Green Bond Credibility and Stock Market Reaction: Evidence from Chinese Listed Firms

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Green Bond Credibility and Stock Market Reaction: Evidence from Chinese Listed Firms

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Green Bond Credibility, Use-of-Proceeds Additionality, and Stock Market Reactions

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Table of Contents

Table of Contents 1

List of Tables 3

Abstract 4

1. Introduction 5

    1.1 Research Background 5

    1.2 Research Question 6

    1.3 Contributions and Structure 9

2. Literature Review 11

    2.1 Green Bonds and Sustainable Finance 11

    2.2 Stock Market Reactions to Green Bond Issuance 13

    2.3 Competing Interpretations 16

    2.4 Use-of-Proceeds Structure: Complementary, Mixed, and Substitution-oriented issuance 19

3. Institutional Background and Hypothesis Development 22

    3.1 Development of China's Green Bond Market 22

    3.2 Regulation and Use-of-Proceeds Disclosure 24

    3.3 Investor Interpretation of Green Bond Announcements 25

    3.4 Hypotheses 26

4. Data and Sample Construction 29

    4.1 Green Bond Announcement Data 29

    4.2 Event Date Definition 30

    4.3 Stock Return and Market Index Data 31

    4.4 Bond Characteristics and Firm-Level Financial Data 32

    4.5 Variable Definitions 34

    4.6 Sample Selection 36

5. Methodology 38
5.1 Event Study Design 38
5.2 Estimation Window and Event Windows 38
5.3 Abnormal Returns and Market Model 38
5.4 Cumulative Abnormal Returns 39
5.5 Regression Specification 39
5.6 Control variables and fixed effects 40
5.7 Treatment of confounding events 40
6. Empirical Results 41
6.1 Descriptive Statistics 41
6.2 Correlation Matrix 43
6.3 Announcement-period Abnormal Returns 45
6.4 Significance Tests of Announcement-period CARs 46
6.5 Use-of-Proceeds Regression Results 47
7. Robustness Checks 51
7.1 Alternative Event Windows 51
7.2 Alternative Use-of-Proceeds Classification 52
7.3 Additional Fixed Effects 53
7.4 Excluding contaminated events 54
8. Discussion 57
9. Conclusion 60
10. References 62

List of Tables

Table 4.1 Event-Study Variables 32

Table 4.2 Bond-Level and Firm-Level Control Variables 33

Table 4.3 Use-of-Proceeds Classification Rules 35

Table 4.4 Sample Distribution by Use-of-Proceeds Category 37

Table 6.1 Sample distribution by use-of-proceeds category 41

Table 6.2 Descriptive statistics of main variables 41

Table 6.3 Correlation Matrix for Core Variables 44

Table 6.4 Correlation Matrix for Control Variables 44

Table 6.5 Announcement-period Cumulative Abnormal Returns 45

Table 6.6 Significance Test of Announcement-Period CARs 46

Table 6.7 Baseline Regression Results 47

Table 6.8 Binary non-complementary classification 48

Table 7.1 Additional Fixed Effects 53

Table 7.2 Robustness Check 54

Abstract

This thesis studies whether green bond announcements generate stock market reactions in China and whether such reactions depend on the disclosed structure of bond proceeds. Using a sample of 520 announcement-level observations by Chinese listed firms, we use event study with cross-sectional CAR regressions. Abnormal returns are estimated around green bond announcement dates, and cumulative abnormal returns are constructed over multiple event windows to capture both short-term and long-term market reactions.

The core research question is whether investors interpret green bond announcements as credible signals of green investment and corporate transition. The thesis classifies green bond proceeds into different use-of-proceeds structures, from mixed proceeds to substitution-oriented issuance. Mixed proceeds refer to announcements in which funds are allocated to both green project investment and other financial activities, such as refinancing or working capital. Substitution-oriented proceeds refer to cases where green bond financing appears to replace existing financing rather than expand green investment.

The empirical results indicate that the market reaction to green bond announcements is not uniform. Overall announcement effects are modest, suggesting that investors do not automatically reward positive valuation effects. However, the use-of-proceeds structure matters. Mixed proceeds are associated with stronger positive effects in longer event windows, implying that investors may view a combination of green investment and financial flexibility as value-relevant when the announcement contains credible information about both environmental commitment and capital allocation. By contrast, the evidence for substitution-oriented proceeds is unstable, indicating that investors do not consistently reward or penalize this type of issuance.

This thesis contributes to the literature on green bonds and market reactions shifting from *whether* firms issue green bonds to *how* the proceeds are used in the context of China's policy-driven green bond market. The study shows that green bond announcements are better understood not as homogeneous sustainability signals, but as information events whose valuation implications depend on the perceived credibility and economic content of the disclosed proceeds structure.

1. Introduction

1.1 Research Background

Sustainable finance has become an important mechanism through which financial markets respond to climate change, environmental degradation, and the transition toward a low-carbon economy. As governments and firms face increasing pressure to reduce carbon emissions and improve environmental performance, capital allocation is expected to play a more active role in supporting green investment. This is particularly relevant for China. China has announced the national objective of reaching peak carbon dioxide emissions before 2030 and achieving carbon neutrality before 2060, making the mobilisation of long-term green capital a central component of its transition strategy. In this context, green finance is not only an environmental policy tool, but also a financial-market mechanism that affects firms' financing choices, investor expectations, and asset prices.

Green bonds are one of the most crucial tools in sustainable finance. Unlike conventional bonds, green bonds are debt securities whose proceeds are intended to finance or refinance environmentally beneficial projects. The International Capital Market Association defines green bonds as bond instruments whose proceeds, or an equivalent amount, are exclusively applied to finance or refinance eligible green projects and which are aligned with the four core components of the Green Bond Principles: use of proceeds, project evaluation and selection, management of proceeds, and reporting. Among these components, the use of proceeds is especially important because it links the financial instrument to real environmental investment. Without credible information on how proceeds are allocated, the green label may provide limited information to investors.

China provides an important angle for studying green bonds. Since the launch of its domestic green bond market, China has become one of the largest green bond markets in the world. According to the Climate Bonds Initiative, China's cumulative aligned green, social, sustainability, sustainability-linked and transition bond issuance reached USD 555.5 billion by the end of 2024, placing China among the four markets globally to exceed the half-trillion-dollar threshold. In 2024, China issued USD 68.9 billion in aligned green bonds across onshore and offshore markets, making it the third-largest source of aligned green bond issuance after the United States and

Germany. The same report shows that green bonds remain the dominant theme among Chinese sustainable debt instruments, accounting for 80% of cumulative aligned volume by the end of 2024.

The development of China's green bond market is closely connected with the country's broader green finance policy framework. In 2016, Chinese authorities issued the Guidelines for Establishing the Green Financial System, which described green finance as financial services that support environmental improvement, climate-change response, and resource-efficient economic activities, including green credit, green bonds, green funds, green insurance, and carbon finance. The guidelines state that the main purpose of establishing a green financial system is to mobilise and incentivise more social capital to invest in green industries and to restrict investment in polluting projects. More recently, the China Green Bond Principles have further strengthened the domestic framework by requiring green bond proceeds to be 100% limited to green industries, green economic activities, and related green projects. The Principles also specify that proceeds may be used for the construction, operation, and acquisition of green projects, the supplementation of working capital for supporting projects, or the repayment of interest-bearing debts of green projects.

These regulations show why use-of-proceeds structure deserves close empirical attention. Green bonds are typically discussed as a single category, but the information conveyed by a green bond announcement may differ depending on how the issuer intends to use the proceeds. A bond whose proceeds are mainly allocated to new green project construction may send a different signal from a bond whose proceeds are partly used for refinancing, debt repayment, working capital, or a combination of multiple uses. In principle, all these uses may be eligible under green bond rules if they are connected to qualifying green projects. However, from the perspective of equity investors, they may imply different degrees of incremental green investment, financial flexibility, and sustainability credibility.

1.2 Research Question

This thesis studies whether green bond announcements affect the stock prices of Chinese listed companies. The central research question is: Do green bond announcements generate significant stock market reactions for Chinese listed firms? The second and more specific research question is: Does the stock market reaction

vary according to the use-of-proceeds structure disclosed in the green bond announcement? By addressing these questions, the thesis moves beyond the binary distinction between green bonds and non-green bonds. Instead, it examines whether investors differentiate between green bond announcements based on the credibility and economic meaning of the proceeds allocation.

The motivation comes from both the green bond literature and the institutional features of the Chinese market. International evidence suggests that green bond issuance can create positive shareholder value. Tang and Zhang (2020) examine firms from 28 countries and document positive stock price reactions around green bond issuance announcements. They argue that these announcement effects are associated with changes in investor ownership and stock liquidity, rather than being explained solely by a lower cost of debt. Flammer (2021) also finds that investors respond positively to corporate green bond issuance announcements, with stronger reactions for first-time issuers and externally certified bonds. Her findings support the interpretation that green bonds can serve as a credible signal of a firm's environmental commitment.

However, the signalling value of green bonds is not necessarily uniform. A green bond announcement may be interpreted positively when investors believe that the issuer is financing additional green investment or strengthening its long-term transition strategy. By contrast, the same green label may be less informative when the proceeds are used to substitute for existing financing needs, such as refinancing existing debt or supplementing working capital. Although such uses can still be legitimate when linked to green projects, investors may perceive them as less indicative of new environmental commitment. Therefore, the credibility of a green bond may depend not only on the label itself, but also on the disclosed allocation of proceeds.

This issue is especially relevant in China because the market has experienced rapid regulatory development and increasing alignment with international markets. The introduction of the China Green Bond Principles puts emphasis on 100% green use of proceeds and more detailed disclosure. However, even within a more standardised framework, green bond announcements may differ in their information content. Some announcements clearly indicate financing for specific new green projects, while others disclose multiple uses or substitution-related purposes. This variation creates

an empirical opportunity to examine whether investors price the structure of proceeds allocation.

The theoretical basis is based on information signalling and market efficiency. In an efficient market, new information released through corporate announcements should be incorporated into stock prices. Event study methodology is widely used to measure this effect because it estimates abnormal stock returns around the event date, thereby capturing the market's assessment of the economic value of the event. MacKinlay (1997) explains that event studies measure the effect of an economic event on firm value by examining security prices around the time the event occurs. In this thesis, the event is the announcement of a green bond issuance by a Chinese listed company. If investors interpret the announcement as value-enhancing, the firm should experience positive abnormal returns around the announcement window. If investors are uncertain about the economic or environmental value of the bond, the market reaction may be weak, insignificant, or vary across different types of proceeds structures.

This thesis applies an event study approach to a sample of green bond announcements by Chinese listed companies. The event date is defined as the public announcement date of the green bond issuance. Abnormal returns are calculated by comparing the actual daily stock return of the issuing firm with its expected return estimated using a benchmark model, such as the market model. Cumulative abnormal returns are then constructed over multiple event windows, including short windows that capture immediate market reaction and longer windows that allow for delayed information processing. This is particularly relevant in the Chinese stock market, where investor attention, disclosure interpretation, and market microstructure may cause reactions to unfold over more than one trading day.

The second stage of the empirical analysis uses CAR regressions to examine whether the magnitude of the stock market reaction is associated with use-of-proceeds structure. The dependent variable is the cumulative abnormal return around the green bond announcement. The main explanatory variables capture the disclosed proceeds structure, including whether the bond has a mixed use of proceeds and whether the proceeds involve substitution-related uses, such as refinancing, repayment of existing debt, or working-capital supplementation related to green projects. The regressions also control for firm characteristics, bond

characteristics, and fixed effects where appropriate. Firm-level controls may include size, leverage, profitability, growth opportunities, ownership type, and industry. Bond-level controls may include issue size, maturity, coupon rate, credit rating, bond type, and whether the bond has external verification.

1.3 Contributions and Structure

The core innovation of this thesis lies in its focus on use-of-proceeds structure. Existing studies often ask whether green bond issuance is associated with positive abnormal returns. This thesis asks a more specific question: which types of green bond proceeds allocation are more credible or more informative to equity investors? This distinction matters because the green bond label alone may not fully reveal whether the bond supports new green investment, refinances prior green investment, improves liquidity, or substitutes for other financing. By decomposing the announcement according to proceeds structure, the thesis provides a more granular test of the credibility channel in green bond markets.

The main empirical findings suggest that the market reaction to green bond announcements by Chinese listed companies is not uniform. In particular, mixed use of proceeds is more strongly associated with abnormal returns in longer event windows. This suggested that investors may require additional time to interpret announcements involving multiple proceeds categories. This result is consistent with the view that mixed proceeds structures contain more complex information than simple, single-purpose green project financing. They may combine environmental investment information with financial flexibility information, which may not be fully incorporated into prices immediately. By contrast, the evidence on substitution-related use of proceeds is less stable. The estimated effect of substitution varies across model specifications and event windows.

These findings have several implications. First, they suggest that green bond announcements should not be treated as homogeneous corporate events. The same green label may carry different valuation implications depending on how the proceeds are allocated. Second, the stronger effect of mixed use of proceeds in longer windows indicates that the market may process complex green bond disclosures gradually. This implies how issuers communicate green bond information and how investors evaluate the credibility of labelled financing instruments. Third, the

unstable effect of substitution-related proceeds suggests that refinancing and similar uses occupy an ambiguous position. They may support green projects and improve financial flexibility, but they may also be perceived as less indicative of incremental environmental investment. This ambiguity is directly related to broader concerns about the credibility of sustainable finance.

This thesis contributes to the literature in three ways. First, it contributes to the green bond literature by shifting the analysis from whether green bonds matter to how specific design features of green bonds matter. Prior research has documented positive market reactions to green bond issuance in international samples, but less attention has been paid to the internal structure of proceeds allocation. By examining use-of-proceeds structure, this thesis provides a more detailed understanding of the information content of green bond announcements. Second, the thesis contributes China-specific evidence. China is one of the largest and most policy-driven green bond markets, while its institutional environment, investor base, regulatory framework, and disclosure practices differ from those in developed markets. Evidence from Chinese listed companies therefore helps assess whether findings from international green bond studies generalise to a major emerging market. Third, the thesis contributes to the discussion of green bond credibility. Since the use of proceeds is the cornerstone of green bond classification, understanding whether investors price proceeds structure provides direct evidence on the role of disclosure credibility in sustainable finance.

The remainder of this thesis is organized as follows. Section 2 reviews the literature on green bonds, sustainable finance, stock market reactions, and use-of-proceeds credibility. Section 3 describes the institutional background of China’s green bond market and develops the hypotheses. Section 4 presents the data sources, sample construction, and variable definitions. Section 5 explains the event study methodology and CAR regression models. Section 6 reports the empirical results. Section 7 presents robustness checks. Section 8 discusses the findings, implications, and limitations. Section 9 concludes.

2. Literature Review

2.1 Green Bonds and Sustainable Finance

Green bonds are among the most visible sustainable finance instruments. Generally, green bonds are fixed-income securities whose proceeds are used for projects with environmental benefits, such as renewable energy, energy efficiency, green buildings, etc. Unlike ordinary corporate bonds, green bonds are not defined soly by their financial characteristics, but by the use-of-proceeds, that the issuer commits to allocating the raised capital to green or climate-friendly projects. Tang and Zhang (2020) emphasize that although green bonds are similar to traditional fixed-income securities in raising capital, they are intended to finance activities with positive environmental impacts and are usually subject to third-party certification or verification. Similarly, Flammer (2021) defines corporate green bonds as bonds with proceeds committed to environmental and climate-friendly projects.

The development of green bonds shows a broader transformation in capital markets. Sustainable finance connects investors' capital allocation decisions with environmental, social, and governance concerns. Pástor, Stambaugh, and Taylor (2021) supported that sustainability preferences can affect asset prices, portfolio allocations, and firms' real activities. Their model suggests that investors may accept lower expected returns from greener assets because these assets provide non-pecuniary utility and hedge against climate-related risks. This perspective is closely related to green bonds because the green bond market creates a direct mechanism through which investors can express environmental preferences in fixed-income portfolios. If investors value environmental outcomes, the green label may affect both the cost of capital for issuers and the interpretation of green financing announcements by equity investors.

The quick growth of the green bond market shows the importance of ESG investment in corporate finance. Gillan, Koch, and Starks (2021) review ESG and CSR research in corporate finance and show that ESG activities are linked to firm characteristics, ownership structure, risk, performance, and valuation, although empirical findings remain mixed. Friede, Busch, and Bassen (2015) further found that the relationship between ESG and corporate financial performance has attracted extensive attention with evidence from more than 2,000 empirical studies. These studies do not focus

exclusively on green bonds, but they provide the broader intellectual context: investors no longer evaluate firms only through conventional accounting and financial metrics; they increasingly incorporate non-financial information, including environmental responsibility and governance quality, into valuation decisions.

A central function of green bonds is to mobilize capital for the low-carbon transition. Deschryver and de Mariz (2020) point out that green bonds have attracted new issuers and a more diversified investor base, but the market remains small relative to the scale of climate-financing needs and the size of the broader bond market. Green bonds can benefit issuers by broadening the investor base, improving communication with sustainability-oriented investors, and potentially reducing financing costs. They can also benefit investors by offering a fixed-income instrument aligned with environmental objectives. From a policy perspective, green bonds are often viewed as tools for channeling private capital toward public sustainability goals. However, the market's continued development depends on transparency, standardization, and credible monitoring.

The financing function of green bonds relates to the debate over the "greenium," or green bond premium. If investors have strong demand for green assets, issuers may be able to sell green bonds at lower yields than comparable conventional bonds. Zerbib (2019) uses a matching method to compare green bonds with synthetic conventional bonds and finds a small negative yield premium, suggesting that investors' pro-environmental preferences have some effect on bond prices, although the magnitude is limited. Hachenberg and Schiereck (2018) also examine whether green bonds are priced differently from conventional bonds and find that certain green bonds trade with tighter spreads than comparable non-green bonds, with industry and ESG ratings helping explain pricing differences. Baker, Bergstresser, Serafeim, and Wurgler (2022) provide related evidence from the U.S. market, showing that green municipal bonds can be issued at a premium and that pricing and ownership effects are stronger for externally certified green bonds.

Certification and verification mechanisms are therefore crucial to the institutional design of the green bond market. Because investors usually cannot directly observe whether proceeds are genuinely allocated to environmentally beneficial projects, certification reduces information asymmetry between issuers and investors. Tang and Zhang (2020) note that green bonds are often certified by third parties, while

Flammer (2021) finds that investor reaction is stronger when green bonds are certified by independent third parties. This implies that certification is not merely a technical requirement but a credibility-enhancing device. The market appears to reward credible green claims more than vague or self-labeled environmental claims.

At the same time, the literature mentions that green bond standards remain imperfect. Deschryver and de Mariz (2020) identify several barriers to the scalability of the green bond market, including insufficiently harmonized global standards, greenwashing risks, perceived issuance costs, limited supply, and the relative infancy of the market. Lebelle, Lajili Jarjir, and Sassi (2020) also discuss the importance of the Green Bond Principles, which helped standardize the definition of eligible green projects and issuer reporting requirements. Yet even with these frameworks, the green bond market relies heavily on issuer disclosure, third-party opinions, and post-issuance reporting, which may vary across countries, exchanges, and regulatory regimes.

This stream of literature supports the design of the present study in three ways. First, because green bonds differ from conventional bonds mainly through their use-of-proceeds commitment, the announcement of a green bond issuance can be treated as an information event about the firm's environmental strategy. Second, because certification and credibility matter, investors may not react uniformly to all green bond announcements. Third, because the Chinese green bond market has developed rapidly but has its own institutional features, it is meaningful to examine whether green bond announcements create shareholder value in China rather than assuming that results from developed markets automatically apply.

2.2 Stock Market Reactions to Green Bond Issuance

A major question is whether the stock market interprets green bond issuance as value-enhancing. If green bonds credibly signal a firm's commitment to environmental transition, investors may revise expectations about the firm's long-term risk profile, stakeholder relationships, and access to sustainability-oriented capital. In this case, the announcement should generate positive abnormal returns. However, if investors view green bonds as costly, the announcement effect may be weak or negative.

Tang and Zhang (2020) provide one of the earliest comprehensive international studies of shareholder reaction to green bond issuance. Using a dataset of corporate

green bond issuances from 28 countries during 2007–2017, they find that stock prices respond positively to green bond issuance announcements. They further show that the positive announcement return is not fully explained by a lower cost of debt. Instead, green bond issuance is followed by increases in institutional ownership and improvements in stock liquidity. This suggests that green bonds may attract a different investor clientele and improve the visibility of issuing firms. Their evidence is important because it links green bond issuance not only to debt financing but also to shareholder wealth.

Flammer (2021) also reports positive market reactions using an event-study approach. The study finds positive cumulative abnormal returns (CARs) around announcements, with stronger effects for first-time issuers and bonds certified by third parties. These findings support the signaling theory that, by issuing green bonds, firms credibly communicate their environmental commitment. Importantly, Flammer also tracks post-issuance outcomes, noting improvements in environmental ratings, reductions in carbon emissions, and increased ownership by long-term and green investors. This reinforces the idea that positive returns reflect investor expectations of real strategic change rather than short-term market hype.

Similarly, Baulkaran (2019) finds positive and significant CARs, concluding that shareholders view green bond financing as value-enhancing. This upside comes either because the proceeds fund profitable green projects or because these investments mitigate firm risk. However, the study also shows that higher coupon rates lead to negative investor reactions. This highlights a key nuance that equity investors welcome green financing, but not unconditionally. Instead, they evaluate green bond announcements through both sustainability and financial ways.

The Chinese market is deserved high importance as it have developed rapidly since the mid-2010s. Wang, Chen, Li, Yu, and Zhong (2020) provide direct evidence from China. They examine both debt market and stock market reactions to corporate green bond issuance and find that Chinese corporate green bonds enjoy a pricing premium relative to conventional bonds. They also document positive stock market reactions to green bond announcements. This suggests that green bond issuance can reduce financing costs and increase shareholder value in an emerging market context. The study is especially relevant for the present research because it uses

Chinese green bond data and evaluates abnormal stock returns around issuance announcements.

European evidence also tends to support positive market reaction. Laborda and Sánchez-Guerra (2021) examine green bond finance in Europe and estimate the effect of green bond issuance on issuers' share prices. They construct event windows around issuance announcements and find a positive market reaction. This result aligns with Tang and Zhang (2020), Flammer (2021), Wang et al. (2020), and Baulkaran (2019), suggesting that in many settings investors interpret green bond announcements as favorable information. However, the European context differs from China in terms of market maturity, disclosure expectations, investor composition, and regulatory environment.

Some findings challenge the assumption that green bond issuance is good news for shareholders. Lebelle et al. (2020) finds negative market reactions to corporate green bond announcements in an international sample. Their study reports cumulative abnormal returns between approximately −0.5% and −0.2%, depending on the asset-pricing model. They argue that investors may interpret green bond issuance as introducing uncertainty about the firm's business model, profitability, or transition strategy.

The mixed evidence implies that the market reaction to green bond issuance depends on context and credibility. Positive abnormal returns are more likely when the market believes that green bonds reveal credible information about future environmental performance, lower risk exposure, or improved investor demand. Weak or negative abnormal returns may occur when investors doubt the issuer's intentions, worry about project profitability, or suspect that the green bond imposes constraints without clear financial benefits. Thus, green bonds are not merely financing instruments; they are also signals whose interpretation depends on investor beliefs about the issuer.

This aligns with broader event-study research on environmental corporate actions. Flammer (2013) examines stock market reactions to environmental news and finds that shareholders react positively to eco-friendly corporate behavior and negatively to environmentally harmful behavior. It suggests that capital markets can incorporate environmental information into firm valuation. However, it also implies that market reaction depends on how investors classify the event: as genuinely value-enhancing

environmental responsibility, as costly compliance, or as reputational risk. Green bond issuance fits naturally into this framework because it is a public event that may reveal information about a firm's environmental strategy.

Methodologically, event studies are well suited to this research question. MacKinlay (1997) defines the event study as a method for measuring the impact of a specific event on firm value using financial market data. The key assumption is that, in an efficient market, new information is quickly reflected in security prices. Brown and Warner (1985) further show that daily stock return data are generally appropriate for event-study methodology, while also noting the importance of model specification and abnormal-return measurement. These methodological foundations justify the use of abnormal returns and cumulative abnormal returns to measure shareholder response to green bond announcements.

This subsection directly supports the empirical design of the present study. Since prior findings are positive in some studies but negative or conditional in others, it is necessary to re-examine the announcement effect in a specific institutional setting. The present study therefore uses Chinese listed firms' green bond issuance announcements as events and calculates abnormal returns and cumulative abnormal returns around the announcement window. This approach allows the study to test whether investors in China interpret green bond issuance as value-enhancing information.

2.3 Competing Interpretations

Existing literature offers several competing interpretations of green bond issuance. The first is the value-enhancing signal interpretation. Under this view, a green bond announcement communicates that the firm is committed to environmental transition and is willing to allocate capital to green projects. Because green bonds require use-of-proceeds disclosure and may involve external review or certification, issuance can serve as a credible signal to investors.

Flammer (2021) provides strong support for this interpretation by showing that market reactions are more positive for first-time issuers and certified green bonds. If green bond issuance were merely symbolic, investors would be less likely to react more strongly to certification and first-time issuance.

The value-enhancing signal may operate through multiple channels. First, green bond issuance may indicate that the firm is investing in projects that reduce regulatory risk, carbon risk, or transition risk. This is consistent with climate-finance studies showing that investors care about climate exposure and carbon emissions (Krueger et al., 2020; Bolton and Kacperczyk, 2021).

Second, green bonds may attract long-term institutional investors and sustainability-oriented investors. Tang and Zhang (2020) show that green bond issuance is followed by increased institutional ownership and improved stock liquidity, suggesting that the shareholder benefit may come partly from investor-clientele effects.

Third, green bond issuance may improve corporate reputation and stakeholder relationships, especially when investors believe that the firm is genuinely pursuing green transformation.

The second interpretation is the financing tool interpretation. Under this view, firms issue green bonds mainly because they provide financing advantages, rather than because they represent a deep environmental commitment. Green bonds may help firms diversify financing channels, reduce borrowing costs, extend debt maturity, or attract investors with green mandates. Gianfrate and Peri (2019) find that issuing green bonds can be financially convenient compared with conventional bonds. Lin and Su (2022) examine the choice between green and conventional bonds in China and suggest that issuer motivation and financing demand play important roles in green bond issuance decisions. Su et al. (2023) also show that reputable underwriters can help reduce green bond financing costs in China, indicating that intermediaries matter in overcoming information asymmetry.

The financing-tool interpretation does not necessarily imply that green bonds are not valuable. If green bonds reduce financing constraints, they may enable firms to undertake green investment that would otherwise be delayed. Wang et al. (2022) show that green bond issuance can promote green innovation by alleviating financing constraints. Zheng et al. (2023) find that green bond issuance improves corporate ESG performance, while Chen et al. (2023) argue that such improvement can occur through internal attention and external supervision. These studies suggest that even when green bonds are partly motivated by financing benefits, they can still contribute to real environmental or organizational outcomes.

However, financing motives can also weaken the signaling value of green bond issuance. If investors believe that the firm is issuing a green bond primarily to exploit investor demand or obtain cheaper debt, they may not interpret the announcement as evidence of genuine green transformation. In this case, the market reaction may be small or insignificant. The stock market may ask whether the green bond finances additional green investment or merely relabels an existing financing need. Therefore, the financing-tool interpretation sits between the value-enhancing signal view and the greenwashing concern view. It may be positive if green financing supports valuable investment, but it may be neutral if it only changes the form of debt.

The third interpretation is the greenwashing concern interpretation. Greenwashing refers to the possibility that firms use environmental labels, green disclosures, or sustainable-finance instruments to create a favorable image without making substantial environmental improvements. Green bonds are particularly exposed to this concern because their environmental value depends on the actual use of proceeds and the credibility of post-issuance reporting. Deschryver and de Mariz (2020) identify greenwashing risk and inconsistent standards as major barriers to green bond market development. Jones et al. (2020) also raise concerns about whether green bonds always generate additional environmental benefits or whether they may sometimes transform environmental problems into financial products without addressing underlying ecological deficits.

Empirical evidence from China reinforces the relevance of greenwashing concerns. Shi et al. (2023) examine whether green bonds lead to genuine green investment or greenwashing among Chinese A-share listed firms. They find that green bond issuance increases the quantity of green patent applications but does not necessarily improve the quality of green innovation. This suggests that firms may respond to green finance incentives by increasing visible green outputs without necessarily producing high-quality technological progress. Such findings are highly relevant to investor perception. If shareholders suspect that a green bond mainly produces symbolic environmental activity, the announcement may not generate positive abnormal returns.

The credibility problem is closely connected to ESG performance. Investors are more likely to trust a green bond announcement when the issuer has a strong prior ESG record. Berdiev (2025) finds that firms with stronger sustainability profiles receive

more favorable stock market reactions to green bond announcements. This supports the argument that investors use past ESG performance as a credibility filter. A green bond issued by a high-ESG firm may be interpreted as part of a consistent long-term strategy, while a green bond issued by a low-ESG firm may raise doubts about opportunistic behavior or greenwashing.

These competing interpretations help explain why the empirical literature reports mixed results. Positive announcement effects are consistent with the value-enhancing signal view. Insignificant reactions are consistent with the financing-tool view, especially when the bond does not reveal much new information about future investment. Negative reactions are consistent with greenwashing concerns, agency problems, or investor concerns about the profitability of green projects. Krüger (2015) shows that CSR events can destroy shareholder value when they are perceived as agency-driven. Similarly, green bond issuance may be penalized if investors believe managers are pursuing reputational benefits or policy incentives rather than shareholder value.

For the present study, this part implies that green bond issuance should be examined as a heterogeneous event. The green label alone is not sufficient to determine the market reaction. Investors may ask whether the issuance represents new green investment, financing optimization, or symbolic relabeling. This provides the foundation for examining the use-of-proceeds structure as a key factor shaping abnormal returns.

2.4 Use-of-Proceeds Structure: Complementary, Mixed, and Substitution-oriented issuance

The use-of-proceeds structure is the defining feature of green bonds. Since green bonds are identified by the commitment to allocate proceeds to eligible green projects, the market’s interpretation depend heavily on how these bonds are used. A For example, a bond financing new renewable energy projects conveys entirely different information than one used to refinance old debt from past projects. Therefore, distinguishing among these structures is essential to understanding the market's mixed reactions.

This study classifies green bond issuance into three categories: complementary issuance, mixed issuance, and substitution-oriented issuance. These categories are

developed from the literature on use of proceeds, additionality, refinancing, certification, and greenwashing. While prior studies may not use these exact terms, this classification captures a fundamental distinction whether a green bond funds additional green investments or only refinances.

Complementary issuance refers to green bond proceeds mainly used to finance new or additional green projects. For example, if a firm issues a green bond to build new renewable energy facilities, upgrade pollution-control systems, or develop new green buildings, investors view it as an expasion of green assets. This type aligns strongly with the value-enhancing signal view signaling new investments that can improve long-term competitiveness and lower environmental risk.

Mixed issuance refers to proceeds that are used for both new green projects and refinancing existing green assets or debt. This structure is common because green bond frameworks often allow both financing and refinancing of eligible projects. Mixed issuance can still be value relevant. Refinancing may reduce financing constraints, improve debt maturity, or release internal capital for future investment. However, mixed issuance is a weaker signal because part of the proceeds is backward-looking. Investors may therefore react positively, but the expected reaction should be weaker than for purely complementary issuance.

Substitution-oriented issuance means proceeds are mainly used to refinance existing projects, replace previous debt, or fund activities that were already planned or completed. This type may still fulfill formal green bond requirements if the underlying projects are eligible. However, regarding shareholder value and environmental benefit, it contributes the weakest signal. If a green bond only substitutes one source of financing for another, the announcement may reveal little about new investment or future growth.

The importance of use-of-proceeds quality is supported by prior research. Maltais and Nykvist (2021) argue that the sustainability contribution of green bonds depends on whether they lead to additional green investment and changes in issuer behavior. Deschryver and de Mariz (2020) stress that green bond credibility depends on transparency, standards, and monitoring. Okafor et al. (2024) suggest that investors differentiate among proceeds categories. This is important because it implies that market participants do not treat all green bonds as homogeneous. The expected environmental and financial value of the bond depends on what the proceeds finance.

From a financing perspective, substitution-oriented issuance may still be beneficial if it lowers borrowing costs or improves capital structure. Lin and Su (2022) show that firms' choice between green and conventional bonds in China is related to financing needs and issuer characteristics. Su et al. (2023) further show that reputable underwriters can reduce green bond financing costs. These findings suggest that some green bond issuances may be motivated by financial optimization rather than new investment.

3. Institutional Background and Hypothesis Development

This chapter studies the institutional background and serves as the basis for the hypotheses. The purpose is to connect China’s green bond market development, regulatory framework, and use-of-proceeds disclosure rules with the empirical design of this thesis.

Green bond issuance announcements not only provide investors with information regarding corporate financing but also reflect the issuer's environmental strategy. However, the information contained in these announcements is not always uniform. The message conveyed can vary depending on whether the proceeds are primarily used to develop new green projects or are partially allocated to refinancing, debt repayment, or supplementing working capital. Under green bond regulations, all these uses are considered legitimate, provided they relate to eligible green projects. However, from the perspective of equity investors, these uses may have differing implications regarding the scale of new green investment, financial flexibility, and sustainability credentials. Therefore, this chapter argues that investors should not focus solely on the "green bond" label but should instead interpret issuance announcements based on the disclosed allocation of proceeds.

3.1 Development of China’s Green Bond Market

China provides a crucial institutional environment for studying green bond issuance announcements. The development of China's green bond market is closely linked to national environmental policies, industrial upgrading, and the establishment of a green financial system. Unlike some markets driven primarily by the voluntary ESG investment demands of institutional investors, China's green bond market has evolved under strong policy guidance. Green bonds are part of a broader policy framework designed to channel capital toward environmentally friendly industries, support low-carbon development, and curb investment in highly polluting activities.

Central to this policy context are China's "dual carbon" goals. China has announced its targets to peak carbon dioxide emissions by 2030 and achieve carbon neutrality by 2060. Consequently, green finance has emerged as a policy tool to align financial markets with environmental transition objectives. The National Development and Reform Commission’s "Action Plan for Carbon Dioxide Peaking Before 2030" also

identifies the achievement of peak carbon emissions and carbon neutrality as a key strategic decision, emphasizing the need to advance the green and low-carbon transition.

The institutional foundation for China's green finance system was strengthened in 2016, when several Chinese authorities jointly issued the Guidelines for Establishing the Green Financial System. The Guidelines define green finance as financial services that support environmental improvement, climate-change response, and efficient resource use. They also describe the green financial system as a framework that includes green credit, green bonds, green funds, green insurance, carbon finance, and related financial products. More importantly, the Guidelines state that the main purpose of establishing a green financial system is to mobilize and incentivize more social capital to invest in green industries while more effectively restricting investment in polluting projects.

Within this policy framework, green bonds became one of the most visible instruments of sustainable finance in China. Green bonds allow firms, financial institutions, and public-sector entities to raise funds specifically for eligible green projects. Compared with bank-based green credit, green bonds also involve capital-market disclosure, investor pricing, and secondary-market information. For listed firms, a green bond announcement is therefore not only a debt-financing event, but also a public signal observed by equity investors. This makes the Chinese green bond market a suitable setting for event-study analysis.

China's green bond market has expanded rapidly since its formal development in the mid-2010s. According to the Climate Bonds Initiative, China issued USD 68.9 billion in aligned green bonds in 2024 across onshore and offshore markets, making it the third-largest source of aligned green bond issuance after the United States and Germany. By the end of 2024, China's cumulative aligned green, social, sustainability, sustainability-linked, and transition bond issuance reached USD 555.5 billion, placing China among the four markets globally to exceed the half-trillion-dollar threshold. Green bonds remained the dominant theme in China's sustainable debt market.

This scale matters for the present thesis because China is no longer a marginal or experimental green bond market. This is one of the world's largest green bond markets, occupying a pivotal position in China's sustainable financial system. At the same time, the market is institutionally unique. It is policy-driven, closely linked to the

transformation of industrial structure, and shaped by domestic regulatory standards. Given these characteristics, investors may interpret Chinese green bond issuances differently than their counterparts in the more mature markets.

3.2 Regulation and Use-of-Proceeds Disclosure

The regulatory landscape of China's green bond market is evolving toward greater rigor and standardization, particularly regarding the use of proceeds. In the market's early stages, different types of green bonds were subject to varying regulatory bodies and standards; for instance, distinct rules applied to green financial bonds, green corporate bonds, and exchange-listed green corporate bonds. This regulatory fragmentation created uncertainty, as the definition of a "green bond" varied across bond types. As the market has matured, regulators have increasingly prioritized the harmonization of project classification, fund allocation, information disclosure, and post-issuance supervision.

A pivotal step in this process was the formulation of the Green Bond Endorsed Projects Catalogue (2021 Edition). Officially released in 2021, this catalogue established more unified standards for identifying eligible green projects, helping to align domestic green bond standards with international green finance practices. Furthermore, it clarified the scope of eligible green projects, thereby enhancing consistency in project classification across China's green bond market.

In 2022, the Green Bond Principles of China, issued by the Green Bond Standards Committee, further strengthened the domestic green bond framework. These principles define green bonds as those where the proceeds are used entirely to support green industries, green projects, or green economic activities that meet specific criteria. The principles also delineate four key elements of green bonds: use of proceeds, project evaluation and selection, management of proceeds, and information disclosure. Most importantly, the principles mandate that 100% of the proceeds raised from green bonds be allocated to eligible green industries, green economic activities, and related green projects.

Even with a 100% green-use requirement, not all green bond proceeds carry the same economic weight. The China Green Bond Principles allow funds to be used for project construction, operation, and acquisition, as well as for working capital and debt repayment. While funding new construction signals incremental green

investment, using proceeds to refinance old debt or boost working capital offers little information about asset expansion. Therefore, use-of-proceeds disclosure is a critical source of value-relevant information for investors.

While independent third-party certification reduces information asymmetry and is encouraged by Chinese regulators, this study treats it as institutional background. Our primary focus remains on the use-of-proceeds structure, as this feature directly drives our empirical classification.

Based on economic interpretation rather than legal eligibility, we divide this structure into three categories:

Complementary proceeds: Funds used for direct investment, such as project construction or acquisition. This represents genuine green growth.

Mixed proceeds: Announcements combining project investments with financing purposes like debt repayment or working capital.

Substitution-oriented proceeds: Capital spent primarily to replace existing financing or refinance past green investments.

3.3 Investor Interpretation of Green Bond Announcements

In an efficient market, stock prices adjust whenever new information changes investor expectations of firm value. A green bond announcement is value-relevant because it shows critical details about a firm's financing, investment, and environmental strategy. However, the market's reaction depends entirely on how investors interpret the news. In this thesis, three mechanisms are particularly important: the green investment signal, the financial flexibility signal, and the refinancing ambiguity.

First, an announcement can serve as a green investment signal. When a company earmarks proceeds for new, clearly identified green projects, it shows it is actively positioning itself for a low-carbon transition. These investments can lower regulatory risks, improve stakeholder relationships, and boost ESG reputation. For firms in carbon-intensive sectors like energy, transport, utilities, construction, and manufacturing, funding green projects also signals strategic alignment with China's "dual-carbon" policy.

Second, a green bond announcement may be interpreted as a financial flexibility signal. This interpretation is particularly relevant for mixed use-of-proceeds structures. Green projects often require large upfront investment, long implementation periods, and coordination with existing financing arrangements. A firm may therefore use green bond proceeds not only to finance new green projects, but also to refinance previous green investments, repay project-related debt, or supplement working capital connected to eligible green activities. From a narrow environmental perspective, such a structure may appear less direct than purely project-financing proceeds. From a corporate finance perspective, however, it may indicate a practical funding strategy that combines environmental investment with balance-sheet management.

This financial flexibility interpretation is important for the Chinese market. Many Chinese firms, especially in capital-intensive sectors, face financing constraints and rely heavily on debt financing. If a green bond allows a listed firm to secure longer-term funding, reduce short-term liquidity pressure, or restructure project-related debt while continuing green investment, investors may view the announcement favorably.

Third, a green bond announcement may create substitution or refinancing ambiguity. This is especially relevant when proceeds are mainly used to refinance existing obligations, repay debt, or supplement working capital. However, equity investors may ask whether the announcement really represents new investment. In this case, the green label may be less powerful as a signal.

The three interpretations are not mutually exclusive. A single green bond announcement may contain elements of green investment, financing flexibility, and refinancing. The key point is that investors are unlikely to treat the green label as a homogeneous signal.

3.4 Hypotheses

The first hypothesis concerns the overall announcement-period stock market reaction to green bond issuance. A green bond announcement may convey positive information to investors because it indicates environmental commitment, policy alignment, and access to green financing channels. In China, these signals may be particularly relevant because green finance is closely connected with national industrial policy and the dual-carbon transition. At the same time, green bond

issuance is still a debt-financing event. It increases financial obligations and may involve project uncertainty, monitoring costs, and disclosure costs. Therefore, the expected market reaction is not necessarily uniformly positive across all firms and announcements.

Nevertheless, if the announcement contains value-relevant information, abnormal stock returns should be observed around the event date. This thesis therefore first tests whether green bond announcements by Chinese listed firms generate announcement-period abnormal returns.

H1: Green bond announcements by Chinese listed firms generate announcement-period abnormal stock returns.

The second hypothesis focuses on mixed use of proceeds. A mixed use-of-proceeds structure combines direct green project investment with other financing-related purposes, such as refinancing, repayment of project-related debt, or supplementary working capital. Although this structure may look more complex than purely complementary proceeds, it may be interpreted positively by investors because it combines green investment with financing flexibility. For capital-intensive firms, mixed proceeds may indicate that the issuer is not only investing in green projects but also managing the financing structure.

Mixed proceeds may also require more time for investors to interpret. Unlike a simple announcement that proceeds will be used only for one specific project, a mixed announcement contains multiple categories of information. Investors may need to evaluate the relative importance of project investment, refinancing, and working-capital support. Therefore, the positive valuation implication of mixed proceeds may be more visible over longer event windows, where market participants have more time to process the announcement.

H2: Green bond announcements with mixed use of proceeds generate stronger abnormal stock returns than announcements with complementary use of proceeds, especially over longer event windows.

The third hypothesis concerns substitution-oriented use of proceeds. Substitution-oriented proceeds are mainly associated with refinancing, repayment of existing debt, or working-capital support related to green projects. These uses can still be consistent with green bond regulation if they are connected to eligible green activities.

However, from the perspective of equity investors, substitution-oriented proceeds may provide weaker evidence of incremental green investment. If the announcement is perceived mainly as replacing existing financing rather than funding new green projects, the green bond may have less positive information content.

This does not imply that substitution-oriented green bonds are necessarily value-destroying. They may improve financial flexibility, reduce liquidity pressure, or support the continuation of existing green projects. However, compared with complementary proceeds that are more directly linked to new green investment, substitution-oriented proceeds are more likely to raise ambiguity about the incremental environmental and strategic value of the issuance. Therefore, the market reaction is expected to be weaker relative to complementary use of proceeds.

H3: Green bond announcements with substitution-oriented use of proceeds generate weaker abnormal stock returns than announcements with complementary use of proceeds.

Taken together, these hypotheses connect China's institutional green bond framework with the empirical design of this thesis. H1 tests whether green bond announcements contain value-relevant information for equity investors. H2 and H3 examine whether investors differentiate among green bond announcements according to the structure of the use of proceeds. The underlying argument is that the green label alone is not sufficient to determine investor reaction. Instead, investors assess whether the disclosed proceeds structure signals incremental green investment, financing flexibility, or substitution of existing financing.

4. Data and Sample Construction

This chapter describes the data sources, sample construction procedure, and variable definitions used in the empirical analysis. The dataset combines green bond announcement information, stock return data, market index returns, bond-level characteristics, issuer-level financial variables, and manually classified use-of-proceeds categories.

The final dataset is constructed at the announcement-event level. Each observation corresponds to a green bond announcement made by a Chinese listed issuer. The key event variable is the public announcement date of the green bond issuance. The dependent variables are cumulative abnormal returns around the announcement date. The main explanatory variables identify whether the stated use of proceeds is complementary, mixed, or substitution-oriented. Since the empirical focus is on use-of-proceeds structure rather than issuer-level ESG ratings, ESG data are not included in the baseline sample. Instead, the analysis controls for observable bond characteristics and firm-level financial conditions.

4.1 Green Bond Announcement Data

The sample is a set of green bond announcements issued by Chinese listed companies. The announcement-level information includes the issuer name, issuer stock code, announcement date, bond type, issue size, maturity, and the stated use of proceeds. The sample is limited to listed firms. Observations without identifiable listed issuers or valid stock codes are excluded from the sample.

Green bond announcements contain both financing information and sustainability-related information. They usually disclose the intended allocation of proceeds to eligible green projects or related green activities. It tests whether investors respond only to the green label itself or whether they also differentiate among different proceeds structures.

The most important information extracted from the announcement documents is the stated use of proceeds. The use-of-proceeds disclosure is used to classify each announcement into one of three categories: complementary, mixed, or substitution-oriented. This classification is central to the empirical design because it captures the economic meaning of the green bond proceeds. A bond whose proceeds are mainly

allocated to new green project construction may send a different signal from a bond whose proceeds are mainly used to refinance existing debt, repay previous project loans, or supplement working capital. Therefore, the announcement data are not only used to identify event dates, but also to construct the main explanatory variables.

In addition to use-of-proceeds information, bond-level characteristics are collected from the announcement documents or related bond databases. These include issue size and maturity, which are used as control variables in the regression analysis. Issue size captures the scale of the financing event, while maturity reflects the duration of the issuer's financing commitment. Where available, additional bond attributes such as bond type and rating can also be used for fixed effects or robustness checks.

4.2 Event Date Definition

The event date is defined as the public announcement date of the green bond issuance. This date represents the first trading-relevant moment at which investors can observe the issuer's intention to issue a green bond and evaluate the information contained in the announcement. Since the objective of the event study is to measure stock market reaction to new public information, correctly identifying the event date is essential.

If the announcement is released on a trading day, that trading day is treated as day 0. If the announcement is released on a non-trading day, such as a weekend or public holiday, the next trading day is used as the event date. This adjustment is necessary because stock prices can only incorporate the information when the market is open. For example, if a green bond announcement is released on a Saturday, the following Monday or the next available trading day is treated as the event date.

The event-time structure is then defined relative to the event date. Day 0 is the event date, day -1 is the trading day immediately before the event, and day +1 is the trading day immediately after the event. The same logic applies to longer windows such as [-3,+3] and [-10,+10]. This trading-day convention ensures that event windows are comparable across observations even when announcements occur around weekends or holidays.

The thesis uses multiple event windows to capture different forms of market reaction. The short window [-1,+1] captures immediate announcement effects and allows for limited information leakage before the announcement. The medium window [-3,+3] captures a broader short-term reaction and is used as the main event window. The longer window [-10,+10] allows for slower information processing, which may be relevant when announcements contain complex use-of-proceeds information. However, longer windows are also more exposed to unrelated market movements and firm-specific news, so they are interpreted with caution.

Potentially overlapping events are also considered. If the same issuer releases multiple green bond announcements within a short period, the event windows may overlap. This creates a concern that abnormal returns may reflect more than one announcement. The baseline sample keeps the available announcement observations, while the robustness analysis excludes overlapping events to examine whether the results are driven by event contamination.

4.3 Stock Return and Market Index Data

Daily stock return data are used to calculate abnormal returns around green bond announcement dates. For each listed issuer, the daily stock returns are collected over the estimation window and event windows. The estimation window is used to estimate the normal relationship between the firm's stock return and the market return, while the event window is used to calculate abnormal returns around the announcement.

The market return is measured using a broad market index return. The market index is used to estimate the expected return of each stock under the market model. In the event study framework, abnormal return is defined as the difference between the actual stock return and the expected return predicted by the benchmark model. This approach removes the part of stock return that can be explained by general market movements, allowing the analysis to focus on firm-specific stock price reactions around the green bond announcement.

The event study requires continuous and reliable return data around the event date. Therefore, observations are excluded if the issuer does not have sufficient daily stock return data for the estimation window or the event windows. Missing stock return observations can arise because of trading suspensions, listing status changes, or

unavailable historical prices. Since cumulative abnormal returns are the dependent variables in the regression analysis, observations without valid CAR measures cannot be used in the corresponding specifications.

The analysis constructs three CAR variables: CAR[-1,+1], CAR[-3,+3], and CAR[-10,+10]. These variables measure the total abnormal stock return accumulated over each event window. CAR[-3,+3] is treated as the main event-window measure because it balances two concerns: it is wide enough to capture limited information leakage and delayed market adjustment, but short enough to reduce the influence of unrelated events. CAR[-1,+1] and CAR[-10,+10] are used to examine the timing and robustness of the announcement effect.

Table 4.1 Event-Study Variables

Variable	Definition	Level	Use
stock_return	Daily return of issuer's listed stock	Firm-day	Actual return
market_return	Daily return of market index	Market-day	Expected return estimation
AR	Actual return minus expected return	Firm-day	Abnormal return
CAR[-1,+1]	Sum of AR from day -1 to day +1	Announcement-event	Dependent variable
CAR[-3,+3]	Sum of AR from day -3 to day +3	Announcement-event	Main dependent variable
CAR[-10,+10]	Sum of AR from day -10 to day +10	Announcement-event	Long-window dependent variable

4.4 Bond Characteristics and Firm-Level Financial Data

The regression analysis includes both bond-level and firm-level control variables. These controls reduce the possibility that the estimated relationship between use-of-proceeds structure and market reaction is driven by other observable characteristics of the bond or issuer.

Bond-level controls include issue size and maturity. Issue size is measured as the natural logarithm of the bond issuance amount. Larger bond issues may generate stronger market reactions because they represent more economically significant financing events. A larger green bond may also imply a more substantial commitment to green projects or green financing activities. Maturity measures the term of the bond. Longer-maturity bonds may be interpreted as longer-term financing

commitments and may therefore have different valuation implications from short-maturity bonds.

Firm-level financial controls include issuer size, leverage, profitability, and valuation. Issuer size is measured as the natural logarithm of issuer size, typically proxied by total assets. Larger firms may have better access to financing, lower information asymmetry, and more stable investor expectations. Leverage controls for the issuer's capital structure and financial risk. Since green bond issuance is still a debt-financing event, investors may interpret the announcement differently depending on the issuer's existing debt burden. ROA controls for profitability, as more profitable firms may be better able to invest in green projects and service debt obligations. The price-to-book ratio controls for valuation and growth opportunities.

The timing of firm-level financial variables should follow a pre-event logic. To avoid look-ahead bias, financial variables should be measured using the most recently available financial statement information before the green bond announcement date. For example, if a green bond announcement occurs after the release of the previous year's annual report, the annual report values can be used. If the announcement occurs before the annual report is available, the most recent earlier reporting period should be used. This ensures that the control variables reflect information available to investors at the time of the announcement.

This thesis does not include ESG ratings as a baseline control or moderating variable because issuer-level ESG data are not available for the full sample. This is an important data limitation, but it does not prevent the empirical analysis from addressing the main research question. The central focus of the thesis is not whether high-ESG firms receive stronger market reactions, but whether investors respond differently to the disclosed structure of green bond proceeds. Therefore, the empirical design uses observable bond characteristics, issuer financial conditions, and fixed effects to control for alternative explanations.

Table 4.2 Bond-Level and Firm-Level Control Variables

Variable	Definition	Expected role
ln_bond_size	Natural logarithm of bond issue size	Bond-level control
maturity	Bond maturity in years	Bond-level control
ln_issuer_size	Natural logarithm of issuer size	Firm-level control
leverage	Issuer leverage ratio	Firm-level control
ROA	Return on assets	Firm-level control

Variable	Definition	Expected role
ln_pb	Natural logarithm of price-to-book ratio	Firm-level control
year FE	Announcement year fixed effects	Controls for time-specific shocks
bond_type_id FE	Bond type fixed effects	Controls for bond-category differences

4.5 Variable Definitions

The main explanatory variables are based on the classification of disclosed use of proceeds. This classification is the key innovation of the empirical design. Instead of treating all green bonds as homogeneous, the thesis distinguishes among green bond announcements according to how the raised capital is expected to be used.

The first category is complementary use of proceeds. This category includes announcements in which the proceeds are mainly used for direct green project investment, such as construction, operation, acquisition, or expansion of eligible green projects. Complementary proceeds are most closely associated with incremental green investment because they suggest that the issuer is using the bond to support new or continuing green project activity. In the regression analysis, complementary use of proceeds is treated as the benchmark category.

The second category is mixed use of proceeds. This category includes announcements in which the proceeds combine green project investment with financing-related purposes, such as refinancing, repayment of project-related debt, or supplementary working capital. Mixed proceeds may contain more complex information than purely complementary proceeds. On the one hand, they still indicate a connection to green investment. On the other hand, they also indicate financial flexibility and balance-sheet management. Investors may therefore interpret mixed use of proceeds as a combination of green investment signal and financing flexibility signal.

The third category is substitution-oriented use of proceeds. This category includes announcements in which the proceeds are mainly used to refinance existing obligations, repay debt, replace previous project financing, or supplement working capital related to green projects. These uses can still be consistent with green bond rules if they are connected to eligible green activities. However, from the perspective of equity investors, substitution-oriented proceeds may provide weaker evidence of

incremental green investment. They may be interpreted as replacing existing financing rather than funding new environmental projects.

Based on this classification, the thesis constructs several dummy variables. The variable sub_mixed equals one if the announcement is classified as mixed use of proceeds and zero otherwise. The variable sub_substitution equals one if the announcement is classified as substitution-oriented use of proceeds and zero otherwise. Complementary use of proceeds is omitted from the regression and serves as the reference group. Therefore, the coefficients on sub_mixed and sub_substitution measure the difference in announcement-period stock market reaction relative to complementary green bonds.

An additional variable, non_complementary, is constructed for robustness analysis. It equals one if the announcement is classified as either mixed or substitution-oriented, and zero if it is classified as complementary. This binary classification is useful because the mixed and substitution categories contain relatively small numbers of observations when treated separately. Combining them provides an alternative way to test whether announcements with less purely project-oriented proceeds differ from complementary green bond announcements.

Table 4.3 Use-of-Proceeds Classification Rules

Category	Coding	Definition	Economic Interpretation
Complementary	Benchmark	Proceeds mainly used for green project construction, operation, acquisition, or expansion	Incremental green investment
Mixed	sub_mixed = 1	Proceeds combine project investment with refinancing, debt repayment, or working capital	Green investment plus financial flexibility
Substitution-oriented	sub_substitution = 1	Proceeds mainly used for refinancing, debt repayment, or working capital	Substitution or refinancing ambiguity
Non-complementary	non_complementary = 1	Announcements classified as mixed or substitution-oriented	Alternative binary classification

4.6 Sample Selection

The final sample is constructed through several steps. First, the initial dataset includes green bond announcements by Chinese listed companies. Second, the sample is restricted to announcements with identifiable issuer names, stock codes, and announcement dates. Third, observations are matched with daily stock return data and market index returns. Announcements without sufficient return data for the estimation window or event windows are excluded. Fourth, bond characteristics and issuer financial variables are merged into the announcement-level dataset. Observations with missing key variables are excluded from regressions that require those variables.

The use-of-proceeds classification is then applied to each announcement based on the disclosed proceeds allocation. Each observation is assigned to one of three categories: complementary, mixed, or substitution-oriented. Complementary announcements form the largest category in the sample, while mixed and substitution-oriented announcements account for smaller shares. This imbalance is important for interpreting the regression results because the coefficients on mixed and substitution-oriented use of proceeds are estimated from relatively small subsamples.

The final descriptive sample contains 520 green bond announcement observations. Among these, 473 observations are classified as complementary, 25 as mixed, and 22 as substitution-oriented. This means that complementary use of proceeds accounts for approximately 90.96% of the sample, while mixed and substitution-oriented proceeds account for approximately 4.81% and 4.23%, respectively. The small size of the mixed and substitution categories motivates the use of the broader non_complementary indicator as an alternative specification.

The number of observations varies across empirical specifications because some variables are missing for a subset of observations. In particular, the price-to-book variable has fewer non-missing observations than the other main variables. As a result, regressions including ln_pb contain fewer observations than the full descriptive sample. This difference between the full sample and the regression sample should be reported clearly to avoid confusion.

The sample construction procedure is designed to balance data coverage and empirical reliability. Keeping listed firms ensures that daily stock return data are available for event-study estimation. Using announcement dates ensures that the event is observable to public market participants. Classifying use of proceeds allows the analysis to test whether investors differentiate among green bond announcements according to the economic meaning of proceeds allocation. At the same time, the sample has limitations. The classification depends on the detail and clarity of announcement disclosure, and the relatively small number of mixed and substitution-oriented observations reduces the precision of category-level estimates. These limitations are considered when interpreting the empirical results.

Table 4.4 Sample Distribution by Use-of-Proceeds Category

Use-of-proceeds category	Frequency	Total	Percentage
Complementary	473	520	90.96%
Mixed	25	520	4.81%
Substitution-oriented	22	520	4.23%

5. Methodology

5.1 Event Study Design

For each announcement event i, event time is defined relative to the adjusted announcement date. The event date is denoted as t = 0. Trading days before and after the event are denoted as negative and positive event days, respectively.

The market model parameters are estimated over a pre-event estimation window, which is kept separate from the event windows to avoid contamination from the announcement itself.

$$t = 0 \text{ denotes the green bond announcement date;}$$

$$t \in [\tau_1, \tau_2] \text{ denotes the event window.} \quad (1)$$

5.2 Estimation Window and Event Windows

There are three event windows: [-1,+1], [-3,+3], and [-10,+10]. The [-1,+1] window captures immediate market reactions, while the [-3,+3] window allows for potential information leakage and delayed adjustment. The [-10,+10] window is used to examine whether green bond information is incorporated more gradually into stock prices.

Among the three windows, CAR[-3,+3] is treated as the main event-window measure, while CAR[-1,+1] and CAR[-10,+10] are used to examine the robustness and timing of market reactions.

5.3 Abnormal Returns and Market Model

Expected returns are estimated using the market model. For each firm i and trading day t in the estimation window, the daily stock return is regressed on the corresponding market index return:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (2)$$

where $R_{i,t}$ is the daily return of firm i on day t, $R_{m,t}$ is the daily market index return, α_i and β_i are firm-specific market model parameters, and $\varepsilon_{i,t}$ is the residual return component.

The abnormal return is defined as the difference between the actual return and the expected return predicted by the estimated market model:

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}) \quad (3)$$

5.4 Cumulative Abnormal Returns

Cumulative abnormal return is calculated by summing daily abnormal returns over each event window. The three dependent variables used in the regression analysis are CAR[-1,+1], CAR[-3,+3], and CAR[-10,+10]. For event window $[\tau_1, \tau_2]$, CAR is defined as follows:

$$CAR_i(\tau_1, \tau_2) = \Sigma\, AR_{i,t}, \quad t = \tau_1,\ldots,\tau_2 \quad (4)$$

5.5 Regression Specification

To examine whether stock market reactions differ by use-of-proceeds structure, the thesis estimates the following cross-sectional CAR regression:

$$CAR_i = \alpha + \beta_1\, Mixed_i + \beta_2\, Substitution_i + \gamma' X_i + \lambda_\gamma + \delta_b + \varepsilon_i \quad (5)$$

where CAR_i is the cumulative abnormal return for announcement event i. $Mixed_i$ equals one when the announcement is classified as mixed use of proceeds, and zero otherwise. $Substitution_i$ equals one when the announcement is classified as substitution-oriented use of proceeds, and zero otherwise. Complementary use of proceeds is the omitted benchmark category. X_i is a vector of bond-level and issuer-level control variables, including ln_bond_size, maturity, ln_issuer_size, leverage, ROA, and ln_pb. λ_γ denotes year fixed effects, and δ_b denotes bond-type fixed effects.

The coefficients β_1 and β_2 are the main parameters of interest. β_1 measures whether mixed use-of-proceeds announcements generate different CARs from complementary announcements. β_2 measures whether substitution-oriented announcements generate different CARs from complementary announcements.

The complementary category is treated as the benchmark group. Therefore, the coefficients on Mixed and Substitution measure the difference in announcement-period stock market reaction relative to green bonds with complementary use of proceeds.

5.6 Control variables and fixed effects

These controls reduce the possibility that the estimated effects are driven by bond characteristics or issuer-level financial conditions. Year and bond-type fixed effects further control for time-specific shocks and systematic differences across bond categories.

5.7 Treatment of confounding events

To mitigate the influence of confounding events, the study uses relatively short event windows and includes year and bond-type fixed effects. However, the possibility of overlapping firm-specific information cannot be fully eliminated and is acknowledged as a limitation.

The empirical study reduces, but cannot completely eliminate, the potential influence of confounding events. This limitation is addressed by comparing results across multiple event windows and additional robustness specifications.

6. Empirical Results

6.1 Descriptive Statistics

Table 6.1 Sample distribution by use-of-proceeds category

Use-of-proceeds category	frequency	total	percentage
Complementary	473	520	90.96
Mixed	25	520	4.81
Substitution	22	520	4.23

Table 6.2 Descriptive statistics of main variables

	count	mean	sd	min	max
CAR_1_1	520	.008024	.0724517	-.2149675	.4086606
CAR_3_3	519	.0078143	.0742986	-.154086	.4923462
CAR_10_10	519	-.0047369	.0547472	-.2201887	.1622048
sub_mixed	520	.0480769	.2141348	0	1
sub_substitution	520	.0423077	.201484	0	1
Non-complementary use of proceeds	520	.0903846	.2870081	0	1
ln_bond_size	520	3.187689	1.341725	0	6.214608
maturity	520	3.400942	1.397174	.04	10
ln_issuer_size	520	18.36964	2.299359	12.59946	22.44196
leverage	520	81.78248	15.72718	19	94.26
ROA	520	.2748077	.5958465	-4.07	4.16
ln_pb	467	-.2237936	.6689877	-1.277619	1.94835

The sample is highly concentrated in the complementary category, while the mixed and substitution categories account for relatively small proportions of the sample. This imbalance should be considered when interpreting the regression coefficients on the more granular use-of-proceeds categories.

Table 6.2 reports the descriptive statistics for the main variables used in the empirical analysis. The event-window cumulative abnormal returns show moderate variation across observations. The mean value of CAR[-1,+1] is 0.0080, while the mean value of CAR[-3,+3] is 0.0078, suggesting that green bond announcements are associated with slightly positive abnormal stock returns over the short and medium event windows. In contrast, the mean value of CAR[-10,+10] is -0.0047, indicating that the average long-window market reaction is slightly negative. This difference suggests that the immediate announcement-period response may be more favorable than the broader long-window reaction, which is more likely to include additional market noise or other firm-specific information.

The descriptive statistics also show that the sample is highly concentrated in the complementary use-of-proceeds category. The mean of sub_mixed is 0.0481, indicating that mixed use-of-proceeds observations account for about 4.8% of the sample. The mean of sub_substitution is 0.0423, meaning that substitution-oriented observations account for about 4.2% of the sample. Consequently, the broader non_complementary indicator has a mean of 0.0904, showing that around 9.0% of the sample is classified as non-complementary. This imbalance is important for interpreting the regression results, because the relatively small number of mixed and substitution observations may reduce the precision of the estimated coefficients.

Regarding control variables, the average log bond issue size is 3.1877, and the average bond maturity is around 3.40 years. The mean log issuer size is 18.3696, while the average leverage ratio is 81.78%, indicating that the sample contains relatively highly leveraged issuers. The mean ROA is 0.2748, suggesting modest profitability on average, although the minimum and maximum values indicate substantial variation across issuers. The log price-to-book ratio has fewer observations than other variables, with 467 non-missing observations, which explains why the number of observations declines in regressions including ln_pb.

Overall, the descriptive statistics suggest that green bond announcements generate mildly positive short-window abnormal returns, but the use-of-proceeds categories are highly unbalanced. This provides an important background for the regression analysis, where the coefficients on the mixed and substitution categories should be interpreted with caution.

6.2 Correlation Matrix

Table 6.3 reports the correlation matrix for the core event-study and use-of-proceeds variables. The correlation between CAR[-1, +1] and CAR[-3, +3] is high and statistically significant, which is expected because the two event windows overlap substantially. CAR[-10, +10] is only weakly correlated with the shorter-window CARs, suggesting that the long-window measure captures somewhat different information from the immediate announcement reaction. Mixed use of proceeds is positively correlated with CAR[-10, +10], while substitution use of proceeds shows no significant correlation with the CAR measures.

The correlations between the use-of-proceeds variables and CARs are generally modest. sub_mixed is positively correlated with CAR[-10, +10], with a correlation coefficient of 0.0936, significant at the 10% level. However, its correlations with CAR[-1, +1] and CAR[-3, +3] are close to zero. sub_substitution is not strongly correlated with any of the three CAR measures. These patterns are consistent with the baseline regression results, where the effect of mixed use of proceeds is most visible in the longer event window, while substitution-oriented proceeds do not show a strong full-sample association with announcement-period CARs.

The matrix also shows that non_complementary is highly correlated with both sub_mixed and sub_substitution, with correlation coefficients of 0.713 and 0.667 respectively. This is expected because non_complementary is constructed by combining the mixed and substitution categories. Therefore, the binary classification variable is not included in the same regression specification as sub_mixed and sub_substitution; instead, it is used as an alternative specification.

Among the control variables, some correlations are relatively high. In particular, ln_bond_size is strongly correlated with ln_issuer_size, with a coefficient of 0.875, suggesting that larger issuers tend to issue larger green bonds. ln_issuer_size is also positively correlated with leverage, while ln_pb is negatively correlated with bond size, issuer size, and leverage. These relationships are economically intuitive, but they also suggest that multicollinearity should be considered when interpreting the regression coefficients on issuer and bond characteristics.

Overall, the correlation matrix provides two main insights. First, the different CAR windows capture related but not identical dimensions of market reaction, especially

when comparing short and long windows. Second, the use-of-proceeds variables do not exhibit excessively high correlations with the dependent variables, suggesting that the regression analysis is necessary to evaluate their association with market reactions after controlling for bond and issuer characteristics.

Table 6.3 Correlation Matrix for Core Variables

	(1)					
	CAR_1_1	CAR_3_3	CAR_10_10	sub_mixed	sub_substitution	Non-complementary use of proceeds
CAR_1_1	1					
CAR_3_3	0.881***	1				
CAR_10_10	0.122**	0.231***	1			
sub_mixed	-0.00245	0.00242	0.0936*	1		
sub_substitution	-0.0183	-0.0253	-0.000923	-0.0472	1	
Non-complementary use of proceeds	-0.0147	-0.0160	0.0692	0.713***	0.667***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.4 Correlation Matrix for Control Variables

	(1)					
	ln_bond_size	maturity	ln_issuer_size	leverage	ROA	ln_pb
ln_bond_size	1					
maturity	-0.0700	1				
ln_issuer_size	0.875***	-0.158***	1			
leverage	0.656***	-0.274***	0.718***	1		
ROA	-0.105*	0.223***	-0.159***	-0.382***	1	
ln_pb	-0.574***	0.225***	-0.554***	-0.597***	0.158***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Taken together, the descriptive statistics and correlation matrix provide initial evidence that market reactions differ across event windows and use-of-proceeds structures. However, these univariate patterns do not control for bond characteristics,

issuer financial conditions, or fixed effects. Therefore, the following sections turn to multivariate regression analysis.

6.3 Announcement-period Abnormal Returns

Table 6.5 Announcement-period Cumulative Abnormal Returns

Use-of-proceeds category	N_CAR_1_1	N_CAR_3_3	N_CAR_10_10	Mean_CAR_1_1	Mean_CAR_3_3	Mean_CAR_10_10	SD_CAR_1_1	SD_CAR_3_3	SD_CAR_10_10
Complementary	473	472	472	0.008	0.008	-0.006	0.075	0.077	0.053
Mixed	25	25	25	0.007	0.009	0.018	0.024	0.031	0.055
Substitution	22	22	22	0.002	-0.001	-0.005	0.037	0.049	0.088

Table 6.5 reports the overall announcement-period cumulative abnormal returns across the three event windows. The mean CAR[-1,+1] is 0.0080, and the mean CAR[-3,+3] is 0.0078, suggesting that green bond announcements are associated with mildly positive abnormal stock returns in the short and medium event windows. In contrast, the mean CAR[-10,+10] is -0.0047, indicating that the average abnormal return becomes slightly negative when the event window is extended. This pattern suggests that the immediate market response to green bond announcements is generally positive, but the long-window reaction may be affected by additional market noise or other firm-specific information unrelated to the bond announcement.

The category-level CARs provide more detailed evidence on how market reactions differ across use-of-proceeds structures. For the complementary category, the mean CAR is 0.0084 for CAR[-1,+1] and 0.0082 for CAR[-3,+3], but turns negative at -0.0059 for CAR[-10,+10]. This suggests that complementary green bond announcements are associated with mildly positive short- and medium-window reactions, but the positive effect does not persist over the longer window.

For the mixed category, the mean CAR is 0.0072 for CAR[-1,+1], 0.0086 for CAR[-3,+3], and 0.0180 for CAR[-10,+10]. Unlike the complementary category, the mixed category shows a stronger positive reaction in the long event window. This is consistent with the later regression evidence that mixed use of proceeds is

associated with a significantly more positive CAR[-10,+10]. A possible interpretation is that mixed use-of-proceeds announcements may require more time for investors to evaluate, especially when the proceeds involve both project-related and financing-related purposes.

For the substitution category, the mean CAR is 0.0017 for CAR[-1,+1], -0.0011 for CAR[-3,+3], and -0.0050 for CAR[-10,+10]. These values suggest that substitution-oriented green bond announcements do not generate an obviously positive average market reaction in the univariate analysis. Compared with complementary and mixed categories, the substitution category displays weaker short- and medium-window CARs and a slightly negative long-window CAR.

Overall, the announcement-period CAR results suggest that market reactions vary across use-of-proceeds categories. The mixed category shows the most favorable long-window abnormal return, while the substitution category shows weaker average CARs. However, these univariate patterns should be interpreted cautiously because they do not control for bond characteristics, issuer financial conditions, or fixed effects. Therefore, the following regression analysis provides a more rigorous test of whether use-of-proceeds structure is systematically associated with announcement-period abnormal returns.

6.4 Significance Tests of Announcement-period CARs

Table 6.6 Significance Test of Announcement-Period CARs

Event window	Obs.	Mean CAR	Std. dev.	t-statistic	p-value
CAR[-1,+1]	520	0.0080	0.0725	2.5255	0.0119
CAR[-3,+3]	519	0.0078	0.0743	2.3960	0.0169
CAR[-10,+10]	519	-0.0047	0.0547	-1.9711	0.0492

To directly test H1, I conduct one-sample t-tests to examine whether the mean cumulative abnormal returns are statistically different from zero. The results show that the mean CAR[-1,+1] is 0.0080 and statistically significant at the 5% level, with a t-statistic of 2.5255 and a two-sided p-value of 0.0119. Similarly, the mean CAR[-3,+3] is 0.0078 and statistically significant at the 5% level, with a t-statistic of 2.3960 and a

two-sided p-value of 0.0169. These results indicate that Chinese listed firms experience significantly positive abnormal stock returns around green bond announcements in the short and medium event windows.

For the longer event window, the mean CAR[-10,+10] is -0.0047 and statistically significant at the 5% level, with a t-statistic of -1.9711 and a two-sided p-value of 0.0492. This suggests that the longer-window market reaction is significantly negative on average. One possible interpretation is that the positive announcement effect is concentrated around the immediate announcement period, while the longer window may capture additional market noise, delayed corrections, or other firm-specific information.

Overall, the t-test results support H1 in the sense that green bond announcements generate statistically significant announcement-period abnormal returns. However, the direction of the abnormal return depends on the event window: short- and medium-window CARs are significantly positive, whereas the long-window CAR is significantly negative. Therefore, H1 is supported with the qualification that the announcement effect is strongest and positive around the shorter event windows.

6.5 Use-of-Proceeds Regression Results

Table 6.7 Baseline Regression Results

	(1)	(2)	(3)
	CAR[-1,+1]	CAR[-3,+3]	CAR[-10,+10]
sub_mixed	0.0094	0.0118	0.0338**
	(0.0075)	(0.0096)	(0.0163)
sub_substitution	0.0103	0.0150	0.0119
	(0.0067)	(0.0106)	(0.0277)
ln_bond_size	0.0053***	0.0083***	0.0133**
	(0.0017)	(0.0029)	(0.0052)
maturity	0.0002	0.0037***	0.0057**
	(0.0008)	(0.0010)	(0.0024)
ln_issuer_size	-0.0002	0.0011	0.0037
	(0.0010)	(0.0017)	(0.0033)
leverage	0.0002	0.0004	-0.0006
	(0.0002)	(0.0003)	(0.0007)
ROA	-0.0034	-0.0018	0.0017
	(0.0023)	(0.0026)	(0.0058)
ln_pb	0.0022	0.0094*	0.0225**
	(0.0032)	(0.0048)	(0.0099)
Constant	-0.0344	-0.0920***	-0.0814
	(0.0213)	(0.0337)	(0.0685)

Observations	466.0000	465.0000	465.0000
Adjusted R-squared	0.0269	0.1064	0.1321

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.8 Binary non-complementary classification

	(1)	(2)	(3)
	CAR[-1,+1]	CAR[-3,+3]	CAR[-10,+10]
Non-complementary use of proceeds	0.0099*	0.0137*	0.0209
	(0.0056)	(0.0081)	(0.0179)
ln_bond_size	0.0053***	0.0082***	0.0137***
	(0.0017)	(0.0029)	(0.0051)
maturity	0.0002	0.0037***	0.0056**
	(0.0008)	(0.0010)	(0.0024)
ln_issuer_size	-0.0002	0.0011	0.0036
	(0.0010)	(0.0017)	(0.0032)
leverage	0.0002	0.0004	-0.0006
	(0.0002)	(0.0003)	(0.0007)
ROA	-0.0035	-0.0020	0.0030
	(0.0022)	(0.0026)	(0.0062)
ln_pb	0.0022	0.0094*	0.0225**
	(0.0032)	(0.0048)	(0.0098)
Constant	-0.0343	-0.0918***	-0.0826
	(0.0212)	(0.0336)	(0.0675)
Observations	466.0000	465.0000	465.0000
Adjusted R-squared	0.0291	0.1082	0.1310

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.7 presents the baseline regression results examining the relationship between use-of-proceeds structure and announcement-period cumulative abnormal returns. The dependent variables are CAR[-1,+1], CAR[-3,+3], and CAR[-10,+10]. The omitted benchmark group is the complementary use-of-proceeds category, so the coefficients on sub_mixed and sub_substitution measure the difference in market reaction relative to green bonds whose proceeds are mainly used for complementary or project-related purposes.

The coefficient on sub_mixed is positive across all three event windows. It is 0.0094 for CAR[-1,+1], 0.0118 for CAR[-3,+3], and 0.0338 for CAR[-10,+10]. The coefficient becomes statistically significant at the 5% level in the long event window. Economically, this suggests that green bonds with mixed use of proceeds are associated with approximately 3.38 percentage points higher cumulative abnormal returns over the [-10,+10] window compared with complementary green bonds. This result indicates that the market reaction to mixed use-of-proceeds green bonds is

more pronounced over a longer event window, possibly because investors require more time to evaluate announcements involving both project-related and financing-related purposes.

By contrast, the coefficient on sub_substitution is positive but statistically insignificant across all three windows. The estimated coefficients are 0.0103 for CAR[-1,+1], 0.0150 for CAR[-3,+3], and 0.0119 for CAR[-10,+10]. These results suggest that, in the full sample, there is no robust evidence that the stock market systematically rewards or penalizes substitution-oriented green bond proceeds relative to complementary use of proceeds. This finding is important because it indicates that substitution-oriented proceeds are not necessarily interpreted as a negative signal by investors, but neither do they generate a statistically reliable positive response in the baseline specification.

The control variables also provide useful evidence. The coefficient on ln_bond_size is positive and statistically significant across all three event windows, suggesting that larger green bond issuances are associated with stronger stock market reactions. Bond maturity is positive and significant for CAR[-3,+3] and CAR[-10,+10], indicating that longer-maturity green bonds may be perceived as stronger or more durable financing commitments. The coefficient on ln_pb is also positive and significant in the medium and long event windows, suggesting that firms with higher valuation ratios receive more favorable announcement-period responses. In contrast, issuer size, leverage, and ROA do not show consistent statistical significance across the baseline specifications.

Table 6.8 reports an alternative specification in which the mixed and substitution categories are combined into a broader non_complementary indicator. This specification is useful because the mixed and substitution categories contain relatively few observations when treated separately. The coefficient on non_complementary is positive across all three event windows and is weakly significant for CAR[-1,+1] and CAR[-3,+3]. Specifically, the estimated coefficient is 0.0099 for CAR[-1,+1] and 0.0137 for CAR[-3,+3], both significant at the 10% level. This indicates that green bonds with non-complementary use of proceeds are associated with approximately 0.99 to 1.37 percentage points higher abnormal returns in the short and medium event windows. However, the coefficient for CAR[-10,+10] is not statistically significant.

Taken together, the baseline and binary classification results suggest that use-of-proceeds structure contains information relevant to stock market reactions around green bond announcements. The evidence is strongest for mixed use of proceeds in the long event window and for the broader non-complementary classification in the short and medium windows. However, the results are not uniformly significant across all specifications and event windows. Therefore, the findings should be interpreted as suggestive evidence that investors respond to differences in green bond proceeds structure, rather than conclusive evidence of a uniformly strong market preference for any single category.

Overall, the regression results indicate that the market does not treat all green bond announcements uniformly. Instead, investors appear to respond differently to the structure of proceeds, although the statistical evidence is moderate rather than overwhelming.

7. Robustness Checks

7.1 Alternative Event Windows

This section examines whether the baseline findings are sensitive to the choice of event window. Since market reactions to green bond announcements may occur immediately, with a short delay, or over a longer adjustment period, the analysis uses three cumulative abnormal return measures: CAR[-1,+1], CAR[-3,+3], and CAR[-10,+10]. The short window captures the immediate announcement reaction, the medium window allows for limited information leakage and delayed adjustment, and the long window captures a broader market response around the announcement date.

The results from Table 6.7 show that the coefficient on sub_mixed is positive across all three event windows. The coefficient is 0.0094 for CAR[-1,+1], 0.0118 for CAR[-3,+3], and 0.0338 for CAR[-10,+10]. While the first two coefficients are not statistically significant, the coefficient becomes significant at the 5% level in the long event window. This suggests that the positive market reaction associated with mixed use of proceeds is not immediately incorporated into stock prices, but becomes more visible when the event window is extended. Economically, the coefficient of 0.0338 indicates that green bonds with mixed use of proceeds are associated with approximately 3.38 percentage points higher cumulative abnormal returns over the [-10,+10] window relative to complementary green bonds.

By contrast, the coefficient on sub_substitution remains statistically insignificant across all three event windows. Although the coefficients are positive, their lack of statistical significance suggests that substitution-oriented use of proceeds does not generate a robustly different market reaction relative to complementary use of proceeds in the full sample.

Overall, the alternative event-window analysis supports the baseline interpretation that the market response to use-of-proceeds information is present but not uniformly strong across all windows. The strongest evidence appears in the long-window specification for mixed use of proceeds, suggesting that investors may require more time to interpret announcements involving both project-related and financing-related purposes.

7.2 Alternative Use-of-Proceeds Classification

Table 6.8 regression separates the use-of-proceeds variable into three categories: complementary, mixed, and substitution. However, the mixed and substitution categories account for a relatively small share of the sample, which may reduce the precision of the estimated coefficients. Therefore, as an alternative specification, this section combines the mixed and substitution categories into a broader non_complementary indicator. This binary classification distinguishes green bonds whose proceeds are mainly complementary or project-related from those involving broader or less purely complementary use of proceeds.

The results show that the coefficient on non_complementary is positive across all three event windows. It is 0.0099 for CAR[-1,+1], 0.0137 for CAR[-3,+3], and 0.0209 for CAR[-10,+10]. The coefficients for CAR[-1,+1] and CAR[-3,+3] are statistically significant at the 10% level, while the coefficient for CAR[-10,+10] is not statistically significant. This suggests that, when the use-of-proceeds classification is simplified, non-complementary green bonds are associated with more favorable short- and medium-window stock market reactions.

This result provides additional evidence that use-of-proceeds structure contains information relevant to investors. Although the statistical significance is modest, the positive coefficients are consistent with the view that investors do not necessarily penalize green bonds whose proceeds are not exclusively classified as complementary. Instead, the market may perceive non-complementary use of proceeds as providing financing flexibility, especially when proceeds involve both investment-related and refinancing-related purposes.

The control variables remain broadly consistent with the baseline specification. In particular, ln_bond_size is positive and statistically significant across all three windows, and maturity is positive and significant for the medium and long windows. The coefficient on ln_pb is also positive and significant for CAR[-3,+3] and CAR[-10,+10]. These patterns are similar to the baseline regression, which suggests that the alternative classification does not materially alter the role of the main control variables.

Overall, the binary classification results reinforce the main finding that the market response to green bond announcements varies with the structure of proceeds.

However, because the significance appears only at the 10% level in the short and medium windows, the evidence should be interpreted as suggestive rather than conclusive.

7.3 Additional Fixed Effects

Table 7.1 Additional Fixed Effects

	(1) CAR[-1,+1]	(2) CAR[-3,+3]	(3) CAR[-10,+10]
sub_mixed	0.0109	0.0107	0.0317*
	(0.0076)	(0.0108)	(0.0179)
sub_substitution	0.0103	0.0146	0.0110
	(0.0069)	(0.0107)	(0.0284)
ln_bond_size	0.0057***	0.0080**	0.0129**
	(0.0018)	(0.0031)	(0.0055)
maturity	0.0005	0.0042***	0.0058**
	(0.0007)	(0.0010)	(0.0025)
ln_issuer_size	-0.0005	-0.0001	0.0035
	(0.0010)	(0.0017)	(0.0033)
leverage	0.0003	0.0004	-0.0006
	(0.0002)	(0.0003)	(0.0007)
ROA	-0.0037	-0.0034	0.0040
	(0.0024)	(0.0033)	(0.0058)
ln_pb	0.0020	0.0110**	0.0237**
	(0.0031)	(0.0045)	(0.0105)
Constant	-0.0339*	-0.0719**	-0.0805
	(0.0194)	(0.0293)	(0.0679)
Observations	464.0000	463.0000	463.0000
Adjusted R-squared	0.0364	0.1192	0.1362

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This section further tests the robustness of the baseline findings by adding additional fixed effects. The baseline model controls for year and bond-type fixed effects, while the extended specification additionally accounts for rating and event-type fixed effects. This stricter specification helps address the possibility that the baseline results are driven by systematic differences in credit quality or announcement type rather than by the use-of-proceeds structure itself.

The results remain broadly consistent with the baseline findings. The coefficient on sub_mixed remains positive across all three event windows. It is 0.0109 for CAR[-1,+1], 0.0107 for CAR[-3,+3], and 0.0317 for CAR[-10,+10]. The coefficient for CAR[-10,+10] remains statistically significant, although the significance level declines from

5% in the baseline specification to 10% in the extended fixed-effects specification. This indicates that the positive long-window association between mixed use of proceeds and cumulative abnormal returns is not fully explained by additional rating or event-type fixed effects.

The coefficient on sub_substitution remains positive but statistically insignificant across all three windows. This is consistent with the baseline results and confirms that there is no robust evidence that substitution-oriented use of proceeds generates a systematically different stock market reaction in the full sample.

The control variables also show similar patterns to the baseline regressions. ln_bond_size remains positive and statistically significant across all three windows. maturity is positive and significant for CAR[-3,+3] and CAR[-10,+10], and ln_pb remains positive and significant in the medium and long windows. These results suggest that the relationship between bond characteristics, issuer valuation, and announcement-period CARs is relatively stable after adding further fixed effects.

Overall, the additional fixed-effects analysis supports the robustness of the main result. The positive effect of mixed use of proceeds in the long event window remains economically meaningful and statistically significant, although at a weaker level. This suggests that the baseline finding is not solely driven by omitted rating-level or event-type heterogeneity. At the same time, the weaker significance under the stricter specification indicates that the result should be interpreted with appropriate caution.

7.4 Excluding contaminated events

Table 7.2 Robustness Check

	(1)	(2)	(3)
	CAR[-1,+1]	CAR[-3,+3]	CAR[-10,+10]
sub_mixed	0.0076	0.0228*	0.0476**
	(0.0104)	(0.0135)	(0.0204)
sub_substitution	-0.0040	0.0047	-0.0474*
	(0.0079)	(0.0136)	(0.0263)
ln_bond_size	0.0130**	0.0095	0.0078
	(0.0060)	(0.0080)	(0.0133)
maturity	-0.0056	0.0032	0.0086
	(0.0049)	(0.0058)	(0.0116)
ln_issuer_size	-0.0041	-0.0042	-0.0036
	(0.0041)	(0.0052)	(0.0082)
leverage	0.0008**	0.0014**	0.0001
	(0.0004)	(0.0007)	(0.0010)

ROA	-0.0020	0.0020	0.0016
	(0.0039)	(0.0044)	(0.0056)
ln_pb	-0.0004	0.0110	0.0185
	(0.0080)	(0.0091)	(0.0129)
Constant	-0.0015	-0.0699	-0.0015
	(0.0635)	(0.0873)	(0.1342)
Observations	88.0000	87.0000	87.0000
Adjusted R-squared	-0.0764	0.0347	0.0752

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This section further examines whether the baseline findings are affected by potentially overlapping events. In event-study analysis, one concern is that multiple announcements by the same issuer within a short period may contaminate the estimated market reaction. If two green bond events occur close to each other, the corresponding event windows may overlap, making it difficult to attribute abnormal returns to a single announcement. To address this concern, this robustness check excludes observations with overlapping events and re-estimates the baseline regression on the remaining sample.

After excluding overlapping events, the number of observations falls substantially to 88 for CAR[-1,+1] and 87 for CAR[-3,+3] and CAR[-10,+10]. This smaller sample size should be kept in mind when interpreting the results, as the estimates are based on a much more restricted set of events. Nevertheless, the results provide useful evidence on whether the main findings are driven by repeated announcements or clustered events by the same issuer.

The coefficient on sub_mixed remains positive across all three event windows. It is 0.0076 for CAR[-1,+1], 0.0228 for CAR[-3,+3], and 0.0476 for CAR[-10,+10]. Importantly, the coefficient becomes statistically significant at the 10% level for CAR[-3,+3] and at the 5% level for CAR[-10,+10]. This indicates that, after excluding potentially overlapping events, mixed use of proceeds continues to be associated with a more favorable market reaction. The magnitude is also economically meaningful: the coefficient of 0.0476 suggests that mixed use-of-proceeds green bonds are associated with approximately 4.76 percentage points higher cumulative abnormal returns over the [-10,+10] window relative to complementary green bonds.

The results for sub_substitution are more mixed. The coefficient is insignificant for CAR[-1,+1] and CAR[-3,+3], but becomes negative and weakly significant for CAR[-10,+10], with a coefficient of -0.0474. This suggests that, once overlapping events are excluded, substitution-oriented use of proceeds may be associated with a weaker long-window market reaction. However, this result should be interpreted cautiously because the restricted sample contains relatively few observations, and the significance is only at the 10% level.

Among the control variables, ln_bond_size remains positive and significant for CAR[-1,+1], while leverage is positive and significant for CAR[-1,+1] and CAR[-3,+3]. Other control variables, including maturity, issuer size, ROA, and ln_pb, are not statistically significant in this restricted sample. This suggests that, after excluding overlapping events, the explanatory power of some control variables weakens, likely because the sample size is much smaller.

Overall, this robustness check strengthens the main conclusion about mixed use of proceeds. The positive coefficient on sub_mixed not only remains positive but becomes statistically significant in both the medium and long event windows after overlapping events are excluded. This supports the interpretation that the favorable market reaction to mixed use-of-proceeds green bonds is not driven solely by clustered or overlapping announcements. At the same time, the negative long-window coefficient on sub_substitution suggests that substitution-oriented green bonds may receive a less favorable market response when event contamination is reduced.

Taken together, the robustness checks provide moderate support for the main empirical findings. The positive association between mixed use of proceeds and long-window CARs remains visible across alternative event windows and after adding additional fixed effects. The alternative binary classification also suggests that non-complementary use of proceeds is positively associated with short- and medium-window abnormal returns.

8. Discussion

This chapter discusses our empirical findings and their implications for literature on green bonds and investor behavior. The core question of this thesis is whether the stock market reacts to corporate green bond announcements, and whether this reaction depends on how the company plans to use the proceeds. Overall, our results show that the market does not respond uniformly to all green bonds. Instead, investors care about whether an announcement provides credible and meaningful details about the fund allocation.

First, we find that the average market reaction to green bond announcements is relatively modest. While the mean CAR is slightly positive in the short and medium term, it turns negative over a longer window. This suggests that the green label alone does not automatically create long-term shareholder value. While green bonds show environmental commitment and can lower financing costs, they are still debt instruments. From an equity investor's perspective, the final value depends on whether the funds will finance profitable new projects or simply refinance old debt.

Second, the regression results confirm that the specific use-of-proceeds structure matters. In our baseline model, bonds with a mixed use of proceeds show a positive and statistically significant relationship with CARs, particularly in the longer [-10, +10] window. This finding holds up well in our robustness checks. In fact, after removing overlapping corporate events, the positive effect of mixed-use green bonds becomes even stronger and stays statistically significant across both medium and long-term windows.

One explanation is that investors view a mixed use of proceeds as a practical and flexible approach. While complementary proceeds go directly into new green projects, mixed proceeds combine green investments with refinancing or general balance-sheet management. This does not mean the bond lacks credibility. In reality, green projects usually require large upfront capital, have long payback periods, and need to work alongside a company's existing debt structure. Therefore, a mixed structure signals that the firm is balancing environmental goals with sound financial planning. In the Chinese market, where firms face both tight financing constraints and strong policy incentives to go green, investors likely value this flexibility. Furthermore,

because this effect is strongest in the longer window, it suggests that the market needs more time to analyze and digest these complex, mixed announcements.

On the other hand, our findings for substitution-oriented proceeds need more caution. In the baseline model, substitution-oriented bonds do not show a statistically significant difference from complementary ones. This implies that, looking at the full sample, the market does not openly penalize companies using green bonds to refinance. However, once we remove overlapping corporate events, the coefficient becomes negative and weakly significant in the long window. This suggests that when the announcement signal is cleaner, investors may view substitution less favorably, likely treating it as a pure refinancing tool rather than a commitment to new green growth. If the funds simply replace existing debt, the green label offers little new information about future transformation or value creation. Still, we should interpret this result carefully, as the substitution category has a relatively small sample size and weak statistical significance.

The binary classification results provide an extra layer of insight. When we combine the mixed and substitution categories into a single non-complementary indicator, the coefficient is positive and weakly significant in both the short and medium windows. This tells us that investors do not automatically penalize green bonds just because the funds aren't purely going into new projects. Instead, the market may see non-complementary structures as good news when they signal financial flexibility or a broader corporate funding strategy. However, because this evidence is not uniformly strong across all windows, these results are suggestive rather than definitive proof that the market always prefers one specific category.

Finally, these findings help clarify conflicting results in existing literature. Some prior studies view green bonds as reliable indicators of environmental commitment that elicit positive stock market reactions, while others highlight risks such as greenwashing and the high costs of green transitions that lead to muted or even negative market responses. Our results suggest that both perspectives may be valid. Green bonds demonstrate their value when their issuance provides investors with clear, reliable information regarding corporate strategy. Conversely, a green label alone is often insufficient to significantly boost the market. Investors clearly evaluate the actual financial fundamentals underlying the label.

We acknowledge four main limitations. First, our sample is heavily skewed toward the complementary category, with very few observations for mixed and substitution bonds. This imbalance reduces statistical precision, so those coefficients require cautious interpretation. Second, while we used multiple event windows and removed overlapping events, our event-study estimates might still catch other firm-specific news released around the announcement dates. Third, our use-of-proceeds classification may not fully reflect the actual quality or environmental impact of the underlying projects. Finally, stock market reactions only capture short-term investor expectations, not the long-term financial or environmental success of the projects.

Overall, the market's reaction to green bonds is conditional. Investors do not reward a bond just because it is labeled green. The strongest evidence points to mixed-use bonds, which perform better in longer windows.

9. Conclusion

This thesis examines whether corporate green bond announcements generate stock market reactions in China, and whether these reactions depend on how the company plans to use the proceeds. Although green bonds are designed to fund environmental projects, their value to equity investors is not always clear. An announcement could signal a real environmental commitment or better access to capital. Conversely, it could offer very little new information if the funds are simply used to refinance old debt or manage the balance sheet. To explore this ambiguity, this thesis uses an event study to estimate cumulative abnormal returns (CARs) around announcement dates, and then compares how the market reacts to complementary, mixed, and substitution-oriented funding structures.

Our empirical findings show that the stock market does not automatically reward companies for issuing green bonds. On average, CARs are mildly positive in the short and medium terms but turn slightly negative over a longer window. This indicates that while green bond announcements may bring some good news initially, the effect is neither strong nor consistent across the full sample. In short, the green label alone is not enough to drive a reliable stock market rally. Investors do not treat these announcements purely as sustainability events; they evaluate them as financial decisions whose ultimate value depends entirely on how the capital will be spent.

The main contribution of this thesis is showing that the specific structure of proceeds matters. Our baseline model indicates that mixed use-of-proceeds bonds are associated with better stock market reactions, especially in the longer window. The coefficient for mixed use of proceeds is positive across all three event windows and becomes statistically significant for CAR[-10, +10]. Economically, this means mixed-use bonds generate higher abnormal returns than purely complementary ones over a longer period. This finding holds up well in our robustness checks; after removing overlapping corporate events, the mixed-use coefficient remains positive and stays significant across both medium and long windows.

In contrast, our findings for substitution-oriented proceeds call for more caution. In the baseline model, substitution-oriented bonds show no statistically significant difference from complementary ones, implying that the market does not openly penalize companies for replacing old debt in the full sample. However, once

overlapping events are excluded, the substitution coefficient becomes negative and weakly significant in the long window. This indicates that when the announcement signal is cleaner, investors are more likely to view substitution bonds as pure refinancing tools rather than commitments to new green growth. Still, we should interpret this carefully, as the substitution category has a relatively small sample size and weak statistical significance across models.

Our alternative binary classification provides more support for these findings. When we combine mixed and substitution bonds into a single non-complementary category, the coefficient is positive and weakly significant in the short and medium windows. This tells us that the market does not automatically penalize green bonds just because the funds aren't purely going into new projects. Instead, investors may see non-complementary structures as a sign of funding flexibility, particularly when they combine investment and refinancing. However, because the statistical significance is modest, this should be taken as suggestive rather than definitive proof.

Taken together, these findings support a conditional interpretation of green bond announcement effects. From an equity investor's perspective, green bonds are neither a guaranteed way to enhance value nor a purely symbolic financing trick. Instead, their market impact depends on the actual information the announcement reveals. The use-of-proceeds structure serves as a key channel through which investors judge whether a bond supports credible green investment, improves financial flexibility, or merely replaces existing debt. This conclusion helps clear up the mixed results in past literature, where some studies report positive reactions and others find weak or negative effects.

10. References

Bachelet, M. J., Becchetti, L., & Manfredonia, S. (2019). The green bonds premium puzzle: The role of issuer characteristics and third-party verification. *Sustainability, 11*(4), 1098. doi:10.3390/su11041098

Baker, M., Bergstresser, D., Serafeim, G., & Wurgler, J. (2022). The pricing and ownership of U.S. green bonds. *Annual Review of Financial Economics, 14*(1), 415–437. doi:10.1146/annurev-financial-111620-014802

Baulkaran, V. (2019). Stock market reaction to green bond issuance. *Journal of Asset Management, 20*(5), 331–340. doi:10.1057/s41260-018-00105-1

Berdiev, U. (2025). Stock market reaction to green bond announcements: The role of firm sustainability. *Finance Research Letters, 86*, 108295. doi:10.1016/j.frl.2025.108295

Bolton, P., & Kacperczyk, M. (2021). Do investors care about carbon risk? *Journal of Financial Economics, 142*(2), 517–549. doi:10.1016/j.jfineco.2021.05.008

Brown, S. J., & Warner, J. B. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics, 14*(1), 3–31. doi:10.1016/0304-405X(85)90042-X

Chen, J., Yang, Y., Liu, R., Geng, Y., & Ren, X. (2023). Green bond issuance and corporate ESG performance: The perspective of internal attention and external supervision. *Humanities and Social Sciences Communications, 10*, 437. doi:10.1057/s41599-023-01941-2

Deschryver, P., & de Mariz, F. (2020). What future for the green bond market? How can policymakers, companies, and investors unlock the potential of the green bond market? *Journal of Risk and Financial Management, 13*(3), 61. doi:10.3390/jrfm13030061

Fatica, S., & Panzica, R. (2021). Green bonds as a tool against climate change? *Business Strategy and the Environment, 30*(5), 2688–2701. doi:10.1002/bse.2771

Fatica, S., Panzica, R., & Rancan, M. (2021). The pricing of green bonds: Are financial institutions special? *Journal of Financial Stability, 54*, 100873. doi:10.1016/j.jfs.2021.100873

Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The environmental awareness of investors. *Academy of Management Journal, 56*(3), 758–781. doi:10.5465/amj.2011.0744

Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics, 142*(2), 499–516. doi:10.1016/j.jfineco.2021.01.010

Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment, 5*(4), 210–233. doi:10.1080/20430795.2015.1118917

Gianfrate, G., & Peri, M. (2019). The green advantage: Exploring the convenience of issuing green bonds. *Journal of Cleaner Production, 219*, 127–135. doi:10.1016/j.jclepro.2019.02.022

Gillan, S. L., Koch, A., & Starks, L. T. (2021). Firms and social responsibility: A review of ESG and CSR research in corporate finance. *Journal of Corporate Finance, 66*, 101889. doi:10.1016/j.jcorpfin.2021.101889

Hachenberg, B., & Schiereck, D. (2018). Are green bonds priced differently from conventional bonds? *Journal of Asset Management, 19*(6), 371–383. doi:10.1057/s41260-018-0088-5

Hyun, S., Park, D., & Tian, S. (2020). The price of going green: The role of greenness in green bond markets. *Accounting & Finance, 60*(1), 73–95. doi:10.1111/acfi.12515

Jones, R., Baker, T., Huet, K., Murphy, L., & Lewis, N. (2020). Treating ecological deficit with debt: The practical and political concerns with green bonds. *Geoforum, 114*, 49–58. doi:10.1016/j.geoforum.2020.05.014

Krueger, P., Sautner, Z., & Starks, L. T. (2020). The importance of climate risks for institutional investors. *The Review of Financial Studies, 33*(3), 1067–1111. doi:10.1093/rfs/hhz137

Krüger, P. (2015). Corporate goodness and shareholder wealth. *Journal of Financial Economics, 115*(2), 304–329. doi:10.1016/j.jfineco.2014.09.008

Laborda, J., & Sánchez-Guerra, Á. (2021). Green bond finance in Europe and the stock market reaction. *Studies of Applied Economics, 39*(3), 1–22. doi:10.25115/eea.v39i3.4125

Larcker, D. F., & Watts, E. M. (2020). Where's the greenium? *Journal of Accounting and Economics, 69*(2–3), 101312. doi:10.1016/j.jacceco.2020.101312

Lebelle, M., Lajili Jarjir, S., & Sassi, S. (2020). Corporate green bond issuances: An international evidence. *Journal of Risk and Financial Management, 13*(2), 25. doi:10.3390/jrfm13020025

Lin, B., & Su, T. (2022). Green bond vs conventional bond: Outline the rationale behind issuance choices in China. *International Review of Financial Analysis, 81*,

102063. doi:10.1016/j.irfa.2022.102063

MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature, 35*(1), 13–39.

Maltais, A., & Nykvist, B. (2021). Understanding the role of green bonds in advancing sustainability. *Journal of Sustainable Finance & Investment, 11*(3), 233–252. doi:10.1080/20430795.2020.1724864

Okafor, A., Adusei, M., & Edo, O. C. (2024). Effects of the utilization of green bonds proceeds on green bond premium. *Journal of Cleaner Production, 469*, 143131. doi:10.1016/j.jclepro.2024.143131

Pástor, L., Stambaugh, R. F., & Taylor, L. A. (2021). Sustainable investing in equilibrium. *Journal of Financial Economics, 142*(2), 550–571. doi:10.1016/j.jfineco.2020.12.011

Pedersen, L. H., Fitzgibbons, S., & Pomorski, L. (2021). Responsible investing: The ESG-efficient frontier. *Journal of Financial Economics, 142*(2), 572–597. doi:10.1016/j.jfineco.2020.11.001

Shi, X., Ma, J., Jiang, A., Wei, S., & Yue, L. (2023). Green bonds: Green investments or greenwashing? *International Review of Financial Analysis, 90*, 102850. doi:10.1016/j.irfa.2023.102850

Su, T., Shi, Y., & Lin, B. (2023). Label or lever? The role of reputable underwriters in Chinese green bond financing. *Finance Research Letters, 53*, 103612. doi:10.1016/j.frl.2022.103612

Tang, D. Y., & Zhang, Y. (2020). Do shareholders benefit from green bonds? *Journal of Corporate Finance, 61*, 101427. doi:10.1016/j.jcorpfin.2018.12.001

Wang, J., Chen, X., Li, X., Yu, J., & Zhong, R. (2020). The market reaction to green bond issuance: Evidence from China. *Pacific-Basin Finance Journal, 60*, 101294. doi:10.1016/j.pacfin.2020.101294

Wang, T., Liu, X., & Wang, H. (2022). Green bonds, financing constraints, and green innovation. *Journal of Cleaner Production, 381*, 135134. doi:10.1016/j.jclepro.2022.135134

Zerbib, O. D. (2019). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. *Journal of Banking & Finance, 98*, 39–60. doi:10.1016/j.jbankfin.2018.10.012

Zheng, J., Jiang, Y., Cui, Y., & Shen, Y. (2023). Green bond issuance and corporate ESG performance: Steps toward green and low-carbon development. *Research in*

International Business and Finance, 66, 102007. doi:10.1016/j.ribaf.2023.102007

Green Bond Credibility, Use-of-Proceeds Additionality, and Stock Market Reactions

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Green Bond Credibility, Use-of-Proceeds Additionality, and Stock Market Reactions

Abstract:

This thesis examines whether stock market investors reward the credibility of green bond announcements by Chinese listed firms. Building on prior research on green bond announcement effects, the study shifts the focus from the existence of green bond issuance to the credibility of information disclosed in bond documents. The analysis is based on 520 green bond announcement-level observations and uses cumulative abnormal returns over three event windows, CAR[-1,+1], CAR[-3,+3], and CAR[-10,+10], with CAR[-3,+3] serving as the main measure of market reaction.

Green bond credibility is measured through three disclosure indicators: third-party verification, specific project disclosure, and environmental benefit disclosure. These indicators are also combined into a composite credibility score and a high-credibility dummy. In addition, the thesis examines whether the credibility effect depends on the structure of the use of proceeds. Complementary proceeds are those primarily from new or additional green investment, whereas non-complementary proceeds include mixed uses and substitution-oriented financing, such as refinancing existing projects, for which the additional green investment associated with the bond is less clear.

The empirical results provide mixed evidence for a general green bond credibility premium. Third-party verification and specific project disclosure are not significantly associated with announcement-period abnormal returns. Environmental benefit disclosure is positively associated with CAR[-10,+10], suggesting that outcome-oriented disclosure may be more informative to investors over a longer window. The composite credibility score does not produce a robust positive effect in the baseline model. However, interaction analyses reveal a more nuanced pattern: credibility_score is positively associated with abnormal returns for complementary green bond announcements, while its interaction with non-complementary proceeds is negative and significant in the short and medium windows.

Overall, the findings suggest that investors do not reward green bond credibility unconditionally. Instead, credibility disclosure appears to be valued mainly when it reinforces a clear and complementary green investment narrative.

Keywords: Green bonds, Credibility disclosure, Stock market reaction, Cumulative abnormal returns, Use of proceeds

Table of Contents

Table of Contents 6

List of Tables 7

1. Introduction 8

2. Literature Review and Hypothesis Development 10

    2.1 From Green Bond Announcements to Credibility Concerns 10

    2.2 Credibility of Green Bond Disclosure 11

    2.3 Use-of-Proceeds Structure and Additionality Concerns 13

3. Data and Methodology 15

    3.1 Data Sources and Sample Construction 15

    3.2 Event Study and Dependent Variables 16

    3.3 Use-of-proceeds Classification 19

    3.4 Regressions 21

4. Empirical Results 24

    4.1 Descriptive Statistics 24

    4.2 Individual Credibility Indicators and Market Reaction 26

    4.3 Composite Credibility Score and High-Credibility Dummy 28

    4.4 Credibility Score and Non-Complementary Proceeds Interaction 30

    4.5 Supplementary Analyses 33

5. Conclusion 38

6. References 39

Appendix: 40

    Appendix I: Declaration of AI Uses 40

    Appendix II: Joint Regressions for Individual Credibility Indicators 40

List of Tables

Table 4-1 Descriptive Statistics 24

Table 4-2 Individual Credibility Indicators and Stock Market Reactions 26

Table 4-3 Credibility Score and High Credibility 28

Table 4-4 Credibility Score × Non-Complementary Interaction..... 30

Table 4-5 Same-sample Robustness: Interaction Model With and Without PB Control..... 33

Table 4-6 Subsample Complementary vs. Non-Complementary Regressions.. 34

Table 4-7 Credibility Score Interactions with Mixed and Substitution-oriented Proceeds 35

Table 4-8 Credibility and Non-complementary Proceeds across Event Windows 36

1. Introduction

Green bonds have become an important instrument in the development of sustainable finance. By earmarking proceeds for environmentally beneficial projects, green bonds are intended to channel capital toward climate mitigation, pollution control, clean energy, energy efficiency, and other green investment activities. In China, the green bond market has expanded rapidly alongside broader policy efforts to promote low-carbon development and environmental transition. For listed firms, issuing a green bond may therefore carry implications beyond debt financing. It may also communicate information to equity investors about the firm's environmental strategy, access to sustainable finance, and commitment to green transformation.

However, the market value of green bond issuance is still ambiguous. On the one hand, a green bond announcement may be interpreted as a positive signal. It may suggest that the issuer is investing in environmentally aligned projects, improving its stakeholder reputation, and responding to regulatory and investor demand for sustainable business practices. If investors believe that green bond financing supports value-enhancing green investment, the announcement may generate positive abnormal stock returns. On the other hand, investors may react cautiously if green bond issuance is perceived as costly, symbolic, or weakly connected to substantive environmental improvement. In particular, concerns about greenwashing may reduce the informational value of green bond announcements. A firm can label a bond as green, but investors may still question whether the proceeds are used for genuinely additional green investment or whether the disclosure mainly serves reputational purposes.

This thesis examines whether Chinese equity investors respond to the credibility of green bond announcements. The core research question is: Does green bond credibility strengthen stock market reactions to green bond announcements in China? The study focuses on announcement-period cumulative abnormal returns (CARs) and tests whether credibility-related disclosure helps investors distinguish more credible green bond issuances from less credible ones.

The thesis further investigates whether the effect of credibility depends on the structure of the bond's use of proceeds. In particular, it distinguishes between complementary proceeds and non-complementary proceeds. Complementary

proceeds refer to green bond financing that appears to support new or additional green investment activities. Non-complementary proceeds include mixed or substitution-oriented uses, where the proceeds may be partly combined with other financing purposes or used in a way that substitutes for existing financing. This distinction is central to the thesis because credibility disclosures may not have the same informational value across different proceeds structures. When proceeds are clearly complementary, credibility disclosures may reinforce a coherent green investment narrative. By contrast, when proceeds are mixed or substitution-oriented, investors may remain concerned about additionality even when the issuer provides more credibility-related information.

The empirical analysis is based on a sample of 520 green bond announcement-level observations by Chinese listed firms. The dependent variables are cumulative abnormal returns around green bond announcements, measured over three event windows: CAR[-1,+1], CAR[-3,+3], and CAR[-10,+10].. It corresponds to one, three, and ten trading days before and after the announcement date respectively. The main explanatory variables capture different dimensions of green bond credibility. These include third-party verification, specific project disclosure, and environmental benefit disclosure. The thesis also constructs a composite credibility score, ranging from 0 to 3, by summing the three credibility indicators. In addition, a high-credibility dummy is used as an alternative measure.

The empirical study estimates regression models of announcement-period CARs on credibility variables, controlling for bond-level and issuer-level characteristics. The main controls include bond size, maturity, issuer size, leverage, return on assets, and price-to-book ratio, with year fixed effects and bond type fixed effects. Robust standard errors are used. The analysis first examines whether individual credibility indicators are associated with stronger stock market reactions. It then tests whether the composite credibility score and the high-credibility dummy are positively related to CARs. Finally, the thesis estimates interaction models between credibility score and non-complementary proceeds to test whether the market value of credibility depends on the structure of the use of proceeds.

The results provide limited evidence of a general credibility premium in green bond announcements. Third-party verification and specific project disclosure are not significantly associated with announcement-period abnormal returns, while

environmental benefit disclosure shows a positive association only over the longer event window. The composite credibility score is also not robustly related to market reactions in the baseline specification. However, the interaction analysis reveals a more pronounced conditional effect: credibility is positively associated with abnormal returns when bond proceeds are complementary, whereas this association is significantly weaker for non-complementary proceeds. These findings suggest that investors evaluate credibility disclosure jointly with the underlying use-of-proceeds structure rather than rewarding credibility signals in isolation.

The remainder of the thesis is organized as follows. Section 2 reviews the literature on green bonds, stock market reactions, disclosure credibility, and use-of-proceeds structure, and develops the hypotheses. Section 3 describes the data, variable construction, event study design, and regression methodology. Section 4 presents the main empirical results and discusses the interpretation of the findings. Section 5 concludes with the main contributions, limitations, and directions for future research.

2. Literature Review and Hypothesis Development

2.1 From Green Bond Announcements to Credibility Concerns

Green bonds have become an important tool in sustainable finance. They differ from conventional bonds because proceeds are formally earmarked for environmentally beneficial projects. For listed firms, this financing choice may have implications beyond debt issuance. A green bond announcement may signal environmental commitment, access to sustainable capital, and alignment with investors' demand for low-carbon transition. However, the value relevance of such announcements depends on whether investors regard the green label as credible.

Tang and Zhang (2020) examines whether green bond announcements generate positive shareholder value. Their findings support the view that green bond announcements contain value-relevant information for equity investors. Flammer (2021) also documents positive stock market reactions to corporate green bond announcements. It suggests that investors respond not only to the green bond label itself, but also to characteristics that make the announcement more informative or more credible.

The Chinese market provides a useful setting for extending this literature. Wang et al. (2020) study green bond issuance in China and provide evidence that both the debt market and the stock market react to corporate green bond issuance.

These studies establish that green bond issuance can be associated with positive market reactions. However, they also leave an important question open. A positive average announcement effect does not imply that all green bonds are equally credible. The green label is based largely on issuer disclosure. At the announcement date, outside investors usually cannot directly observe the quality, additionality, or environmental impact of the financed projects. This creates information asymmetry between issuers and investors. A green bond may finance genuine environmental investment, but it may also serve reputational or symbolic purposes.

2.2 Credibility of Green Bond Disclosure

The second part of literature focuses on credibility, certification, and the informational quality of green bonds. Third-party verification is the most widely discussed credibility mechanism in the literature. Bachelet et al. (2019) examine the green bond premium and show that issuer characteristics and third-party verification help explain differences between green and conventional bonds. Their results indicate that external verification can affect how green bonds are priced and perceived by the market. This supports the view that verification reduces uncertainty about the issuer's green claim.

Hyun et al. (2020) also emphasize the role of greenness in green bond markets. They show that the market value of green bonds depends on how investors assess the environmental quality of the bond. This finding is relevant for the present thesis because it suggests that the green label itself is incomplete. Investors require credible information about the underlying greenness of the bond. Third-party verification can therefore serve as an external credibility signal, especially when investors cannot directly observe project quality.

Based on this literature, third-party verification should improve the credibility of a green bond announcement. If investors view external certification as a meaningful signal, certified green bond announcements should be associated with higher cumulative abnormal returns.

H1: Green bond announcements with third-party verification are associated with higher cumulative abnormal returns.

A second credibility channel is project-level disclosure. Compared with third-party verification, this dimension has received less direct attention in event-study research. However, it is closely related to the transparency function of green bonds. Maltais and Nykvist (2021) argue that the role of green bonds in advancing sustainability depends on how they influence issuer behavior and how they connect finance to concrete sustainability activities. Their interview-based evidence suggests that green bonds matter not only because of their pricing effects, but also because they can change how organizations structure, communicate, and monitor sustainability-related investment.

This argument implies that project-level disclosure should be value-relevant. When issuers disclose specific project names, categories, allocation amounts, or allocation ratios, investors can better evaluate whether the bond is connected to real green investment. General statements about green financing are less informative. Specific project disclosure makes the use of proceeds more observable and reduces uncertainty about whether the issuer's environmental claim is substantive.

Therefore, this thesis expects specific project disclosure to strengthen the market reaction to green bond announcements.

H2: Green bond announcements with specific project disclosure are associated with higher cumulative abnormal returns.

The third credibility channel is environmental benefit disclosure. This form of disclosure is more outcome-oriented than third-party verification or project description. It provides information on expected environmental effects, such as carbon emission reductions, energy savings, water savings, pollution reduction, or clean energy generation. Such disclosure is important because investors may care not only about whether proceeds are allocated to green projects, but also about whether those projects are expected to produce measurable environmental outcomes.

Fatica and Panzica (2021) provide evidence that green bond issuance can be associated with reductions in carbon emissions among nonfinancial issuers. Their study suggests that green bonds may be linked to real environmental engagement, rather than only financial labeling. However, this relationship cannot be assumed for

every green bond. Shi et al. (2023) examine whether green bonds lead to genuine green investment or greenwashing. They find that green bond issuance increases the number of green patent applications, but the increase is concentrated in lower-quality patents, which raises concerns about strategic green innovation and greenwashing.

Taken together, these studies imply that investors may value environmental benefit disclosure because it provides more direct evidence about expected outcomes. If greenwashing is a concern, disclosure of measurable environmental benefits may help investors distinguish more substantive green bond issuances from weaker ones. This thesis therefore expects environmental benefit disclosure to be positively associated with announcement-period abnormal returns.

H3: Green bond announcements with environmental benefit disclosure are associated with higher cumulative abnormal returns.

The three credibility indicators capture different aspects of information quality. Third-party verification provides external validation. Specific project disclosure provides transparency about allocation. Environmental benefit disclosure provides information about expected outcomes. Since these dimensions are complementary in theory, this thesis also constructs a composite credibility score. The score captures the overall amount of credibility-related information disclosed in the bond documents. A higher score should indicate a more credible green bond announcement.

H4: A higher green bond credibility score is associated with higher cumulative abnormal returns.

2.3 Use-of-Proceeds Structure and Additionality Concerns

A third strand of literature raises a more critical question: whether green bonds generate additional environmental value. This question is directly related to the use of proceeds. Green bonds are defined by their stated use of proceeds, but the economic substance of that use can vary. Some bonds finance new green projects. Others refinance existing projects, replace prior financing, or combine green investment with broader corporate financing needs. These differences matter because the green label may be less informative when the proceeds do not clearly support additional investment.

The concept of additionality is central here. A green bond is more environmentally meaningful if it finances investment that would not otherwise have occurred. If the bond mainly refinances existing assets, its incremental environmental contribution is less clear. Maltais and Nykvist (2021) argue that the contribution of green bonds should be evaluated in terms of how they affect capital allocation and organizational sustainability practices, not only in terms of how they are marketed. This supports the idea that the substance of proceeds matters for evaluating green bond credibility.

Jones et al. (2020) offer a more critical view. They argue that green bonds should be examined carefully because linking debt finance to projects with claimed environmental benefits does not automatically solve underlying ecological problems. Their study highlights the risk that green bonds may create an appearance of environmental action without necessarily ensuring meaningful additionality. This critique is relevant to this thesis because it suggests that investors may discount green bond announcements when the use of proceeds appears less clearly connected to new environmental investment.

The empirical concern is reinforced by Shi et al. (2023), who explicitly examine whether green bonds represent green investment or greenwashing. Their findings suggest that green bond issuance may encourage firms to increase the quantity of green innovation, but not necessarily its quality. This distinction is important because it shows that environmental labels and green activity indicators can be strategically used. Investors may therefore need to assess whether green bond disclosures are supported by credible economic substance.

This thesis incorporates additionality concerns by distinguishing between complementary and non-complementary proceeds. Complementary proceeds refer to green bond financing that appears to support new or additional green investment, while non-complementary proceeds include mixed uses and substitution-oriented financing, such as refinancing existing projects or replacing other funding sources. This distinction matters because credibility disclosure may be interpreted differently depending on the underlying proceeds structure. When proceeds are complementary, credibility-related disclosure reinforces a clear and economically substantive green investment narrative. By contrast, when proceeds are mixed or substitution-oriented, additionality concerns may weaken the informational value of credibility signals. Accordingly, credibility disclosure is expected to have a stronger positive association

with market reactions when the use of proceeds is complementary rather than non-complementary.

H5: The positive association between green bond credibility and cumulative abnormal returns is stronger for complementary use of proceeds than for non-complementary use of proceeds.

3. Data and Methodology

3.1 Data Sources and Sample Construction

The dataset consists of green bond issuance information, stock market data, issuer financial characteristics, and manually coded bond disclosure information.

Green bond issuance and announcement information are obtained from Qinglv ESG Open Data Platform (qlesg.com), and stock income and firm financial data are from FinChina financial terminal (qyyjt.cn).

The unit of observation is a green bond announcement by a Chinese A-share listed firm. The sample period covers green bond announcements from 2016 – 2026. The analysis is conducted at the announcement level instead of firm level, which means a listed firm may appear more than once if it makes multiple green bond announcements during the sample period. The final sample contains 520 green bond announcement-level observations.

Stock returns and market benchmark returns are measured at a daily frequency, and the event windows are therefore defined in trading days relative to the green bond announcement date. Bond characteristics are measured at the issuance or announcement level. Issuer financial characteristics are measured using quarterly accounting data, with the latest available financial information prior to the announcement assigned to each green bond announcement.

Bond size is measured in RMB billion. Because the exported database reports issuance size at limited precision, a small number of very small issuances were recorded as zero in the exported data. The logarithmic transformation was therefore defined only for strictly positive reported bond sizes. Observations with a reported value of zero were assigned a missing value for ln_bond_size and did not enter regressions that included this control variable.

While the full announcement sample contains 520 observations, specifications including the price-to-book ratio contain approximately 466–467 observations, depending on the event-window measure. Specifications that exclude this control retain approximately 519 observations. These differences in sample size are taken into account in the supplementary analyses, which compare specifications on a common sample when assessing sensitivity to the inclusion of the price-to-book ratio.

3.2 Event Study and Dependent Variables

The event study is used to measure the short-term stock market response to the release of green bond-related information. The dependent variables are cumulative abnormal returns (CARs) around green bond announcement dates. The event date, denoted as (t=0), is defined as the trading day on which the green bond announcement are publicly available. Stock returns and market returns are daily data and from China A-share listed firms.

Expected stock returns are estimated using the market model. For each issuing firm (i), the market model is specified as:

$$R_{i,t} = \alpha_i + \beta_i R_{M,t} + \varepsilon_{i,t}$$

where (R_{i,t}) denotes the daily stock return of firm (i), and (R_{M,t}) denotes the corresponding daily market return. The Shanghai Composite Index is used as the market benchmark.

The market model is estimated over a 252-trading-day estimation window from day -281 to day -30 relative to the green bond announcement date. The estimated coefficients from this pre-event period are then used to obtain the expected return during the event window.

The abnormal return for firm (i) on trading day (t) is calculated as:

$$AR_{\{i,t\}} = R_{\{i,t\}} - E\left(R_{\{i,t\}}\right)$$

where $R_{\{i,t\}}$ denotes the observed daily stock return and $E\left(R_{\{i,t\}}\right)$ denotes the expected return based on market model.

Cumulative abnormal returns are calculated by summing daily abnormal returns over a specified event window:

$$\sum_{t=\tau_1}^{\tau_2} AR_{i,t}$$

where τ_1 and τ_2 denote the beginning and end of the event window in trading days relative to the announcement date.

The empirical analysis uses three event windows: CAR[-1,+1], CAR[-3,+3], and CAR[-10,+10]. CAR[-1,+1] captures the immediate stock market reaction from one trading day before to one trading day after the announcement. CAR[-3,+3] allows for limited information leakage before the formal announcement and delayed incorporation of announcement-related information shortly after the event date. CAR[-10,+10] provides a broader measure of the market response and allows for more gradual information processing.

Multiple event windows are used to assess whether the relationship between green bond credibility and stock market reaction is concentrated around the immediate announcement date or persists over a broader period.

Credibility VariablesIndependent Variables: Green Bond CredibilityThe key explanatory variables measure the credibility of green bond disclosure. The credibility variables are constructed at the green bond announcement level using green bond disclosure data obtained from the Qinglv ESG database. The underlying dataset contains information related to third-party verification, specific project disclosure, and environmental benefit disclosure for each green bond observation.

An AI-assisted extraction process was first used to identify relevant information from the underlying green bond disclosure documents or announcements. The extracted information was then reviewed and verified manually by the author before the final variables were coded.

For third-party verification, the review focused on whether the underlying documentation identified an external certification, verification, assurance, or review institution. For specific project disclosure, the coding was based on whether one or more specific project names were disclosed. For environmental benefit disclosure, the review examined whether environmental benefit indicators were reported and, where available, whether associated quantitative values were provided.

AI was used to assist with information retrieval from the underlying disclosure materials, while the author manually checked the extracted information and made the final classification decisions. Each of the three credibility measures is coded as a binary indicator equal to one when the corresponding disclosure characteristic is present and zero otherwise.

The first indicator is **Third-party verification**. This variable equals one if the bond documents disclose independent third-party verification, certification, assurance, external review, or a second-party opinion, and zero otherwise.

The variable caputures whether the green characteristics of the bond receive external validation. The underlying logic is that an independent review may increase investor confidence that the bond is consistent with recognized green finance standards and that the issuer's green claim is not purely self-declared. In the full sample of 520 green bond announcements, 389 observations have third-party verification and 131 do not.

The second indicator is **Specific project disclosure**. This variable equals one if the bond documents disclose specific project-level information, such as project names, project categories, allocation amounts, allocation ratios, or other identifiable project details, and zero otherwise. This variable captures the transparency of the bond's use of proceeds. A green bond announcement that provides detailed information about the projects being financed should be more informative than one that only provides broad or generic descriptions. Specific project disclosure can help investors evaluate whether the proceeds are linked to concrete environmental investments.

The third indicator is **Environmental benefit disclosure**. This variable equals one if the bond documents disclose expected environmental benefit indicators, such as carbon emission reductions, energy savings, water savings, pollution reduction, clean energy generation, or other measurable environmental outcomes, and zero otherwise. This variable captures outcome-oriented disclosure. Compared with procedural information, environmental benefit disclosure provides investors with more direct information about the expected environmental impact of the financed projects.

In addition to the three individual indicators, the thesis constructs a composite variable, **credibility_score**. This variable is calculated as the sum of third_party_verification, specific_project_disclosure, and

environmental_benefit_disclosure. It ranges from zero to three, where a higher value indicates that the green bond announcement contains more credibility-related disclosure dimensions. The purpose of this measure is to test whether investors respond to the overall strength of credibility disclosure rather than to each individual component separately.

The thesis also uses an alternative binary measure, **high_credibility**. This variable equals one if credibility_score is at least two, and zero otherwise. The high-credibility dummy is used to examine whether the market responds differently when a green bond contains multiple credibility signals. This specification allows for the possibility that credibility has a threshold effect rather than a strictly linear relationship with abnormal returns.

The distribution of the credibility variables shows substantial variation across the sample. Among the 520 observations, 389 bonds disclose third-party verification, while 131 do not. Specific project disclosure is less common: 123 observations include specific project disclosure, while 397 do not. Environmental benefit disclosure is relatively frequent, with 370 observations disclosing environmental benefit information and 150 not doing so. The credibility_score distribution is also uneven: 45 observations have a score of zero, 118 have a score of one, 307 have a score of two, and 50 have a score of three. The high_credibility variable equals one for 357 observations and zero for 163 observations. These distributions suggest that while some credibility-related disclosures are common, the disclosure of specific project-level information is considerably less frequent.

3.3 Use-of-proceeds Classification

In addition to credibility disclosure, this thesis examines the structure of the green bond's use of proceeds. The use-of-proceeds structure is central to the interpretation of a green bond because it determines whether the raised capital appears to support additional green investment or whether it is connected to broader, mixed, or substitution-oriented financing purposes. This distinction is important because credibility disclosure may be interpreted differently depending on how the proceeds are used.

The thesis classifies green bond proceeds into three categories: complementary, mixed, and substitution-oriented. **Complementary** proceeds refer to green bond

financing that appears to support new or additional green investment activities. In this category, the bond proceeds complement the issuer's environmental investment strategy and provide a relatively clear link between the bond announcement and green project financing. These announcements are expected to provide a more coherent green investment narrative to investors.

Mixed proceeds refer to cases in which the use of proceeds combines green project financing with other financing purposes or where the proceeds structure is less clearly tied to a single category of green investment. These announcements may still contain legitimate green financing elements, but the link between the bond proceeds and additional green investment is less direct than in the complementary category.

Substitution-oriented proceeds refer to cases where the green bond proceeds appear to replace existing financing, refinance existing projects, or otherwise substitute for previous sources of funding rather than clearly financing new green investment. This category may raise stronger concerns about additionality because the environmental benefits associated with the bond may not be incremental. If investors believe that the bond primarily refinances or substitutes for existing financing, the green bond label may be viewed as less informative about new environmental commitment.

For the interaction analysis, the thesis combines mixed and substitution-oriented bonds into a binary variable, **non_complementary**. This variable equals one if the use-of-proceeds category is mixed or substitution-oriented, and zero if the proceeds are complementary. The purpose of this classification is to test whether the effect of credibility disclosure differs between green bonds with a clear complementary investment narrative and green bonds with less clearly complementary proceeds.

The sample is highly imbalanced across use-of-proceeds categories. In the full sample, 473 observations are classified as complementary, 25 as mixed, and 22 as substitution-oriented. Therefore, the non_complementary group contains 47 observations in total, while the complementary group contains 473 observations. In regressions that include the price-to-book ratio, the non_complementary subsample falls to approximately 40 observations. This small sample size is important for interpretation. While the interaction model can test whether the association between credibility and abnormal returns differs across proceeds structures, estimates for the

non_complementary group should be interpreted cautiously because the group is much smaller than the complementary group.

3.4 Regressions

The empirical analysis estimates several regression models to test the hypotheses developed in Section 2. The dependent variable is the cumulative abnormal return for firm (i) around the green bond announcement. The main dependent variable is CAR[-3,+3], while CAR[-1,+1] and CAR[-10,+10] are used as alternative event windows. All regressions include robust standard errors. The baseline specifications include year fixed effects and bond type fixed effects to control for time-specific factors and differences across bond categories.

The first specification examines the three individual credibility indicators:

$$\mathrm{CAR_i} = \alpha + \beta_1 \mathrm{Verification_i} + \beta_2 \mathrm{ProjectDisclosure_i} + \beta_3 \mathrm{ImpactDisclosure_i} + \gamma \mathrm{X_i} + \delta_t + \lambda_b + \varepsilon_i \ (1)$$

where $\mathrm{CAR_i}$ is the cumulative abnormal return for announcement (i).

$\mathrm{Verification_i}$ represents third_party_verification, $\mathrm{ProjectDisclosure_i}$ represents specific_project_disclosure, and $\mathrm{ImpactDisclosure_i}$ represents environmental_benefit_disclosure. $\mathrm{X_i}$ is a vector of control variables. δ_t denotes year fixed effects, λ_b denotes bond type fixed effects, and ε_i is the error term. This model is used to test H1, H2, and H3. A positive and statistically significant coefficient on each credibility indicator would suggest that the corresponding disclosure dimension is associated with stronger stock market reactions.

As an additional specification, the three credibility indicators are also estimated separately, one at a time, while retaining the same control variables, year fixed effects, bond-type fixed effects, and heteroskedasticity-robust standard errors. This allows the analysis to examine whether the estimated association of each credibility dimension is affected by the simultaneous inclusion of the other two indicators. The results of these separate specifications are reported in Appendix II.

The second specification examines the composite credibility score:

$$\mathrm{CAR_i} = \alpha + \beta_1 \mathrm{CredibilityScore_i} + \gamma \mathrm{X_i} + \delta_t + \lambda_b + \varepsilon_i \ (2)$$

where $\mathrm{CredibilityScore_i}$ is the sum of the three credibility indicators and ranges from zero to three. This model is used to test H4. A positive and statistically significant

coefficient on $\mathrm{CredibilityScore_i}$ would indicate that the market rewards green bond announcements with more credibility-related disclosure dimensions.

The thesis also estimates a related specification using the high-credibility dummy:

$$\mathrm{CAR_i} = \alpha + \beta_1 \mathrm{HighCredibility_i} + \gamma \mathrm{X_i} + \delta_t + \lambda_b + \varepsilon_i \ (3)$$

where $\mathrm{HighCredibility_i}$ equals one if credibility_score is at least two, and zero otherwise. This alternative measure tests whether market reactions differ when a bond contains multiple credibility signals, rather than assuming that credibility increases linearly with each additional disclosure dimension.

The third and most important specification examines whether the association between credibility and market reaction depends on the use-of-proceeds structure:

$$\mathrm{CAR_i} = \alpha + \beta_1 \mathrm{CredibilityScore_i} + \beta_2 \mathrm{NonComplementary_i} + \beta_3 (\mathrm{CredibilityScore_i} \times \mathrm{NonComplementary_i}) + \gamma \mathrm{X_i} + \delta_t + \lambda_b + \varepsilon_i \ (4)$$

In this model, $\mathrm{NonComplementary_i}$ equals one for mixed or substitution-oriented proceeds and zero for complementary proceeds. The interaction term $\mathrm{CredibilityScore_i} \times \mathrm{NonComplementary_i}$ tests H5. The coefficient β_1 captures the marginal association between credibility_score and CARs for the baseline group, namely green bonds with complementary proceeds. The coefficient β_2 captures whether this association differs for non_complementary proceeds. A positive and statistically significant β_3 would support the hypothesis that credibility matters more for non-complementary proceeds. A negative coefficient would indicate that the positive association between credibility and market reaction is weaker for non-complementary proceeds than for complementary proceeds.

The control variables are included to account for bond-level and issuer-level characteristics that may affect announcement-period stock returns. The bond-level controls include **ln_bond_size**, measured as the natural logarithm of bond size, and **maturity**, measured as the maturity of the bond. Bond size is measured in RMB 100 million and transformed using the natural logarithm. Therefore, a minimum value of zero for log bond size corresponds to an original issue size of RMB 100 million. These variables control for the scale and time structure of the financing. Larger bond issues may have different market implications from smaller issues, while longer maturities may reflect different financing needs or risk profiles.

Issuer-level controls include **ln_issuer_size**, **leverage**, **ROA**, and **ln_pb**. Issuer size controls for differences in firm scale and visibility. Leverage captures the firm's capital structure and financial risk. Return on assets controls for operating profitability. The price-to-book ratio controls for market valuation and growth expectations. Including these controls helps reduce the possibility that the estimated credibility effects simply reflect systematic differences between firms that provide more credibility disclosure and firms that do not.

Year fixed effects control for macroeconomic conditions, regulatory changes, and general market sentiment that vary over time. This is particularly relevant in the Chinese green bond market, where policy support and market development may change across years. Bond type fixed effects control for differences across categories of green bonds. Together, these fixed effects help isolate within-period and within-bond-type variation in credibility disclosure and proceeds structure.

The empirical analysis is designed to identify associations rather than causal effects. Although event-study regressions are useful for examining stock market reactions around announcement dates, the credibility variables are not randomly assigned. Firms that provide stronger credibility disclosure may differ systematically from firms that provide weaker disclosure. The inclusion of controls and fixed effects helps address observable differences, but the results should still be interpreted as conditional associations between credibility-related disclosure and announcement-period abnormal returns. Accordingly, the thesis avoids making strong causal claims and instead focuses on whether investors appear to price credibility signals differently across green bond announcements.

Overall, the methodology allows the thesis to test three related questions. First, do individual credibility indicators strengthen stock market reactions to green bond announcements? Second, does a composite credibility score provide evidence of a general credibility premium? Third, does the association between credibility and abnormal returns depend on whether the bond's use of proceeds is complementary or non-complementary? These questions directly correspond to the hypotheses developed in Section 2 and provide the empirical foundation for the results presented in the next section.

4. Empirical Results

4.1 Descriptive Statistics

Table 4-1 Descriptive Statistics

	count	mean	sd	min	max
CAR_1_1	520	0.0080	0.0725	-0.2150	0.4087
CAR_3_3	519	0.0078	0.0743	-0.1541	0.4923
CAR_10_10	519	-0.0047	0.0547	-0.2202	0.1622
third_party_verification	520	0.7481	0.4345	0.0000	1.0000
specific_project_disclosure	520	0.2365	0.4254	0.0000	1.0000
environmental_benefit_disclosure	520	0.7115	0.4535	0.0000	1.0000
credibility_score	520	1.6962	0.7603	0.0000	3.0000
high_credibility	520	0.6865	0.4643	0.0000	1.0000
non_complementary	520	0.0904	0.2870	0.0000	1.0000
sub_mixed	520	0.0481	0.2141	0.0000	1.0000
sub_substitution	520	0.0423	0.2015	0.0000	1.0000
ln_bond_size	520	3.1877	1.3417	0.0000	6.2146
maturity	520	3.4009	1.3972	0.0400	10.0000
ln_issuer_size	520	18.3696	2.2994	12.5995	22.4420
leverage	520	81.7825	15.7272	19.0000	94.2600
ROA	520	0.2748	0.5958	-4.0700	4.1600
ln_pb	467	-0.2238	0.6690	-1.2776	1.9484

Table 1 reports the descriptive statistics for the main variables used in the empirical analysis. CARs are reported in decimal return units. For example, a CAR of 0.008 corresponds to an abnormal return of 0.8%. The baseline sample consists of 520 green bond announcement-level observations by Chinese listed firms. The dependent variables are cumulative abnormal returns measured over three event

windows: CAR[-1,+1], CAR[-3,+3], and CAR[-10,+10]. CAR[-3,+3] is treated as the main event-window measure because it balances the need to capture announcement-related information with the need to limit contamination from unrelated news. CAR[-1,+1] and CAR[-10,+10] are used as alternative windows to examine whether the results are concentrated in the immediate announcement period or extend over a longer horizon.

The descriptive statistics also show variation in the credibility characteristics of green bond announcements. Among the 520 observations, 389 announcements disclose third-party verification, while 131 do not. This suggests that external review or certification is relatively common in the sample. By contrast, specific project disclosure is less frequent: only 123 observations disclose specific project-level information, while 397 do not. Environmental benefit disclosure is also common, with 370 observations disclosing expected environmental benefit indicators and 150 observations not doing so.

The use-of-proceeds classification shows that the sample is highly concentrated in complementary green bond announcements. In the full sample, 473 observations are classified as complementary, 25 as mixed, and 22 as substitution-oriented. The non_complementary variable combines mixed and substitution-oriented proceeds, resulting in 47 non-complementary observations and 473 complementary observations. This imbalance is important for the interpretation of later results. The interaction analysis can still test whether credibility has a different association with abnormal returns across proceeds structures, but estimates for the non-complementary group should be interpreted cautiously because the subsample is small. In specifications that include the price-to-book ratio, the non-complementary subsample falls to approximately 40 observations.

Overall, the descriptive statistics suggest three points. First, credibility-related disclosure is present in much of the sample, but the different dimensions of credibility are not equally common. Third-party verification and environmental benefit disclosure are relatively frequent, while specific project disclosure is less common. Second, most green bond announcements are classified as complementary, meaning that the use of proceeds appears to support new or additional green investment activities. Third, because non-complementary observations represent a small share of the

sample, the results involving mixed or substitution-oriented proceeds should be interpreted with appropriate caution.

4.2 Individual Credibility Indicators and Market Reaction

Table 4-2 Individual Credibility Indicators and Stock Market Reactions

	(1) CAR_1_1	(2) CAR_3_3	(3) CAR_10_10
third_party_verification	-0.00196	-0.00512	0.0148
	(0.00523)	(0.00600)	(0.0133)
specific_project_disclosure	-0.00129	0.00574	-0.00590
	(0.00533)	(0.00571)	(0.0117)
environmental_benefit_disclosure	0.00256	0.00875	0.0203**
	(0.00385)	(0.00557)	(0.00942)
ln_bond_size	0.00535***	0.00843***	0.0130***
	(0.00193)	(0.00249)	(0.00386)
maturity	0.000209	0.00360	0.00596
	(0.00179)	(0.00229)	(0.00375)
ln_issuer_size	-0.000221	0.00117	0.00368
	(0.00117)	(0.00150)	(0.00253)
leverage	0.000250	0.000450	-0.000523
	(0.000208)	(0.000275)	(0.000545)
ROA	-0.00241	0.000654	0.00605
	(0.00301)	(0.00331)	(0.00643)
ln_pb	0.00314	0.0107**	0.0245***
	(0.00352)	(0.00428)	(0.00705)
Observations	467	466	466
R-squared	0.0731	0.152	0.182

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2 presents the regression results for the three individual credibility indicators: third_party_verification, specific_project_disclosure, and environmental_benefit_disclosure. The purpose of this analysis is to test whether specific dimensions of green bond credibility are associated with stronger stock

market reactions around announcement dates. The dependent variables are CAR[-1,+1], CAR[-3,+3], and CAR[-10,+10]. The regressions include the full set of control variables, year fixed effects, and bond type fixed effects, with robust standard errors.

The results do not provide evidence that third-party verification is positively associated with announcement-period abnormal returns. The coefficient on third_party_verification is -0.00196 for CAR[-1,+1], -0.00512 for CAR[-3,+3], and 0.0148 for CAR[-10,+10]. None of these coefficients is statistically significant. Therefore, H1 is not supported. Although third-party verification is theoretically expected to reduce information asymmetry and increase the credibility of green bond announcements, the empirical results do not show that investors systematically reward this indicator in the Chinese listed-firm sample.

The coefficient on specific_project_disclosure is also statistically insignificant across all three event windows. The coefficient is -0.00129 for CAR[-1,+1], 0.00574 for CAR[-3,+3], and -0.00590 for CAR[-10,+10]. These estimates do not provide evidence that project-level disclosure, by itself, generates a stronger stock market reaction. Therefore, H2 is not supported. This result suggests that simply disclosing project-specific information may not be sufficient to produce a positive market response. One possible interpretation is that project disclosure may vary in quality or detail, and investors may not treat all forms of project disclosure as equally informative.

Environmental benefit disclosure shows a more positive pattern, although the evidence remains limited. The coefficient on environmental_benefit_disclosure is 0.00256 for CAR[-1,+1], 0.00875 for CAR[-3,+3], and 0.0203 for CAR[-10,+10]. The coefficient is positive in all three windows, but it is statistically significant only in the longer CAR[-10,+10] window. This provides partial support for H3. The result suggests that disclosure of expected environmental benefits may be more informative to investors than third-party verification or project-specific disclosure. However, the fact that statistical significance appears only in the long window indicates that investors may require more time to interpret outcome-oriented environmental information.

Taken together, the results in Table 2 indicate that the market does not uniformly reward individual credibility signals. Third-party verification and specific project disclosure are not significantly associated with CARs, while environmental benefit

disclosure is positively associated with abnormal returns only in the longer event window. This pattern is important because it suggests that not all credibility-related disclosures carry the same informational value. Investors may distinguish between procedural credibility signals, such as external verification, and more outcome-oriented signals, such as expected environmental benefits. The results also suggest that the relationship between green bond credibility and market reaction may be more complex than a simple direct effect of individual disclosure indicators.

As a supplementary check, the three credibility indicators are also estimated separately. The results, reported in Appendix II, are broadly consistent with the joint specification: third-party verification and specific project disclosure remain insignificant across all event windows, while environmental benefit disclosure is positive and significant only for CAR[-10,+10].

4.3 Composite Credibility Score and High-Credibility Dummy

Table 4-3 Credibility Score and High Credibility

	(1) CAR_1_1	(2) CAR_3_3	(3) CAR_10_10
high_credibility	-0.00279	-0.00927*	0.00270
	(0.00408)	(0.00537)	(0.0114)
ln_bond_size	0.00546***	0.00843***	0.0140***
	(0.00191)	(0.00250)	(0.00373)
maturity	0.0000907	0.00356	0.00545
	(0.00179)	(0.00228)	(0.00372)
ln_issuer_size	-0.000232	0.00112	0.00354
	(0.00117)	(0.00151)	(0.00249)
leverage	0.000252	0.000392	-0.000540
	(0.000197)	(0.000272)	(0.000550)
ROA	-0.00228	-0.000426	0.00561
	(0.00293)	(0.00324)	(0.00656)
ln_pb	0.00298	0.0107**	0.0237***
	(0.00349)	(0.00431)	(0.00738)
Observations	467	466	466
R-squared	0.0725	0.150	0.168

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4-4 Credibility Score and High-Credibility Indicator

	(1) CAR[-1,+1]	(2) CAR[-3,+3]	(3) CAR[-10,+10]
credibility_score	-0.000428	0.00307	0.00813
	(0.00349)	(0.00365)	(0.00603)
ln_bond_size	0.00546***	0.00840***	0.0139***
	(0.00190)	(0.00249)	(0.00375)
maturity	0.000120	0.00359	0.00534
	(0.00179)	(0.00229)	(0.00373)
ln_issuer_size	-0.000238	0.00115	0.00364
	(0.00116)	(0.00150)	(0.00249)
leverage	0.000251	0.000432	-0.000471
	(0.000206)	(0.000277)	(0.000540)
ROA	-0.00234	0.000380	0.00735
	(0.00295)	(0.00334)	(0.00675)
ln_pb	0.00288	0.0102**	0.0235***
	(0.00348)	(0.00427)	(0.00716)
high_credibility			
Observations	467	466	466
R-squared	0.0719	0.147	0.172

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This section examines whether the overall credibility of a green bond announcement is associated with stock market reactions. Two alternative measures are considered: the continuous credibility score and the high-credibility dummy. The credibility score ranges from zero to three and summarizes the number of credibility-related disclosure dimensions present in an announcement. The high-credibility dummy equals one when the credibility score is at least two and zero otherwise.

Table 4-3 reports the results for the high-credibility dummy. The coefficient is -0.0028 for CAR[-1,+1] and 0.0027 for CAR[-10,+10], and neither estimate is statistically significant. For CAR[-3,+3], the coefficient is -0.0093 and is statistically significant at the 10% level. This negative association is therefore weak in statistical terms and is not observed consistently across the other event windows.

Table 4-4 reports the corresponding regressions using the continuous credibility score. The estimated coefficients are -0.0004 for CAR[-1,+1], 0.0031 for CAR[-3,+3], and 0.0081 for CAR[-10,+10]. None of these coefficients is statistically significant. The results therefore provide no evidence of a systematic linear relationship between the overall credibility score and cumulative abnormal returns.

Taken together, the two specifications do not provide robust support for a general credibility premium in stock market reactions to green bond announcements. The absence of consistent significance across the event windows suggests that higher overall disclosure credibility, by itself, is not sufficient to generate a stronger market response. The weakly negative coefficient on the high-credibility dummy for CAR[-3,+3] should be interpreted cautiously, as it appears only in one event window and is significant only at the 10% level.

These findings motivate the subsequent analysis of whether the effect of credibility depends on the underlying use-of-proceeds structure. In particular, credibility may matter differently when green bond proceeds are used for complementary versus non-complementary purposes, rather than having a uniform effect across all green bond announcements.

4.4 Credibility Score and Non-Complementary Proceeds Interaction

Table 4-5 Credibility Score × Non-Complementary Interaction

	(1) CAR_1_1	(2) CAR_3_3	(3) CAR_10_10
credibility_score	0.00436	0.00874**	0.0142**
	(0.00359)	(0.00383)	(0.00645)
1.non_complementary	0.0441***	0.0500***	0.0489
	(0.0130)	(0.0146)	(0.0402)
1.non_complementary#c.credibility_score	-0.0181**	-0.0179**	-0.0113
	(0.00736)	(0.00771)	(0.0215)
ln_bond_size	0.00511***	0.00794***	0.0133***
	(0.00189)	(0.00245)	(0.00367)
maturity	0.000265	0.00378*	0.00560
	(0.00180)	(0.00229)	(0.00371)
ln_issuer_size	0.00000351	0.00141	0.00388
	(0.00115)	(0.00148)	(0.00246)
leverage	0.000315	0.000485*	-0.000465
	(0.000216)	(0.000280)	(0.000569)
ROA	-0.00332	-0.00118	0.00478
	(0.00310)	(0.00304)	(0.00648)
ln_pb	0.00178	0.00866**	0.0214***
	(0.00350)	(0.00420)	(0.00721)
Observations	467	466	466
R-squared	0.0885	0.163	0.183

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4 presents the main interaction analysis. This model examines whether the association between credibility_score and cumulative abnormal returns depends on whether the green bond proceeds are complementary or non-complementary. The non_complementary variable equals one for mixed or substitution-oriented proceeds and zero for complementary proceeds. The key coefficient of interest is the interaction term between credibility_score and non_complementary.

The results show a clear conditional pattern. The coefficient on credibility_score is positive in all three event windows and statistically significant in CAR[-3,+3] and

CAR[-10,+10]. Specifically, the coefficient is 0.00436 for CAR[-1,+1], 0.00874 for CAR[-3,+3], and 0.0142 for CAR[-10,+10]. Because complementary proceeds are the baseline group in this interaction model, these coefficients represent the marginal association between credibility_score and CARs for complementary green bond announcements. The positive and significant coefficients in the medium and long windows suggest that credibility_score is associated with higher abnormal returns when the use of proceeds is complementary.

The coefficient on non_complementary is positive and large in the short and medium windows. It is 0.0441 for CAR[-1,+1], 0.0500 for CAR[-3,+3], and 0.0489 for CAR[-10,+10]. The coefficient is statistically significant in the short and medium windows. However, this main effect must be interpreted carefully. In an interaction model, the coefficient on non_complementary represents the difference between non-complementary and complementary announcements when credibility_score equals zero. Since this is a conditional comparison at the lowest level of credibility_score, it should not be interpreted as a general average premium for non-complementary green bonds.

The interaction term between credibility_score and non_complementary is negative across all three event windows. The coefficient is -0.0181 for CAR[-1,+1], -0.0179 for CAR[-3,+3], and -0.0113 for CAR[-10,+10]. The interaction is statistically significant in CAR[-1,+1] and CAR[-3,+3], but not in CAR[-10,+10]. This result does not support H5. The hypothesis predicted that credibility would matter more for non-complementary proceeds because mixed or substitution-oriented proceeds may create greater uncertainty and therefore increase the value of credibility disclosure. Instead, the results indicate the opposite: the positive association between credibility_score and market reaction is weaker for non-complementary proceeds than for complementary proceeds.

The economic interpretation is clearest in the main CAR[-3,+3] window. For complementary green bonds, the marginal effect of credibility_score is 0.00874. For non-complementary green bonds, the marginal effect is the sum of the credibility_score coefficient and the interaction coefficient: [0.00874 - 0.0179 = -0.00916]

This means that, in the main event window, credibility_score is positively associated with CARs for complementary announcements, but the corresponding association for

non-complementary announcements is negative. In other words, credibility disclosure appears to be rewarded mainly when the proceeds structure supports a clear and complementary green investment narrative. When proceeds are mixed or substitution-oriented, additional credibility disclosure does not strengthen the market reaction and may even be associated with lower CARs.

The negative interaction is especially important because it contradicts the original expectation in H5. The ex ante hypothesis assumed that credibility disclosure would be more valuable when proceeds are less clearly complementary, because investors would rely more heavily on credibility signals to evaluate uncertain green claims. The empirical results instead suggest that credibility signals are more effective when the underlying proceeds structure is already consistent with a clear green investment narrative. This implies that credibility disclosure and use-of-proceeds structure are complements rather than substitutes. Disclosure can strengthen a credible investment story, but it may not fully compensate for a proceeds structure that raises additionality concerns.

The fact that the interaction is significant in the short and medium windows but not in the long window also provides information about timing. The negative interaction appears to be incorporated relatively quickly around the announcement date. This suggests that investors may process the joint information contained in credibility_score and proceeds structure during the immediate announcement period. In the longer CAR[-10,+10] window, additional firm-specific or market-wide information may dilute the interaction effect, leading to a statistically weaker estimate.

4.5 Supplementary Analyses

Table 4-6 Same-sample Robustness: Interaction Model With and Without PB Control

	(1) CAR_3_3	(2) CAR_3_3
credibility_score	0.00939**	0.00874**
	(0.00379)	(0.00383)
1.non_complementary	0.0537***	0.0500***
	(0.0150)	(0.0146)
1.non_complementary#c.cre	-0.0188**	-0.0179**

dibility_score		
	(0.00785)	(0.00771)
ln_bond_size	0.00730***	0.00794***
	(0.00248)	(0.00245)
maturity	0.00320	0.00378*
	(0.00232)	(0.00229)
ln_issuer_size	0.00181	0.00141
	(0.00148)	(0.00148)
leverage	0.000645**	0.000485*
	(0.000266)	(0.000280)
ROA	-0.000310	-0.00118
	(0.00299)	(0.00304)
ln_pb		0.00866**
		(0.00420)
Observations	466	466
R-squared	0.155	0.163

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4-7 Subsample Complementary vs. Non-Complementary Regressions

	(1) Complementary	(2) Non-complementary
credibility_score	0.00772**	-0.0156
	(0.00390)	(0.0116)
ln_bond_size	0.00797***	0.0280
	(0.00256)	(0.0168)
maturity	0.00461*	-0.00623
	(0.00235)	(0.00671)
ln_issuer_size	0.00115	-0.00480
	(0.00153)	(0.0107)
leverage	0.00000382	0.00422***
	(0.000254)	(0.00128)
ROA	-0.00521	0.0224***
	(0.00347)	(0.00761)

ln_pb	0.0111**	0.00586
	(0.00436)	(0.0193)
Observations	426	40
R-squared	0.174	0.700

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4-8 Credibility Score Interactions with Mixed and Substitution-oriented Proceeds

	(1) Mixed interaction	(2) Substitution interaction	(3) Both interactions
credibility_score	0.00395	0.00617	0.00879**
	(0.00373)	(0.00385)	(0.00385)
1.sub_mixed	0.0251		
	(0.0194)		
1.sub_mixed#c.credibility_score	-0.00948		-0.0153
	(0.00951)		(0.0100)
ln_bond_size	0.00816***	0.00842***	0.00797***
	(0.00251)	(0.00249)	(0.00249)
maturity	0.00363	0.00367	0.00378*
	(0.00229)	(0.00229)	(0.00229)
ln_issuer_size	0.00121	0.00125	0.00142
	(0.00150)	(0.00150)	(0.00149)
leverage	0.000433	0.000479*	0.000486*
	(0.000288)	(0.000272)	(0.000282)
ROA	-0.000369	0.000474	-0.00111
	(0.00340)	(0.00327)	(0.00314)
ln_pb	0.00999**	0.00934**	0.00862**
	(0.00427)	(0.00423)	(0.00420)
1.sub_substitution		0.0404**	
		(0.0174)	
1.sub_substitution#c.credibility_score		-0.0151	-0.0198*
		(0.0110)	(0.0110)
Observations	466	466	466

R-squared	0.149	0.156	0.163

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4-9 Credibility and Non-complementary Proceeds across Event Windows

	(1) CAR[-1,+1]	(2) CAR[-3,+3]	(3) CAR[-10,+10]
credibility_score	0.00436	0.00874**	0.0142**
	(0.00359)	(0.00383)	(0.00645)
1.non_complementary	0.0441***	0.0500***	0.0489
	(0.0130)	(0.0146)	(0.0402)
1.non_complementary#c.credibility_score	-0.0181**	-0.0179**	-0.0113
	(0.00736)	(0.00771)	(0.0215)
ln_bond_size	0.00511***	0.00794***	0.0133***
	(0.00189)	(0.00245)	(0.00367)
maturity	0.000265	0.00378*	0.00560
	(0.00180)	(0.00229)	(0.00371)
ln_issuer_size	0.00000351	0.00141	0.00388
	(0.00115)	(0.00148)	(0.00246)
leverage	0.000315	0.000485*	-0.000465
	(0.000216)	(0.000280)	(0.000569)
ROA	-0.00332	-0.00118	0.00478
	(0.00310)	(0.00304)	(0.00648)
ln_pb	0.00178	0.00866**	0.0214***
	(0.00350)	(0.00420)	(0.00721)
Observations	467	466	466
R-squared	0.0885	0.163	0.183

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

To further assess the reliability of the main interaction result, this subsection reports several supplementary analyses. These tests are not intended to introduce a separate empirical argument, but rather to examine whether the central finding in Section 4.4 is robust to alternative specifications and sample splits. The main finding from the baseline interaction model is that credibility_score is positively associated

with CARs for complementary green bond announcements, while the interaction between credibility_score and non_complementary proceeds is negative and statistically significant in the short and medium event windows. The supplementary analyses provide additional support for this conditional interpretation.

First, the same-sample PB robustness test addresses the concern that the baseline results may be affected by missing values in the price-to-book ratio. The full sample contains 520 green bond announcement-level observations, but the inclusion of ln_pb reduces the regression sample to approximately 466 observations. Therefore, differences between specifications with and without ln_pb may reflect changes in sample composition rather than the effect of the control variable itself. Table 4-6 compares the interaction model with and without ln_pb using the same PB-available sample. The results remain highly similar. Without ln_pb, the coefficient on credibility_score is 0.00939 and statistically significant at the 5% level, while the interaction between credibility_score and non_complementary is -0.0188 and statistically significant at the 5% level. After including ln_pb, the coefficient on credibility_score is 0.00874 and the interaction term remains negative and significant, with a coefficient of -0.0179. This suggests that the negative interaction is not mechanically driven by the inclusion of the price-to-book control.

Second, the subsample analysis separates complementary and non-complementary green bond announcements. Table 4-7shows that the positive credibility effect is concentrated in the complementary subsample. For complementary proceeds, the coefficient on credibility_score is 0.00772 and statistically significant at the 5% level, based on 426 observations. For non-complementary proceeds, the coefficient on credibility_score is -0.0156 and statistically insignificant, based on 40 observations. The direction of the estimate in the non-complementary subsample is consistent with the negative interaction in the baseline model, but the result should be interpreted cautiously because the subsample is small and the estimate is imprecise. Nevertheless, this test supports the interpretation that credibility disclosure is rewarded mainly when the use of proceeds is complementary.

Third, Table 4-8 separates the non-complementary category into mixed and substitution-oriented proceeds. This test is useful because mixed and substitution-oriented green bonds may not carry the same economic meaning. Mixed proceeds may still contain meaningful green investment components, whereas substitution-

oriented proceeds may raise stronger concerns about whether the bond finances additional green investment. The results show that the coefficient on credibility_score remains positive and significant for the baseline complementary group. The interaction between sub_mixed and credibility_score is negative but statistically insignificant, while the interaction between sub_substitution and credibility_score is -0.0198 and weakly significant. This suggests that the negative non-complementary interaction is driven more by substitution-oriented bonds than by mixed bonds. Investors may be particularly skeptical when green bond proceeds appear to replace existing financing rather than support additional green investment.

Overall, the supplementary analyses reinforce the main empirical conclusion. The evidence does not support a simple and unconditional green bond credibility premium. Instead, credibility_score is positively associated with market reactions primarily when proceeds are complementary. When proceeds are mixed or substitution-oriented, additional credibility disclosure does not produce a stronger market response, and the negative interaction appears especially related to substitution-oriented proceeds. These results suggest that investors evaluate credibility disclosure jointly with the economic substance of the use-of-proceeds structure. Credibility signals appear most valuable when they reinforce a clear green investment narrative, but they may not fully offset concerns about additionality when the proceeds structure is non-complementary.

5. Conclusion

The results provide mixed evidence for a general credibility premium in Chinese green bond announcements. Individual credibility indicators are mostly insignificant, except for environmental benefit disclosure, which is positively associated with long-window CARs. However, the interaction analysis reveals a more nuanced pattern. Credibility score is positively associated with CARs for complementary green bond announcements, while this effect is significantly weaker, and in some specifications negative, for non-complementary announcements. This suggests that credibility disclosure is valued by investors when it reinforces a clear green investment narrative, but it does not necessarily resolve concerns when proceeds are mixed or substitution-oriented.

6. References

Bachelet, Maria J., Leonardo Becchetti, and Stefano Manfredonia, 2019, The green bonds premium puzzle: The role of issuer characteristics and third-party verification, Sustainability 11, 1098.

Fatica, Serena, and Roberto Panzica, 2021, Green bonds as a tool against climate change?, Business Strategy and the Environment 30, 2688–2701.

Flammer, Caroline, 2021, Corporate green bonds, Journal of Financial Economics 142, 499–516.

Gianfrate, Gianfranco, and Mattia Peri, 2019, The green advantage: Exploring the convenience of issuing green bonds, Journal of Cleaner Production 219, 127–135.

Hyun, Suk, Donghyun Park, and Shu Tian, 2020, The price of going green: The role of greenness in green bond markets, Accounting & Finance 60, 73–95.

Jones, Ryan, Tom Baker, Katherine Huet, Laurence Murphy, and Nick Lewis, 2020, Treating ecological deficit with debt: The practical and political concerns with green bonds, Geoforum 114, 49–58.

Maltais, Aaron, and Björn Nykvist, 2021, Understanding the role of green bonds in advancing sustainability, Journal of Sustainable Finance & Investment 11, 233–252.

Shi, Xianwang, Jianteng Ma, Anxuan Jiang, Shuang Wei, and Leilei Yue, 2023, Green bonds: Green investments or greenwashing?, International Review of Financial Analysis 90, 102850.

Tang, Dragon Yongjun, and Yupu Zhang, 2020, Do shareholders benefit from green bonds?, Journal of Corporate Finance 61, 101427.

Wang, Jun, Xiaohua Chen, Xuan Li, Jiang Yu, and Rui Zhong, 2020, The market reaction to green bond issuance: Evidence from China, Pacific-Basin Finance Journal 60, 101294.

Zerbib, Olivier David, 2019, The effect of pro-environmental preferences on bond prices: Evidence from green bonds, Journal of Banking & Finance 98, 39–60.

Appendix:

Appendix I: Declaration of AI Uses

The use of AI tool ChatGPT contributed to the quality of the thesis in several ways.

First, AI was used to polish the language and correct grammatical errors, aiming to improve coherence, clarity and format consistency. The author has reviewed and revised the generated content accordingly and was responsible for its authenticity and accuracy.

Second, AI helped with data cleaning and coding. This included checking data processing and helping diagnose coding bugs.

Third, AI was used to read and extract information from green bond announcement and disclosure documents. In particular, AI-assisted extraction was used to identify information related to third-party verification, specific project names, and environmental benefit disclosure. The extracted information was subsequently reviewed and verified manually before being used in regressions.

There could be some potential risks when applying AI tools. One of them was the possibility of overclaiming results and presenting statistical associations as causal effects. To manage these risks, all the text and descriptions were reviewed manually and cautiously before being used.

Appendix II: Joint Regressions for Individual Credibility Indicators

As an additional specification, the three individual credibility indicators are estimated separately, one at a time, while retaining the same control variables, year fixed effects, bond-type fixed effects, and heteroskedasticity-robust standard errors as in the baseline specification.

The findings are broadly consistent with the joint specification. Third-party verification and specific project disclosure remain statistically insignificant across all three event windows. Environmental benefit disclosure is also insignificant for CAR[-1,+1] and CAR[-3,+3], but is positively and statistically significantly associated with CAR[-10,+10]. The coefficient on environmental benefit disclosure in the longest event window is 0.0215 and is significant at the 5% level. Overall, the separate specifications do not materially change the interpretation of the individual credibility

indicators and suggest that the results are not driven by the simultaneous inclusion of the three credibility measures.

Panel A. Third-Party Verification

	(1) CAR[-1,+1]	(2) CAR[-3,+3]	(3) CAR[-10,+10]
third_party_verification	-0.00210	-0.00484	0.0141
	(0.00531)	(0.00601)	(0.0131)
Observations	467	466	466
R-squared	0.0722	0.147	0.171

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B. Specific Project Disclosure

	(1) CAR[-1,+1]	(2) CAR[-3,+3]	(3) CAR[-10,+10]
specific_project_disclosure	-0.00187	0.00385	-0.00901
	(0.00514)	(0.00559)	(0.0117)
Observations	467	466	466
R-squared	0.0723	0.147	0.170

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel C. Environmental Benefit Disclosure

	(1) CAR[-1,+1]	(2) CAR[-3,+3]	(3) CAR[-10,+10]
environmental_benefit_disclosure	0.00289	0.00747	0.0215**
	(0.00356)	(0.00526)	(0.00962)
Observations	467	466	466
R-squared	0.0726	0.149	0.178

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$