

DETERMINANTS OF GREEN CREDIT DISTRIBUTION:

A CASE STUDY ON GREEN BANKING IN INDONESIA

A THESIS



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YOGYAKARTA
2025**

TITLE PAGE

Determinants of Green Credit Distribution: A Case Study on Green Banking in
Indonesia

A BACHELOR'S THESIS

Written and filed to accomplish the final exam requirements to obtain a
Bachelor's degree in the Economic Development International Program, Faculty
of Business and Economics, Universitas Islam Indonesia

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2025**

DECLARATION OF AUTHENTICITY

Here I declare the originality of the thesis; I have not presented anyone else's work to obtain my university degree, nor have I presented anyone else's words, ideas, or expression without acknowledgment. All quotations are cited and listed in the bibliography of the thesis.

If this declaration is false in the future, I am willing to accept any sanction that complies with the determined regulation or its consequences.

Yogyakarta, 23 October 2025



A handwritten signature in black ink, appearing to read 'Hani Nur Anisyah', is written over the banknote.

Hani Nur Anisyah

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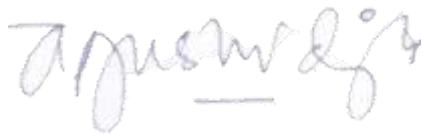
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DEVELOPMENT ECONOMICS MAJOR
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No: 173/Ka.ProdiEp/10/Prodi.Ep/UTA/XI/2025**

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**DETERMINANTS OF GREEN CREDIT DISTRIBUTION: A CASE STUDY ON GREEN BANKING
IN INDONESIA**

A BACHELOR DEGREE THESIS

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MOTTO

God Would Not Carry You This Far Merely To Let You Fall.

ACKNOWLEDGEMENT

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

In the name of Allah, the Most Gracious and Most Merciful, all praises and gratitude are due to Him, the Creator and Sustainer of the universe. I express my deepest thanks to Allah SWT for His countless blessings, incomparable mercy, and the strength granted to complete this thesis.

I convey my prayers and greetings to our beloved Prophet Muhammad SAW, a perfect example of patience, strength, and nobility. Through his teachings, I find inspiration to navigate the challenges of life. With great hope, I seek his intercession on the Day of Judgment and yearn to meet him at Al-Kawthar.

With heartfelt humility, I offer this small work as a token of gratitude and devotion to Allah SWT, who has blessed me with opportunities and guidance throughout this journey.

This thesis, titled “**Determinants of Green Credit Distribution: A Case Study on Green Banking in Indonesia,**” is presented as a requirement for obtaining a Bachelor's Degree in Economics from Universitas Islam Indonesia. I dedicate this thesis to:

1. Allah SWT, I acknowledge Allah SWT with the deepest gratitude for His endless mercy and blessings, which enabled me to complete this thesis successfully.
2. My Beloved Parents, Mr. Darmawansyah and Mrs. Suryani, thank you for your unwavering support, prayers, and encouragement. Your sacrifices and love have been my greatest strength throughout this journey.
3. Prof. Drs. Agus Widarjono, M.A., Ph.D. I am profoundly grateful to my thesis advisor for his patience, dedication, and guidance, all of which have been invaluable in completing this thesis.

4. Mr. Awan Setya Dewanta. I extend my gratitude to Mr. Awan Setya Dewanta, Secretary of the IUP Development Economics Program, for his continuous guidance and support from the very first semester until the end of my studies.
5. Mr. Abdul Hakim. My sincere thanks for your guidance and support as Head of the Development Economics Program, which significantly shaped my academic journey.
6. Universitas Islam Indonesia. I am deeply grateful to UII, especially the Faculty of Economics and the Department of Development Economics, for the valuable opportunity and support it has given me for my academic and personal growth.
7. To my partners in crime, Hana Nur Aisyah and Hasna Nur Aisyah, your endless mischief keeps life interesting, and you two never fail to inspire me to be the coolest big sister ever. I will do my best to make you proud.
8. Bunda Indah Permata Sari. Thank you for being a part of this small family and for your unwavering support.
9. To my amazing classmates (Dian, Vita, Dhita, Dhicko, Zenath), thank you for the laughs and memories. Our little class was the liveliest! I wish you all success and happiness ahead.
10. To El, who I first met on Mount Atin in late August 2025 and who has made everything feel lighter ever since. Thank you for the steady support and the kind of presence that always feels like home.
11. To those who have stood by me, listened to my stories, and supported me during my time in Yogyakarta (Aurora, HBW, Elder Radi), thank you for always being there.
12. My cute and lovable little sister (Shaynala Tavisha Ramadhani) never fails to make me laugh, even in the midst of all the thesis chaos.
13. IUP Faculty Staff (Mrs. Alfi, Mrs. Annisa, and Mrs. Putri): I want to thank the staff of the IUP Faculty of Business and Economics for their guidance and assistance from my first semester until now.
14. My dear cat, Beef, I hope you are always healthy and happy. You were my companion during two semesters of studying in Yogyakarta, and I hope there will be a chance to revisit you someday.

Through perseverance, belief, and the invaluable support of those around me, I have learned important lessons in discipline, patience, and dedication while writing this thesis.

I acknowledge my limitations and the areas where I still have much to learn. Therefore, I extend my sincerest gratitude to everyone who has guided and supported me in completing this work. May Allah SWT bless your kindness abundantly.

Yogyakarta, 15 November 2025

Writer,

Hani Nur Anisyah

TABLE OF CONTENTS

TITLE PAGE.....	ii
DECLARATION OF AUTHENTICITY.....	iii
ADVISORS' APPROVAL.....	iv
BOARD OF EXAMINERS APPROVAL.....	v
ACKNOWLEDGEMENT.....	vii
TABLE OF CONTENTS.....	x
LIST OF TABLES.....	xiii
LIST OF FIGURES.....	xiv
LIST OF APPENDICES.....	xv
ABSTRACT.....	xvi
ABSTRAK.....	xvii
CHAPTER I. INTRODUCTION.....	1
1.1 Background.....	1
1.2 Problem Formulation.....	7
1.3 Research Objective.....	7
1.4 Research Contribution.....	8
1.5 Systematic of Writing.....	8
CHAPTER II. LITERATURE REVIEW.....	10
2.1 Literature Review.....	10
2.2 Theoretical Framework.....	11
2.2.1 Concept of Green Banking and Green Loan.....	11
2.2.2 Sustainable Finance Theory.....	12
2.2.3 Agency Theory.....	13
2.2.4 Signaling Theory.....	14
2.2.4 Stakeholder Theory.....	14
2.2.5 Macroeconomic Credit Theory.....	15
2.3 Relationship between Dependent and Independent Variable.....	16
2.4 Research Framework.....	18
2.5 Hypothesis Formulation.....	19
CHAPTER III. RESEARCH METHODS.....	21

3.1 Data and Data Source.....	21
3.2 Definition of Operational Variables.....	21
3.2.1 Dependent Variable.....	23
3.2.2 Independent Variable.....	23
3.3 Analysis Methods.....	25
3.3.1 Common Effect Model (CEM)	26
3.3.2 Fixed Effect Model (FEM)	28
3.3.3 Random Effect Model (REM)	29
3.4 Selection on Estimation Model.....	30
3.4.1 F-Test (Chow Test).....	30
3.4.2 Breusch–Pagan Lagrange Multiplier (LM Test).....	31
3.4.3 Hausman Test.....	32
3.5 Statistical Testing.....	32
3.5.1 Partial Statistical Test (t-Test).....	33
3.5.2 Simultaneous Statistical Test (F-Test).....	33
3.5.3 Coefficient of Determination Test (R-Square Test).....	34
CHAPTER IV. DATA ANALYSIS AND DISCUSSION.....	35
4.1 Data Description.....	35
4.2 Regression Result.....	41
4.2.1 Common Effect Model (CEM)	41
4.2.2 Fixed Effect Model 9FEM)	40
4.2.3 Random Effect Model (REM)	40
4.3 Selection of the Estimation Model.....	41
4.3.1 Chow Test.....	42
4.3.2 Lagrange Multiplier Test.....	43
4.3.3 Hausman Test.....	44
4.4 Regression Analysis.....	44
4.4.1 Coefficient of Determination (R-squared)	45
4.4.2 F-Test.....	45
4.4.3 T-Test.....	46
4.5 Discussion.....	48

4.5.1 Analyzing the Effect of Return on Assets (ROA) on Green Credit Distribution.....	48
4.5.2 Analyzing the Effect of Total Assets on Green Credit Distribution.....	48
4.5.3 Analyzing the Effect of Capital Adequacy Ratio (CAR) on Green Credit Distribution.....	49
4.5.4 Analyzing the Effect of Cost to Income Ratio (CIR) on Green Credit Distribution.....	50
4.5.5 Analysing the Effect of Non-Performing Loan (NPL) on Green Credit Distribution.....	50
4.5.6 Analyzing the Effect of Gross Domestic Product (GDP) on Green Credit Distribution.....	51
CHAPTER V. CONCLUSION AND SUGGESTION.....	53
5.1 Conclusion.....	53
5.2 Suggestion.....	54
REFERENCES.....	1
APPENDICES.....	7

LIST OF TABLES

Table 2.1 Literature Review.....	10
Table 3.1 List of Research Data and Data Source.....	22
Table 4.1 List of Research Samples.....	35
Table 4.2 Result of Descriptive Statistics Variable Analysis.....	38
Table 4.3 Common Effect Model Test Result.....	39
Table 4.4 Fixed Effect Model Test Result.....	40
Table 4.5 Random Effect Model Test Result.....	41
Table 4.6 Result of F-Test.....	43
Table 4.7 Result of LM – Test.....	44
Table 4.8 Result of Hausman Test.....	44
Table 4.9 Result of Panel Regression with Random Effect Model.....	45
Table 4.10 Result of T-Test.....	46

LIST OF FIGURES

Figures 1.1 Green Bond Issuance in Asia Pacific Countries.....	3
Figures 2.1 Research Framework.....	19

LIST OF APPENDICES

Appendix 1 Research data tabulation.....	7
Appendix 2 Estimated Results from Common Effect Model (CEM) Regression	11
Appendix 3 Estimated Results from Fixed Effect Model (FEM) Regression.....	12
Appendix 4 Estimated Results from Random Effect Model (REM) Regression...	13
Appendix 5 Chow Test Estimate Result.....	14
Appendix 6 Lagrange Multiplier Results.....	15
Appendix 7 Hausman Estimate Result.....	16

ABSTRACT

Green credit has become an essential instrument in advancing Indonesia's sustainable development agenda, yet empirical evidence on the drivers of its distribution remains limited. This study seeks to examine the determinants of green credit allocation among Indonesian banks that implement green banking practices. Employing unbalanced panel data from 34 banks over the 2018–2024 period, the analysis utilizes a Random Effect Model selected through the Chow, LM, and Hausman specification tests. The model incorporates ROA, Total Assets, CAR, CIR, NPL, and GDP as explanatory variables. The empirical results reveal that ROA and Total Assets exert a significant positive influence on green credit distribution, whereas CIR demonstrates a significant negative effect. Conversely, CAR, NPL, and GDP show no statistically significant impact. These findings underscore the predominance of internal financial conditions over macroeconomic factors in shaping banks' green lending decisions within the Indonesian context.

Keyword : *Green Credit, Green Banking, Panel Data, Bank Performance, Sustainable Finance, Indonesia*

ABSTRAK

Green credit merupakan instrumen penting dalam mendukung agenda pembangunan berkelanjutan di Indonesia, namun bukti empiris mengenai faktor-faktor yang memengaruhi penyalurannya masih terbatas. Penelitian ini bertujuan untuk mengidentifikasi determinan yang memengaruhi distribusi green credit pada bank-bank yang menerapkan praktik green banking di Indonesia. Dengan menggunakan data panel tidak seimbang dari 34 bank selama periode 2018–2024, analisis dilakukan menggunakan Random Effect Model yang dipilih berdasarkan uji Chow, LM, dan Hausman. Variabel penjelas dalam penelitian ini meliputi ROA, Total Aset, CAR, CIR, NPL, dan GDP. Hasil empiris menunjukkan bahwa ROA dan Total Aset berpengaruh positif dan signifikan terhadap distribusi green credit, sementara CIR berpengaruh negatif dan signifikan. Di sisi lain, CAR, NPL, dan GDP tidak menunjukkan pengaruh yang signifikan. Temuan ini menegaskan bahwa kondisi keuangan internal memiliki peran yang lebih dominan dibandingkan faktor makroekonomi dalam membentuk keputusan penyaluran green credit pada perbankan di Indonesia.

Kata Kunci : *Green Credit, Green Banking, Data Panel, Kinerja Bank, Keuangan Berkelanjutan, Indonesia*

CHAPTER I

INTRODUCTION

1.1 Background

Climate change is a real and urgent threat to life on earth caused by increasing concentrations of greenhouse gases in the atmosphere due to human activities, especially from the energy, industry, and land use sectors. According to the Intergovernmental Panel on Climate Change (IPCC) 2023 report, global surface temperatures have already increased by about 1.1°C compared to pre-industrial times. They are projected to exceed the 1.5°C threshold by the early 2030s if no drastic action is taken to reduce global emissions (Venturini et al., 2023). The impacts of climate change are not hypothetical. However, they are already being felt realistically, such as melting polar ice caps, rising sea levels, and increasing intensity and frequency of extreme weather events, including widespread heat waves, storms, floods, and droughts.

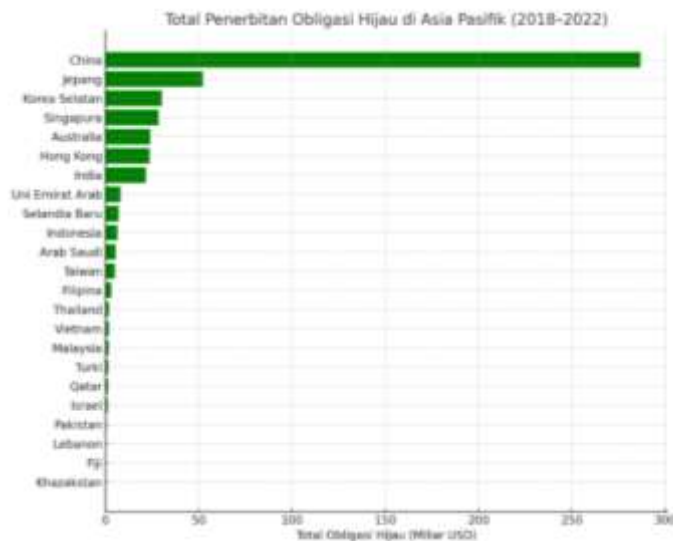
Indonesia, an archipelago of more than 17,000 islands, is highly vulnerable to climate change risks. A World Bank Group and Asian Development Bank (2021) note that about 40% of Indonesia's population lives in coastal areas vulnerable to rising sea levels, and the agricultural sector, which absorbs about 29% of the national workforce, is threatened by changing rainfall patterns and increasing temperatures. In addition, hydrometeorological disasters such as floods and landslides have risen steadily in the past decade, both in frequency and economic losses. Therefore, climate change is not only an environmental issue, but also an economic and social development issue that

requires a cross-sectoral approach and multi-stakeholder collaboration. In this context, the financial sector has a crucial role in supporting the financing of the transition to a low-carbon economy through instruments such as green credit and green investment.

The need for green finance is becoming increasingly urgent as global commitments to reduce carbon emissions and achieve net-zero emission targets increase. According to the United Nations Environment Programme (UNEP), to meet climate targets under the Paris Agreement, the world needs an annual investment of USD 4.3 trillion in green infrastructure by 2030, covering the renewable energy, sustainable transportation, and energy efficiency sectors (UNEP, 2022). At the national level, the Ministry of National Development Planning estimates that Indonesia needs IDR 3,779 trillion in funding to support its low-carbon development agenda until 2030, most of which must come from the private sector and financial institutions (Bappenas, 2021). This gap between the need and availability of funding shows the important role of the financial system, especially banking institutions, in channeling credit and investment that support green initiatives. Green credit is one of the strategic instruments that encourages a more sustainable economic transformation while maintaining growth.

Green banking is a strategic approach in the financial sector that aims to encourage sustainable and environmentally responsible business practices. Conceptually, green banking refers to banking policies, products, and services that support environmentally friendly projects, such as renewable energy,

energy efficiency, waste management, and green transportation (Scholtens, 2006). Banks not only act as financial intermediaries, but also as agents of change that have a significant role in determining the direction of development through the financing policies they implement. In Indonesia, the Financial Services Authority (OJK) has encouraged the implementation of green banking through POJK No. 51/POJK.03/2017 on the Implementation of Sustainable Finance, which requires financial services institutions to develop Sustainable Finance Action Plans (SFAPs) and report on their sustainability regularly (Songtiar & Naiborhu, 2023). This concept is important from an environmental perspective and contributes to long-term risk management, institutional reputation, and the stability of the national financial system.



Source: Environment Institute 2023

Figure 1.1 Green Bond Issuance in Asia Pacific Countries

Based on data on green bond issuance in the Asia Pacific region in the 2018-2022 period, Indonesia was recorded to have only issued around US\$6.4 billion, far behind countries such as China (US\$286.9 billion), Japan (US\$52.1

billion), and South Korea (US\$30.2 billion). This fact shows that Indonesia's contribution to regional green financing is still relatively low, despite the vast potential and need for a clean energy transition. This gap signals the need to strengthen the national strategy in encouraging green financing, one of which is through domestic financial instruments such as green credit, which is more affordable and integrated with the national banking system.

Green credit constitutes financing specifically allocated to environmentally sustainable activities, including renewable energy development, energy efficiency, green building, and waste management. This financing mechanism is crucial in facilitating the transition toward a low-carbon economy while fostering greater environmental and social responsibility within the banking sector. Empirical evidence indicates that green credit positively influences bank profitability and reinforces institutional commitments to sustainability (Kirani & Astuti, 2024). Nevertheless, despite its strategic role, the effect of green credit on mitigating credit risk remains inconclusive, underscoring the necessity for enhanced regulatory frameworks and implementation strategies (Hatmadi & Trihadmini, 2018). Accordingly, the advancement of green credit practices in Indonesia requires comprehensive support through robust regulations, increased financial literacy, and incentive mechanisms to encourage financial institutions to prioritize sustainable financing.

Banking strategically promotes sustainable development by distributing financing that supports environmentally friendly projects and businesses, such

as green credit. As the leading financial institution, banks function as capital providers and as agents of change that can influence business behavior towards greener and more sustainable practices (Hendratni et al., 2022). In addition, regulations and policies issued by authorities such as OJK through POJK No. 51/POJK.03/2017 emphasized the importance of implementing sustainable finance principles to integrate environmental, social, and governance (ESG) aspects in banking operations (Prihandono et al., 2023). Through green banking, banks in Indonesia began to actively report their sustainability performance and direct their credit portfolio to sectors that support climate change mitigation and efficient resource utilization, thus directly contributing to national and global sustainable development targets (Khaer et al., 2022).

In recent years, the Indonesian banking sector has shown a significant increase in sustainability reporting and growing awareness of the importance of transparency and accountability in sustainable finance practices. A study by Bayu and Novita (2023) revealed that despite an increase in the number of banks publishing sustainability reports, the level of disclosure of information related to sustainable finance and green financing is still relatively low. This shows that although compliance with regulations has increased, the quality and depth of information presented in the report still need to be improved. Furthermore, Maftuchah et al. (2023) found that only about 56.6% of banks' sustainability reports met the principles of materiality and stakeholder engagement after implementing sustainable finance regulations. This finding

indicates that despite progress, there are still challenges in improving the quality of sustainability reporting in the Indonesian banking sector.

Research on green credit in Indonesia remains relatively scarce and has predominantly focused on its relationship with bank financial performance, such as profitability and stability. A study by Sutrisno et al. (2024) revealed that green credit positively impacts bank profitability, although it does not significantly affect financial stability. Nevertheless, previous research has not explored green credit distribution's internal and external determinants. To address this gap, the present study conducts an empirical analysis of six key factors, total assets, Capital Adequacy Ratio (CAR), Non-Performing Loan (NPL), Return on Assets (ROA), Cost to Income Ratio (CIR), and Gross Domestic Product (GDP) using data from 34 commercial banks in Indonesia that have published Sustainability Reports through the Financial Services Authority (OJK). This study is expected to contribute to the literature on green banking and support the advancement of sustainable finance practices in Indonesia.

1.2 Problem Formulation

1. How does bank profitability (Return on Assets/ROA) influence the distribution of green credit in Indonesia?
2. How do total assets affect the distribution of green credit in Indonesia?
3. How does capital adequacy (Capital Adequacy Ratio/CAR) affect the distribution of green credit in Indonesia?

4. How does operational efficiency (Cost to Income Ratio/CIR) affect the distribution of green credit in Indonesia?
5. How does credit risk (Non-Performing Loan/NPL) influence the distribution of green credit in Indonesia?
6. How does economic growth (Gross Domestic Product/GDP) affect the distribution of green credit in Indonesia?

1.3 Research Objectives

1. To analyze the effect of bank profitability (Return on Assets/ ROA) on the distribution of green credit in Indonesia.
2. To analyze the effect of total assets on the distribution of green credit in Indonesia.
3. To analyze the effect of bank capital (Capital Adequacy Ratio/ CAR) on the distribution of green credit.
4. To analyze the effect of operational efficiency (Cost to Income Ratio/ CIR) on the distribution of green credit.
5. To analyze the effect of credit risk (Non-Performing Loan/ NPL) on the distribution of green credit.
6. To analyze the effect of economic growth (Gross Domestic Product/ GDP) on the distribution of green credit.

1.4 Research Contributions

1. Theoretical: Enriches the literature by examining the determinants of green credit distribution, especially in Indonesia.

2. Practical: Provide a reference for banks in improving green financing strategies.
3. Policy Contribution: The research results can be used by regulators to encourage the implementation of sustainable finance.

1.5 Systematics of Writings

The structure of the research is as outlined below:

CHAPTER I: INTRODUCTION

Provides background, research problem, objectives, benefits, and writing structure.

CHAPTER II: THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

This chapter outlines the theoretical framework on green credit, bank-specific and macroeconomic factors, prior empirical findings, research gap, and hypothesis development.

CHAPTER III: METHODOLOGY

Explains research methods, variable definitions, data collection, and analysis techniques.

CHAPTER IV: DATA ANALYSIS AND DISCUSSION

Presents findings, empirical analysis, and interpretation based on relevant theories.

CHAPTER V: CONCLUSION AND SUGGESTION

This chapter concludes the research findings, outlines their implications, and provides suggestions for banks, policymakers, and future researchers.

CHAPTER II

LITERATURE REVIEW

This chapter outlines the key literature that supports the present study. It discusses prior theories and empirical findings to build the conceptual framework and guide the research focus. It also presents the hypotheses formulated based on theoretical perspectives and insights from the literature review.

2.1 Literature Review

Research on the determinants of green credit distribution has gained increasing attention as global and national commitments to sustainable finance continue to intensify. Green credit is widely recognized as a strategic instrument for the banking sector to support the transition toward a green economy, making a comprehensive understanding of the factors influencing its allocation essential. Prior studies highlight that internal bank characteristics such as profitability, bank size, capital adequacy, operational efficiency, and asset quality, alongside broader macroeconomic conditions, play a critical role in shaping banks' capacity and willingness to provide environmentally oriented financing. Accordingly, this literature review aims to examine the theoretical foundations and empirical findings related to these determinants as the conceptual basis for analyzing green credit distribution within the Indonesian banking context.

Table 2.1 Literature Review

Name	Research Objective	Findings
Gayo et al. (2020)	To examine the effects of key financial indicators, TPF, NPL, CAR, BOPO, and NIM on credit distribution in Indonesian banks	The study found that Third Party Funds (TPF) and Net Interest Margin (NIM) positively and significantly influence credit distribution, while Non-Performing Loans (NPL), Capital Adequacy Ratio (CAR), and Operating Expenses to Operating Income (BOPO) do not have a significant effect.
Indrajaya et al. (2022)	To analyze the influence of internal financial factors (DPK, CAR, CASA) and external macroeconomic factors (BI Rate and inflation) on credit distribution by commercial banks in Indonesia.	The study found that DPK, CAR, CASA ratio, and inflation significantly influence credit distribution with DPK being the most dominant factor while the BI Rate has no significant effect.
Khaer & Anwar (2022)	To examine the development, role, and benefits of green banking practices in Indonesia, and to evaluate how these practices support sustainability, environmental responsibility, and risk management within the banking sector.	The study found that green banking practices significantly support environmental sustainability by enabling banks to manage environmental risks, expand green lending, improve credit quality, and enhance institutional reputation—while underscoring the importance of regulatory compliance and continued promotion of sustainable practices.
Sutrisno et al. (2024)	To examine the effect of green credit on bank profitability and stability in Indonesia, while also evaluating the influence of CAR, LDR, and CIR on bank performance during the 2019–2022 period.	The study found that green credit significantly improves bank profitability but does not affect bank stability; additionally, profitability is positively influenced by CAR and LDR and negatively influenced by CIR, indicating that strong bank fundamentals and operational efficiency remain critical for performance.

Indriyani (2019)	To evaluate the environmental performance of Islamic banks in Indonesia by assessing the extent of green banking implementation using the Environmental Risk Index (ERI), which measures environmental risk management across ten thematic categories.	The study found that Islamic banks in Indonesia exhibited a low overall level of green banking implementation reflected by an average ERI score of 304.42/1000 with strong performance in basic environmental practices but substantial weaknesses in carbon neutrality, waste management, ESG-focused funding, environmental due diligence, and staff training.
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2.2 Theoretical Framework

2.2.1 Concept of Green Banking and Green Loan

Green banking is an approach that integrates environmental and social factors in banking operations to reduce negative impacts on the environment and increase contributions to sustainable development (Khaer et al., 2022). Shipalana, P. (2022) argues that green banking is a financial practice that integrates environmental and social considerations into banking operations and lending decisions. It involves designing products, services, and strategies that contribute to environmental sustainability while maintaining the core functions of financial intermediation. The concept emerged as part of global efforts to align the financial sector with sustainable development goals (SDGs), particularly in response to the increasing need for climate-conscious economic systems. One of the main instruments of green banking is the green loan, which refers to credit allocated explicitly for projects with positive environmental impacts. These may include investments in renewable

energy, energy efficiency, pollution reduction, waste management, sustainable agriculture, and clean transportation (Griffiths, 2021). Financial Services Authority (2022) argues that green loans support eco-friendly activities, help banks manage environmental risks, and improve long-term asset quality. In this context, green banking strategically mobilizes financial resources for the green economy and fosters low-carbon, climate-resilient development.

2.2.2 Sustainable Finance Theory

Sustainable Finance Theory is a financial approach that integrates environmental, social, and governance (ESG) aspects into investment and financing decision-making. This theory emphasizes the importance of sustainability in financial activities to support environmentally friendly and sustainable development in the long term. In the banking context, this theory encourages banks to pursue financial returns and pay attention to their financing activities' social and environmental impacts. Applying Sustainable Finance in the banking sector can increase green lending that focuses on environmentally friendly projects, so that banks contribute to efforts to mitigate climate change and conserve natural resources (Friede et al., 2015).

Through the sustainable finance theory, financial institutions are expected to integrate sustainability principles into their products and services, including green banking and credit. This approach is also relevant in the context of policies and regulations that support sustainable

finance, such as those launched by OJK in Indonesia. As such, the theory provides a basis for analyzing how banks' internal factors, such as capital, risk, and efficiency, and external factors, such as macroeconomic conditions, can influence the distribution of green credit. Sustainable Finance Theory provides a comprehensive framework for understanding the role of banks in supporting sustainable development through responsible financial products (Scholtens, 2017).

2.2.3 Agency Theory

Agency Theory explains the relationship between principals (bank owners) and agents (bank management) that can lead to conflicts of interest in decision-making, especially related to risk and credit policies. In the context of banking, managers as agents may take risks that are not in line with the owner's interests, so it is necessary to have a supervisory mechanism to align the objectives of the two parties (Hendrastuti & Harahap, 2023). Good risk management through indicators such as Capital Adequacy Ratio (CAR), Non Performing Loan (NPL), and Cost to Income Ratio (CIR) is important to maintain bank stability while supporting green lending (Al-Sharkas et al., 2022).

2.2.4 Signaling Theory

Signaling Theory is rooted in information asymmetry between market participants, particularly in the relationship between lenders and borrowers. In banking, the theory suggests that financial institutions send signals to the market through key indicators such as capital adequacy

(CAR) and asset size. A bank with firm capital reserves and substantial assets signals financial strength, stability, and lower risk, enhancing its credibility among stakeholders (Spence, 1973). These signals can influence investor confidence, borrower trust, and regulatory perceptions.

Applied to green loan distribution, signaling theory implies that well-capitalized banks are more likely to engage in sustainable financing because they possess the capacity to absorb potential risks associated with green projects. Green lending often involves long-term financing and emerging technologies, which carry uncertainty. Therefore, banks with strong financial fundamentals are in a better position to take the lead in allocating capital toward environmentally sustainable sectors. Capital Adequacy Ratio (CAR) and total assets, in this regard, serve not only as financial metrics but also as trust-building mechanisms in advancing green banking agendas (Connelly et al., 2011).

2.2.5 Stakeholder Theory

Stakeholder Theory emphasizes that companies, including banks, have responsibilities not only to shareholders, but also to various stakeholders such as customers, employees, communities, governments, and the environment. In green banking, this theory encourages banks to consider their activities' social and environmental impacts and fulfill stakeholders' expectations of sustainable financial practices. Thus, banks are expected to pursue financial returns and contribute to sustainable development and the welfare of the wider community (Jillani et al., 2024).

The application of Stakeholder Theory in green banking in Indonesia can be seen from banks' efforts to extend green credit that supports environmentally friendly projects. Through the distribution of green credit, banks demonstrate their commitment to sustainability and social responsibility, which in turn can improve their reputation and trust from stakeholders. The study by Sutrisno et al. (2024) shows that green credit positively impacts bank profitability in Indonesia, signaling that attention to stakeholder interests can go hand in hand with good financial performance (Sutrisno et al., 2024).

2.2.6 Macroeconomic Credit Theory

Macroeconomic Credit Theory explains how macro-level economic conditions influence an economy's supply and demand for credit. Credit expansion is generally stimulated by positive macroeconomic indicators such as GDP growth, low inflation, and stable interest rates. Gross Domestic Product (GDP) is one of the most widely used indicators to measure overall economic activity and national income. An increase in GDP reflects a growing economy, encouraging banks to extend more credit due to improved borrower confidence and greater investment demand (Bernanke & Gertler, 1995). Similarly, economic expansion often reduces credit risk, making financial institutions more willing to engage in lending activities, including long-term or high-impact financing like green loans.

In sustainable finance, macroeconomic performance is critical in shaping the environment for green lending. A growing economy provides a favorable landscape for developing environmentally friendly sectors such as renewable energy, sustainable infrastructure, and clean technology. Banks are more likely to support green initiatives when supported by stable and expanding macroeconomic fundamentals. Furthermore, macroeconomic growth can also lead to increased government incentives and private sector participation in green finance (Levine, 2021). Therefore, GDP serves as a background indicator and as an enabling factor for banks to expand their green loan portfolios.

2.3 Relationship Between Dependent Variable and Independent Variables

To identify the determinants of green credit disbursement in conventional banks in Indonesia, this study examines the relationship between the dependent variable of green credit and the independent variables consisting of ROA, total assets, CAR, CIR, NPL, and GDP. The following description explains the relevance of each variable to green lending based on theoretical foundations and empirical findings.

2.3.1 Return on Asset (ROA) and Green Credit

ROA reflects the bank's ability to generate profits from its assets. ROA can also mediate the influence of third-party funds and NPLs on bank credit (Hermuningsih et al., 2020). This means that banks with high profitability have more flexible space in channeling green credit because they have sufficient financial reserves to support sustainable investment.

2.3.2 Total Asset and Green Credit

Total assets reflect a bank's capacity to expand credit. Banks with larger assets generally have adequate resources to channel large amounts of financing, including the green sector. However, a study by Sutrisno, Widarjono, and Hakim (2024) shows that small banks gain more profitability from green credit than large banks, indicating that bank size does not always determine the intensity of green credit disbursement. Thus, the relationship between total assets and green credit is contextual and may differ depending on the bank's strategy.

2.3.3 Capital Adequacy Ratio (CAR) and Green Credit

CAR shows the bank's ability to absorb the risk of loss. The study of Indrajaya et al. (2022) shows that CAR significantly affects the distribution of bank loans in general. This is in line with the findings of Sutrisno et al. (2024), which states that capital strength is an important factor in determining bank profitability and stability, so banks with high CAR tend to be more confident in channeling green credit as part of a long-term strategy.

2.3.4 Cost to Income Ratio (CIR) and Green Credit

CIR is used to measure the operational efficiency of banks. Although not explicitly discussed in the uploaded journal, the findings of Sutrisno et al. (2024) mentioned that efficiency is one of the keys to bank profitability and stability. Thus, the more efficient a bank's operational

performance is, the more likely they are to invest in green sectors that require long-term commitment.

2.3.5 Non-Performing Loan (NPL) and Green Credit

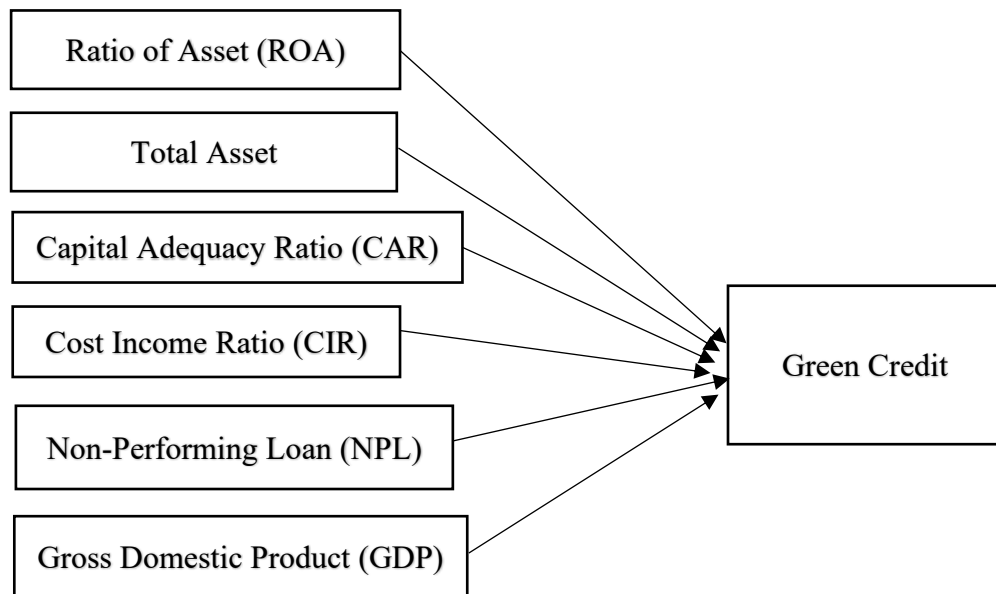
NPL is an indicator of credit risk. Hermuningsih et al. (2020) found that NPLs significantly negatively influence lending, including in the green sector. This suggests that banks with high NPLs tend to hold back credit expansion due to the increased risk of default, which may limit the allocation to green credit.

2.3.6 Gross Domestic Product (GDP) and Green Credit

GDP is a key indicator that reflects the macroeconomic conditions of a country. Positive GDP growth creates an economic climate conducive to developing sustainable projects, thus driving the demand and supply for green credit. Although the journals you have uploaded do not directly discuss the relationship between GDP and green credit, other literature suggests that an increase in GDP can contribute to an increase in green credit disbursement. For example, Chen et al. (2023) found that a 1% increase in green credit can increase local GDP by 0.482%, suggesting a positive relationship between the two.

2.4 Research Framework

Based on the framework and research objectives that have been described, the research hypothesis can be formulated as follows:



Figures 2.1 Research Framework

Figure 2.1 presents the research framework illustrating the relationship between six independent variables, ROA, total assets, CAR, CIR, NPL, and GDP, and the dependent variable, green credit. Each variable is assumed to directly influence banks' sustainable financing. This framework is built from theoretical and empirical studies to explain how internal bank factors and macroeconomic conditions shape the distribution of green credit.

2.5 Hypothesis Development

Based on the theoretical framework and previous empirical studies, the following hypotheses are proposed to examine the influence of bank-specific and macroeconomic factors on sustainable financing distribution:

1. H1: Return on Assets (ROA) positively affects green credit distribution.
2. H2: Total assets have a positive effect on green credit distribution.

3. H3: Capital Adequacy Ratio (CAR) has a positive effect on green credit distribution.
4. H4: Cost to Income Ratio (CIR) has a negative effect on green credit distribution.
5. H5: Non-Performing Loan (NPL) has a negative effect on green credit distribution.
6. H6: Gross Domestic Product (GDP) has a positive effect on green credit distribution.

CHAPTER III

RESEARCH METHODS

3.1 Data and Data Source

This study uses secondary data organized in the form of unbalanced panel data. Data is obtained from 34 conventional banks in Indonesia that are registered with the Financial Services Authority (OJK) and have published sustainability reports during the period 2018 to 2024. Internal bank data includes variables of total assets, capital adequacy ratio (CAR), cost to income ratio (CIR), return on assets (ROA), non-performing loans (NPL), and green credit. Meanwhile, external data in the form of gross domestic product (GDP) is obtained from official sources such as Bank Indonesia (BI) and the Central Statistics Agency (BPS).

Data collection techniques were carried out through the documentation method, which involved accessing annual reports and sustainability reports available on the official websites of banks and related institutions. All data obtained were processed using EViews 13 software, which supports panel data regression analysis and statistical model testing required in this study.

3.2 Definition of Operational Variables

The data in this study were obtained from 34 conventional banks in Indonesia that are registered with the Financial Services Authority (OJK) and have uploaded sustainability reports in the period 2018 to 2024. These banks were selected due to the consistency of reporting and disclosure of information

related to sustainable financing (green credit) and other financial indicators. An operational definition of each variable used in this study is required to ensure clarity in the data measurement and analysis process. This operational definition explains the concept of variables, the indicators used, and the units and measurement scales. This study includes one dependent variable and six independent variables, which are systematically explained in the following table.

Table 3.1 List of Research Data and Data Source

Data	Unit	Symbol	Source
Green Credit	Trillion IDR	GC	Sustainable Report
Total Asset	Trillion IDR	Asset	Sustainable Report
Cost to Income Ratio	Percentage	CIR	Sustainable Report
Capital Adequacy Ratio	Percentage	CAR	Sustainable Report
Non-Performing Loan	Percentage	NPL	Sustainable Report
Ratio of Asset	Percentage	ROA	Sustainable Report
Gross Domestic Product	Trillion IDR	GDP	Bank Indonesia (BI)

3.2.1 Dependent Variable

According to Andrade (2021), a dependent or endogenous variable is a variable that is influenced by changes in other variables. In this research, the dependent variable is green credit, which reflects the total financing banks provide for environmentally friendly projects or sectors as part of their sustainable banking practices.

3.2.1.1 Green Credit (Y)

Green credit refers to bank lending directed toward environmentally sustainable projects, such as renewable energy, energy efficiency, sustainable agriculture, and waste management, which align with the green banking principles encouraged by OJK. This variable indicates banks' commitment to supporting the sustainability agenda through responsible financing. The data are obtained from the Sustainability Reports published by the 34 conventional banks registered with the Financial Services Authority (OJK) in Indonesia. The unit of measurement used is Indonesian Rupiah (IDR), which is presented as a ratio in the financial report covering the period of 2018–2024.

3.2.2 Independent Variables

Variables that can influence changes in other variables are called exogenous or independent variables (Andrade, 2021). The variables listed below will be used in this research as independent variables.

3.2.2.1 Return on Asset (X1)

Return on Assets (ROA) is a financial ratio used to measure how efficiently a bank utilizes its assets to generate profit. ROA is calculated by

comparing net income to total assets. This ratio provides an overview of a bank's profitability and reflects management's efficiency in managing available resources (Wulandari & Novitasari, 2020).

3.2.2.2 Total Asset of Bank (X2)

Bank assets are the total wealth owned by a bank at a specific period. They include all economic resources controlled by the bank due to past events and expected to provide economic benefits in the future. Bank assets include cash, loans, securities, investments, and fixed assets. Total assets are often used as an indicator of a bank's size and strength in performing its functions in the financial sector (Sari & Yuniningsih, 2022).

3.2.2.3 Capital Adequacy Ratio (X3)

Capital Adequacy Ratio (CAR) measures a bank's level of capital adequacy in facing the risk of loss from its assets. This ratio shows how much bank capital is available to cover potential losses and support healthy operations. CAR is one of the main indicators used to assess the stability and safety of banking institutions in accordance with the provisions of the supervisory authority (Purwaningtyas & Hartono, 2020).

3.2.2.4 Cost to Income Ratio (X4)

Cost to Income Ratio (CIR) is a financial ratio that measures the efficiency of bank operations by comparing total operating costs to total operating income. CIR provides an overview of how much it costs for the bank to generate revenue. This ratio is commonly used to assess management

performance in managing the efficiency of operations (Alyssa & Lestari, 2022).

3.2.2.5 Non-Performing Loan (X5)

Non-Performing Loan (NPL) is a ratio that describes the proportion of non-performing or uncollectible loans to total loans disbursed by the bank. Loans are considered non-performing if they have exceeded the maturity date and show the potential for default by the debtor. This ratio is used to assess the quality of credit assets owned by the bank and the effectiveness of risk management in the credit-granting process. The higher the NPL value, the greater the credit risk borne by the bank (Wulandari & Novitasari, 2020).

3.2.2.6 Gross Domestic Product (X6)

Gross Domestic Product (GDP) is the total value of all goods and services produced by a country in a given period, usually one year. GDP is the main indicator to measure a country's economic growth rate. In the context of the banking sector, GDP growth reflects macroeconomic conditions that can affect the overall demand and supply of credit, including in the financing activities of certain sectors (Nengsih et al., 2023).

3.3 Analysis Methods

This study uses a quantitative approach with a panel data regression method to analyze the determinants of green credit distribution in banks in Indonesia. The data used combines time series and cross-sectional data, so it is referred to as panel data. This research involves 34 banks that have published sustainability reports from 2018 to 2024. However, not all banks

have complete data in all years of observation. For example, some banks only started reporting green credit in 2020 or 2021, so the panel data structure used is unbalanced.

The estimation model is conducted using a static panel regression approach, which includes three methods: Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). To determine the best estimation method, a series of specification tests are used, namely the F-test to choose between CEM and FEM, the Breusch-Pagan Lagrange Multiplier (LM test) to choose between CEM and REM, and the Hausman test to choose between FEM and REM. The best model is selected based on the results of these tests in order to produce robust estimates.

All variables used in this study are processed annually and obtained from bank sustainability reports, annual reports, and other public sources. The regression model refers to previous research by Sutrisno et al. (2024), which also used a panel data approach to analyze green credit's effect on bank performance in Indonesia.

3.3.1 Common Effect Model (CEM)

The Common Effect model (Pooled Least Square (PLS)) is the most basic approach in panel data regression. This model assumes that combined data from various individuals (banks) and time periods can be analyzed without distinguishing the specific characteristics of each entity or time period. In other words, this model treats all observational data homogeneously without considering any individual or time effects.

This model is used as a starting point before determining whether the Fixed Effect or Random Effect model is more appropriate through further specification tests. Model estimation uses the Ordinary Least Squares (OLS) method, which minimizes the sum of squared residuals. In this study, the general model used to analyze the determinants of green credit distribution can be formulated as follows:

$$\begin{aligned} \log(\text{Green Credit}_{it}) &= \beta_0 + \beta_1 \text{ROA}_{it} + \beta_2 \text{Log}(\text{Asset}_{it}) + \beta_3 \text{CAR}_{it} + \beta_4 \text{CIR}_{it} \\ &+ \beta_5 \text{NPL}_{it} + \beta_6 \text{Log}(\text{GDP}_{it}) + \epsilon_{it} \end{aligned}$$

Description:

- Log (Green Credit) = The natural logarithm of the green credit distributed by Banks
- ROA = Return on Assets, a profitability ratio
- Log (Asset) = The natural logarithm of total bank assets
- CAR = Capital Adequacy Ratio
- CIR = Cost to Income Ratio, operational efficiency ratio
- NPL = Non-Performing Loan Ratio
- Log (GDP) = The natural logarithm of Indonesia's Gross Domestic Product
- ϵ_{it} = Error term
- i = Bank index
- t = Time index

In this model, the variables Green Credit, Asset, and GDP are transformed into their natural logarithm (log) forms, as they represent large-scale absolute values. Log transformation is applied to reduce data skewness, improve linear relationships in the regression model, and address potential heteroscedasticity issues. Meanwhile, the variables ROA, CAR, CIR, and NPL are maintained in their original ratio form, since they are already proportionally scaled and comparable across banks.

3.3.2 Fixed Effect Model (FEM)

The Fixed Effect Model (FEM) is used to estimate panel regression by considering the differences in fixed (unique) characteristics between entities or observation units, in this case, each bank. FEM assumes that unobserved but fixed factors within each bank (such as internal management policies, long-term business strategies, and organizational structure) can influence the dependent variable, green credit. By using FEM, interbank variation that is not explicitly measured can be controlled so as not to cause estimation bias.

The model includes individual bank dummies to capture the fixed effects of each bank, which means each bank has its own intercept. The general formula of the Fixed Effect model used in this study is as follows:

$$\begin{aligned} \log(\text{Green Credit}_{it}) &= \alpha_i + \beta_1 \text{ROA}_{it} + \beta_2 \text{Log}(\text{Asset}_{it}) + \beta_3 \text{CAR}_{it} + \beta_4 \text{CIR}_{it} \\ &+ \beta_5 \text{NPL}_{it} + \beta_6 \text{Log}(\text{GDP}_{it}) + \alpha_1 D_1 + \dots + \alpha_{33} D_{33} + \epsilon_{it} \end{aligned}$$

Notes:

α_i = intercept specific to each bank i , which represents fixed characteristics.

D_i = dummy variables

The use of FEM is important in the context of this study because the data structure is an unbalanced panel, i.e., not all banks have complete data in all observation years (2018-2024). According to the availability of sustainability reports, some banks only started reporting green credit in 2020 or 2021. Therefore, FEM can control for heterogeneity between banks that does not change over time without disturbing the estimation results.

The FEM model will be selected over other models after running specification tests, such as the F-test and Hausman test, to determine whether fixed or random effects are more appropriate for the data in this study.

3.3.3 Random Effect Model (REM)

Random Effect Model (REM) is one of the panel regression approaches that assumes that differences in characteristics between entities (in this case, banks) are random and uncorrelated with the independent variables in the model. Unlike the Fixed Effect Model (FEM), which treats individual effects as part of a constant (intercept) that is different for each bank, REM treats variations between banks as part of the error term. Thus, REM is more efficient than FEM if the assumption of no correlation between individual effects and independent variables is met. The REM regression model in this study is formulated as follows:

$$\begin{aligned}
& \text{Log}(\text{Green Credit}_{it}) \\
& = \beta_0 + \beta_1 \text{ROA}_{it} + \beta_2 \text{Log}(\text{Asset}_{it}) + \beta_3 \text{CAR}_{it} + \beta_4 \text{CIR}_{it} \\
& + \beta_5 \text{NPL}_{it} + \beta_6 \text{Log}(\text{GDP}_{it}) + \alpha_1 D_1 + \dots + \alpha_{33} D_{33} + u_i \\
& + \epsilon_{it}
\end{aligned}$$

Description:

u_i = error component representing random individual effects for bank-i

D_i = dummy variables

REM is used when individual variation between banks is considered random noise uncorrelated with the explanatory variables. This model is suitable if the data comes from a random sample or the entities in the panel data are representative of a larger population. Therefore, model selection tests such as the Hausman Test are important to determine whether REM or FEM is more appropriate.

The REM model saves degrees of freedom because dummies are not needed for each bank, as in the FEM. However, if the individual effects are correlated with the independent variables, then REM will provide biased and inconsistent estimates. Therefore, the validity of using this model will be statistically tested before it is used in hypothesis testing.

3.4 Selection on Estimation Model

To determine the best panel regression estimation model between the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM), a series of statistical specification tests was conducted. Each test compares two models in pairs based on data characteristics and

assumptions met. The stages of selecting the model used in this study are as follows:

3.4.1 F-Test (Chow Test)

The F-Test, also known as the Chow Test, is used to determine whether the Fixed-Effect model is more appropriate than the Common-Effect Model. This test works by comparing the residual values of the Fixed-Effect model and the Common-Effect model. If the variation between entities (in this case, between banks) is considered significant and affects the estimation results, then using fixed effects is necessary.

Hypothesis:

- H_0 : Common Effect Model is more appropriate (no individual fixed effects)
- H_1 : Fixed Effect Model is more appropriate (there are individual fixed effects)

If the significance value (p-value) < 0.05 , then H_0 is rejected and the Fixed Effect model is more appropriate.

3.4.2 Breusch–Pagan Lagrange Multiplier (LM Test)

The Lagrange Multiplier test, developed by Breusch and Pagan, is used to choose between the Common Effect Model and the Random Effect Model. It aims to determine whether there is variation in random effects among cross-sectional units. If the variation is significant, then the Random Effect model is more appropriate than the Common Effect model.

Hypothesis:

- H_0 : Common Effect Model is more appropriate (no random individual effects)
- H_1 : Random Effect Model is more appropriate (there are random individual effects)

If the significance value (p-value) < 0.05 , then H_0 is rejected and the Random Effect Model is considered more appropriate.

3.4.3 Hausman Test

The Hausman Test determines whether the Fixed-Effect or Random-Effect model is more appropriate. This test examines the presence of correlation between individual effects (unobserved effects) and independent variables. If there is a correlation, then the Random-Effect model cannot be used because it will produce biased and inconsistent estimates.

Hypothesis:

- H_0 : Random Effect Model is more suitable (there is no correlation between individual effects and independent variables)
- H_1 : Fixed Effect Model is more suitable (there is a correlation between individual effects and independent variables)

If the significance value (p-value) < 0.05 , then H_0 is rejected and the Fixed Effect Model is considered the most appropriate.

3.5 Statistical Testing

After the best panel regression estimation model is selected through a series of model specification tests, the next step is to conduct statistical testing

of the regression coefficients in the model. This test aims to determine whether each independent variable statistically significantly affects the dependent variable, Green Credit.

In this study, statistical testing was carried out with two types of tests, namely:

3.5.1 Partial Statistical Test (t-Test)

The t-test is used to determine the significance of each independent variable's influence on the dependent variable individually. This test tests whether a variable's coefficient is significantly different from zero, which means that the variable influences Green Credit.

Hypothesis:

- H0: Independent variable regression coefficient = 0 (no significant effect on Green Credit)
- H1: The regression coefficient of the independent variable $\neq 0$ (has a significant effect on Green Credit)

If the significance value (p-value) < 0.05 , then H0 is rejected, which means that the independent variable has a statistically significant effect on the Green Credit variable.

3.5.2 Simultaneous Statistical Test (F-Test)

The F-test tests the significance of all independent variables on the dependent variable. That is, this test examines whether the regression model used as a whole is good and able to explain the variations that occur in Green Credit.

Hypothesis:

- H0: All regression coefficients = 0 (no independent variable simultaneously affects Green Credit).
- H1: At least one independent variable simultaneously affects Green Credit.

If the significance value (p-value) < 0.05 , then H0 is rejected, meaning that simultaneously the independent variables in the model affect Green Credit significantly.

3.5.3 Coefficient of Determination Test (R-Square Test)

The R-Square test measures the extent to which independent variables influence the dependent variable. The coefficient of determination ranges from 0 to 1. A value closer to 1 indicates that the independent variables provide nearly all the necessary information to predict the dependent variable, suggesting that the regression model is suitable for use. Conversely, the panel data regression model is inappropriate if the R-Square value is close to 0.

CHAPTER IV

DATA ANALYSIS AND DISCUSSION

4.1 Data Description

This study utilizes panel data from secondary data obtained through sustainability reports and annual reports published by banks on the Indonesia Stock Exchange (IDX). The research focuses on 34 banks that consistently or partially disclosed sustainability-related information from 2018 to 2024.

The selection of banks was based on the availability of sustainability reports published either on the IDX website or through each bank's official platform. Due to variations in disclosure practices, not all banks began reporting from 2018. Several institutions only started issuing sustainability reports in 2020 or 2021, resulting in an unbalanced panel data structure across the observation period.

The study adopts a quantitative approach and compiles relevant financial and sustainability-related data from these reports. After the data screening process, 199 observations were identified and analyzed over the seven-year period. This data structure allows for longitudinal assessment while accommodating inconsistencies in reporting across banks and time.

Table 4.1 List of Research Samples

No.	Banks Name	Stock Code
1.	Mandiri Bank	BMRI
2.	Bank Rakyat Indonesia (BRI)	BBRI
3.	Raya Bank	AGRO

4.	Bank Tabungan Negara (BTN)	BBTN
5.	West Java Regional Development Bank	BJBR
6.	Banten Regional Development Bank	BEKS
7.	Central Java Regional Development Bank	BJTG
8.	East Java Regional Development Bank	BJTM
9.	East Nusa Tenggara Regional Development Bank	BNTT
10.	South West Sulawesi Regional Development Bank	BSBB
11.	North Sulawesi Gorontalo Regional Development Bank	BSLT
12.	Maluku Regional Development Bank	BMLK
13.	Bank Central Asia (BCA)	BBCA
14.	Sinarmas Bank	BSIM
15.	OCBC Bank	NISP
16.	Mega Bank	MEGA
17.	Bumi Artha Bank	BNBA
18.	CIMB Niaga Bank	BNGA
19.	Sumitomo Mitsui Banking Corporation (SMBC)	BTPN
20.	Mayapada bank	MAYA
21.	Permata Bank	BNLI
22.	Danamon Bank	BDMN
23.	Indonesia Amar Bank	AMAR
24.	UOB Indonesia	BBIA

25.	Mestika Dharma Bank	BBMD
26.	Neo Commerce Bank	BBYB
27.	Ganesha Bank	BGTG
28.	Maybank Indonesia	BNII
29.	Indonesia Victoria Bank	BVIC
30.	Oke Indonesia Bank	DNAR
31.	Ina Perdana Bank	BINA
32.	Artha Graha Bank	INPC
33.	China Construction Bank	MCOR
34.	Bank Negara Indonesia (BNI)	BBNI

Descriptive statistics are used in this study to provide a comprehensive overview of the dataset prior to empirical testing. These statistics summarize key features of the data by presenting measures of central tendency and dispersion, including the mean, standard deviation, median, minimum, and maximum values. Through these metrics, researchers can identify the data's general patterns, variability, and potential outliers. The descriptive analysis helps to understand the overall distribution and characteristics of the observed variables across the sample of banks during the study period. The summary results are presented in Table 4.2 as a preliminary step to support further econometric analysis.

Table 4.2 Result of Descriptive Statistics Variable Analysis

	ROA	Asset	CAR	CIR	NPL	GDP	Green credit
N	199	199	199	199	199	199	199
Mean	0.016801	275.9342	0.290459	0.761404	0.033451	18507.67	46.90843
Median	0.016	92.51	0.2428	0.7135	0.0281	19588	3.360000
Maximum	0.136	2427.22	1.2631	4.951800	0.26	22139	785.2200
Minimum	-0.1371	4.05	0.0901	0.315	0.005100	14837	0.008
Std. Deviation	0.019172	487.7902	0.167993	0.503304	0.028200	2594.2145	121.7332

Data source: Data processed using EViews 13

The test results are presented in Table 4.2, showing the descriptive statistics including the mean, median, maximum, minimum, and standard deviation for each variable across 199 observations from 34 banks between 2018 and 2024.

ROA shows a low average profitability (mean = 0.0168) with a relatively small dispersion, suggesting that most banks operate with modest returns on assets. Assets display extremely high variation (mean = 275.93; max = 2,427.22), reflecting the large size differences between smaller banks and major commercial banks.

For CAR, the mean value of 0.2904 indicates strong capitalization on average, though the wide range (0.0901 to 1.2631) implies that some banks maintain exceptionally high buffers. CIR also varies widely, with a mean of 0.7614, showing that operational efficiency differs significantly among banks, from highly efficient to highly inefficient institutions.

NPL averages at 0.0334, consistent with generally healthy credit quality, although the maximum value of 0.26 indicates that some banks experienced

substantial default risk. GDP values reflect annual macroeconomic movements (mean = 18,507.67), functioning as an external macro variable.

Finally, Green Credit exhibits the highest variability (mean = 46.90; std. dev. = 121.73), indicating strong disparities in banks' commitment and capacity to distribute environmentally-related financing. The minimum value is near zero, while the maximum reaches 785.22, showing that only a few banks allocate green financing at a significant scale.

4.2 Regression Results

4.2.1 *Common Effect Model (CEM)*

Table 4.3 presents the Common Effect Model analysis results for the variables Return on Assets (ROA), Total Assets, Capital Adequacy Ratio (CAR), Cost to Income Ratio (CIR), Non-Performing Loan (NPL), and Gross Domestic Product (GDP) on Green Credit Distribution from 2018 to 2024 across selected Indonesian commercial banks.

Table 4.3 *Common Effect Model Test Result*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.6733	5.8259	-0.4589	0.6469
ROA	22.3922	4.2571	5.2599	0.0000
LOG(ASSET)	0.9808	0.0616	15.9120	0.0000
CAR	0.7084	0.5731	1.2360	0.2180
CIR	-0.4915	0.2099	-2.3417	0.0202
NPL	1.5332	3.5142	0.4363	0.6631
LOG(GDP)	-0.0043	0.5958	-0.0072	0.9942
R-squared	0.7390			
F-statistic	90.6226			

Prob (F-statistic)	0.0000
--------------------	--------

Data source: Data processed using EViews 13

4.2.2 Fixed Effect Model (FEM)

The Fixed Effect Model is utilized as a statistical approach to estimate panel data while controlling for unobserved heterogeneity that remains constant over time. The estimation results of the Fixed Effect Model are presented in Table 4.4. This study explores the relationship between green credit distribution and the variables of Return on Assets (ROA), total bank assets, Capital Adequacy Ratio (CAR), Cost to Income Ratio (CIR), Non-Performing Loans (NPL), and Gross Domestic Product (GDP) across selected banks in Indonesia from 2018 to 2024.

Table 4.4 Fixed Effect Model Test Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.7599	3.6658	-1.0256	0.3066
ROA	10.7591	3.5553	3.0261	0.0029
LOG(ASSET)	1.5197	0.3601	4.2202	0.0000
CAR	0.0460	0.5518	0.0834	0.9335
CIR	-0.6432	0.1672	-3.8468	0.0002
NPL	1.0883	2.4296	0.4479	0.6548
LOG(GDP)	-0.0772	0.4530	-0.1704	0.8649
R-squared	0.9330			
F-statistic	56.8492			
Prob (F-statistic)	0.0000			

Data source: Data processed using EViews 13

4.2.3 Random Effect Model (REM)

The Random Effect Model is applied to examine the influence of Return on Assets (ROA), total bank assets, Capital Adequacy Ratio (CAR), Cost to Income

Ratio (CIR), Non-Performing Loans (NPL), and Gross Domestic Product (GDP) on green credit distribution among selected banks in Indonesia during the period 2017–2022. The estimation results of the Random Effect Model are presented in Table 4.5.

Table 4.5 Random Effect Model Test Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.9569	3.4650	-1.4305	0.1541
ROA	12.6429	3.3757	3.7451	0.0002
LOG(ASSET)	0.9824	0.1067	9.2014	0.0000
CAR	0.0323	0.5103	0.0633	0.9495
CIR	-0.6501	0.1605	-4.0491	0.0001
NPL	1.3708	2.3808	0.5757	0.5654
LOG(GDP)	0.2769	0.3635	0.7616	0.4472
R-squared	0.4509			
F-statistic	26.2777			
Prob (F-statistic)	0.0000			

Data source: Data processed using EViews 13

4.3 Selection of the Estimation Model

Panel data regression consists of three primary estimation models: the *Common Effect Model*, *Fixed Effect Model*, and *Random Effect Model*. Following the estimation of each model, a series of model selection tests was conducted to determine the most appropriate approach. Specifically, the Chow Test was employed to compare the *Common Effect Model* with the *Fixed Effect Model*, the Hausman Test was used to assess the suitability of the *Fixed Effect* and *Random*

Effect Models, and the Lagrange Multiplier (LM) Test was applied to evaluate the *Random Effect Model* in comparison with the *Common Effect Model*.

4.3.1 Chow-Test

The Chow Test is a statistical procedure used to determine the presence of structural breaks within a time series regression model. In the context of panel data estimation, the test helps to decide between using the Fixed Effect Model or the Common Effect Model. This decision is made by evaluating the p-value obtained from the test. The Fixed Effect Model is considered the more appropriate choice if the p-value is below the 0.10 threshold, indicating statistical significance. Conversely, the Common Effect Model is preferred if the p-value exceeds 0.10, suggesting no significant difference. A more stringent interpretation uses a 1% significance level, where a p-value below 0.01 supports the Fixed Effect Model, and a value above 0.01 indicates the Common Effect Model as the optimal approach.

Based on Table 4.6, the Chow Test (Cross-section F and Chi-square) yields p-values of 0.0000, below the 0.01 significance level. Therefore, the null hypothesis is rejected, confirming that the Fixed Effect Model is more suitable than the Common Effect Model. The Fixed Effect Model is justified because it captures unobserved heterogeneity across commercial banks in Indonesia during 2018–2024, such as differences in organizational structure, management style, and operational characteristics, which are constant over time but vary across banks.

Table 4.6 Result of F-Test

Redundant Fixed Effects Tests			
Test cross-section fixed effects			
Effect Tests	Statistics	d.f.	Prob.
Cross-section F	13.9721	(33,159)	0.0000
Cross-section Chi-square	270.8280	33	0.0000

Data sourced: Data processed using EViews 13

Based on Table 4.6, the Chow Test (Cross-section F and Chi-square) yields p-values of 0.0000, below the 0.01 significance level. Thus, the null hypothesis is rejected, indicating that the Fixed Effect Model is more suitable than the Common Effect Model for capturing unobserved heterogeneity across Indonesian provinces from 2018 to 2024.

4.3.2 Lagrange Multiplier Test

The Lagrange Multiplier (LM) test, introduced by Breusch-Godfrey, is a general approach to identify potential autocorrelation issues. This test plays a crucial role in selecting the most appropriate model between the common and random effects. Based on the Lagrange Multiplier (LM) Test results in Table 4.7, the Breusch-Pagan value for the cross-section effect is 204.1923 with a significance level of 0.0000. For the combined (both) effect, it is 205.6236 with the same significance level (0.0000). Since the p-values are less than 0.01, it can be concluded that the Random Effect model is more appropriate than the Pooled Least Square (PLS) model. This indicates significant variability across cross-sectional units, and the Random Effect model is better suited to capture these differences in panel data analysis.

Table 4.7 Result of LM – Test

Lagrange Multiplier Tests for Random Effects			
Test Hypothesis			
	Cross Section	Time	Both
Breusch-Pagan	204.1923 (0.0000)	1.4313 (0.2315)	205.6236 (0.0000)

Data sources: Data processed using EViews 13

4.3.3 Hausman Test

The Hausman Test is a statistical method used to determine the most suitable model, Fixed Effect or Random Effect, for panel data regression analysis. Table 4.8 presents the results of the Hausman test, which yielded a probability value of $0.2744 > \alpha 0.01$. Therefore, H_0 is not rejected and H_a is not accepted, as the probability value exceeds the chosen significance level. This indicates that, according to the Hausman test, the Random Effect Model is the more appropriate.

By comparing the results of the Chow test, LM test, and Hausman test, the researcher decided to use the Random Effect Model to estimate the data in this study.

Table 4.8 Result of the Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	7.5323	6	0.2744

Data sources: Data processed using EViews 13

4.4 Regression Analysis

The Random Effect Model, as shown in Table 4.8, is considered the most appropriate regression model for examining the relationship between Return on Assets (ROA), Total Assets, Capital Adequacy Ratio (CAR), Cost to Income Ratio

(CIR), Non-Performing Loans (NPL), and Gross Domestic Product (GDP) on the distribution of green credit by banks in Indonesia from 2019 to 2024. Table 4.9 displays the estimation results based on the Random Effect Model.

Table 4.9 Result of Panel Regression with *Random Effect Model*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.9569	3.4650	-1.4305	0.1541
ROA	12.6429	3.3757	3.7451	0.0002
LOG(ASSET)	0.9824	0.1067	9.2014	0.0000
CAR	0.0323	0.5103	0.0633	0.9495
CIR	-0.6501	0.1605	-4.0491	0.0001
NPL	1.3708	2.3808	0.5757	0.5654
LOG(GDP)	0.2769	0.3635	0.7616	0.4472
R-squared	0.4509			
F-statistic	26.2777			
Prob (F-statistic)	0.0000			

Data sources: Data processed using EViews 13

4.4.1 Coefficient of Determination (R-squared)

The R-squared value in this regression is 0.4509, meaning that approximately 45.09% of the variation in green credit distribution can be explained by the independent variables: Return on Assets (ROA), Total Assets, Capital Adequacy Ratio (CAR), Cost to Income Ratio (CIR), Non-Performing Loans (NPL), and Gross Domestic Product (GDP). The remaining 54.91% is influenced by other factors not included in the model, such as environmental policies, bank-specific strategies, or other macroeconomic indicators.

4.4.2 F-Test

The F-statistic value is 26.2777 with a p-value of 0.0000, smaller than the significance level of 0.05. This result indicates that the independent variables, taken together, have a statistically significant influence on the distribution of green credit.

Therefore, the regression model is valid for explaining the relationship between the selected bank and economic indicators and green credit.

4.4.3 T-Test

To determine the individual influence of each independent variable on green credit distribution, a partial test (t-test) was conducted. This test assesses whether each variable has a statistically significant effect while controlling for the influence of the other variables. This study applies three significance levels (0.01, 0.05, and 0.10). A variable is considered statistically significant if its p-value falls below one of these thresholds; otherwise, it is deemed insignificant.

Table 4.10 Result of T-Test

Variable	t-Statistic	Prob	α	Description
ROA	3.7451	0.0002	0.01	Significant
LOG(ASSET)	9.2014	0.0000	0.01	Significant
CAR	0.0633	0.9495	0.10	Not Significant
CIR	-4.0491	0.0007	0.01	Significant
NPL	0.5757	0.5655	0.10	Not Significant
LOG(GDP)	0.7616	0.4472	0.10	Not Significant

Data sources: Data processed using EViews 13

1. Return on Assets (ROA)

The t-test result for the ROA variable shows a t-statistic value of 3.745 and a significance level (p-value) of $0.0002 < 0.01$. This indicates that ROA has a statistically significant effect on Green Credit.

2. Total Assets (log (ASSET))

The t-test result for the log (ASSET) variable shows a t-statistic value of 9.201 and a significance level of $0.0000 < 0.01$. Therefore, log (ASSET) significantly influences Green Credit.

3. Capital Adequacy Ratio (CAR)

The t-test result for the CAR variable shows a t-statistic value of 0.063 and a significance level of $0.9495 > 0.10$. This means that CAR does not have a significant effect on Green Credit.

4. Cost to Income Ratio (CIR)

The t-test result for the CIR variable shows a t-statistic value of -4.049 and a significance level of $0.00007 < 0.01$. Thus, CIR has a significant influence on Green Credit.

5. Non-Performing Loan (NPL)

The t-test result for the NPL variable shows a t-statistic value of 0.576 and a significance level of $0.5655 > 0.10$. Therefore, NPL does not significantly affect Green Credit.

6. Gross Domestic Product (log (GDP))

The t-test result for the log (GDP) variable shows a t-statistic value of 0.762 and a significance level of $0.4472 > 0.10$. This implies that log (GDP) does not significantly affect Green Credit.

4.5 Discussion

4.5.1 Analyzing the Effect of Return on Assets (ROA) on Green Credit Distribution

The t-test shows that ROA significantly affects green credit distribution ($p\text{-value} = 0.0002 < 0.01$), indicating that more profitable banks have greater financial capacity to support environmentally oriented lending. Thus, the first hypothesis is accepted.

This finding is consistent with Sutrisno et al. (2024), who showed that stronger profitability encourages banks to expand sustainable lending portfolios. Banks with higher ROA possess greater internal capital buffers, stronger liquidity positions, and higher flexibility to absorb potential risks associated with green projects, which often require longer payback periods. Although Ali (2024) notes that green credit may reduce profitability in certain cases, banks with high ROA are better equipped to diversify risks while still pursuing green financing. Therefore, profitability operates as a key driver enabling banks to support the growth of green credit.

4.5.2 Analyzing the Effect of Total Assets on Green Credit Distribution

The t-test shows that Total Assets (log Asset) have a highly significant positive effect on Green Credit ($t = 9.201; p < 0.01$), indicating that larger banks are substantially more capable of distributing green credit. Banks with greater asset bases possess stronger lending capacity, broader risk-absorption ability, and more resources to finance long-term green projects, which typically require substantial capital and slower returns.

This result is consistent with Ali (2024), who finds that larger Indonesian banks allocate more funds to sustainable lending due to stronger capital buffers and wider operational networks. Sutrisno et al. (2024) similarly highlight bank size as a key determinant of green financing capacity. Bigger banks face lower marginal costs of fund allocation and can diversify portfolios more effectively, making them more willing and able to engage in green credit. Therefore, Total Assets function as a critical enabling factor for expanding green credit distribution in Indonesia.

4.5.3 Analyzing the Effect of Capital Adequacy Ratio (CAR) on Green Credit Distribution

The t-test result shows that CAR has no significant effect on Green Credit distribution ($t = 0.063$; $p = 0.9495 > 0.10$), leading to the rejection of the hypothesis. This indicates that a bank's capital buffer does not meaningfully determine its commitment to green lending.

This outcome is consistent with Sutrisno & Furqan (2023), who also found CAR to be an insignificant predictor of green credit in Indonesia. Studies on Chinese commercial banks support this pattern, showing that although a higher CAR reflects stronger risk tolerance, it does not necessarily translate into more efficient green lending (Deng et al., 2022). Banks often maintain high CAR levels as a precautionary measure rather than a strategic signal to expand lending especially toward green projects that may be perceived as long-term, uncertain, or less profitable. As a result, strong capital adequacy does not automatically motivate banks to channel more funds into sustainable financing.

4.5.4 Analyzing the Effect of Cost to Income Ratio (CIR) on Green Credit Distribution

The t-test result shows that CIR has a statistically significant negative effect on green credit distribution ($t = -4.049$; $p = 0.00007 < 0.01$), indicating that banks with higher operational inefficiency are less likely to allocate funds to green credit. A higher CIR reflects greater costs relative to income, leaving banks with fewer financial and managerial resources to support environmentally oriented lending programs.

This finding aligns with Siauwijaya et al. (2023), who highlight that cost efficiency is essential for improving bank performance in the context of green lending in Indonesia. Supporting evidence from Lalon et al. (2025) also demonstrates that higher CIR weakens key profitability indicators such as ROA and NIM, reducing the bank's capacity to engage in sustainable financing. When operational costs rise, banks tend to prioritize core lending activities, making green credit often perceived as requiring additional screening, monitoring, and risk assessment less of a priority.

4.5.5 Analysing the Effect of Non-Performing Loan (NPL) on Green Credit Distribution

The t-test result shows that NPL has no statistically significant effect on green credit distribution ($t = 0.576$; $p = 0.5655 > 0.10$). Therefore, the hypothesis that higher credit risk reduces green credit allocation is rejected. This indicates that fluctuations

in NPL levels in conventional portfolios do not meaningfully influence banks' decisions to extend green credit.

This finding is consistent with Fata & Arifin (2024), who observed that green credit distribution does not significantly affect or reduce NPL ratios in Indonesian banks, and with Sutrisno & Furqan (2023), who also concluded that credit risk is not a major determinant of green credit volume. Banks typically implement stricter screening, enhanced monitoring, and specialized risk-mitigation frameworks for green projects. As a result, even when overall NPL levels are high, these risk management practices help ensure that green credit remains insulated from conventional credit risks, allowing banks to continue financing environmentally oriented projects.

4.5.6 Analyzing the Effect of Gross Domestic Product (GDP) on Green Credit Distribution

The t-test results from the Random Effect Model show that $\log(\text{GDP})$ has no significant effect on green credit distribution ($t = 0.762$; $p = 0.4472 > 0.10$). Thus, the hypothesis that macroeconomic growth influences green credit allocation is rejected. This suggests that fluctuations in national economic output do not translate into proportional changes in banks' environmentally oriented lending.

This finding aligns with prior studies indicating that macroeconomic indicators like GDP are not primary drivers of green lending behavior. Ali (2024) highlights that bank-level financial capacity and regulatory requirements exert stronger influence over corporate green credit strategies than aggregate economic growth. Likewise, sustainable finance literature (Lalon et al., 2025; Sutrisno et al.,

2024) underscores that policy mandates, regulatory incentives, and institutional readiness not GDP expansion are the key determinants shaping banks' engagement in green credit. This occurs because green financing is often compliance-driven and mission-oriented, meaning banks pursue it regardless of short-term macroeconomic cycles.

The t-test analysis reveals that only Return on Assets (ROA), Total Assets, and Cost to Income Ratio (CIR) statistically affect green credit distribution in Indonesian banks. Meanwhile, capital adequacy ratio (CAR), non-performing loans (NPL), and gross domestic product (GDP) do not. These results highlight the more decisive influence of internal financial performance, such as profitability, asset scale, and operational efficiency, over external or macroeconomic factors in supporting green credit disbursement.

CHAPTER V

CONCLUSION AND SUGGESTION

5.1 Conclusion

This study aimed to analyze the factors influencing the distribution of green credit by banks in Indonesia using unbalanced panel data from 34 banks over the period 2018 to 2024. The independent variables tested include Return on Assets (ROA), Total Assets, Capital Adequacy Ratio (CAR), Cost to Income Ratio (CIR), Non-Performing Loans (NPL), and Gross Domestic Product (GDP). The model chosen was the Random Effects Model based on statistical tests. The following are the conclusions derived for each research question:

1. The results show that ROA significantly and positively affects green credit distribution. Specifically, for every 1 unit increase in ROA, the distribution of green credit increases by approximately 12.64 units (coefficient = 12.64, $p < 0.01$). This implies that banks with higher profitability tend to allocate more funds toward environmentally friendly credit.
2. Total assets, represented in logarithmic form, also have a significant positive impact on green credit. A 1% increase in bank assets is associated with approximately a 0.98% increase in green credit distribution (coefficient = 0.982, $p < 0.01$), suggesting that larger banks are more capable and willing to engage in green financing initiatives.
3. CAR has no statistically significant effect on green credit distribution (coefficient = 0.032, $p = 0.949$). This indicates that the level of bank capital

adequacy does not play a major role in determining the amount of green credit provided during the observation period.

4. CIR has a significant negative impact on green credit. The coefficient of -0.65 ($p < 0.01$) suggests that for every 1 unit increase in the cost-to-income ratio, green credit decreases by approximately 0.65 units. This implies that the less efficiently a bank manages its operating costs, the lower its tendency to distribute green credit.
5. The NPL variable does not significantly affect green credit distribution (coefficient = 1.37, $p = 0.565$). Thus, the level of non-performing loans in banks does not statistically influence their willingness or capacity to issue green credit.
6. Logarithmic GDP also has no statistically significant effect on green credit (coefficient = 0.276, $p = 0.447$). This suggests that broader economic growth does not necessarily translate into increased green financing by banks, at least not during the study period.

5.2 Suggestion

Based on the conclusions drawn from the analysis of the six variables influencing green credit distribution in Indonesian banks, the following suggestions are proposed for relevant stakeholders:

1. Since bank profitability (ROA) significantly and positively affects green credit distribution, banks are encouraged to enhance their profitability through efficient asset management and productive investments. Profitability can serve as a lever to expand environmentally sustainable

financing. The government and regulators may incentivize profitable banks to channel their profits into green sectors.

2. Given the significant influence of bank size (Total Assets) on green credit, larger banks should lead in developing green financing portfolios, utilizing their broader capital base and risk management capacity. Smaller banks may need technical assistance, partnerships, or risk-sharing mechanisms to encourage their participation in the green credit market.
3. As CAR was not found to influence green credit significantly, future regulatory focus should not solely rely on capital buffers to drive green lending. However, it remains important for banks to maintain a healthy capital position as a prerequisite for overall financial stability. Future studies or pilot programs could explore linking capital relief or green-weighted assets as part of sustainable finance strategies.
4. Because operational efficiency (CIR) negatively and significantly affects green credit, banks must improve cost efficiency to create more room for sustainable financing. Investment in digital banking, automation, and lean operational models could enhance efficiency and thus indirectly promote green credit growth.
5. Since NPLs did not significantly influence green credit, banks may still expand green lending without significant concerns about rising credit risk, mainly if green sectors are managed prudently. However, risk assessments specific to green projects should still be improved, and banks could develop sector-specific credit scoring models for environmental projects.

6. Despite GDP's insignificant impact on green credit, economic growth provides the broader environment in which green investments can thrive. Policymakers should ensure that macroeconomic planning is aligned with environmental goals, such as through green fiscal policies, carbon pricing, or sustainable infrastructure development, to create more demand for green credit.

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APPENDICES

Appendix 1 Research data tabulation

Banks Name	Year	ROA	Asset	CAR	CIR	NPL	GDP	Green Credit
Mandiri Bank	2018	0,0317	1.202,25	0,2096	0,4435	0,0279	14.837	100,06
	2019	0,0303	1.411,24	0,2139	0,4568	0,0239	15.833	148,20
	2020	0,0164	1.541,96	0,1990	0,4489	0,0329	15.434	175,70
	2021	0,0253	1.725,61	0,1960	0,4254	0,0281	16.970	205,07
	2022	0,0330	1.992,55	0,1946	0,3819	0,0188	19.588	228,76
	2023	0,0403	2.174,22	0,2148	0,3436	0,0102	20.892	264,00
	2024	0,0359	2.427,22	0,2110	0,3504	0,0097	22.139	293,00
BRI	2019	0,0350	1.416,75	0,2255	0,4003	0,0262	15.833	492,87
	2020	0,0198	1.610,06	0,2061	0,4540	0,0294	15.434	550,36
	2021	0,0272	1.678,09	0,2528	0,4326	0,0308	16.970	614,20
	2022	0,0376	1.865,63	0,2330	0,4195	0,0282	19.588	694,90
	2023	0,0393	1.965,00	0,2523	0,3774	0,0312	20.892	772,74
	2024	0,0376	1.992,98	0,2441	0,3697	0,0294	22.139	785,22
BNI	2018	0,0280	808,57	0,1850	0,4250	0,0190	14.837	134,68
	2019	0,0240	845,61	0,1970	0,4390	0,0230	15.833	139,59
	2020	0,0050	891,34	0,1680	0,4420	0,0430	15.434	143,27
	2021	0,0140	964,84	0,1970	0,4330	0,0370	16.970	172,38
	2022	0,0250	1.029,83	0,1930	0,4260	0,0280	19.588	182,93
	2023	0,0260	1.086,66	0,2200	0,4290	0,0210	20.892	181,10
	2024	0,0250	1.129,80	0,2140	0,4460	0,0200	22.139	190,05
BRI AGRO (Raya Bank)	2019	0,0031	27,06	0,2428	0,9664	0,0766	15.833	3,36
	2020	0,0012	28,05	0,2433	0,9712	0,0497	15.434	7,54
	2021	0,1360	16,86	0,2024	2,8786	0,0398	16.970	3,17
	2022	0,0080	13,89	0,4374	0,9334	0,0290	19.588	2,45
	2023	0,0020	12,44	0,4384	0,9051	0,0440	20.892	2,69
	2024	0,0040	13,13	0,4429	0,9668	0,0322	22.139	2,97
	2019	0,0013	311,77	0,1732	0,5808	0,0478	15.833	1,24

BTN	2020	0,0069	361,20	0,1934	0,5385	0,0437	15.434	1,67
	2021	0,0081	371,86	0,1914	0,4818	0,0370	16.970	2,41
	2022	0,0102	402,14	0,2017	0,4666	0,0338	19.588	3,50
	2023	0,0107	438,74	0,2007	0,4526	0,0301	20.892	3,43
	2024	0,0083	469,61	0,1850	0,5715	0,0316	22.139	4,84
West Java Regional Development Bank	2019	0,0168	123,53	0,1771	0,6843	0,0158	15.833	1,58
	2020	0,0166	140,96	0,1731	0,7670	0,0140	15.434	2,07
	2021	0,0173	158,35	0,1778	0,6700	0,0124	16.970	7,60
	2022	0,0175	181,24	0,1919	0,7004	0,0116	19.588	14,64
	2023	0,0133	188,30	0,2012	0,6902	0,0121	20.892	16,48
	2024	0,0086	219,99	0,1970	0,7147	0,0222	22.139	17,48
Banten Regional Development Bank	2018	0,0157	9,48	0,1004	1,7930	0,0590	14.837	5,51
	2019	0,0209	8,10	0,0901	2,3863	0,0501	15.833	0,05
	2020	0,0380	5,33	0,3475	4,9518	0,2227	15.434	0,13
	2021	0,0294	8,84	0,4168	3,8965	0,1409	16.970	0,04
	2022	0,0346	7,22	0,4438	2,2240	0,0945	19.588	0,35
	2023	0,0072	6,80	0,4472	0,9576	0,0936	20.892	0,32
	2024	0,0102	7,55	0,4299	1,1050	0,0753	22.139	0,35
Central Java Regional Development Bank	2019	0,0188	71,86	0,1770	0,5669	0,0288	15.833	11,62
	2020	0,0203	73,10	0,1970	0,5299	0,0352	15.434	12,25
	2021	0,0220	80,34	0,2101	0,5035	0,0317	16.970	13,94
	2022	0,0295	84,49	0,2170	0,5105	0,0252	19.588	15,52
	2023	0,0245	88,45	0,2228	0,5856	0,0354	20.892	18,03
	2024	0,0206	94,40	0,2240	0,6215	0,0365	22.139	19,60
East Java Regional Development Bank	2019	0,0273	76,75	0,2133	0,3831	0,0277	15.833	0,88
	2020	0,0195	83,61	0,2164	0,3691	0,0400	15.434	1,07
	2021	0,0205	100,72	0,2352	0,3883	0,0448	16.970	0,87
	2022	0,0195	103,03	0,2474	0,3841	0,0283	19.588	1,12
	2023	0,0187	103,85	0,2571	0,3956	0,0249	20.892	1,36
	2024	0,0160	118,14	0,2349	0,3921	0,0345	22.139	5,65
	2019	0,0226	14,52	0,2102	0,7933	0,0404	15.833	2,00

East Nusa Tenggara Regional Development Bank	2020	0,0203	14,72	0,2150	0,8038	0,0449	15.434	2,29
	2021	0,0185	15,66	0,2433	0,8140	0,2600	16.970	2,45
	2022	0,0182	17,03	0,2689	0,8059	0,0263	19.588	2,50
	2023	0,0065	17,32	0,2535	0,8723	0,0287	20.892	2,51
South West Sulawesi Regional Development Bank	2018	0,0367	20,57	0,2428	0,5588	0,0051	22.139	2,47
	2019	0,0336	23,54	0,2298	0,5000	0,0125	15.833	2,78
	2020	0,0312	24,83	0,2403	0,5118	0,0067	15.434	2,76
	2021	0,0309	27,78	0,2130	0,4916	0,0092	16.970	3,03
	2022	0,0295	29,65	0,2754	0,4883	0,0123	19.588	2,70
	2023	0,0291	30,79	0,2861	0,4655	0,0216	20.892	2,57
North Sulawesi Gorontalo Regional Development Bank	2019	0,0144	15,14	0,1582	0,7434	0,0182	15.833	1,56
	2020	0,0160	16,40	0,1519	0,7454	0,0358	15.434	1,51
	2021	0,0124	18,47	0,1626	0,7693	0,0344	16.970	1,30
	2022	0,0165	20,17	0,1851	0,7529	0,0290	19.588	1,29
	2023	0,0168	20,85	0,2040	0,7403	0,0270	20.892	1,60
	2024	0,0140	21,19	0,1944	0,7677	0,0241	22.139	1,54
Maluku Regional Development Bank	2019	0,0278	7,86	0,2546	0,7434	0,0154	15.833	0,36
	2020	0,0281	8,40	0,2616	0,7523	0,0190	15.434	0,30
	2021	0,0299	8,94	0,2768	0,7083	0,0229	16.970	0,34
	2022	0,0288	10,26	0,3221	0,7147	0,0248	19.588	0,31
	2023	0,0185	9,32	0,3112	0,7221	0,0318	20.892	0,22
	2024	0,0243	8,82	0,2878	0,6892	0,0339	22.139	0,24
BCA	2018	0,0400	824,78	0,2340	0,4430	0,0140	14.837	102,20
	2019	0,0400	918,98	0,2380	0,4130	0,0130	15.833	124,92
	2020	0,0270	1.075,50	0,2580	0,3740	0,0180	15.434	127,62
	2021	0,0280	1.228,30	0,2570	0,3490	0,0220	16.970	159,48
	2022	0,0320	1.314,70	0,2580	0,3510	0,0180	19.588	183,22
	2023	0,0360	1.408,10	0,2940	0,3410	0,0190	20.892	203,00
	2024	0,0390	1.449,30	0,2940	0,3150	0,0180	22.139	229,00
	2019	0,0023	36,55	0,1732	0,6124	0,0783	15.833	1,49

Sinarmas Bank	2020	0,0030	44,61	0,1729	0,6875	0,0475	15.434	1,69
	2021	0,0034	52,67	0,2912	0,7135	0,0464	16.970	2,38
	2022	0,0054	47,35	0,2949	0,7410	0,0799	19.588	2,38
	2023	0,0015	52,63	0,2534	0,8116	0,0153	20.892	2,39
	2024	0,0082	55,62	0,3046	0,8807	0,0149	22.139	1,79
OCBC	2018	0,0210	173,58	0,1763	0,7443	0,0179	14.837	14,60
	2019	0,0220	180,70	0,1917	0,7477	0,0173	15.833	33,38
	2020	0,0147	206,29	0,2204	0,8113	0,0193	15.434	28,97
	2021	0,0155	214,39	0,2305	0,7650	0,0236	16.970	30,38
	2022	0,0186	238,49	0,2153	0,7109	0,0242	19.588	33,80
	2023	0,0214	249,75	0,2369	0,7101	0,0164	20.892	32,20
	2024	0,0224	281,00	0,2360	0,7099	0,0155	22.139	37,90
Mega Bank	2019	0,0290	100,80	0,2368	0,7410	0,0246	15.833	11,84
	2020	0,0364	112,20	0,3104	0,6594	0,0139	15.434	12,72
	2021	0,0422	132,87	0,2730	0,5606	0,0112	16.970	16,63
	2022	0,0400	141,75	0,2541	0,5676	0,0123	19.588	18,24
	2023	0,0347	132,05	0,2617	0,6560	0,0157	20.892	22,53
	2024	0,0256	134,91	0,2577	0,7361	0,0169	22.139	20,03
Bumi Artha Bank	2019	0,0096	7,60	0,2355	0,8955	0,0153	15.833	2,25
	2020	0,0070	7,63	0,2598	0,8100	0,0263	15.434	2,10
	2021	0,0074	8,66	0,4187	0,7565	0,0304	16.970	1,83
	2022	0,0059	8,21	0,5927	0,7215	0,0456	19.588	1,43
	2023	0,0071	7,99	0,7287	0,7332	0,0443	20.892	1,77
	2024	0,0096	8,17	0,6507	0,8224	0,0365	22.139	1,93
CIMB Niaga	2019	0,0199	274,46	0,2147	0,5120	0,0279	15.833	71,87
	2020	0,0106	280,94	0,2192	0,4895	0,0362	15.434	50,12
	2021	0,0188	310,78	0,2268	0,4588	0,0346	16.970	45,07
	2022	0,0216	306,75	0,2219	0,4491	0,0280	19.588	51,44
	2023	0,0259	334,36	0,2402	0,4483	0,0196	20.892	55,45
	2024	0,0253	360,22	0,2334	0,4432	0,0176	22.139	59,12
	2019	0,0230	181,63	0,2420	0,5650	0,0120	15.833	10,84

BTPN	2020	0,0140	183,16	0,2560	0,5390	0,0080	15.434	9,87
	2021	0,0220	191,91	0,2620	0,4930	0,0170	16.970	12,02
	2022	0,0240	209,16	0,2730	0,4980	0,0140	19.588	12,96
	2023	0,0170	201,44	0,2990	0,5270	0,0140	20.892	13,77
	2024	0,0180	241,09	0,3000	0,5390	0,0250	22.139	18,12
Mayapada Bank	2018	0,0073	86,97	0,1582	0,9261	0,0554	14.837	12,05
	2019	0,0078	93,40	0,1618	0,9216	0,0385	15.833	12,36
	2020	0,0012	92,51	0,1545	0,9841	0,0409	15.434	4,51
	2021	0,0007	119,10	0,1437	0,9883	0,0393	16.970	2,03
	2022	0,0004	135,38	0,1113	0,9932	0,0470	19.588	2,18
	2023	0,0004	141,48	0,1078	0,9940	0,0377	20.892	2,05
	2024	0,0004	150,18	0,1050	0,9951	0,0347	22.139	2,13
Permata Bank	2019	0,0130	161,45	0,1990	0,6240	0,0280	15.833	0,17
	2020	0,0090	197,72	0,3570	0,5870	0,0290	15.434	0,19
	2021	0,0070	234,37	0,3490	0,5490	0,0320	16.970	0,19
	2022	0,0110	255,11	0,3420	0,5510	0,0310	19.588	13,76
	2023	0,0130	257,44	0,3530	0,5150	0,0290	20.892	12,44
	2024	0,0180	259,06	0,3460	0,5010	0,0210	22.139	22,60
Danamon Bank	2019	0,0210	193,53	0,2420	0,5090	0,0300	15.833	32,56
	2020	0,0050	200,89	0,2500	0,4630	0,0280	15.434	26,89
	2021	0,0080	192,24	0,2670	0,4770	0,0270	16.970	20,91
	2022	0,0170	197,73	0,2630	0,5010	0,0260	19.588	46,18
	2023	0,0170	221,30	0,2750	0,5160	0,0230	20.892	54,47
	2024	0,0140	242,33	0,2620	0,5410	0,0190	22.139	55,51
Amar Bank	2020	0,0074	4,05	0,4543	0,9673	0,0693	15.434	0,89
	2021	0,0002	5,20	0,2985	0,9976	0,0658	16.970	1,45
	2022	0,0475	4,50	0,8252	1,1936	0,0609	19.588	1,48
	2023	0,0478	4,37	1,1953	0,8607	0,0923	20.892	1,71
	2024	0,0585	4,86	1,2631	0,8414	0,1025	22.139	1,96
UOB Indonesia	2019	0,0087	105,66	0,1655	0,9037	0,0169	15.833	16,12
	2020	0,0070	116,55	0,1885	0,9226	0,0244	15.434	14,89
	2021	0,0071	121,39	0,1798	0,9019	0,0351	16.970	16,38
	2022	0,0084	138,27	0,1657	0,8774	0,0298	19.588	15,29
	2023	0,0061	162,54	0,1832	0,9231	0,0258	20.892	16,08

	2024	0,0035	156,14	0,1651	0,9564	0,0205	22.139	18,31
Mestika Dharma Bank	2020	0,0317	14,15	0,4649	0,3985	0,0169	15.434	1,63
	2021	0,0431	15,98	0,4812	0,3531	0,0118	16.970	2,18
	2022	0,0397	16,58	0,4424	0,3798	0,0126	19.588	2,24
	2023	0,0326	16,05	0,4993	0,4523	0,0137	20.892	2,31
	2024	0,0323	16,57	0,4493	0,4721	0,0066	22.139	2,34
Neo Commerce Bank	2021	-0,1371	11,33	0,5549	2,2401	0,0175	16.970	0,01
	2022	-0,0520	19,69	0,3679	1,2728	0,0256	19.588	0,98
	2023	-0,0299	18,16	0,2786	1,1227	0,0373	20.892	0,10
	2024	0,0100	17,40	0,3530	0,9934	0,0330	22.139	0,15
Ganesha Bank	2020	0,0010	5,36	0,3747	0,9840	0,0549	15.434	0,13
	2021	0,0023	8,57	0,6778	0,9481	0,0513	16.970	0,12
	2022	0,0060	8,96	1,0641	0,8663	0,0201	19.588	0,50
	2023	0,0155	9,40	0,9467	0,7936	0,0162	20.892	0,67
	2024	0,0276	10,35	0,7483	0,6721	0,0116	22.139	0,72
Maybank	2018	0,0174	177,53	0,1904	0,8347	0,0259	14.837	58,28
	2019	0,0145	169,08	0,2138	0,8578	0,0333	15.833	42,60
	2020	0,0104	173,18	0,2431	0,8783	0,0400	15.434	40,41
	2021	0,0134	168,71	0,2710	0,8269	0,0369	16.970	38,18
	2022	0,0125	160,81	0,2665	0,8310	0,0346	19.588	24,82
	2023	0,0141	171,80	0,2774	0,8313	0,0292	20.892	21,84
	2024	0,0085	197,17	0,2555	0,8956	0,0268	22.139	22,09
Victoria Bank	2020	0,0126	26,22	0,1739	1,1209	0,0758	15.434	1,78
	2021	0,0071	24,94	0,1792	1,0494	0,0727	16.970	3,21
	2022	0,0147	25,93	0,2259	0,7944	0,0423	19.588	3,06
	2023	0,0048	29,62	0,2069	0,9167	0,0399	20.892	3,53
	2024	0,0051	31,04	0,2238	0,8800	0,0327	22.139	3,77
Oke Indonesia Bank	2019	0,0027	5,10	0,4127	1,0121	0,0295	15.833	0,57
	2020	0,0035	6,27	0,5398	0,9582	0,0352	15.434	1,50
	2021	0,0038	7,72	0,5088	0,9533	0,0358	16.970	1,08
	2022	0,0022	10,18	0,4767	0,9728	0,0275	19.588	1,39
	2023	0,0035	11,07	0,4922	0,9635	0,0380	20.892	1,83
	2024	0,0061	11,87	0,4683	0,9364	0,0249	22.139	1,62
	2022	0,0109	20,55	0,3113	0,8243	0,0173	19.588	3,40

Ina Perdana Bank	2023	0,0117	24,38	0,2616	0,8437	0,0344	20.892	5,29
	2024	0,0044	24,43	0,2511	0,9387	0,0346	22.139	3,62
Artha Graha Bank	2020	0,0011	30,52	0,1666	1,0389	0,0458	15.434	1,04
	2021	0,0073	26,12	0,2236	0,6758	0,0339	16.970	0,75
	2022	0,0025	25,43	0,2382	0,6905	0,0273	19.588	0,46
	2023	0,0060	26,10	0,2548	0,7805	0,0174	20.892	0,32
	2024	0,0055	30,12	0,2655	0,7864	0,0240	22.139	0,37
China Construction Bank	2021	0,0041	26,19	0,4156	0,9275	0,0439	16.970	3,52
	2022	0,0069	25,02	0,3557	0,8776	0,0340	19.588	3,29
	2023	0,0122	27,85	0,4076	0,8276	0,0287	20.892	1,70
	2024	0,0122	33,54	0,3278	0,8339	0,0212	22.139	2,88

Appendix 2 Estimated Results from Common Effect Model (CEM) Regression

Dependent Variable: LOG(GC)
 Method: Panel Least Squares
 Date: 07/24/25 Time: 16:22
 Sample: 2018 2024
 Periods included: 7
 Cross-sections included: 34
 Total panel (unbalanced) observations: 199

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.673294	5.825940	-0.458861	0.6469
ROA	22.39217	4.257150	5.259896	0.0000
LOG(ASSET)	0.980796	0.061639	15.91203	0.0000
CAR	0.708409	0.573146	1.235999	0.2180
CIR	-0.491520	0.209898	-2.341712	0.0202
NPL	1.533220	3.514227	0.436289	0.6631
LOG(GDP)	-0.004317	0.595779	-0.007247	0.9942
R-squared	0.739037	Mean dependent var		1.766379
Adjusted R-squared	0.730882	S.D. dependent var		2.158258
S.E. of regression	1.119631	Akaike info criterion		3.098418
Sum squared resid	240.6862	Schwarz criterion		3.214263
Log likelihood	-301.2926	Hannan-Quinn criter.		3.145303
F-statistic	90.62263	Durbin-Watson stat		0.414752
Prob(F-statistic)	0.000000			

Appendix 3 Estimated Results from Fixed Effect Model (FEM) Regression

Dependent Variable: LOG(GC)
 Method: Panel Least Squares
 Date: 07/24/25 Time: 16:22
 Sample: 2018 2024
 Periods included: 7
 Cross-sections included: 34
 Total panel (unbalanced) observations: 199

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.759901	3.665892	-1.025644	0.3066
ROA	10.75915	3.555386	3.026156	0.0029
LOG(ASSET)	1.519723	0.360104	4.220240	0.0000
CAR	0.046055	0.551879	0.083452	0.9336
CIR	-0.643204	0.167201	-3.846898	0.0002
NPL	1.088370	2.429681	0.447947	0.6548
LOG(GDP)	-0.077224	0.453056	-0.170450	0.8649

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.933084	Mean dependent var	1.766379
Adjusted R-squared	0.916671	S.D. dependent var	2.158258
S.E. of regression	0.623019	Akaike info criterion	2.069131
Sum squared resid	61.71635	Schwarz criterion	2.731102
Log likelihood	-165.8786	Hannan-Quinn criter.	2.337048
F-statistic	56.84928	Durbin-Watson stat	1.524115
Prob(F-statistic)	0.000000		

Appendix 4 Estimated Results from Random Effect Model (REM)

Regression

Dependent Variable: LOG(GC)
 Method: Panel EGLS (Cross-section random effects)
 Date: 07/24/25 Time: 20:13
 Sample: 2018 2024
 Periods included: 7
 Cross-sections included: 34
 Total panel (unbalanced) observations: 199
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.956992	3.465030	-1.430577	0.1542
ROA	12.64296	3.375783	3.745194	0.0002
LOG(ASSET)	0.982454	0.106771	9.201477	0.0000
CAR	0.032341	0.510393	0.063364	0.9495
CIR	-0.650109	0.160556	-4.049112	0.0001
NPL	1.370811	2.380885	0.575757	0.5655
LOG(GDP)	0.276933	0.363594	0.761655	0.4472

Effects Specification		S.D.	Rho
Cross-section random		0.979538	0.7120
Idiosyncratic random		0.623019	0.2880

Weighted Statistics			
R-squared	0.450906	Mean dependent var	0.430963
Adjusted R-squared	0.433746	S.D. dependent var	0.823100
S.E. of regression	0.625518	Sum squared resid	75.12436
F-statistic	26.27777	Durbin-Watson stat	1.237320
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.727133	Mean dependent var	1.766379
Sum squared resid	251.6647	Durbin-Watson stat	0.369352

Appendix 5 Chow Test Estimate Result

Redundant Fixed Effects Tests
Equation: FIXED
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	13.972138	(33,159)	0.0000
Cross-section Chi-square	270.828096	33	0.0000

Cross-section fixed effects test equation:

Dependent Variable: LOG(GC)

Method: Panel Least Squares

Date: 07/25/25 Time: 20:53

Sample: 2018 2024

Periods included: 7

Cross-sections included: 34

Total panel (unbalanced) observations: 199

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.673294	5.825940	-0.458861	0.6469
ROA	22.39217	4.257150	5.259896	0.0000
LOG(ASSET)	0.980796	0.061639	15.91203	0.0000
CAR	0.708409	0.573146	1.235999	0.2180
CIR	-0.491520	0.209898	-2.341712	0.0202
NPL	1.533220	3.514227	0.436289	0.6631
LOG(GDP)	-0.004317	0.595779	-0.007247	0.9942
R-squared	0.739037	Mean dependent var		1.766379
Adjusted R-squared	0.730882	S.D. dependent var		2.158258
S.E. of regression	1.119631	Akaike info criterion		3.098418
Sum squared resid	240.6862	Schwarz criterion		3.214263
Log likelihood	-301.2926	Hannan-Quinn criter.		3.145303
F-statistic	90.62263	Durbin-Watson stat		0.414752
Prob(F-statistic)	0.000000			

Appendix 6 Lagrange Multiplier Results

Lagrange Multiplier Tests for Random Effects

Null hypotheses: No effects

Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided
(all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	204.1923 (0.0000)	1.431348 (0.2315)	205.6237 (0.0000)
Honda	14.28959 (0.0000)	-1.196390 (0.8842)	9.258289 (0.0000)
King-Wu	14.28959 (0.0000)	-1.196390 (0.8842)	4.286917 (0.0000)
Standardized Honda	15.33874 (0.0000)	-0.802281 (0.7888)	6.245809 (0.0000)
Standardized King-Wu	15.33874 (0.0000)	-0.802281 (0.7888)	1.842012 (0.0327)
Gourieroux, et al.	--	--	204.1923 (0.0000)

Appendix 7 Hausman Estimation Result

Correlated Random Effects - Hausman Test
Equation: RANDOM
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	7.532376	6	0.2744

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
ROA	10.759151	12.642961	1.244861	0.0913
LOG(ASSET)	1.519723	0.982454	0.118274	0.1182
CAR	0.046055	0.032341	0.044069	0.9479
CIR	-0.643204	-0.650109	0.002178	0.8824
NPL	1.088370	1.370811	0.234739	0.5599
LOG(GDP)	-0.077224	0.276933	0.073059	0.1901

Cross-section random effects test equation:

Dependent Variable: LOG(GC)

Method: Panel Least Squares

Date: 07/25/25 Time: 20:54

Sample: 2018 2024

Periods included: 7

Cross-sections included: 34

Total panel (unbalanced) observations: 199

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.759901	3.665892	-1.025644	0.3066
ROA	10.75915	3.555386	3.026156	0.0029
LOG(ASSET)	1.519723	0.360104	4.220240	0.0000
CAR	0.046055	0.551879	0.083452	0.9336
CIR	-0.643204	0.167201	-3.846898	0.0002
NPL	1.088370	2.429681	0.447947	0.6548
LOG(GDP)	-0.077224	0.453056	-0.170450	0.8649

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.933084	Mean dependent var	1.766379
Adjusted R-squared	0.916671	S.D. dependent var	2.158258
S.E. of regression	0.623019	Akaike info criterion	2.069131
Sum squared resid	61.71635	Schwarz criterion	2.731102
Log likelihood	-165.8786	Hannan-Quinn criter.	2.337048
F-statistic	56.84928	Durbin-Watson stat	1.524115
Prob(F-statistic)	0.000000		