Corporate Governance and Market Changes under Climate Change

Wenshuo Jin[1,*], Qian Shan[2], and Siyi Dai[3]

[1]School of Economics and Management, Harbin Institute of Technology, Weihai, 264209, China
[2]School of Economics, Guangxi University for Nationalities, Nanning, 530001, China
[3]International Department of Shude High School, Chengdu, 610066, China
Email: Kimwich@outlook.com (W.S.J.); 2764886452@qq.com (Q.S.); 1559471432@qq.com (S.Y.D.)
*Corresponding author
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***Abstract*—Climate risk has become a common topic of concern across various sectors of society. In today's major economies, various enterprises are affected by the impacts of climate change in many ways. Therefore, this article starts by examining the market challenges faced by enterprises and further analyzes how enterprises can break the deadlock. At the same time, as the main entity of macroeconomic regulation, the government should also take action against climate change. The government can use various financial tools to coordinate with the financial market for regulation, while the financial market can also cooperate with enterprises to respond to, regulate, and hedge against climate risks related to green finance and other derivatives. In conclusion, the three parties of enterprises, government, and financial markets need to work together to address climate challenges.**

***Keywords*—climate change, green finance, environmental policy**

I. Introduction

Climate change has become one of the most pressing global challenges. It is not only just an environmental issue, but also is actually reshaping corporate operations, and market dynamics. As we all know, extreme weather events have become more frequent in recent years: heavy rains may disrupt supply chains, and extreme heat may affect factory production. Meanwhile, the shift toward a low-carbon lifestyle means enterprises face both risks and opportunities for transformation. This change prompts us to think: how do external supervision influence corporate actions and change market trends?

Corporate governance plays a key role in climate change. Governments and international organizations have strengthened regulation: As an illustration, the EU stipulates that since 2024, large companies must report in detail on their carbon emissions and climate risks. China has also rolled out a national carbon market, where if they exceed emission limits, energy-intensive enterprises must purchase allowances. These rules not only create pressures on enterprises but also encourage them to take proactive environmental actions.

At the same time, expectations from stakeholders related to enterprises have changed. For instance, major institutions like Norway's sovereign wealth fund withdraw money from high-polluting companies and instead invest in green enterprises like solar and wind power firms. The global scale of green funds has exceeded $5 trillion. Consumers are also more likely to choose eco-friendly products, such as biodegradable straws and electric vehicle (Teutrine *et al.*, 2024). These pressures have pushed enterprises to improve information disclosure, strengthen risk management, and invest more in clean energy technologies like solar and wind power.

Markets are changing too. Green bonds have gained popularity: here is one example, an energy company issued green bonds specifically to build power plants, which investors were willing to buy, making it easier for the enterprise to secure financing. Conversely, high-carbon industries face greater risks. This offers a typical instance of Coal-fired power companies, who may find newly built power plants unused due to policy restrictions (Gao *et al.*, 2024).

Although attention to this topic is growing, our understanding of how different external supervision methods interact to drive corporate responses to climate issues and trigger market changes remains incomplete. This research aims to clarify: How the tripartite collaboration among enterprises, governments and markets has an influence on climate change?

II. Research Status

In this field such, existing research has formed a multi-dimensional exploration pattern. In view of the correlation among the carbon market, energy market and financial market, Tan *et al.* adopted the modified error variance decomposition, network graph and Iterative Cumulative Sum of Squares (ICSS) algorithm, combined with the Shapley value method, to analyze the "carbon-energy-finance" system. Their findings mainly include the following points: Information spillovers within the system are time-varying; The oil and carbon markets are closely related to the stock and non-energy commodity markets, but have a relatively weak connection with the bond market. The contribution of financial risk-based macroeconomic factors to system connectivity is greater than that of commodity factors. This study systematically reveals the dynamic spillover mechanism between the carbon market and the multi-asset market, which can serve as a theoretical basis for investors to optimize their investment portfolios and for governments to improve their monitoring of systemic risks (Tan *et al.*, 2020).

In the study of the market spillover effects of Climate Policy Uncertainty (CPU), Wang *et al.* employed the quantile connectedness method to explore the connectedness between CPU and energy prices, green bond, and carbon prices. They

Wenshuo Jin and Siyi Dai are co-first authors.

found that the connectedness at extreme quantiles is significantly higher than that at the median. Meanwhile, international events have intensified the effect of spillover effects. The spillover effect of green bonds and the carbon market on CPU is particularly prominent and can be used as an indicator to predict. This discovery highlights the sensitivity of market connections to extreme conditions and provides a new perspective for predicting climate policy uncertainties, helping market participants better cope with potential policy shocks (Wang *et al.*, 2023).

Chevallier *et al.* employed a stochastic model with a stop time and Monte Carlo simulation to trace the development trajectories of 17 major international oil and gas companies. They found that if they did not adjust their business models, these companies might face the risk of bankruptcy by 2050, and due to strict emission limits, 60% of their fossil fuel reserves might not be exploitable. This simulation result quantifies the survival pressure of high-carbon enterprises in the low-carbon transformation, prompting them to accelerate the transformation of their business models (Chevallier *et al.*, 2021). Meanwhile, Hakovirta *et al.* adopted a descriptive statistical approach to summarize the development of climate innovation startups. They pointed out that these start-ups have driven breakthroughs in low-carbon technologies in areas such as energy grid technology and green energy power generation, with a post-valuation of 27 billion euros from 2000 to 2022. This indicates that start-ups have become a key force driving the progress of low-carbon technologies, and cooperation with traditional enterprises may become an important path for the green transformation of the industry (Hakovirta *et al.*, 2023).

In terms of the impact of climate risk on the financing cost of enterprises, Cepni *et al.* analyzed the relationship between climate exposure and the financing cost of enterprises by using the data of American enterprises and the empirical regression method. They found that there is a positive correlation between climate exposure and equity financing costs, mainly driven by climate transition risks. This correlation is more prominent in enterprises with high climate attention, significant climate impact, and strong financing constraints. This study clarifies the mechanism by which climate risks affect corporate equity financing, reminding high-risk enterprises to attach importance to climate risk management and alleviate financing pressure (Cepni *et al.*, 2024).

Jaroslaw *et al.* conducted a joint survey experiment to comp are the support levels of different green investment and financing tools. They found that compared with broad-based taxation, debt financing provided about 10 percentage points more support for green investment. It can be seen from this that carbon taxes and wealth taxes are favored by the public. The government can also reduce the issuance cost of green bonds by adjusting interest rates and lowering tax rates, thereby promoting the development of green bonds and responding to the public's expectations (Kantorowicz *et al.*, 2024).

The economic and financial risks associated with global warming have become a prominent topic in academia. Wang *et al.* assessed the impact of the severity of global warming on financial risks. Global warming affects households, businesses, financial institutions, and governments. The impact of climate change on financial risks exhibits heterogeneity. Global warming is likely to lead to a greater accumulation of financial risks in economically developed regions. Additionally, it can trigger financial risks by causing a decline in household income, a reduction in corporate profits, an increase in the number of non-performing loans recognized by financial institutions, and an expansion of the gap between government revenues and expenditures. All of these effects will have adverse cascading effects on the economy. Climate change poses long-term effects on businesses (Wang *et al.*, 2024). All of these effects will have an adverse domino effect on the economy.

Kung-Cheng Ho *et al.* examined the long-term impact of climate change on credit spreads using a sample of A-share listed companies. They noted that the greater the climate change risk faced by companies, the larger the credit spreads of their bonds, and awareness of the potential harms of such climate change in the secondary bond market is also increasing; therefore, climate change may lead to potential harms. They indicated that climate change heightens the likelihood of corporate bankruptcies, profit volatility, and negative investor sentiment. Their research holds significant implications for exploring the impact of climate risks on the bond market and the vital policy implications for green finance (Ho *et al.*, 2024).

Luke uses Foucault's theories of "biopolitics" and "governmentality" as the core theoretical framework to view ESG investment as a new type of "device": ESG reconstitutes investor ethics through "self-techniques" by transforming personal values into capital allocation behaviors. He critically points out that ESG may become a form of "soft legislation" that avoids radical institutional change through market mechanisms, perpetuating the logic of neoliberal governance (Luke, 2022). Aibar-Guzmán *et al.* propose the concept of "climate governance" based on the resource-based view and agency theory, suggesting that climate governance mechanisms are a "strategic resource" for companies to address climate risks, which can be converted into financial competitive advantages. Long-term institutional investors mitigate agency problems through share concentration and board intervention, driving the internalization of climate strategies (Aibar-Guzmán, 2024).

III. Solutions

A. Government

Establish mandatory climate risk disclosure systems requiring businesses to report physical and transition risks, eliminating information asymmetry (Griffin, 2020). For enterprises with high pollution levels, it is essential to strengthen environmental supervision. Industries such as coal, petroleum, and steel should be required to establish a comprehensive environmental risk disclosure system and consistently place high importance on ESG reports. At the same time, the government should also pay attention to the daily operational risks of enterprises to avoid over-correction. In instances where companies face serious climate-related physical risks, they should receive appropriate financial or other forms of support. Additionally, the government can establish relevant departments or build a complete monitoring system to conduct comprehensive analyses of

enterprises' environmental indicators, market trends, and weather changes in real-time, aiming for more objective policy implementation.

Reduce green bond issuance costs and offer tax incentives and interest rate subsidies to stimulate corporate green financing (Leitao *et al.*, 2023). Due to the heightened attention to climate risks only in recent years, many investors may lack confidence, leading to lower government focus on relevant green financial derivatives. This results in high purchase costs for financial products such as green bonds and green options. The government can collaborate with central banks and other relevant financial institutions to regulate green financial products overall, adjusting interest rates accordingly. This can ensure that investors receive a more objective return, while issuers can finance at lower costs to hedge against environmental risks (Wang *et al.*, 2025).

B. Financial Market

Develop climate-sensitive financial derivatives to direct capital toward low-carbon and climate-resilient industries (He *et al.*, 2025). In the face of escalating climate risks, market participants such as exchanges, acting as intermediaries, should pay more attention to the analysis of climate risks. When matching different strategies for enterprises, investment banks can remind them to focus on the threats posed by climate change, guiding them to develop green investment and financing strategies. Intermediaries in the financial market, such as exchanges and investment banks, can effectively guide a wide range of investment and financing participants to invest funds into the field of green finance through their authority, professionalism, and broad reach, thereby ensuring a solid and reliable funding base for green finance.

Implement climate stress tests for small financial institutions to prevent chain reactions of financial defaults. Due to scale limitations, small banks have weaker risk resistance capabilities, and most of their clients are small and micro enterprises. Small and micro enterprises are more sensitive to climate risks, facing a higher probability of bankruptcy when experiencing such risks, which may lead to bad debt risks for small micro financial institutions during the transmission of financial risks. Regular climate risk stress testing for small micro financial institutions can ensure they have corresponding strategies to cope with climate risks when they genuinely arise. This can not only enhance their risk resistance capabilities and mechanism resilience but also improve the service levels of small micro financial institutions, thereby ensuring the overall stability of the financial system (Dorfleitner *et al.*, 2025).

Establish climate-tech venture capital funds targeting critical sectors supporting startups in overcoming innovation bottlenecks (Hakovirta *et al.*, 2023). Startups are just getting started and face particularly daunting market challenges. Meanwhile, related technologies such as climate forecasting have developed, but there is still a lack of widespread commercial application. Therefore, a relevant technology fund could be established to support startups in addressing climate risks. For example, in the agricultural sector, the widespread application of blockchain technology is of great significance for the construction of agricultural supply chains, as it can effectively enhance the resilience of upstream and downstream industries. Even in extreme weather years, when they suffer huge losses, they can ensure continuous operation through fund support.

C. Enterprise

Optimize fossil fuel reserves in response to market sensitivity (Hudson & Bowness, 2021). High-pollution industries represented by energy and chemical sectors have always been a particularly focused subject in climate risk response. These enterprises often come with high pollution, but their enormous economic value cannot be denied, as the energy industry is the economic lifeline for some countries. Such companies can actively engage in green financing, proactively invest in green financial products in the financial market, and can avoid corresponding risks through the allocation of financial resources (Zhang *et al.*, 2025)

Enhance governance frameworks and disclosure transparency to lower equity financing costs (Düsterhöft *et al.*, 2023). Internal corporate governance is also particularly important. Increasing the disclosure of climate risks and appropriately revealing the climate risks faced by the company to the market and the government can enhance investor confidence and eliminate communication and trust barriers between the market, enterprises, and the government. At the same time, companies should actively publish ESG reports and participate in environmental protection activities to reflect their corporate social responsibility, which can effectively attract green investments from investors while reducing financing costs for both parties.

Optimize financing strategies using bonds, options, and other derivatives to hedge climate-related risks. Enterprises can formulate green development strategies, actively use green credit tools such as climate loans and green loans, and can also actively utilize financial services such as green bonds and green insurance. By appropriately combining financial instruments, they can achieve risk hedging when facing climate risks, reducing losses from climate disasters. In addition, enterprises can increase their investment in the green sector, actively investing in green industry funds and building green supply chains. This not only helps them develop their own green industry system but also demonstrates corporate social responsibility and builds good social relationships.

IV. Conclusion

Climate change does have a significant impact on markets and business operations, and effective collaboration between governments, enterprises and markets is urgently needed. The government should simplify the corresponding monitoring measures as much as possible to reduce the cost of green financing for enterprises. Enterprises should reasonably match financing policies to achieve risk hedging and reduce losses caused by climate change.

V. Research Prospect

Future research needs to break down the isolated analysis of "policy-enterprise-market", build a dynamic synergy framework, and strengthen empirical support from emerging markets, the private economy and small financial institutions. Corporate governance needs to shift from passive disclosure to active strategic estructuring. The market mechanism needs

to solve the problems of industry sensitivity pricing bias and the lack of extreme risk transmission models. Policy tools should explore the synergy of public debt, central bank regulation and derivatives innovation. If the relationship between the government, enterprises, and the market can be properly managed, both the physical risks brought about by climate change and the indirectly induced financial risks will be alleviated and appropriately avoided.

Conflict of Interest

The authors declare no conflict of interest.

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Wenshuo Jin, Qian Shan and Siyi Dai contributed equally to this work and should be considered co-first authors.

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