AI-Based -Green Banking Technologies And Bank Stability –Moderating Role Of Climate Change

Dr Amina Elshamly[1] , Shafiq Ur Rehman[2] , Mohammad Mizanur Rahman[3] , Rabia Hameed[4] , Zainab Jameel[5]

[1]Taibahu University KSA
ashamly@taibahu.edu.sa
[2]School of Finance and Banking University of Utara Malaysia
Email: Shafiq.Rehman321@gmail.com
[3]Lecturer Department of Accounting Gurudayal Government College, Kishoreganj (Affiliated with National University, Bangladesh)
Email duaccmizanur@gmail.com
[4]Research scholar University of Utara Malaysia
Scorpionkool1@gmail.com
[5]Assistant Professor Business school Qassim University KSA
Email: Za.jameel@qu.edu.sa

Abstract:-

An unstable banking system may result in poor economic outcomes. By using SEM techniques through SMART-PLS; this study analyzes the data from **N=380** key respondents of banks who are actively involved in adopting green banking technologies adoption and implementing climate change initiatives (i.e., renewable energy). This study found that the adoption of green banking technologies (i.e., chatbots, facial recognition, fraud detection) has significantly and positively improved bank stability and bank responses to climate change initiatives, partially and positively mediated the relationship between AI-based green banking technologies and bank stability. This study has both practical and theoretical significance for managers and policymakers.

Keywords: Bank Stability, Artificial intelligence, Chatbot, facial recognition, fraud detection, renewable energy.

1 Introduction

A stable financial system can efficiently allocate resources, manage and assess financial risk, enhance employment levels, and avoid fluctuations in the relative prices of tangible or financial assets that

might affect the amount of employment or the monetary system (Flejterski, 2019, Čihák, 2007). A financial system is said to operate within a range of stability when it can correct economic imbalances caused endogenously or as a consequence of substantial unanticipated occurrences (Das et al., 2010).

There are several risks associated with financial stability, for instance, economic uncertainty (Altig et al., 2020), country governance (Kamran et al., 2019), market concentration (Kamran et al., 2019), financial literacy (Philippas and Avdoulas, 2020), financial inclusion and corporate social responsibility (Jahmane and Gaies, 2020) however, the effects of climate change have only lately been identified as a new potential threat to the global financial system. As a result, several central banks and financial regulators have advised investors and financial institutions over the last several years to evaluate the extent to which they are exposed to financial risks associated with climate change (Battiston et al., 2021).

The changing environment has become a problem for contemporary economies, not only in terms of their capacity to continue existing here on earth but also in terms of their ability to maintain their economic stability and financial stability. According to the world bank, It is anticipated that the climatic shifts would have the greatest impact on the countries of the globe that are also the most developed. There is a possibility that climate change may result in an increase in temperature, an increase in the level of the sea, and frequent severe shifts in meteorological conditions, such as earthquakes, floods, and other natural disasters. These shifts have made it more likely that there would be a deficiency in the supply of food and drinking water, an increase in the prevalence of sickness, and worsening conditions of poverty and hunger. Alterations to the climate not only have an effect on the lives of the average person living in underdeveloped nations but also have an effect on many organizations in the world.

Today, most of the organizations (i.e., banks) are promoting green financing in their projects to enhance the usage of environment-friendly projects so as to decrease the negative impact of climate on their economy. This shift in banking policy has brought new opportunities for technology firms to introduce new types of services, such as the integration of new blockchain technology, the implication of artificial intelligence to verify the identity and

distribute information, the use of big-data analytics to evaluate the credit worthiness of applicant as most of the operations such as education, banking, and selling and buying went online (Vaishya et al., 2020, Nguyen et al., 2020, Naudé, 2020) however, the role of these new technologies (i.e., green banking) in financial stability is still unclear. Therefore, the first objective of this paper is to investigate the role of Artificial intelligence adoptions (green banking technologies) during climate change and its impact on the financial stability of the UK.

In addition, the majority of nations are moving toward the consumption of alternative forms of energy, such as renewable energy, to lower the amount of pollution in their environments and so reduce the adverse effects of climate change on their economy; however, it is still unclear that renewable energy moderate the relationship between the green banking technologies (IA) and financial stability.

We collected data from 380 bank representatives (i.e., technology heads, deposit managers, credit managers, and bank representatives) who are actively involved in the adoption and implementation of green banking initiatives or artificial intelligence applications (i.e., chatbots, facial recognition banking apps, and fraud detection systems) during the climate crisis. Results show that green banking technologies significantly and positively affect banks' financial stability (ROA, ROE); however, the adoption of renewable energy has significantly and positively moderated the relationship between the stability of UK banks and green banking technologies

This research is significant for central banks, private banks, and managers of banks, as well as for the policymakers who make policies for climate change. The remaining paper includes a literature review section, research methodology, results, discussion, and future implications. The next section of this paper will discuss the literature review

2 Literature review

Only a small number of studies have been published in the past that demonstrate the connection between green banking technology, climate change, and the safety of commercial banks. Significant research studies have determined the elements of bank stability(Laskowska, 2018, Zhang et al., 2022, Shaumya and

Arulrajah, 2016, Sharma and Choubey, 2022). Sharma and Choubey (2022) pointed out that the stability of the stock market and the broader economy are the primary factors that contribute to the reliability of the banking system. He believed that the market index was the most important component in determining the overall stability of commercial banks. Laskowska (2018) discovered that the economic environment has a negative impact on the state of stable banks.Shaumya and Arulrajah (2016) examined the significance of early warning signs, the implications of regional spillovers, and the impact of the economic cycle on the unstable circumstances of banks as potential determinants of these situations. Muhammad and Zaheer (2012) variables particular to the company, the economy, and the governance system were taken into consideration in connection to the stability of the bank. They discovered that the quality of the organization in terms of governance has a detrimental effect on the bank's stability.

Some other bank-specific factors that determine the bank stability or the economic factors like GDP growth, inflation, organizational quality, etc., impact bank stability. However, limited literature is available on how green banking technologies can improve bank stability, does renewable energy initiatives by banks moderate the relationship between green banking technologies and bank stability?

Its well documented in the literature that, adopting new artificial intelligence tools in the financial sector has significantly improved the banking system over the years. For instance, AI-based facial recognition eased the account opening process and prevented fraud in the banking sector (Kaya et al., 2019, Soni, 2019, Smith and Nobanee, 2020, Donepudi, 2017, Abdulla et al., 2020). however, the role of these technologies during the climate change process is still to be determined. Therefore, this study hypothesized that

H_1 – the adoption of green banking technologies (AI) has significantly and positively increased bank stability.

H_2 –Climate change initiatives mediate the significant and positive relationship between green banking technologies and financial stability.

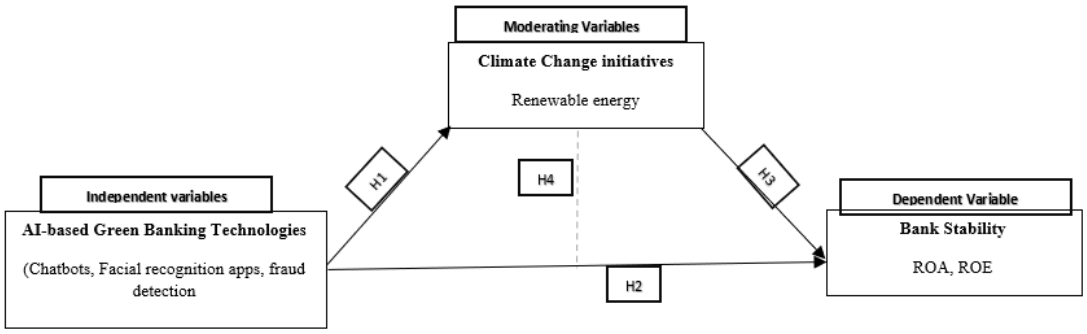
H_3 –Climate change initiatives affect financial stability both significantly and positively.

H_4 – the adoption of green banking technologies (AI) has significantly and positively increased renewable energy initiatives

3 Data and Research Methodology

This study collects data from 380 respondents from banking sector representatives (i.e., technology heads, deposit managers, credit managers, and bank representatives). Initially, 560 questionnaires was distributed however, 380 responses were recorded from different banks (both commercial and private banks) of UK. SPSS was used to test the relationship between the indented (Climate change), mediator (AI (i.e., chatbots, facial recognition banking apps, and fraud detection systems) and bank stability (ROE & ROA).

Figure 3-1 Shows the conceptual framework



4 Results and Discussion

This section of this study discussed the results of the analysis.

4.1.1 Pretest

Before conducting the survey at a large scale, a pretest technique is used to evaluate the quality of the questionnaire (Willis, 2016) . This decreases the uncertainty and reduces the redundancy in the survey constructs.

4.1.2 Pilot Testing

Before we collected the data on a larger scale, we ran some preliminary tests on the survey questions to determine whether the suggested model was sound. When conducting pilot tests, it is critical to verify the constructs that are being suggested in terms of their validity and reliability. It was challenging to acquire a substantial amount of data for the pilot testing since the sample

frame consisted of persons who were employed. However, a manageable sample of bank managers from the surrounding region was adequate to validate the information included in the report. Our primary goal was to verify the dependability of the materials that were used in the research. We were in charge of developing the questions for the online survey, and we communicated with respondents by sending them a link to the survey. The overall number of accurate solutions received was 42, and there were 55 total responders. In order to guarantee an adequate limit of reliabilities, the collected data were validated via the use of the SmartPLS software. It was discovered that the whole construct presented relatively excellent results, and reliabilities were above the acceptable range, for example, alpha > 0. 7, with many values over 0.9. Similarly, factor loadings are more than 0.70, **with many loadings greater than 0.90 (see table 3.1).**

Table 3.1: Results of Pilot Test

Constructs		Cronbach's Alpha (α)		Means (SD)	Factor Loading Range
AI-Based Green Banking	CB	0.827	0.826	3.55 (1.17)	0.899-0.925
	FR	0.829			
	FD	0.826			
Climate change			0.935	3.90 (1.2)	0.822-0.841
Bank- Stability			0.936	3.39 (1.01)	0.927-0.956

4.1 Measurement Model Estimation

4.1.1 Reliability

In the next stage, factor loadings were determined by the use of SMARTPLs. The findings are shown in table 5.3, and it displays the factor loadings range for items of the relevant constructs. All of these factor loadings ranges were found to be over the acceptable range, defined as more than 0.70. Table 5-5 contains information on the loading of the elements for each of the builds.

We first examined the whole sample data set with the anchor points, then calculated the mean of each suggested construct and compared it to that. This was done before delving into a more in-depth investigation of the constructs. The findings of the study are shown in Table 3-2 for each construct. We have concluded that none of the constructions shed light on key problems such as insufficient variety

Table 3.2: Mean and anchor point for each construct

Constructs		Anchor points	Means	
AI-Based Green Banking	CB	7-Strongly Agree, 1-Strongly Disagree	4.64	4.64
			4.62	
	FR		4.66	
	FD			
Climate change		7-Strongly Agree, 1-Strongly Disagree	4.74	
Bank Stability		7-Strongly Agree, 1-Strongly Disagree	4.59	

The next phase was using CFA to determine whether or not a certain component was leading. Every single component of the construct was put into the corresponding latent variable. We discovered that the factor loading of each individual build item was more than 0.70, which is the upper limit of the allowed range. The specifics of factor loading, together with the amount of items representing each construct that were employed for this research, are detailed in Table 3.3

Table 3.3: Factor Loadings

Constructs		items		Factor Loading Range	
AI-Based Green Banking	CB	7	21	0.621-0.822	0.548-0.822
	FR	7		0.591-0.772	
	FD	7		0.548-0.807	
Climate Change			6		0.524-0.890
Bank- Stability			6		0.599-0.831

The concept that was employed in this research was subjected to testing, and its convergent validity and reliability were evaluated using the measures of "Cronbach's alpha," "factor loadings," and "average variance extracted" (AVE) (Hair et al., 1998). In a CFA that was done to check the validity of the items, it was discovered that all of the constructs displayed a degree of reliability (Cronbach's alpha was more than 0.70). It was discovered that the factor loading for every building item was more than the permissible limit, defined as factor loadings greater than 0.60. Lastly, the AVE of each construct has shown that the value of each construct is more than the suggested cutoff level, which is to say that the AVE is more significant than 0.50. If the AVE is larger than 0.50, the

latent factor accounts for at least fifty percent of the variation between the items.

Table 3.4: Construct Reliability and Validity

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Climate Change	0.775	0.807	0.844
Bank Stability	0.834	0.851	0.880
CB	0.833	0.846	0.875
FR	0.836	0.852	0.876
FD	0.867	0.875	0.898

To determine whether or not the variables in the research had factor loadings greater than 0.7, a CFA was performed using SmartPLS (Hair et al., 2010). The findings are shown in Table 3.4 below. CFA is often used to validate the validity of the item-factor toning and to train for the purpose of factor association analysis. The results of the CFA suggest that the indices for the overall fit of the proposed model are legitimate. This is because the resultant values fall within the specified cut-off range for loading values between 0.628 and 0.856. The Cronbach's Alpha values of the associated constructions all above the 0.70 minimum required threshold value. As can be seen in Table 3.4, both CR and AVE have reached a level that may be considered acceptable. As a result, it established that each and every instrument used for the builds was dependable. Except for one indicator, all of the readings are higher than the level that is suggested, which indicates that there are no problems caused by cross-loading. Therefore, this component was not included in the build.

7 Hypotheses Testing

Before talking about the proposed hypothesized relationship, the results of the control variables are presented

Testing Hypothesis - (H_1-H_4)

H1: Green banking technologies positively influence the climate change initiatives of a firm.

The results from structural analysis support the results GBT (H_1: $\beta = 0.238$, $p <. 001$, $\beta = 0.313$, $p <. 001$, $\beta = 0.333$, $p <. 001$) is a significant predictor of CC

H2: Green banking technologies significantly influence the bank stability. The results also shows that GBT (H_2: β = 0.406, p <. 001, β = 0.288, p <. 001, β = 0.113, p < 0.001) is significant predictor of bank stability.

H3: climate change (i.e., renewable energy) positively influences bank stability.

The results also show that CC is true predictor of BS (H_3: β = 0.138, p <. 001)

H4: Climate change initiatives mediates the relationship between Green banking technologies and bank stability.

Results from the structural analysis yield support that CC mediate the relationship between the GBT and BS (H_4: β = 0.033, p <. 059, β = 0.043, p <. 001, β = 0.046, p <. 001). Therefore, structural analysis finds support for all the hypotheses (H_I-H_4) which are fully supported.

Table 3.5: Hypothesis testing results.

Hypothesis	Path	Path Coefficient	p-value	Result
H1	CB → CC	0.238	2.639	Supported
	FR → CC	0.313	4.325	Supported
	FD → CC	0.333	5.572	Supported
H2	CB → BS	0.406	5.978	Supported
	FR → BS	0.288	4.732	Supported
	FD → BS	0.113	2.110	Supported
H3	CC → BS	0.138	3.006	Supported
H4	CB→ CC → BS	0.033	1.892	Not Supported
	CB → CC → BS	0.043	2.422	Supported
	CB → CC → BS	0.046	2.586	Supported

5 Conclusion

A stable financial system can efficiently allocate resources, manage and assess financial risk, enhance employment levels, and avoid fluctuations in the relative prices of tangible or financial assets that might affect the amount of employment or the monetary system. Due to fast climate changes the, bank stability as risk and banks are suffering to generate profits. Therefore, banks are adopting technologies to overcome the cost of operations and also environmentally friendly, however the research in this context is very limited. This study collected data from data from 380 bank representatives (i.e., technology heads, deposit managers, credit managers, and bank representatives) who are actively involved in

the adoption and implementation green banking initiatives or the artificial intelligence applications (i.e., chatbots, facial recognition banking apps, and fraud detection systems) during the climate crisis. Results show that green banking technologies significantly and positively affect banks' financial stability (ROA, ROE); however, adoption of renewable energy has significantly and positively moderated the relationship between the stability of UK banks and green banking technologies. This study has a few limitations. First, this study is only UK based study; secondly, the number of correct responses is only 380. The future researcher can increase the number of responses and change the sample size to another country to generalize the results.

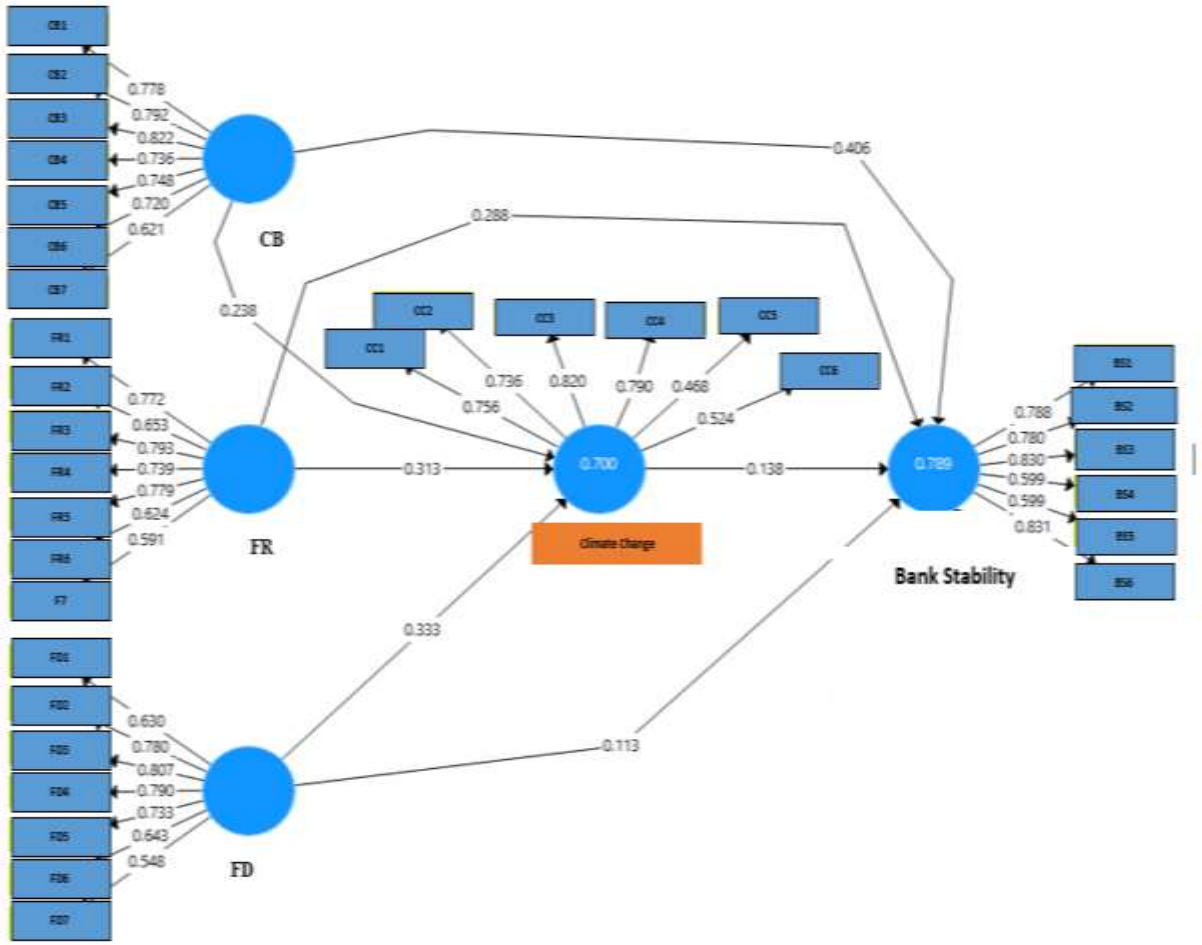


Figure 3.2 measurement model

Table 3.6 Descriptive statics of respondents

Descriptive statics	Of respondents	Frequency	Percentage
Position in the company	IT Heads	113	29.7
	General Manager	127	33.4
	Sales/Marketing Manager	40	10.5
	Export Manager	20	5.3
	Business Development Manager	8	2.1
	Managing Director	9	2.4
	Production mangers	10	2.6
	Quality Assurance Manager	4	1.1
	Others (e.g. R&D manager, human resource manager, etc.)	49	12.9
	Total (N=380)	**380**	**100**
Ethnic	USA	122	32.1
	UK	234	61.6
	Chines	15	3.9
	Others	9	2.4
	Total (N=380)	**380**	**100**

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