the regression analysis of this paper.

Table 4. Unit root test

	At level			First order difference		
	LLC	IPS	Breitung	LLC	IPS	Breitung
Z-score ROA	0.0019	0.7243	0.5192	0.0000	0.0118	0.0000
CO2	0.0000	0.5798	0.3060	0.0000	0.0316	0.0000
GF	0.0000	0.0000	0.0000	-	-	-
OQ	0.0000	0.0733	0.0023	-	-	-
BS	0.0003	0.8066	1.0000	0.0000	0.1420	0.0095
CR	0.0000	0.6928	0.7779	0.0000	0.0121	0.0020

https://doi.org/10.24191/jeeir.v11i3.25208

The panel ARDL estimates for the Malaysian banking sector are shown in Table 5. These estimates were made using the pooled mean group (PMG), mean group (MG), and dynamic fixed effect (DFE) analysis methods. The table reported that the Hausman specification test shows that the p-value is statistically insignificant (0.05), which means it accepted the null hypothesis. It indicates that the PMG technique is an appropriate approach for estimating the objective of this paper. Next, this paper uses three robustness tests: Mean VIF, Wooldridge, and modified Wald. The VIF result determines variable multicollinearity. The variables are not multicollinear if the mean VIF is less than 7.

Meanwhile, Wooldridge is to check the autocorrelation test, where the null hypothesis indicates no serial correlation, and the alternative hypothesis indicates serial correlation in model regression. In the modified Wald test for heteroskedasticity, where the null hypothesis is homoscedasticity or no heteroskedasticity, the alternative hypothesis is heteroskedasticity. The finding shows that the data do not suffer from multicollinearity because the value of mean VIF 2.22 is lower than 7. However, this paper's data suffers from the autocorrelation and heteroskedasticity problems. Therefore, the researcher has conducted the robustness technique due to the existing heteroskedasticity problem, and the result after robustness is shown in the regression result table.

The final model estimations of the PMG technique revealed that the coefficient of climate change for the long run is -2.17, while for the short run, the coefficient is -1.06, showing a negative association with banking stability at the 0.01 significance level, which revealed that it was able to decrease bank stability in Malaysia in both the long-term and short-term periods.

Furthermore, green financing as an independent variable has positively affected bank stability in this region only in the long term, with a coefficient value of 1.4431 and a 0.01 significance level (Table 5). Meanwhile, the control variables of organisational quality and bank size positively affected bank stability for long-term and short-term periods with a 0.01 significance level. Lastly, the constant variable of credit risk has a negative association with bank stability at a 0.01 significance level only in the long-term period. In the short term, credit risk negatively affects bank stability in this region, with a low significance at level of 0.10 significance. Generally, climate change will not only affect banking stability in the short term but can also influence it in the long term. At the same time, green financing plays a crucial role in the long term to help the banking sector improve its stability.

Table 5. Regression of panel ARDL

	PMG	MG	DFE
Long – run			
CO2	-2.1765 ***	14.6763	0.0330 ***
	(0.3310)	(13.8455)	(0.7090)
GF	1.6544 ***	-0.2882	-0.1513
	(0.2214)	(1.6587)	(0.4352)
OQ	5.8329 ***	-1.1952	4.9376 ***
	(0.2214)	(3.6909)	(2.2159)
B.S.	0.0010 ***	0.0002	-0.0003
	(0.0013)	(0.0002)	(0.0003)
CR	-1.4519 ***	-8.7145	-0.0894
	(0.0659)	(6.9586)	(0.2320)

https://doi.org/10.24191/jeeir.v11i3.25208

Short – run			
ECT	-0.2692	-1.2893	-0.6355
	(0.1701)	(0.5498)	(0.1485)
CO2	-1.0598 ***	-0.8312	-1.1199 *
	(0.2627)	(0.6817)	(0.3586)
GF	0.4635	-0.9524 *	0.0799
	(0.4963)	(0.5118)	(0.2789)
OQ	2.6407 ***	-0.9876	-3.2604 ***
	(0.9323)	(1.7404)	(1.0736)
BS	0.0001 ***	0.0001	0.0003
	(0.0001)	(0.0001)	(0.0001)
CR	-0.3751 *	-1.1615	-0.0522
	(0.2250)	(0.9565)	0.1816
Constant	-6.8390	-14.9604	3.6024
	(4.7199)	(14.0756)	4.2443
Hausman	1.0000	-	-

Notes: Climate Change (CO2), Green Financing (GF), Organizational Quality (OQ), Bank Size (BS), Credit Risk (CR), The values in the parentheses are robust standard errors. ***, **, and * indicate significance at 1%, 5% and 10% significance levels, respectively.

5. Discussion and Conclusion

In recent decades, climate change has become the most challenging issue for business industries, especially the worldwide banking sector. Therefore, this study aimed to examine climate change's impact on bank stability. The study further identified the influence of green finance on bank stability in Malaysia. The result panel data of eight commercial banks in Malaysia from 2012 until 2021 indicates that bank stability has a powerful negative impact from climate change in Malaysia. The findings of this paper highlighted that climate change can immediately affect bank stability in both the long and short term. This result agrees with Kuznets's theory that environmental pressures increase as income levels increase at the initial stage of economic development. However, these pressures diminish along with income levels. Economics is always associated with quality health and financial systems. This finding is consistent with the literature review by Fabris (2020), which shows that climate change can potentially increase credit default rates, endangering the financial stability of any nation. Climate change may cause a drop in lending activity due to rising bad loans, resulting in slower economic development, decreased employment, and a negative impact on welfare. Therefore, this paper rejects the null hypothesis and concludes that climate change impacts bank stability.

Apart from that, the role of green financing shows that it is an effective tool for maintaining commercial bank stability. The findings of this study revealed that green financing had also been found to have a tangible impact on bank stability in the case of Malaysia. This result supports the study by Li Z et al. (2022) that points out that there is an essential role in implementing green financing to balance the economy and sustainable development. However, it can only be enhanced in the long run, supported by the Dynamic Ecosystem Finance Economy, or DEFINE model. Thus, green financing is a tool that can enhance the bank's stability and performance by investing in various environmentally friendly projects such as renewable energy and energy efficiency. In general, the paper's findings lead it to reject the null hypothesis and conclude that green financing impacts bank stability.

https://doi.org/10.24191/jeeir.v11i3.25208

In addition, this study also included the internal factors of the banking sector, such as organisational quality, bank size, and credit risk, in the regression. This study points out that having good organisational quality in companies can help the industry, especially the banking industry, enhance its stability. It is similar to the previous scholars Berber, Slavi, and Aleksic (2020), who stated that better cooperation in the organisation itself could lead to an excellent joint effort to reach the goals of the firms and achieve better performance in the future. Last but not least, bank size and credit risk can also influence banking stability in Malaysia for both the short and long term.

In summary, this paper proposes the following policy implications: First, the policymakers, especially Bank Negara Malaysia (BNM), should continue to promote the development of green financing in all the banks as the source of an alternative that can improve the finance development infrastructure, which can reduce the risk of changes in climate, so that bank stability in this region is protected. Furthermore, banking or financial banking institutions encourage banks and financial institutions to provide professional investment services for green innovation, such as renewable energy and clean manufacturing technologies. Build a financial services system that supports green innovation and continues to leverage the role of financial development in promoting green innovation. Strongly support and promote private equity and capital institutions focused on green technology investment and build a multi-layer financing and risk management mechanism, which will play an essential role in financial development by reducing carbon emission intensity. Moreover, the government should give full play to the role of environmental regulations in improving green technological innovation and work together to achieve green upgrading. The government should fully consider regional heterogeneity when formulating environmental regulations, combining regional characteristics, and integrating environmental subsidies and politics through green technology innovation to achieve environmental protection and coordination of economic development.

Acknowledgments

The author wishes to extend heartfelt gratitude to the corresponding author, Professor Ts. Dr. Imbarine Bujang, for his invaluable guidance, mentorship, and financial support. Similarly, to Dr. Flicia Rimin, who acted as coauthor for this paper. This paper would not have been adequately completed without their exceptional support. The author would like to extend their gratitude to all individuals who have helped, either directly or indirectly, in the successful completion of this article.

Conflict of interest statement

The authors affirm that this study was carried out without personal gains, commercial interests, or financial conflicts and declare no conflicting interests with the funders.

References

Adusei, M. 2015. The impact of bank size and funding risk on bank stability. *Cogent Economics & Finance* 1(3): 1-19. https://doi.org/10.1080/23322039.2015.1111489

Ahamed, M. M., and Mallick, S. K. 2015. Is financial inclusion good for bank stability? International evidence. *Journal of Economic Behavior & Organization, Elsevier* 157: 403-427. https://doi.org/10.1016/j.jebo.2017.07.027

Breitung, J. 2000. The Local Power of Some Unit Root Tests for Panel Data. *Advances in Econometrics* 15:161-177. https://doi.org/10.1016/S0731-9053(00)15006-6

Berber, N., Slavic, A., & Aleksic, M. (2020). Relationship between Perceived Teamwork Effectiveness and Team Performance in Banking Sector of Serbia. Sustainability, 12(20), 8753. https://doi.org/10.3390/su12208753

Burke, M., and Emerick, K. 2016. Adaptation to Climate Change: Evidence from U.S. Agriculture. *American Economic Journal: Economic Policy* 8(3): 106-140. https://doi.org/ 10.1257/pol.20130025

Canh, P. N., Schinckus, C., Su, T., and Chang. 2021. Do Institutions and Technologies Matter for Trade Openness? Empirical Evidence from African Countries. *The International Trade Journal* 35(5): 15-36. https://doi.org/10.1080/08853908.2021.1929584

Chand, S., Kumar, R. R., and Stauvermann, P. J. 2021. Determinants of bank stability in a small island economy: a study of Fiji. *Accounting Research Journal* 34(1): 22-42. https://doi.org/10.1108/ARJ-06-2020-0140

Dafermos, Y., Nikolaidi, M., and Galanis, G. 2018. Climate Change, Financial Stability, and Monetary Policy. *Ecological Economics* 152: 219-234. https://doi.org/10.1016/j.ecolecon.2018.05.011

Din, S. U., Nazar, M. S., & Shahzad, A. (2021). Money at risk: climate change and performance of Canadian banking sector. Journal of Economic and Administrative Sciences, Vol 35, 112-119. https://doi.org/10.1108/JEAS-02-2021-0033

Djebali, N., and Zaghdoudi, K. 2020. Threshold effects of Liquidity Risk and Credit Risk on Bank Stability in the MENA region. *Journal of Policy Modeling* 42(5): 1049-1063. https://doi.org/10.1016/j.jpolmod.2020.01.013

Fabris, N. 2020. Financial Stability and Climate Change. *Journal of Central Banking Theory and Practice* 3: 27-43. https://doi.org/10.2478/jcbtp-2020-0034

Furukawa, K., Ichiue, H., and Shiraki, N. 2020. How Does Climate Change Interact with the Financial System? A Survey. *Bank of Japan Working Paper Series*, No 20-E-8.

Gazi, M. A., Nahid, M. N., Harymawan, I., & Masud, A. A. (2022). Impact of COVID-19 on Financial Performance and Profitability of Banking Sector in Special Reference to Private Commercial Banks: Empirical Evidence from Bangladesh. Sustainability, 14(10), 10.

H.Ibrahim, M., & Rizvi, S. A. 2017. Do we need bigger Islamic banks? An assessment of bank stability. *Journal of Multinational Financial Management* 40: 77-91. https://doi.org/10.1016/j.mulfin.2017.05.002

Hoshen, M. S., Hasan, M., Hossain, S., Mamun, M., Mannan, A., and Mamun, D. 2017. Green Financing: An Emerging Form of Sustainable Development in Bangladesh. *Journal of Accounting and Finance in Emerging Economies* 6: 309-315. https://doi.org/ 10.9790/487X-1912072430

Im, K. S., Pesaran, M. H., and Shin, Y. 2003. Testing for unit roots in heterogeneous panels. *Journal of Econometrics* 15(1): 53-74. https://doi.org/10.1016/S0304-4076(03)00092-7

Ji, X., Tang, Y., & Huang, S. (2022). The effect of carbon-based copper nanocomposites on Microcystis aeruginosa and the movability of antibiotic resistance genes in urban water. Chemosphere, 286(3), 131744. https://doi.org/10.1016/j.chemosphere.2021.131744

Kamran, H. W., Haseeb, M., and Nguyen, V. C. 2020. Climate Change And Bank Stability: The Moderating. *Talent Development & Excellence* (12): 3738-3751.https://doi.org/10.31219/osf.io/v48fa

Levin, A., Lin, C.-F., and Chu, C.-S. J. 2002. Unit root tests in panel data: asymptotic and finite sample properties. *Journal of Econometrics* 108: 1-24. https://doi.org/10.1016/S0304-4076(01)00098-7

Li, F., and Zou, Y. 2014. The Impact of Credit Risk Management on Profitability of Commercial Banks: A Study of Europe. *International Journal of Economics and Finance* 7(11): 163-178.

Li,Lu and Lin 2022. Bank Interest Margin and Green Lending Policy under Sunflower Management. Sustainability 14(14):8643. https://doi.org/10.3390/su14148643

Liu, Z., Sun, H., and Tang, S. 2021. Assessing the impacts of climate change to financial stability: evidence from China. *International Journal of Climate Change Strategies and Management* 13(3): 375-393.

Louati, S., and Boujelbene, Y. 2015. Banks' stability-efficiency within dual banking system: a stochastic frontier analysis. *International Journal of Islamic and Middle Eastern Finance and Management* 8(4): 472-490.https://doi.org/ https://doi.org/10.1108/IMEFM-12-2014-0121

Mei, Q., Shahzad, F., Liu, S., Long, X., and Zhang, J. 2020. Untangling the Impact of Green Finance on the Enterprise Green Performance: A Meta-Analytic Approach. *Sustainability* 12(21): 1-16. https://doi.org/10.3390/su12219085

Muganyi, T., Linnan, Y., and Sun, H. P. 2020. Green finance, fintech, and environmental protection: Evidence from China. *Environmental Science and Ecotechnology* (7): 100-107. https://doi.org/10.1016/j.ese.2021.100107

Nasir MA, Duc Huynh TL, Xuan Tram HT. 2019. Role of financial development, economic growth & foreign direct investment in driving climate change: A case of emerging ASEAN. *Journal of Environmental Management* 242:131-141 https://doi.org/10.1016/j.jenvman.2019.03.112

Ning, Q. Q., Guo, S. L., and Chang, X. C. 2021. Nexus between green financing, economic risk, political risk, and environment: evidence from China. *Economic ResearchEkonomska Istrazivanja*, 1-24. https://doi.org/10.1080/1331677X.2021.2012710

Noth, F., and Schüwer, U. 2017. How do insured deposits affect bank risk? Evidence from the 2008 Emergency Economic Stabilization Act. *Journal of Financial Intermediation* 29: 81-102. https://doi.org/10.1016/j.jfi.2015.07.001

Pankratz, Bauer, R., & Derwall, J. 2023. Climate Change, Firm Performance, and Investor Surprises. *Management Science Management Science* 1: 1-10 https://doi.org/10.1287/mnsc.2023.4685

Pesaran, H., Shin, Y., and Smith, R. P. 1999. Pooled Estimation of Long-run Relationships in Dynamic Heterogeneous Panels. *Journal of the American Statistical Association* 94: 621-634. https://doi.org/10.1016/0304-4076(94)01644-F

Rajhi, W., and Hassairi, S. A. 2013. Islamic Banks And Financial Stability: A Comparative Empirical Analysis Between Mena And Southeast Asian Countries. *Region et Developpement* 37: 149-177.

Sari, S., Ajija, S. R., Wasiaturrahma, W., & Ahmad, R. A. (2022). The Efficiency of Indonesian Commercial Banks: Does the Banking Industry Competition Matter? Sustainability, 14(17), 10995. https://doi.org/10.3390/su141710995

Sharmeen, K., and Yeaman, A. M. 2020. Benefits That Islamic And Conventional Banks Can Attain By Implementing Green Banking. *Journal of Islamic Monetary Economics and Finance* 6(4): 883-860. https://doi.org/10.21098/jimf.v6i4.1134

Stern, N., and Taylor, C. 2007. Climate Change: Risk, Ethics, and the Stern Review. *Science*, 317: 203-204. https://doi.org/10.1126/science.1142920

Wang, Y., and Zhi, Q. 2016. The role of green finance in environmental protection: Two aspects of market mechanism and policies. *Energy Procedia* 104: 311 - 316. https://doi.org/10.1016/j.egypro.2016.12.053

Yang, C., and Masron. Impact of Digital Finance on Energy Efficiency in the Context of Green Sustainable Development. *Sustainability* 14(8): 1-17 https://doi.org/10.3390/su141811250

About the Authors

Mohd Razuan Abd Hishamuddin is a Ph.D. candidate at the Faculty of Business and Management, Universiti Technology MARA Sabah Branch, Kota Kinabalu Campus.

Imbarine Bujang is a Professor in the Faculty of Business and Management, Universiti Technology MARA Sabah Branch, Kota Kinabalu Campus. He has also been the Chairman of the Audit, Compliance, and Risk Management Committee for Saham Sabah Berhad since 2021. He was awarded the Honorary Fellowship from the Centre of Business and Economic Research in the United Kingdom in 2019. He has vast experience in research with many publications majoring in finance. His research areas include financial economics and behavioral finance in Malaysia and beyond.

Flicia Rimin, Ph.D., is a senior lecturer in the Faculty of Business Management of Universiti Teknologi MARA, Malaysia. She obtained her Doctorate in Business Administration from the Arshad Ayub Graduate Business School (AAGBS), Universiti Teknologi MARA, Malaysia. Her research interests concentrate on financial management and corporate governance.

Jamaliah Said is a professor and currently serves as Director of the Accounting Research Institute, UiTM Shah Alam. She has vast experience in research with many publications majoring in financial accounting and reporting. Her research areas include strategic management, governance, accountability, integrity, and performance.

Dwi Astuti Rosmianingrum Nainggolan is a Ph.D. candidate at the Accounting Research Institute, UiTM Shah Alam. She is a senior lecturer at the Department of Accounting, Faculty of Economics and Business, University of Indonesia. She has more than fifteen years of working experience in the capital market sector in Indonesia in the field of investment banking and fund management. She also has exposure to assisting the Indonesian Financial Accounting Standards Board in the continuation of implementing IFRS Standards in Indonesia. Her research interests include capital markets, accounting standards, and corporate governance.

Authors' contributions

Mohd Razuan Abd Hishamuddin conducted research, data curation, and formal analysis. Imbarine Bujang Flicia Rimin conceptualized the investigation, supervised the research progress, and provided the article's methodology. Jamaliah Said and Dwi Astuti Rosmianingrum Nainggolan anchored the review revisions and approved the article submission. All authors have read and agreed to the published version of the manuscript.