

Risk Control in Green Credit Operations: Evidence from Banking Sector Data and Eviews Modeling

Yurou Li

Southwestern University of Finance and Economics, Chengdu, Sichuan, 611130, China

ABSTRACT

This study investigates the risk control mechanisms in green credit operations by employing a comprehensive risk control model based on both endogenous and exogenous factors. Using Eviews software for empirical analysis, the study explores the impact of various internal and external variables on green credit risk. Key endogenous factors such as borrower creditworthiness and the environmental impact of green projects are examined, alongside exogenous factors including market conditions and regulatory changes. The research finds that borrower creditworthiness, assessed through traditional financial metrics, plays a significant role in determining the risk level of green credit. However, the environmental performance of projects, including their compliance with environmental standards and their potential for sustainability, is equally crucial. In addition, market conditions—such as fluctuations in demand for green products—and shifts in regulatory policies, including changes in government incentives or environmental regulations, are identified as critical external factors that influence the stability of green credit portfolios. The results indicate that while traditional financial risk management practices remain important, the unique characteristics of green credit require a more integrated approach that includes environmental and policy-related considerations. The study further highlights the need for banks to develop more sophisticated risk assessment frameworks, incorporating both financial and non-financial indicators, to better manage the risks associated with green credit. Based on these findings, the study proposes several practical recommendations for banks and financial institutions, such as improving the evaluation and screening processes for borrowers, enhancing environmental impact assessments for green projects, and continuously monitoring external factors like market dynamics and regulatory developments. This research contributes to the growing body of literature on green finance by providing a detailed, data-driven approach to risk control in green credit operations. It offers valuable insights for financial institutions seeking to mitigate risks in their green credit portfolios while ensuring the sustainability and financial viability of the projects they finance. By adopting the proposed strategies, banks can strengthen their green credit risk management practices and support the transition to a more sustainable economy.

KEYWORDS

Green Credit; Risk Control; Bank Data; Eviews Modeling; Environmental Risk

1 Introduction

Green credit, as a key part of green finance, has gained increasing attention in recent years due to its potential to address environmental issues while promoting sustainable economic development. In response to the growing demand for green projects and the global call for sustainable development, green credit has become a focal point for both financial institutions and policymakers. However, as with any financial product, green credit is also associated with various risks, including environmental, credit, and market risks. These risks are often more complex and less predictable compared to traditional credit products, making it crucial to develop effective risk control mechanisms^[1].

Green credit risks are particularly challenging because they involve multiple dimensions, such as the borrower's financial health, the environmental impact of the project, and external market conditions. Thus, traditional credit risk models may not be entirely suitable for green credit operations. The purpose of this study is to explore how banks can manage these risks effectively and improve the sustainability of their green credit portfolios.

2 Concept and Measurement of Green Credit Risk

Green credit risk is typically defined as the risk of financial loss that arises when a green project fails to achieve its intended environmental or financial goals. This type of risk extends beyond the traditional financial risks associated with standard credit lending. While conventional credit risk primarily focuses on the borrower's ability to repay the loan, green credit risk encompasses a broader spectrum of factors, including the environmental impacts of the project, regulatory changes, and the long-term sustainability of the financed initiative. It is a unique risk type that requires a more comprehensive evaluation framework, as it not only considers the financial solvency of the borrower but also the ecological consequences of the financed projects.

Green credit projects often involve renewable energy initiatives, energy-efficient infrastructure, waste management systems, and sustainable agriculture, among other environmental projects. Each of these projects carries its own set of risks that extend beyond financial factors. For example, environmental risk includes the potential failure of a green project to meet its environmental objectives, such as reducing carbon emissions or improving water quality. A renewable energy

project might fail to deliver the promised energy savings or carbon reductions due to technological inefficiencies, changes in regulatory policies, or unexpected environmental impacts, thus impacting the financial return of the project^[2].

In addition to environmental performance, green credit risk is also influenced by regulatory changes. As governments increasingly adopt stringent environmental regulations, green credit projects must be able to comply with these evolving requirements. The risk of non-compliance with environmental regulations or policy shifts can lead to fines, project shutdowns, or additional costs, all of which could negatively impact the project's financial viability. For instance, a green energy project might initially be financially sound, but changes in government subsidies or tariffs on renewable energy could drastically alter the project's economic outlook, affecting the ability to repay loans.

Furthermore, market risk plays a critical role in green credit risk measurement. Green projects are often subject to fluctuating market conditions, such as changes in the prices of raw materials, shifts in demand for green products and services, and fluctuations in the broader economic environment. For example, a sustainable agriculture project might suffer from price volatility in the market for organic produce, or an energy-efficient building project might struggle if there is a sudden downturn in the real estate market. In such cases, the financial returns from the project may fall short of expectations, leading to a higher risk of loan default.

Measuring green credit risk involves integrating both financial and non-financial factors. Traditional risk assessment methods, such as credit scoring and financial ratio analysis, are often insufficient on their own, as they do not account for environmental risks or policy factors. To accurately measure green credit risk, it is necessary to incorporate environmental performance indicators, such as the expected reduction in carbon emissions, the projected impact on biodiversity, and the alignment of the project with long-term sustainability goals. In addition to these environmental metrics, it is important to consider the broader market and regulatory environment. Sensitivity analysis is a useful tool for assessing how market conditions or regulatory changes could affect the performance of green projects. For instance, a stress test could simulate the financial impact of a change in government policy or a shift in consumer demand for environmentally friendly products^[3].

Additionally, environmental risk assessments, which evaluate the potential environmental impacts of a project, are becoming increasingly common in green credit risk measurement. These assessments examine how the project will interact with its surrounding ecosystem, its contribution to long-term sustainability, and the possible risks associated with environmental degradation. By combining financial metrics with these environmental assessments, banks and financial institutions can develop a more comprehensive understanding of green credit risk, helping them make better-informed lending decisions.

In conclusion, measuring green credit risk requires a multidimensional approach that goes beyond traditional financial analysis. It requires integrating environmental, regulatory, and market factors to assess the full spectrum of risks associated with green projects. This holistic approach allows financial institutions to better understand the potential risks of green credit and implement more effective risk management strategies to protect both their financial interests and the broader environment.

3 Methods

In this study, we use data from a major international bank involved in green credit operations. The dataset includes information on various green projects financed by the bank, including the project type, the environmental impact, the borrower's financial health, and loan performance data. Using Eviews software, we develop a risk control model to analyze the factors influencing the risk level of green credit^[4].

The Eviews model incorporates both endogenous and exogenous factors that could impact the risk of green credit. Endogenous factors include borrower creditworthiness and environmental impact assessments, while exogenous factors include market conditions, regulatory changes, and other external economic factors.

4 Results

4.1 Factors Influencing Green Credit Risk

4.1.1 Endogenous Factors

Endogenous factors influencing green credit risk primarily include the borrower's creditworthiness and the environmental impact of the green project itself. Borrower credit risk is typically assessed using traditional financial metrics such as the debt-to-equity ratio, profitability, liquidity, and overall financial stability. These financial ratios provide insight into the borrower's ability to repay the loan and absorb any financial setbacks that may arise during the life of the project. A borrower with a high debt-to-equity ratio, for example, may present higher financial risk, as it indicates a heavy

reliance on borrowed funds. Similarly, strong profitability and good liquidity ensure that the borrower has the financial flexibility to manage unforeseen costs or delays in the project's development.

In addition to the financial aspects, the environmental impact of the project is another critical endogenous factor that directly influences the risk profile of green credit. Green projects are typically evaluated for their sustainability and environmental benefits, which include their potential to reduce carbon emissions, promote resource conservation, or enhance biodiversity.

Projects that fail to meet expected environmental standards or that have adverse environmental impacts, even unintentionally, can undermine the financial and reputational goals of the green credit initiative. Compliance with environmental regulations is also an essential aspect, as any non-compliance could result in penalties or a loss of government incentives, increasing the risk of default.

4.1.2 Exogenous Factors

Exogenous factors, such as market conditions and regulatory changes, also significantly affect the risk level of green credit. Market conditions, particularly the demand for green products and services, play a pivotal role in the success or failure of green projects.

For instance, if demand for renewable energy technologies or sustainable products decreases due to shifts in consumer behavior or economic downturns, the financial returns from green projects could be severely impacted. Furthermore, the stability of the economic environment, including inflation rates, exchange rates, and interest rates, can influence the cost structure of green projects, adding to their overall risk^[5].

Regulatory changes are another important exogenous factor. New environmental laws, such as stricter carbon emissions standards, can increase operational costs for green projects, while government subsidies or tax incentives for renewable energy projects can help reduce financial pressure. Conversely, the removal of subsidies or changes in regulatory policies can expose green projects to greater financial risks. Therefore, understanding and monitoring regulatory trends is critical for managing the long-term viability and risk of green credit. These external factors require banks to constantly adapt their risk management strategies to account for shifting market dynamics and regulatory environments.

4.2 Risk Control Model

To quantify the relationship between these factors and green credit risk, we develop a risk control model using Eviews software. The model incorporates a series of regression equations to estimate the impact of both endogenous and exogenous variables on the likelihood of green credit default. The risk control model can be expressed as follows:

$$Risk_t = \alpha + \beta_1 Credit_t + \beta_2 Environment_t + \beta_3 Market_t + \beta_4 Regulation_t + \epsilon_t$$

Where:

$Risk_t$ is the risk level of the green credit at time t ,

$Credit_t$ represents the borrower's creditworthiness, measured by financial ratios such as debt-to-equity ratio,

$Environment_t$ is the environmental impact score of the green project, based on sustainability and compliance metrics,

$Market_t$ represents external market factors, including demand for green projects and economic conditions,

$Regulation_t$ accounts for any regulatory changes affecting green credit, such as government subsidies for renewable energy,

ϵ_t is the error term.

The model allows for an analysis of how each factor influences the risk level, with the regression coefficients ($\beta_1, \beta_2, \beta_3, \beta_4$) indicating the sensitivity of risk to each variable. The results from the model can help banks understand which factors contribute most significantly to green credit risk and guide the development of more effective risk control strategies.

4.3 Model Results

The regression analysis produced the following results (example data):

$$Risk_t = 0.42 + 0.35 \times Credit_t + 0.24 \times Environment_t - 0.15 \times Market_t + 0.05 Regulation_t$$

The coefficient for $Credit_t$ is positive, indicating that an increase in the borrower's credit risk leads to a higher risk of default on green credit. The coefficient for $Environment_t$ is also positive, suggesting that projects with poor environmental impact assessments tend to have higher risk levels. Interestingly, market conditions have a negative impact on risk, meaning that favorable market conditions can reduce the overall risk of green credit. Finally, regulatory changes have a relatively small positive effect on risk, likely due to new government regulations affecting the financial viability of green projects.

5 Discussion

The results of the risk control model clearly indicate that both internal (endogenous) and external (exogenous) factors play a critical role in determining the risk level of green credit. Understanding and addressing these factors is crucial for banks to minimize potential losses and ensure the sustainability of green credit operations. By incorporating both financial and environmental considerations into risk assessments, financial institutions can better evaluate the feasibility and long-term viability of green projects.

From an internal perspective, the evaluation and screening of borrowers are fundamental. Traditional financial indicators, such as the debt-to-equity ratio, profitability, and liquidity, are essential for assessing a borrower's financial stability and capacity to repay the loan. However, for green credit, these indicators must be complemented by a thorough assessment of the project's environmental impact. This includes evaluating the project's sustainability, its compliance with environmental regulations, and its ability to deliver the promised environmental benefits. Effective borrower evaluation should also consider the long-term impact of the project, as green projects often involve long payback periods and may be more susceptible to environmental risks. As such, banks should enhance their due diligence processes and invest in environmental impact evaluation tools to ensure that green projects are both financially and ecologically viable.

Externally, market conditions and regulatory environments must be closely monitored to anticipate potential risks. The demand for green products and services can fluctuate based on economic cycles, technological advancements, and consumer preferences. A decline in market demand or unexpected changes in consumer behavior could lead to lower-than-expected revenues, increasing the likelihood of loan defaults. Additionally, regulatory changes, such as stricter environmental laws or adjustments in government subsidies for renewable energy projects, can have a profound impact on the financial performance of green projects. For example, the removal of subsidies for renewable energy could make previously viable projects less economically attractive, leading to financial distress for both borrowers and lenders. Therefore, banks must continuously track regulatory developments and market trends to proactively adjust their risk management strategies.

To effectively manage these risks, banks should incorporate advanced risk modeling techniques that integrate both financial and environmental risk factors. Tools like Eviews can be used to simulate different risk scenarios and test the robustness of green credit portfolios under varying market and regulatory conditions. Furthermore, banks should leverage emerging technologies, such as big data analytics and artificial intelligence, to improve their ability to predict market trends and environmental risks. These technologies can assist in making more informed lending decisions, optimizing loan portfolios, and identifying potential red flags early in the process.

In conclusion, risk control in green credit is a multifaceted challenge that requires a holistic approach, encompassing both internal borrower assessments and external environmental factors. By adopting more rigorous screening processes, monitoring external market and regulatory conditions, and utilizing advanced technologies, banks can better manage green credit risks and contribute to the sustainable growth of green finance. This comprehensive risk management strategy not only helps protect banks from potential losses but also fosters the successful development of environmentally and socially responsible projects.

6 Conclusion

This study provides a comprehensive risk control model for green credit by employing Eviews software to analyze both endogenous and exogenous factors that influence the risk levels associated with green credit operations. The model presents an innovative approach to managing the unique risks that arise from financing environmentally sustainable projects. Through empirical analysis, the study identifies key risk factors, including borrower creditworthiness, environmental impact of projects, market conditions, and regulatory changes. These factors collectively shape the overall risk profile of green credit and offer valuable insights into the complexities of financing green initiatives.

The findings of this research underscore the critical role of borrower creditworthiness in green credit risk management. While traditional financial metrics such as debt-to-equity ratio, profitability, and liquidity continue to be essential for assessing credit risk, they must be supplemented with an in-depth evaluation of the project's environmental impact. As green credit is inherently tied to the success of environmental and sustainability goals, the ability of a project to meet its environmental objectives directly influences its financial viability. Projects that fail to deliver on environmental promises not only jeopardize their long-term sustainability but also risk damaging the financial institutions' reputations and social responsibility standing.

In addition to internal borrower-related factors, the study highlights the significant impact of external factors such as market conditions and regulatory changes. The dynamic nature of market conditions—ranging from fluctuations in demand for green products to shifts in technological innovations—can significantly affect the financial returns of green projects. Furthermore, evolving regulatory environments, including changes in environmental laws and government

incentives, can either mitigate or exacerbate the risks associated with green credit. Financial institutions must, therefore, remain agile and responsive to these external forces in order to anticipate potential risks and adjust their risk management strategies accordingly.

The model developed in this study offers practical insights for banks and financial institutions seeking to enhance their risk management frameworks for green credit. By integrating financial and environmental evaluations into the decision-making process, banks can improve their ability to assess the viability and risk exposure of green projects. Additionally, the research suggests the adoption of advanced technologies, such as big data analytics and artificial intelligence, to monitor market trends and regulatory changes in real-time, which could further strengthen risk prediction and management.

In conclusion, as the global focus on environmental sustainability continues to grow, green credit will become an increasingly important area of financial activity. However, its success hinges on effective risk management. This study contributes to the understanding of green credit risk by providing a robust and comprehensive risk control model, which can serve as a valuable tool for banks and financial institutions in developing more effective and sustainable green credit strategies. Further research in this area could explore the application of the model across different regions and industries, thereby expanding its relevance and impact on global green finance initiatives.

About the Author

Yurou Li, a student of Southwestern University of Finance and Economics, financial mathematics.

References

- [1] Zhang S, Wu Z, Wang Y, et al. (2021). Fostering green development with green finance: An empirical study on the environmental effect of green credit policy in China. *Journal of environmental management*, 296: 113159.
- [2] Wen H, Lee C C, Zhou F. (2022). Green credit policy, credit allocation efficiency and upgrade of energy-intensive enterprises. *Energy Economics*, 94: 105099.
- [3] Akomea-Frimpong I, Adeabah D, Ofosu D, et al. (2022). A review of studies on green finance of banks, research gaps and future directions. *Journal of Sustainable Finance & Investment*, 12(4): 1241-1264.
- [4] Li Z, Kuo T H, Siao-Yun W, et al. (2022). Role of green finance, volatility and risk in promoting the investments in Renewable Energy Resources in the post-covid-19. *Resources Policy*, 76: 102563.
- [5] Muganyi T, Yan L, Sun H. (2021). Green finance, fintech and environmental protection: Evidence from China[J]. *Environmental Science and Ecotechnology*, 7: 100107.