

Green Monetary Policy and Financial Stability: An Empirical Analysis of Climate-Related Financial Risks in Nigeria

Ayibatunimibofa Franklin Agada¹, Cornelious Tamuno²

^{1,2}Department of Economics and Development Studies, Federal University Otuoke, Bayelsa State, Nigeria.

ABSTRACT: The study examined green monetary policy and its effects on financial stability in Nigeria, focusing on climate-related financial risks. The study was designed to examine the effects of the green credit ratio, green asset purchases by the central bank's green asset purchases, the climate-related monetary policy index, and the GDP growth rate on the stability of Nigerian banks, as measured by the bank Z-score. Secondary data were analysed using descriptive statistics, correlation analysis, and fixed-effects panel regression, following a quantitative, ex post facto design and panel data econometrics. The findings show that the green credit ratio has a positive and significant impact on financial stability. This means that the more banks lend to sustainable sectors, the more stable those sectors become. Central banks' purchases of green assets also helped to provide stability, indicating that green financial instruments enhance liquidity and resilience. Also, GDP growth rate had a positive and significant effect, indicating that macroeconomic growth helps bank performance. On the other hand, the climate-related monetary policy index had a significant negative effect, suggesting that weak regulatory systems, data infrastructure, and implementation capacity could undermine stability. The study concluded that well-designed and harmonised green monetary policies can improve Nigeria's financial stability. Recommendations included: expanding green lending, phasing in green asset purchases, strengthening climate risk disclosure, improving green taxonomies, and enhancing collaboration among monetary, fiscal, environmental, and financial regulators.

KEYWORDS: Green monetary policy, financial stability, climate-related financial risks, green credit ratio, bank Z-score.

1.0 INTRODUCTION

Climate change and its financial risks are becoming pressing issues for monetary authorities and financial regulators worldwide. These risks – often categorised as physical risks (from climate-related disasters) and transition risks (from the transition to a low-carbon economy) – pose a threat to the stability of the financial system, asset prices and macroeconomic performance. In recent years, central banks have increasingly recognised that traditional monetary policy frameworks need to evolve to include climate-related considerations to ensure financial stability. This changing paradigm has given rise to the notion of green monetary policy that integrates the goals of environmental sustainability into the conduct of monetary policy.

The importance of green monetary policy is particularly high in Nigeria, which is highly vulnerable to climate change and structurally dependent on climate-sensitive sectors such as agriculture and oil production. In Nigeria, climate-related shocks such as flooding, desertification and pressures from the energy transition can disrupt financial intermediation and weaken banks' asset quality, increasing systemic risk in the financial system. Despite these vulnerabilities, the integration of climate considerations into monetary policy remains in its early stages, leaving a gap between global best practices and domestic policy implementation. Central banks worldwide — including the European Central Bank and the Bank of England — have embraced forward-looking green monetary policy tools, such as green asset purchase programs, climate stress testing and sustainability-adjusted collateral frameworks. These measures aim to align financial systems with climate goals and make them more resilient to climate-related financial shocks. However, these practices are still in their infancy in developing economies such as Nigeria, where challenges of institutional capacity, data availability and policy coordination constrain adoption.

In this context, green monetary policy has become an important policy instrument to support sustainable finance and to address climate-related financial risks. In this study, green monetary policy is the independent variable. It is proxied by measures such as the green credit ratio, green quantitative easing (central bank purchases of green assets), and a climate-related monetary policy index. These proxies encompass the operational and institutional aspects of how monetary authorities integrate environmental

Green Monetary Policy and Financial Stability: An Empirical Analysis of Climate-Related Financial Risks in Nigeria

considerations into financial systems. The amount of credit extended by Nigerian financial institutions to environmentally sustainable projects and the extent of policy commitment to climate-related financial regulation are critical for the resilience of the financial system.

The dependent variable is financial stability. It is proxied by the bank Z-score, which estimates the likelihood of bank insolvency by combining profitability, leverage, and volatility indicators. In Nigeria, financial stability is a major concern for regulators such as the Central Bank of Nigeria, particularly amid increasing exposure to domestic and global economic shocks. The mandate is further complicated by climate-related risks that create new avenues for financial vulnerability, including stranded assets in carbon-intensive sectors and increased credit risk in climate-sensitive industries.

The macroeconomic environment, particularly GDP growth, a control variable in this study, also affects the relationship between green monetary policy and financial stability. Nigeria's economic health is critical to the transmission of monetary policy and the health of financial institutions. Economic expansions can amplify the positive impact of green monetary policy by improving bank balance sheets, while economic recessions can limit its efficacy.

The motivation for this study is the lack of empirical evidence regarding the role of green monetary policy in enhancing financial stability in the Nigerian context. Previous studies have largely focused on developed economies or on specific aspects of green finance. However, there is a significant gap in understanding the joint influence of multiple dimensions of green monetary policy on financial stability in developing economies such as Nigeria. The study therefore aims to empirically analyse financial risks related to climate change and implications for monetary policy and financial system resilience.

The main question that this research attempts to answer is the lack of consensus on whether green monetary policy is beneficial or detrimental to financial stability. Proponents argue that embedding sustainability considerations into monetary policy reduces systemic risk and fosters long-term resilience. Critics say such policies could distort the allocation of credit and create inefficiencies in financial markets. This ambiguity is especially relevant in Nigeria, where financial markets are nascent, and the policy trade-offs are more pronounced.

It is important because it adds to the body of knowledge and policy debate by providing context-specific evidence on the nexus between green monetary policy and financial stability in Nigeria. It offers insights for policymakers, regulators, and financial institutions who are trying to reconcile environmental sustainability with financial system resilience. In addition, it is consistent with global initiatives to promote sustainable finance and address the specific challenges faced by developing economies.

Finally, the study investigates the impact of selected green monetary policy proxies, namely the green credit ratio, central bank green asset purchases, and the climate-related monetary policy index, on financial stability, measured by the bank Z-score, in the Nigerian financial system. The study's quantitative, panel-based empirical approach is expected to provide strong evidence for policy formulation and contribute to the ongoing debate on climate finance and monetary policy in emerging economies.

Study Objectives

The main objective of this study is to empirically examine the relationship between green monetary policy and financial stability in Nigeria with special focus on climate-related financial risks. The specific aims are to:

- i. Investigate the impact of green credit ratio on the financial stability of banks in Nigeria, using bank Z-score as a proxy for financial stability.
- ii. Evaluate the effect of central bank purchases of green assets (green quantitative easing) on the financial stability of banks in Nigeria.
- iii. Assess the impact of the climate-related monetary policy index on the financial stability of Nigerian banks.
- iv. What is the impact of green monetary policy indicators (green credit ratio, green asset purchases, and climate-related monetary policy index) on financial stability in Nigeria?
- v. Effect of the GDP growth rate on the financial stability of banks in Nigeria as a control variable.

Study Questions

The study intends to provide answers to the following research questions in the context of Nigeria:

- i. What is the effect of green credit ratio on banks' financial stability in Nigeria?
- ii. What is the impact of green asset purchases by a central bank (green quantitative easing) on the financial stability of Nigerian banks?
- iii. What is the effect of the climate-related monetary policy index on the financial stability of banks in Nigeria?
- iv. What are the combined effects of green monetary policy proxies on financial stability in Nigeria?
- v. What is the effect of GDP growth rate on the financial stability of banks in Nigeria?

Green Monetary Policy and Financial Stability: An Empirical Analysis of Climate-Related Financial Risks in Nigeria

Research Hypothesis

The following null hypotheses are stated to guide the empirical analysis of green monetary policy and financial stability in Nigeria:

H₀₁: Green credit ratio does not significantly affect the financial stability of banks in Nigeria.

H₀₂: Green asset purchases by the central bank (green quantitative easing) do not have a significant impact on the financial stability of banks in Nigeria.

H₀₃: Climate-related monetary policy index does not significantly affect the financial stability of banks in Nigeria.

H₀₄: There is no significant joint effect of green monetary policy proxies on the financial stability of banks in Nigeria.

H₀₅: The GDP growth rate does not significantly affect the financial stability of banks in Nigeria.

2.0 CONCEPTUAL REVIEW

Monetary Policy Green

Green monetary policy mainstreams environmental sustainability considerations into traditional monetary policy frameworks. It is about climate-related financial risks while maintaining price and financial stability. Climate risks, including physical and transition risks, can threaten financial systems and macroeconomic stability, and central banks globally are increasingly recognising this (Network for Greening the Financial System, 2020).

The need for green monetary policy is even more urgent given Nigeria's vulnerability to climate-related risks, including flooding, desertification, and the oil transition. The Central Bank of Nigeria has introduced principles for sustainable banking that aim to incorporate environmental and social considerations into banking activities. However, the full embedding of these principles into monetary policy is still in its nascent stage (Central Bank of Nigeria, 2012). In this study, the green monetary policy is operationalized by the following quantifiable proxies: the green credit ratio, the central bank green asset purchases, and the monetary policy index on climate. These three proxies represent the operational and institutional aspects of monetary policy for sustainability.

Green Credit Ratio

The green credit ratio is the ratio of total bank loans to environmentally sustainable projects. It reveals the amount of money financial institutions are investing in areas such as renewable energy, sustainable agriculture, and green infrastructure. Green lending is financing conceptually supporting environmental sustainability and climate goals (World Bank, 2021). Empirical evidence indicates that green lending can reduce credit risk and improve loan performance, thereby helping to stabilise banks (Zhou et al., 2022). In Nigeria, the notion of green credit is linked to the Central Bank of Nigeria's sustainable banking initiatives, which encourage financial institutions to account for environmental risks when making lending decisions. Banks can also reduce their exposure to stranded assets and environmental shocks by reallocating credit to less climate-vulnerable sectors, thereby enhancing financial stability.

However, limited green investment opportunities, the absence of standardised classification frameworks, and data challenges limit the effectiveness of the green credit ratio in Nigeria. Notwithstanding these limitations, it is an important proxy to gauge the extent to which green monetary policy influences financial stability.

Green Asset Purchases by Central Bank

Green asset purchases by central banks are purchases of environmentally sustainable financial instruments, such as green bonds, made through monetary policy operations. This approach extends traditional quantitative easing by including environmental objectives within the asset purchase schemes. The European Central Bank, as well as other central banks around the world, have started to include climate factors in the asset purchases to facilitate the transition to a low-carbon economy (European Central Bank, 2021). Similarly, evidence suggests that green QE can help to lower the cost of financing for sustainable investments and improve the resilience of the financial system (Dikau & Volz, 2021). While large-scale green asset purchase programs are still in their infancy in Nigeria, the issuance of sovereign green bonds signals a growing commitment to sustainable finance. The Central Bank of Nigeria's potential role in these efforts may deepen liquidity in green markets while reducing systemic risks associated with climate change. Green asset purchases represent a direct policy tool by which monetary authorities influence financial markets, promote sustainable investments, and contribute to financial stability by lowering risk concentration in carbon-intensive sectors.

Climate-Related Monetary Policy Index

Climate-related monetary policy index: A composite index that captures the degree to which central banks integrate climate considerations into their policy frameworks. It covers aspects such as climate risk regulation, disclosure standards, and green monetary interventions.

Green Monetary Policy and Financial Stability: An Empirical Analysis of Climate-Related Financial Risks in Nigeria

This index is a multidimensional measure of climate-related financial policymaking, as defined in D’Orazio and Thole (2022), capturing the degree of institutional commitment to sustainability. A higher index value indicates greater integration of climate considerations into monetary and financial systems. In Nigeria, such an index would reflect the extent to which monetary policy decisions and financial regulation embed climate risks. Although Nigeria has sustainable banking guidelines, the integration of climate policy is more moderate than in advanced economies.

The index provides a conceptual measure of overall green monetary policy intensity, enabling comparative and empirical analysis of its impact on financial stability.

Financial Stability (Banks Z-Score)

Financial stability means that the financial system can absorb shocks, allocate resources efficiently, and preserve confidence in financial institutions. It is a core objective of monetary and regulatory authorities.

In this study, we use the bank Z-score as a proxy for financial stability, which measures the probability of insolvency through profitability, leverage, and volatility. The World Bank defines Z-score as a common indicator of bank soundness and risk (World Bank, n.d.).

In Nigeria, ensuring financial stability is a core mandate of the Central Bank of Nigeria, given the country’s exposure to macroeconomic volatility and external shocks. Climate-related risks increase vulnerabilities, including increased credit risk in climate-sensitive sectors and potential losses from stranded assets. Therefore, the Z-score serves as a reliable quantitative measure of the extent to which green monetary policy affects the resilience of the Nigerian banking sector.

GDP Growth Rate

The GDP growth rate measures economic output growth and is an important control variable in this study. It reflects the performance of the economy as a whole and influences financial stability and the efficiency of monetary policy. According to the World Bank (n.d.), GDP growth is one of the most important indicators of economic health and macroeconomic conditions. More growth usually means better performance for banks, a lower risk of defaults, and greater resilience in the financial system. In Nigeria, the main drivers of GDP growth are oil prices, fiscal policy, and structural economic conditions. The study controls for GDP growth to isolate the specific effect of green monetary policy on financial stability and ensure that broader macroeconomic fluctuations do not drive results.

Theoretical Literature

Green Finance Theory

The Green Finance Theory was introduced in the 2010s by scholars such as Jeongmin Lee and policy-oriented organisations, indicating the integration of environmental sustainability into financial systems. The theory suggests that financial markets and institutions can be organised to incentivise investments that are environmentally sustainable while reducing climate-related risks. Supporters argue that green finance improves the long-term resilience of the financial system by channelling capital flows to low-carbon and environmentally friendly sectors (D’Orazio & Thole, 2022; World Bank, 2020). This is consistent with the empirical studies by Zhou et al. (2022) and Al-Qudah et al. (2023) that green lending reduces credit risk and enhances the financial performance of banks. However, critics argue that green finance could generate inefficiencies and distortions in financial markets, especially when green classifications are ambiguous or politically driven (Flammer, 2021; Ehlers & Packer, 2017). This theory provides the conceptual basis for the current study, which tests the effects of proxies for green monetary policy (e.g., the green credit ratio and green asset purchases) on financial stability outcomes (e.g., bank Z-scores).

Moreover, Green Finance Theory assumes that integrating financial incentives with environmental objectives yields double dividends in sustainability and stability. Proponents argue that integrating climate considerations into financial systems minimises systemic risks from climate shocks and stranded assets (Bolton et al., 2020). Conversely, opponents of this view argue that the absence of harmonised green taxonomies and measurement frameworks undermines the credibility of green financial products and may lead to “greenwashing” (EBA, 2023; Ehlers et al., 2020). Nevertheless, the theory remains relevant because it identifies the evolving role of financial systems in addressing climate change. The present study tries to shed light on the contribution of green monetary policy tools in enhancing financial stability by reducing exposure to climate-related financial risks.

Theory of Financial Intermediaries

John Gurley and Edward Shaw developed the Financial Intermediation Theory in 1960 to explain how financial institutions channel funds from savers to borrowers. The theory is based on the idea that financial intermediaries reduce transaction costs, handle risk, and allocate resources efficiently in the economy (Gurley & Shaw, 1960). Proponents argue that efficient intermediation enhances financial stability by improving the allocation of credit and reducing information asymmetry (Diamond, 1984; Levine, 1997). In the area of green finance, theory suggests that banks can channel funds to environmentally sustainable projects, thereby

Green Monetary Policy and Financial Stability: An Empirical Analysis of Climate-Related Financial Risks in Nigeria

affecting both economic development and financial stability. However, critics argue that financial intermediaries can lead to a misallocation of resources due to agency problems, moral hazard, and market imperfections (Stiglitz & Weiss, 1981). This theory supports the current study by explaining how the allocation of green credit (green credit ratio) can affect bank stability by improving risk management and resource allocation.

Moreover, the Financial Intermediation Theory helps to understand the impact of policy interventions on financial behaviour. Proponents point out that banks play an important role in transmitting monetary policy signals to the real economy, including the signals of green monetary policy initiatives (Levine, 2005). However, critics argue that excessive intervention in credit allocation, for example, directing credit to specific sectors, can distort market efficiency and reduce profitability (Beck et al., 2010). However, the theory remains widely accepted as demonstrating the key role played by financial institutions in economic and financial stability. In this work, the green credit ratio is analysed as an important factor affecting banks' Z-scores, thereby linking lending behaviour to the financial system's resilience.

Modern Portfolio Theory (MPT)

Modern Portfolio Theory was pioneered by Harry Markowitz in 1952 and is based on the principle of diversification to reduce investment risk. The general concept of the theory is that investors can maximise their returns by diversifying and balancing the risk and return in their portfolio (Markowitz, 1952). Proponents argue that the inclusion of green assets in investment portfolios can reduce exposure to climate-related risks and improve long-term stability (Bolton et al., 2020; Friede et al., 2015). This is consistent with the idea that central bank purchases of green assets can improve financial stability by diversifying risk and supporting sustainable sectors. However, opponents argue that environmental, social and governance (ESG) investments are not always associated with higher financial returns and may impose additional limitations on portfolio optimisation (Berk & van Binsbergen, 2021). The theory supports the study in that it provides a basis for the analysis of the impact of green asset purchases on the stability of banks through risk diversification.

Modern Portfolio Theory emphasises the significance of risk-return trade-offs in financial decision-making. Supporters of sustainable investments claim that they can increase the resilience of a portfolio by lowering exposure to long-term risks like climate change (Friede et al., 2015). However, critics argue that ESG factors could be inconsistent with traditional financial goals and could limit investment efficiency (Berk & van Binsbergen, 2021). However, the theory remains relevant as a framework for understanding the impact of green financial assets on the stability of the overall financial system, despite these critiques. This paper rationalises the use of central bank green asset purchases as a proxy for green monetary policy and studies their potential impact on financial stability.

The theory of monetary policy transmission mechanism

The Monetary Policy Transmission Mechanism Theory was first proposed by John Maynard Keynes in 1936. It describes the impact of monetary policy decisions on economic activity through a series of channels including interest rates, credit, and asset prices. The theory assumes that changes in monetary policy affect financial conditions that in turn affect investment, consumption, and economic performance in general (Keynes, 1936). Some argue that monetary policy tools, including green monetary policy tools, can influence financial stability by altering credit flows and asset prices (Bernanke & Gertler, 1995). However, the effectiveness of monetary policy transmission may be limited by structural factors, including imperfections in financial markets and institutional constraints (Mishkin, 1996). The theory supports the study's explanation of how green monetary policy instruments can affect bank Z-scores through these transmission channels.

Besides, the theory highlights the role of central banks in determining financial conditions and economic outcomes. Proponents contend that embedding climate considerations into monetary policy can improve its efficacy in mitigating long-term risks (NGFS, 2024). Critics, however, warn that expanding the scope of monetary policy to include environmental goals could undermine its core objective of maintaining price stability (Goodhart, 2020). These debates notwithstanding, the theory remains essential for understanding how policy interventions affect financial systems. The paper develops a theory to analyse the effect of proxies for green monetary policy on financial stability.

Theory of financial stability

The Financial Stability Theory, and especially the Financial Instability Hypothesis developed by Hyman Minsky in 1986, explains how financial systems move from stability to instability through excessive risk-taking and leverage. The theory holds that periods of economic stability encourage risk-taking behaviour, which eventually leads to financial fragility and crises (Minsky, 1986). Supporters contend that regulation and policy interventions are necessary to promote financial stability and prevent systemic risks (Kindleberger & Aliber, 2011). In the climate finance literature, proponents argue that green monetary policy can reduce systemic risk by constraining exposure to high-carbon and climate-vulnerable assets (Bolton et al., 2020). However, critics argue

Green Monetary Policy and Financial Stability: An Empirical Analysis of Climate-Related Financial Risks in Nigeria

that excessive intervention can generate new risks and distort financial markets (Goodhart & Lastra, 2010). This theory informs the study by providing a framework for analysing how green monetary policy improves financial stability by reducing systemic risk. In addition, Minsky's theory emphasises the cyclical nature of financial instability and the importance of policy in preventing systemic risks. Advocates contend that mainstreaming climate considerations into financial regulation can help avert future crises associated with environmental risks (NGFS, 2020). However, the theory has been criticised for its limited predictive power and failure to fully account for the complexities of modern finance (Krugman, 2009). However, the theory remains influential in understanding the dynamics of the financial system, despite these criticisms. This study calls for an exploration of the role of green monetary policy in bolstering financial stability by mitigating emerging climate-related risks.

Empirical Literature

Aguila and Wullweber (2024). The Effectiveness of Green Monetary Policy in Europe: A Focus on Inflation and Financial Stability. The research employed econometric modelling and policy evaluation methods to analyse the impact of green monetary interventions on economic and financial outcomes. The paper found that green monetary policy can help stabilise financial systems while pursuing environmental objectives. The study concluded that green monetary policy is a viable tool for sustainable finance and recommended that central banks adopt targeted green asset purchase strategies.

Bouvatier et al. (2023) examined the validity of the bank Z-score as a proxy for financial stability across countries using time-series and panel econometric methods. The results show that the Z-score is a good indicator of the risk of bank insolvency and financial resilience. The paper concludes that the Z-score is appropriate for empirical research on financial stability and should be used in macro-financial studies.

Al-Qudah et al. (2023) investigated the effect of green lending on credit risk in the United Arab Emirates using panel regression analysis of bank-specific data. Results showed that green lending has a substantial impact on the decline of credit risk and enhancement of financial performance. It suggests that green finance increases stability in the banking sector and recommends policies that promote sustainable lending practices.

D’Orazio and Thole (2022) built a climate-related financial policy index based on the composite index methodology and panel data analysis to measure the level of green financial policymaking across countries. Their findings reveal that increased climate policy engagement enhances the resilience of the financial system. The policy inference is that policy integration enhances financial stability, and the policy suggestion is to create standardised climate-related monetary policy frameworks.

Zhou et al. (2022) investigated the relationship between green lending and bank credit risk in China and whether green credit improves financial stability, using a fixed-effects regression model and panel data of Chinese commercial banks. Results suggest green credit has a significant impact on reducing non-performing loans and improving bank stability, implying that green credit policies can strengthen financial resilience. The authors called for increased regulatory support for green lending to preserve financial stability.

Dikau and Volz (2021) investigated the role of green central bank monetary policy in supporting financial stability in advanced and emerging economies using a mixed-methods approach, combining qualitative and quantitative analyses based on policy analysis and cross-country evidence. Their results showed that green asset purchases and climate-related policy tools have a positive impact on financial stability through reducing exposure to climate risks. They concluded that central banks need to integrate sustainability into their monetary frameworks and that green quantitative easing programs should be expanded.

Flammer (2021) studied the impact of green bonds on firm performance and financial stability in the US, using an event-study approach and regression analysis. The study found that green bond issuance enhances financial performance and lowers risk, suggesting that sustainable finance instruments can support financial stability, and recommended more green bond issuance.

Bolton et al. (2020) used theoretical and empirical analyses within the Bank for International Settlements to study the implications of climate risks for global financial stability. The results showed that climate change poses systemic risks to financial systems and concluded that it is necessary to incorporate climate considerations into financial policy. The authors recommended adopting green monetary policies to mitigate these risks.

Friede et al. (2015) meta-analyzed more than 2,000 empirical studies on environmental, social, and governance (ESG) investments across the globe. The results indicated a positive relationship between ESG performance and financial performance, concluded that sustainable investments enhance financial stability, and suggested greater integration of ESG factors into financial decision-making.

Bernanke and Gertler (1995) studied the credit channel of monetary policy transmission in the United States through macroeconomic modelling and empirical analysis. They found that monetary policy significantly affects financial stability via credit markets. The authors argued that policy interventions influence bank behaviour and stability and recommended targeted monetary tools to improve financial outcomes.

Literature Gap

The existing literature on green finance and financial stability has several important gaps. Most studies are based on a single proxy, especially green lending, while ignoring a comprehensive framework that covers multiple dimensions of green monetary policy such as green credit, green asset purchases, and climate-related policy indices (Zhou et al., 2022; Al-Qudah et al., 2023). Moreover, although many studies examine macro-level policy debates, they generally do not establish a direct link between these policies and bank-specific indicators such as the Z-score, making it difficult to evaluate their effects on financial stability (Dikau & Volz, 2021; Aguila & Wullweber, 2024). There is also little empirical integration of composite indices, such as climate-related financial policy measures, into econometric models (D'Orazio & Thole, 2022).

Moreover, the literature is heavily skewed towards developed economies and emerging markets such as China, with little attention to Sub-Saharan Africa, particularly Nigeria (Bolton et al., 2020; World Bank, 2022). Many of the studies are cross-sectional or qualitative and do not employ panel data techniques to capture time dynamics. The importance of macroeconomic variables (e.g., the GDP growth rate) for financial stability (World Bank, 2021) is often overlooked. These gaps suggest the need for a more comprehensive, context-specific, and methodologically rigorous study that combines multiple proxies and focuses on Nigeria.

Summary of Literature

The literature generally supports the argument that green finance and green monetary policy can improve financial stability. Empirical studies have shown that green lending reduces credit risk and improves bank performance (Zhou et al., 2022; Al-Qudah et al., 2023). The bank Z-score, among other measures, is a well-established, reliable indicator of financial stability (Bouvatier et al., 2023). Moreover, green monetary policy measures, such as green asset purchases, support sustainable investments and reduce the financial system's vulnerability to climate-related risks, thereby strengthening financial system resilience (Dikau & Volz, 2021; Aguila & Wullweber, 2024). However, the literature presents mixed results and differing views. Some studies highlight the benefits of integrating climate considerations into financial systems due to systemic risks from climate change (Bolton et al., 2020), while others suggest that green finance can lead to inefficiencies or distortions when ESG standards are vague (Berk & van Binsbergen, 2021). Furthermore, variations in policy implementation across countries reveal that the effectiveness of green monetary policy is conditional on institutional capacity and macroeconomic conditions (D'Orazio & Thole, 2022). The literature highlights significant potential for green monetary policy to support financial stability. However, its influence remains context-dependent and requires further empirical validation, particularly in developing economies such as Nigeria.

3.0 METHODOLOGY

The study employed an ex post facto research design, using existing historical data on green monetary policy, bank Z-scores, and macroeconomic variables, with no manipulation. This design is suitable, as the study aims to determine the effects of the green credit ratio, central bank green asset purchases, the climate-related monetary policy index, and the GDP growth rate on the financial stability of Nigerian banks. Variables are secondary and have already occurred; the design allows for objective empirical analysis and hypothesis testing, but causal interpretations must be made with caution. The study population comprises Nigerian deposit money banks and relevant monetary and macroeconomic institutions that provide data on green monetary policy and financial stability. The sample will be drawn from selected deposit money banks with complete and reliable annual data for the period of study. This study requires banks with consistent financial statements and sufficient information to calculate bank Z-scores and other variables; therefore, a purposive sampling technique is used. This approach ensures that the panel data analysis is based on reliable and comparable observations across banks and over time, in line with empirical banking studies (Al-Qudah et al., 2023; Zhou et al., 2022). The study relies on secondary data, such as banks' annual reports, financial statements, banking sector databases, central bank publications, sustainable finance reports, climate-related financial policy databases, and macroeconomic sources. Financial stability is measured by the bank Z-score, which captures insolvency risk by considering profitability, capitalisation, and volatility (Bouvatier et al., 2023). The higher the Z-score, the higher the stability. We measure green monetary policy by the green credit ratio, central bank green asset purchases, and a climate-related monetary policy index. The control variable is the GDP growth rate. This is because macroeconomic conditions can influence bank profitability, loan quality, and financial resilience. The study specifies a panel regression model in which financial stability, measured by the bank Z-score, is modelled as a function of proxies for green monetary policy and the GDP growth rate. The functional form can be expressed as: $ZSCOR_{it} = f(GCR_{it}, CGAP_t, CMPI_t, GDPG_t)$, where ZSCOR is the bank Z-score. GCR is the green credit ratio. CGAP is the volume of central bank purchases of green assets, also known as green quantitative easing. CMPI is the climate-related monetary policy index. GDPG is the GDP growth rate. The econometric model is expressed as $ZSCOR_{it} = \beta_0 + \beta_1 GCR_{it} + \beta_2 CGAP_t + \beta_3 CMPI_t + \beta_4 GDPG_t + \mu_{it}$. In this model, β_0 is the intercept, β_1 – β_4 are the coefficients on the explanatory variables, μ is the error term, i is the bank,

Green Monetary Policy and Financial Stability: An Empirical Analysis of Climate-Related Financial Risks in Nigeria

and t is the time period. The model is suitable because it captures the direct effect of each proxy of green monetary policy, as well as the control effect of macroeconomic performance on financial stability. Descriptive statistics, correlation analysis, and panel regression will be used to analyse the data. Descriptive statistics will summarise the characteristics of the variables, and correlation analysis will indicate preliminary relationships among them. The main estimation technique will be based on fixed- and random-effects panel regression models, and a Hausman test will be conducted to select the most suitable model. Diagnostic tests for multicollinearity, heteroskedasticity, serial correlation, and cross-sectional dependence will ensure the robustness of the results. The hypotheses will be tested at the 5% significance level, and the null hypothesis will be rejected if the p-value is less than 0.05. The signs and magnitudes of the coefficients will indicate whether each green monetary policy proxy is pro- or counter-financial stability.

4.0 RESULTS AND DISCUSSION OF FINDINGS

Descriptive Statistics

Table 4.1: Descriptive Statistics

	ZSCOR	GCR	CGAP	CMPI	GDPG
Mean	18.397467	6.671945	57.318182	38.272727	1.872727
Median	17.171916	6.506500	38.000000	35.000000	2.700000
Maximum	33.178988	12.691000	165.000000	67.000000	3.600000
Minimum	11.947528	1.475000	0.000000	18.000000	-1.800000
Std. Dev.	4.673075	2.920441	54.124505	15.787237	1.858820
Skewness	0.925255	0.210637	0.736771	0.432081	-1.105065
Kurtosis	3.346244	2.024488	2.211288	1.928615	2.729065
Jarque-Bera	16.244582	5.175019	12.803035	8.683767	22.724545
Probability	0.000297	0.075207	0.001659	0.013012	0.000012
Sum	2023.721383	733.914000	6305.000000	4210.000000	206.000000
Sum Sq. Dev.	2380.301726	929.658358	319311.363636	27166.818182	376.618182
Observations	110	110	110	110	110

Source: Researchers' computation using E-view

Table 4.1 presents the descriptive statistics for ZSCOR, GCR, CGAP, CMPI, and GDPG across 110 observations. The mean ZSCOR is 18.397467, and the median is 17.171916, indicating that the banks recorded a moderate level of financial stability. The minimum and maximum values of 11.947528 and 33.178988 indicate variation among banks, and the standard deviation of 4.673075 confirms the moderate dispersion.

The green credit ratio has a mean of 6.671945 and a median of 6.506500, indicating a moderate level of green lending among banks. The minimum is 1.475000, and the maximum is 12.691000, indicating differences in banks' green credit activities. The standard deviation is 2.920441, which indicates moderate variation. The Jarque–Bera probability value of 0.075207 is greater than 0.05, so we accept/fail to reject the normality hypothesis for GCR.

The average for CGAP is 57.318182, and the median is 38.000000, indicating that buying of green assets is not evenly distributed. The minimum value is 0.000000, the maximum is 165.000000, and the high standard deviation of 54.124505 indicates a large spread. The Jarque–Bera probability is 0.001659, which is less than 0.05. This results in rejection of the normality hypothesis for CGAP.

The CMPI has a mean of 38.272727, a median of 35.000000, a minimum of 18.000000, and a maximum of 67.000000, indicating variation in the intensity of climate-related monetary policy. Its Jarque–Bera probability is 0.013012, so the normality is rejected. GDPG has a mean of 1.872727, a median of 2.700000, a minimum of -1.800000, and a maximum of 3.600000. Also, its Jarque–Bera probability of 0.000012 implies that normality is rejected.

However, the descriptive statistics alone cannot accept or reject the main research hypotheses regarding the effects of GCR, CGAP, CMPI, and GDPG on financial stability. Table 4.1 describes the nature, spread, and distribution of the variables. The panel regression results, including coefficients, t-statistics, F-statistics, and values, should be used to test the hypotheses. The normality of ZSCOR, CGAP, CMPI, and GDPG is rejected in Table 4.1, but not for GCR.

Table 4.2: Coefficient-Only Correlation Matrix

ZSCOR	GCR	CGAP	CMPI	GDPG
-------	-----	------	------	------

Green Monetary Policy and Financial Stability: An Empirical Analysis of Climate-Related Financial Risks in Nigeria

ZSCOR	1.000000	0.885740	0.908862	0.905312	0.526266
GCR	0.885740	1.000000	0.933032	0.955946	0.495423
CGAP	0.908862	0.933032	1.000000	0.991438	0.539880
CMPI	0.905312	0.955946	0.991438	1.000000	0.539385
GDPG	0.526266	0.495423	0.539880	0.539385	1.000000

Source: Researchers' computation using E-view

Table 4.2 presents the correlation matrix of the coefficients for ZSCOR, GCR, CGAP, CMPI, and GDPG across 110 observations. As ZSCOR measures financial stability, the correlation coefficients indicate the direction and magnitude of the association between financial stability and each explanatory variable. The results show that all the variables are positively related to ZSCOR, implying that increases in green monetary policy variables and GDP growth are associated with higher bank financial stability.

The green credit ratio has no significant effect on financial stability for H_{01} . The correlation coefficient between GCR and ZSCOR is 0.885740. This indicates a strong positive relationship, i.e., the higher the green credit activity, the closer it is to bank stability. With such a high coefficient, we reject H_{01} and accept the alternative hypothesis. This suggests that the green credit ratio is closely linked to financial stability.

The coefficient for H_{02} (central bank green asset purchases do not have a significant effect on financial stability) between CGAP and ZSCOR is 0.908862. This is a very strong positive relationship. It shows that increases in green asset purchases are associated with improvements in financial stability. Therefore, H_{02} is rejected, and the alternative hypothesis is accepted. For H_{03} , the coefficient between CMPI and ZSCOR indicates that the effect of the climate-related monetary policy index on financial stability is insignificant, with a coefficient of 0.905312. This is a very strong positive correlation. This suggests that higher commitment to climate-related monetary policy is associated with higher bank Z-scores. Therefore, H_{03} is rejected, and the alternative hypothesis is accepted.

For H_{05} , stating that the GDP growth rate has no significant effect on financial stability, the correlation between GDPG and ZSCOR is 0.526266. This shows a moderate positive relationship: better economic growth is associated with greater bank stability. Thus, the positive coefficient implies rejection of H_{05} . However, using only a coefficient correlation matrix, the H_{04} that green monetary policy proxies have no significant joint effect on financial stability cannot be fully accepted or rejected because to assess a joint effect, one needs to have a regression output, especially the F-statistic and its probability value. However, because GCR, CGAP and CMPI are all strongly positively correlated with ZSCOR, the table provides initial evidence that proxies for green monetary policy are jointly related to financial stability.

Table 4.3: Panel Regression Result

Panel option: Cross-section fixed effects

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19.092868	1.753528	10.888258	0.0000
GCR	1.665707	0.310120	5.371170	0.0000
CGAP	0.133000	0.020231	6.574134	0.0000
CMPI	-0.490161	0.115178	-4.255690	0.0000
GDPG	0.181198	0.065332	2.773471	0.0067

Table 4.3.1: Effects Specification: Cross-section fixed effects

Regression Statistics	Value	Regression Statistics	Value
R-squared	0.955398	Mean dependent var	18.397467
Adjusted R-squared	0.949358	S.D. dependent var	4.673075
S.E. of regression	1.051617	Akaike info criterion	3.056948
Sum squared resid	106.166193	Schwarz criterion	3.400645
Log likelihood	-154.132133	Hannan-Quinn criterion	3.196353
F-statistic	158.182335	Durbin-Watson stat	2.175820
Prob(F-statistic)	0.000000		

Source: Researcher's computation using EViews

Green Monetary Policy and Financial Stability: An Empirical Analysis of Climate-Related Financial Risks in Nigeria

The estimated model is: $ZSCOR = 19.092868 + 1.665707GCR + 0.133000CGAP - 0.490161CMPI + 0.181198GDPG$

The panel regression is based on the study model, in which ZSCOR is the measure of financial stability, while GCR, CGAP, CMPI, and GDPG are explanatory and control variables. The research paper further reveals that hypotheses were tested at the 5% significance level, and thus a probability value of less than 0.05 was used to reject the null hypothesis. The results indicate that GCR has a positive and significant impact on financial stability with a coefficient of 1.665707, a t-statistic of 5.371170, and a probability value of 0.0000. This means that an increase in the green credit ratio raises the bank's Z-score, indicating that green lending improves financial stability. Hence, H_{01} is rejected.

The impact of CGAP on financial stability is positive and significant. Its coefficient is 0.133000, the t-statistic is 6.574134, and the probability is 0.0000. This implies that central bank purchases of green assets make banks more stable. Hence, H_{02} is rejected.

The coefficient of CMPI on financial stability is -0.490161, with a t-statistic of -4.255690 and a probability value of 0.0000, indicating a significant negative impact on financial stability. This suggests that the climate-related monetary policy index has a significant effect on financial stability; however, the effect is negative in this model. Hence, H_{03} is rejected. However, the effect is adverse.

GDPG has a positive and significant impact on financial stability with a coefficient of 0.181198, a t-statistic of 2.773471, and a probability value of 0.0067. This suggests that economic growth supports financial stability. Therefore, H_{05} is rejected.

The overall model is statistically significant as the F-statistic is 158.182335 with a p-value of 0.000000, which is less than 0.05. This implies that the explanatory variables jointly affect financial stability. Thus, we do not accept H_{04} . The value of R-squared is 0.955398, indicating that the model explains approximately 95.54% of the variance in financial stability. The Durbin-Watson statistic of 2.175820 means that there is no serious autocorrelation problem.

DISCUSSION OF THE FINDINGS

The result for the green credit ratio (GCR) is in strong agreement with the empirical studies cited in the review. The present study found that GCR has a positive and significant effect on financial stability, with a coefficient of 1.665707 and a probability value of 0.0000, indicating that an increase in green lending would improve the bank Z-score and enhance bank stability. This is in line with Zhou et al. (2022), who found that green lending reduces non-performing loans and improves bank stability in China, and Al-Qudah et al. (2023), who found that green lending reduces credit risk and improves financial performance in the UAE. It is also consistent with Bouvatier et al. (2023), who use the bank Z-score as a valid indicator of financial stability. This finding is consistent with Green Finance Theory, which argues, in theory, that redirecting finance to environmentally sustainable sectors reduces climate-related financial risks. It also complies with the Financial Intermediation Theory, as banks have been shown to increase stability by channelling credit to productive, less climate-vulnerable sectors.

The result on central bank green asset purchases (CGAP) is also consistent with the empirical literature. The result indicates that CGAP has a positive and significant impact on financial stability, with a coefficient value of 0.133000 and a probability value of 0.0000. This proves that green asset purchases enhance bank stability in Nigeria. This is consistent with the finding of Dikau and Volz (2021) that green monetary policy instruments by central banks, such as green asset purchases, reduce exposure to climate-related risks and support financial stability. It also aligns with the results of Aguila and Wullweber (2024), who find that green monetary interventions can stabilise financial systems while pursuing environmental goals. Similarly, the result supports Flammer (2021), who found that green bonds increase financial performance and decrease risk. Theoretically, this finding is consistent with the Modern Portfolio Theory, which emphasises risk diversification. Buying green assets can reduce exposure to carbon-intensive and climate-risk assets. It is also consistent with the Monetary Policy Transmission Mechanism Theory, as the central bank's decision to buy assets affects credit flows, asset prices, and financial conditions.

The results on the climate-related monetary policy index (CMPI) is somewhat at odds with some of the previous studies cited in the empirical review. Although the correlation matrix indicated an initial positive correlation between CMPI and financial stability, the panel regression results revealed a significant negative effect with a coefficient of -0.490161 and a p-value of 0.0000. This suggests that climate-related monetary policy integration has a significant impact on financial stability. However, in this model, the effect is negative. This contrasts with D'Orazio and Thole (2022), who find that increased climate-policy engagement enhances the resilience of the financial system. The latter is also at odds with Bolton et al. (2020) and Dikau and Volz (2021), who argue that embedding climate risks in financial policy should reduce systemic risk. However, the result is consistent with the critical view in the existing literature, particularly the argument that green finance may lead to distortions, inefficiencies, or implementation challenges, especially if green classification, institutional capacity, and policy coordination are weak. The finding challenges the optimistic view of Green Finance Theory to some extent, at least in theory. However, it aligns with its critical stance, suggesting that poorly implemented green policies or immature markets can create unintended financial risks.

Results on the GDP growth rate (GDPG) and the model's joint effect are also consistent with empirical and theoretical expectations. GDPG has a positive and significant effect on financial stability. The coefficient of GDPG is 0.181198, and the probability value is

Green Monetary Policy and Financial Stability: An Empirical Analysis of Climate-Related Financial Risks in Nigeria

0.0067. This means that the stronger the economic growth, the better for bank stability. The model as a whole is significant with an F-statistic of 158.182335 and a probability value of 0.000000. In contrast, the R-squared value of 0.955398 indicates that the explanatory variables together explain about 95.54% of the variation in financial stability. This aligns with the broader empirical survey, which reveals that green monetary policy, sustainable finance and macroeconomic environment jointly shape financial resilience. The overall result is consistent with Financial Stability Theory in general and Minsky's view that policy intervention is needed to reduce systemic risk in particular. The negative coefficient on CMPI, however, also suggests the need for careful intervention design. The study is thus generally in line with previous research and theory on green credit, green asset purchases, GDP growth, and joint policy effects. However, it is at odds with the generally positive expectations on the climate-related monetary policy index, as the Nigerian results show a significant adverse effect.

5.0 CONCLUSION AND RECOMMENDATIONS

Conclusion

In conclusion, this study examines Green Monetary Policy and Financial Stability, specifically the effect of the green credit ratio, central bank green asset purchases, the climate-related monetary policy index, and the GDP growth rate on the financial stability of Nigerian banks. The results show that green monetary policy has a positive and significant impact on Nigeria's financial stability, although each policy indicator exerts distinct effects. The positive and significant effect of the green credit ratio suggests that the greater the lending to environmentally sustainable sectors, the more it helps improve banks' stability by reducing their exposure to climate-sensitive and high-risk sectors. Likewise, the positive impacts of central bank green asset purchases highlight that green quantitative easing or purchases of green financial assets can enhance bank resilience by increasing liquidity, promoting sustainable markets, and reducing systemic risk from carbon-intensive assets. Furthermore, positive GDP growth indicates that a favorable macroeconomic environment enhances bank stability by increasing repayment capacity, profitability, and the overall strength of the financial system.

The large negative effect of the climate-related monetary policy index suggests that policy commitment alone may not automatically enhance financial stability where the institutional, regulatory, and market frameworks are weak. In Nigeria, the introduction of climate-related monetary policy could force banks to change, especially as green taxonomies, data systems, disclosure standards, and implementation capacity evolve. The overall significance of the model suggests that green monetary policy indicators along with GDP growth explain variations in financial stability; thus, climate-related financial risks are interlinked with monetary and banking-sector stability. Therefore, the study highlights the importance of green monetary policy as a crucial tool for enhancing Nigeria's financial system if it is properly designed with proper coordination between the Central Bank of Nigeria and financial institutions, improved green finance data, and phased implementation that balances environmental sustainability and the preservation of a resilient and stable financial system.

Recommendations

The Central Bank of Nigeria and deposit money banks should increase lending to green sectors, including renewable energy, climate-smart agriculture, waste management, and sustainable infrastructure, as a higher green credit ratio significantly improves financial stability. This might be done through a clear green credit framework, minimum green lending targets, incentives for verified green loans, staff training, and climate risk screening in the loan appraisal process.

Given that the central bank's purchase of green assets has a positive and significant impact on financial stability, the CBN should gradually introduce such programs. This can be done by supporting sovereign and corporate green bonds, accepting qualified green bonds as collateral, enhancing liquidity in green bonds, and ensuring independent verification to prevent greenwashing.

Due to the significant negative effect of the monetary policy index associated with climate, climate-related policy should be implemented cautiously. Before imposing strict requirements on banks, the CBN should strengthen green taxonomies, climate risk disclosure, data systems, and pilot climate stress tests to ensure that policy implementation does not undermine bank profitability or lending stability.

Since GDP growth has a positive and significant effect on financial stability, green monetary policy should be accompanied by policies that promote broader economic growth. This should be done through the coordination of monetary, fiscal, industrial, and environmental authorities, with incentives for productive green sectors that can create jobs, improve repayment capacity, and enhance bank performance.

This is because green monetary policy proxies impact financial stability simultaneously; Nigeria should adopt an integrated green monetary policy framework. This should be achieved through a coordination platform comprising the CBN, the Ministry of Finance, the Ministry of Environment, the SEC, the NDIC, banks, and capital market operators to monitor climate-related financial risks and review the impact of green policies on bank stability.

REFERENCES

- 1) Aguila, N., and Wullweber, J. (201). (2024). Greener and cheaper: Green monetary policy in times of inflation and high interest rates. *Eurasian Economic Review*, 14, 39–60. <https://doi.org/10.1007/s40822-024-00266-y>
- 2) Al-Qudah, A. A., Hamdan, A., Al-Okaily, M. & Alhaddad, L. (2023). Impact of green lending on credit risk: Evidence from banks in UAE. *Environmental Science and Pollution Research*, 30 (22), 61381–61393. <https://doi.org/10.1007/s11356-021-18224-5>
- 3) Bank of England. (2021). Greening the corporate bond purchase scheme. <https://www.bankofengland.co.uk/>
- 4) Beck, T., Demirgüç-Kunt, A. and Levine, R. (2010). Financial markets and institutions. The World Bank. <https://doi.org/10.1596/978-0-8213-8378-3>
- 5) Berk, J., and van Binsbergen, J. (2021). The effect of ESG investing. *Journal of Financial Economics*. <https://doi.org/10.1016/j.jfineco.2021.06.019>
- 6) Bernanke, B., and Gertler, M. (1995). In the black box: The credit channel of monetary transmission policy. *Journal of Economic Perspectives*, 9(4), 27–48. <https://doi.org/10.1257/jep.9.4.27>
- 7) Bolton, P., Després, M., Pereira da Silva, L. A., Samama, F., & Svartzman, R. (2020). The green swan: central banking and financial stability in an age of climate change. International Bank for Settlements. <https://www.bis.org/publ/othp31.pdf>
- 8) Bouvatier, V., Lepetit, L., Rehault, P.-N. & Strobel, F. (2023). Best practice: Time-varying Z-score measures of bank insolvency risk. *Journal of Empirical Finance* 73, 170–179. <https://doi.org/10.1016/j.jempfin.2023.06.002>
- 9) CBN. (2012). Principles of Sustainable Banking in Nigeria. <https://www.cbn.gov.ng/>
- 10) Diamond, D. W. (1984). Delegated monitoring and financial intermediation. *Review of Economic Studies* 51(3): 393–414. <https://doi.org/10.2307/2297430>
- 11) Dikau, S. & Volz, U. (2021). Central bank requirements, sustainability objectives and the promotion of green finance. *Ecological Economics* 184, Article 107022. <https://doi.org/10.1016/j.ecolecon.2021.107022>
- 12) D’Orazio, P. (2023). Dataset of climate-related financial policy index. *Data in Brief*, 49, 109365. <https://doi.org/10.1016/j.dib.2023.109365>
- 13) D’Orazio, P. and Thole, S. (2022). Financial policy index related to climate. *Ecological Indicators* 146, Article 109065. <https://doi.org/10.1016/j.ecolind.2022.109065>
- 14) Ehlers, T., Mojon, B. & Packer, F. (2020). Climate risk and green bonds. *BIS Quarterly Review*. https://www.bis.org/publ/qtrpdf/r_qt2009c.pdf
- 15) Ehlers, T. & Packer, F. (2017). Green bond finance and certification. *BIS Quarterly Review* https://www.bis.org/publ/qtrpdf/r_qt1709f.pdf
- 16) European Banking Authority. (2023). View on green loans and mortgages. <https://www.eba.europa.eu/>
- 17) European Central Bank (2021). The ECB has developed an action plan to incorporate climate change considerations into its monetary policy strategy. <https://www.ecb.europa.eu/>
- 18) European Central Bank (2025). Climate factors in corporate bond purchases. <https://www.ecb.europa.eu/home/html/index.en.html>
- 19) Flammer, C. (2021). Green bonds issued by corporations. *Journal of Financial Economics*, 142 (2), 499–516. <https://doi.org/10.1016/j.jfineco.2021.01.010>
- 20) Friede, G., Busch, T., Bassen, A. (2015). ESG and financial performance: Meta-analysis of over 2,000 empirical studies. *Journal of Sustainable Finance and Investment*, 5(4), 210–233.
- 21) Goodhart, C. (2020). Monetary policy and climate change. <https://voxeu.org/>
- 22) Gurley, J. G., & Shaw, E. S. (1960). Money in a theory of finance. Brookings Institution.
- 23) International Monetary Fund (2020). Guide for the compilation of financial soundness indicators. <https://www.imf.org>
- 24) Keynes, J. M. (1936). The general theory of money and interest in employment. Macmillan.
- 25) Kindleberger, C. P., and Aliber, R. Z. (2011). Manias, Panics, and Crashes: A History of Financial Crises. Palgrave Macmillan.
- 26) Krugman, P. (2009). How did economists get it so wrong? The New York Times. <https://www.nytimes.com>
- 27) Levine, R. (1997). Financial development and economic growth: Issues and prospects. *Journal of Economic Literature*, 35(2), 688–726.
- 28) Levine R. (2005). Theory and evidence. Growth and finance. In P. Aghion & S. N. Durlauf (Eds.), *Handbook of economic growth* 1(1), 865–934. Elsevier [https://doi.org/10.1016/S1574-0048\(05\)01012-9](https://doi.org/10.1016/S1574-0048(05)01012-9)
- 29) Markowitz, H. (1952). Portfolio choice. *The Journal of Finance* 7 (1): 77–91. <https://doi.org/10.1111/j.1540-6261.1952.tb01525.x>
- 30) Minsky, H. P. (1986). Keeping an unstable economy stable. University Press.
- 31) Mishkin, F. S. (1996). The channels of monetary transmission: Lessons for monetary policy. NBER Working Paper No. 5464. National Bureau of Economic Research. <https://www.nber.org>

- 32) Network for Greening Financial System. (2020). Supervisory guidance on incorporating environmental and climate-related risks into prudential supervision. <https://www.ngfs.net>
- 33) Network for Greening the Financial System. (2024). The green transition and macroeconomy. <https://www.ngfs.net/>
- 34) Network for Greening the Financial Systems (2025). Climate and green monetary policies as financial risk. <https://www.ngfs.net/>
- 35) Organisation for Economic Co-operation and Development (OECD). (2026). Real GDP Index. <https://www.oecd.org/en/data/indicators/real-gross-domestic-product-gdp.html>
- 36) Schinasi, G.J. (2004). Defining Financial Stability. IMF Working Paper No. 04/187. IMF. <https://doi.org/10.5089/9781451859546.001>.
- 37) Stiglitz, J. E. & A. Weiss. (1981). Credit Rationing in Markets with Asymmetric Information. American Economic Review 71(3), 393–410.
- 38) World Bank (2020). Report on green finance. <https://documents.worldbank.org/>
- 39) The World Bank. (2021). Green loans: What you should know. <http://www.worldbank.org>
- 40) Bank, World. (2022). World development report. <https://www.worldbank.org>
- 41) The World Bank. (no date) Z-score of the bank. <https://databank.worldbank.org/>
- 42) World Bank. (n.d.). Annual GDP growth (%) <https://worldbank.org/data>
- 43) Zhang, D., Mohsin, M., Rasheed, A. K., Chang, Y., & Taghizadeh-Hesary, F. (2021). Green Finance: The Mediating Role of Public Expenditure on Green Economic Growth in BRI Region. Energy Policy, 153 (2023) 112256.
- 44) Zhou, X., Caldecott, B., Hoepner, A. G. F., Wang, Y. (2022). Bank green lending and credit risk: Evidence from China. Business Strategy and the Environment, 31(4), 1623–1640. <https://doi.org/10.1002/bse.2973>



There is an Open Access article, distributed under the term of the Creative Commons Attribution – Non Commercial 4.0 International (CC BY-NC 4.0) (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits remixing, adapting and building upon the work for non-commercial use, provided the original work is properly cited.