



# Stock Price Reactions to Green Bond Issuances – A Comparative Analysis of Europe and the US

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## **Abstract**

This study examines the impact of green bond issuances on stock prices in Europe and the United States, focusing on differences in market reactions between these two regions. Utilizing an event study methodology, the analysis covers green bond announcements from publicly traded firms between 2015 and 2024. The research evaluates expected stock returns based on historical market data and risk-adjusted performance measures, analyzing event windows of  $(-2/2)$ ,  $(-2/5)$ , and  $(-5/5)$  days to capture short- and mid-term market responses.

Findings indicate a generally negative stock price reaction following green bond announcements, with a more pronounced and prolonged decline in the U.S. than in Europe. Regression analyses reveal that market risk perceptions significantly influence cumulative abnormal returns (CARs), particularly in the U.S., where regulatory uncertainty and concerns over greenwashing contribute to more sceptical investor sentiment. In contrast, European markets exhibit more stable reactions, likely due to structured regulatory frameworks enhancing transparency and credibility. Firm-specific factors such as leverage and profitability further shape market responses, while ESG ratings show no significant impact.

**Title:** Stock Price Reactions to Green Bond Issuances – A Comparative Analysis of Europe and the US

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## **Abstract (Portuguese)**

Este estudo examina o impacto das emissões de títulos verdes nos preços das ações na Europa e nos Estados Unidos, com foco nas diferenças nas reações do mercado entre essas duas regiões. Utilizando a metodologia de estudo de eventos, a análise abrange anúncios de títulos verdes de empresas de capital aberto entre 2015 e 2024. A pesquisa avalia os retornos esperados das ações com base em dados históricos do mercado e medidas de desempenho ajustadas ao risco, analisando janelas de evento de  $(-2/2)$ ,  $(-2/5)$  e  $(-5/5)$  dias para capturar as respostas do mercado a curto e médio prazo.

Os resultados indicam uma reação geralmente negativa dos preços das ações após os anúncios de títulos verdes, com um declínio mais acentuado e prolongado nos Estados Unidos do que na Europa. As análises de regressão revelam que as percepções de risco do mercado influenciam significativamente os retornos anormais acumulados (CARs), especialmente nos EUA, onde a incerteza regulatória e preocupações com greenwashing contribuem para um sentimento mais cético entre os investidores. Em contraste, os mercados europeus apresentam reações mais estáveis, provavelmente devido a estruturas regulatórias bem definidas, que aumentam a transparência e a credibilidade. Fatores específicos das empresas, como alavancagem e lucratividade, também moldam as respostas do mercado, enquanto as classificações ESG não apresentam impacto significativo.

**Título:** Reações dos Preços das Ações às Emissões de Obrigações Verdes - Uma Análise Comparativa da Europa e dos EUA

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**Palavras-chave:** Obrigações Verdes, Preço das Ações, Estudo de Eventos, Regressão, Europa, US

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## **1. Introduction**

In recent years, sustainable finance has become a key driver of capital markets, with environmental, social, and governance (ESG) criteria becoming increasingly important in investment decisions. As the financial sector shifts towards more responsible and sustainable investment practices, green bonds have gained significant traction as a means for companies to finance environmentally friendly projects. These bonds, specifically designated to fund sustainability initiatives, serve as a financing tool and a signalling mechanism to investors, demonstrating a firm's commitment to ESG principles. While green bonds have been widely adopted across global markets, investor reactions to their issuance remain a subject of debate. Some studies suggest that green bond announcements generate positive stock price reactions, as they are perceived as value-enhancing signals of corporate sustainability efforts (Flammer, 2021). Others argue that investor responses can be neutral or even negative, especially in situations where concerns regarding greenwashing emerge when companies issue green bonds without implementing substantial operational changes (Lebelle et al., 2020). This divergence in market reactions raises an important question: What factors influence how investors respond to green bond issuances?

A key factor that may influence stock price reactions is the regulatory environment. Europe has developed a structured and standardized framework for sustainable finance, including the EU Green Bond Standard and the EU Taxonomy for Sustainable Activities, which enhance transparency and credibility. In contrast, the United States operates under a more fragmented and voluntary system, where issuers often follow non-mandatory guidelines such as the Green Bond Principles by ICMA. These regulatory differences may shape investor perceptions, leading to varying regional stock price responses. However, empirical evidence on how these regulatory discrepancies impact investor sentiment remains limited.

This thesis addresses this gap by examining how stock markets in Europe and the United States react to green bond issuance announcements and what factors drive potential differences in these reactions. It employs an event study methodology to measure cumulative abnormal returns (CARs) surrounding green bond announcements, offering a comparative analysis between European and U.S. firms. By doing so, the study aims to contribute to the existing literature by providing new insights into the role of regulatory frameworks in shaping investor sentiment and identifying key financial and firm-specific factors influencing stock price reactions. Beyond the regulatory aspect, this study also explores the economic implications of green bond issuances. While green bonds are often promoted for their sustainability benefits,

their financial impact on issuers and investors remains an important consideration. Companies may issue green bonds to attract socially responsible investors and improve their corporate reputation, but do they also benefit from lower capital costs or enhanced stock performance? Similarly, do investors primarily value the sustainability aspect of green bonds, or do they still prioritize traditional financial indicators such as profitability, leverage, and valuation metrics? This thesis addresses these questions and contributes to the growing body of research on sustainable finance and capital markets. The findings will provide practical insights for corporate issuers, helping them understand how investors perceive green bond issuances, and for policymakers, offering a deeper understanding of how regulatory structures influence market reactions. Moreover, they will inform investors on the extent to which green bonds serve as credible sustainability signals or whether traditional financial factors continue to dominate investment decisions.

The rest of the thesis continues as follows: In Section II, I describe the research questions and hypotheses that form the basis of my analysis and explain the theoretical framework underpinning the study. In Section III, I review the relevant literature on green bonds, sustainable finance, and market reactions, highlighting both established insights and research gaps. Section IV details my methodology, including the event study design and regression analysis to assess stock price reactions across different regulatory environments. In Section V, I present my empirical findings and discuss their implications for both European and U.S. markets. Finally, in Section VI, I conclude the thesis by summarizing the key insights, drawing policy implications, and suggesting avenues for future research.

## **2. Research Question & Hypothesis**

Sustainable finance has become an essential driver of global capital markets, with green bonds significantly facilitating environmentally responsible investments. These financial instruments provide funding for sustainability projects and act as a signalling mechanism to investors, indicating a firm's commitment to environmental, social, and governance (ESG) principles. However, the market's reaction to green bond issuances varies across regions. While some studies suggest that these bonds are perceived as value-enhancing signals leading to positive stock price reactions, others raise concerns about greenwashing, wherein companies issue green bonds without making substantial environmental commitments. The regulatory environment and investor preferences will likely shape these perceptions differently in Europe and the United States. It is essential to explore whether and how stock markets in these two regions respond

differently to green bond issuances. To address this issue, the central research question of this thesis is as follows:

How do stock markets in Europe and the United States react to green bond issuance announcements, and what factors drive potential differences in these reactions?

To answer this question, this study examines whether abnormal stock price movements occur following green bond announcements and whether these reactions vary systematically between the two financial markets. The analysis is structured around three key hypotheses, developed based on signaling theory and prior empirical findings.

The first hypothesis (H1) investigates whether green bond issuances lead to a positive stock price reaction. According to the Signaling Theory (Spence, 1973), firms use green bonds to reduce information asymmetry and reinforce their long-term commitment to sustainability. Prior research (Flammer, 2021) has shown that green bond issuances can be perceived as a positive corporate signal, particularly when investors trust the firm's sustainability efforts. Therefore, this study examines whether stock prices reflect such optimism, leading to positive cumulative abnormal returns (CARs) in response to green bond announcements.

While a positive reaction to green bond issuances may be a global phenomenon, its magnitude can vary across regions. Europe has established a comprehensive regulatory framework for sustainable finance, including the EU Green Bond Standard and the EU Taxonomy for Sustainable Activities, which enhance credibility and transparency. In contrast, the U.S. operates under a more fragmented and voluntary ESG regulatory system, resulting in greater uncertainty and potential scepticism among investors. Consequently, the second hypothesis (H2) suggests that the stock price reaction to green bond issuances is stronger in Europe than in the United States, as European investors may view these issuances as more credible and aligned with long-term sustainability objectives.

Beyond regional differences, firm-specific and market characteristics may also influence stock price reactions. Companies with strong financials and high ESG ratings may be perceived as more credible in their sustainability efforts, leading to more pronounced positive abnormal returns. Conversely, firms with weaker financial profiles or credibility concerns might experience neutral or even negative stock price reactions, as investors could interpret their green bond issuance as a superficial attempt to capitalize on sustainability trends. Therefore, the third hypothesis (H3) explores how firm-specific characteristics, such as profitability, leverage, ESG score, and market capitalisation, influence the magnitude of stock price reactions to green bond issuances. This thesis contributes to the growing body of research on sustainable finance and capital markets by empirically testing these hypotheses. It provides a comparative perspective

on market reactions to green bond issuances in two major financial markets, sheds light on the role of regulatory frameworks in shaping investor sentiment, and highlights key firm-specific factors that drive stock price movements. The study employs an event study methodology to achieve this, analysing cumulative abnormal returns (CARs) surrounding green bond issuance announcements. The comparative approach between the U.S. and European markets will help identify whether and why stock market reactions differ across regions. Additionally, a regression analysis will be used to assess how firm-specific and market factors contribute to variations in abnormal returns.

### **3. Literature Overview**

#### **3.1. Green Bonds**

Green bonds are specialized financial instruments designed to fund projects with positive environmental or climate impacts. Unlike traditional bonds, the proceeds from green bonds are explicitly allocated for sustainable initiatives, including renewable energy, energy efficiency, clean transportation, and climate adaptation projects. Introduced by the European Investment Bank in 2007, the green bond market has rapidly expanded, driven by growing demand for sustainable investments and increasing awareness of climate risks.

These bonds align issuers' capital-raising activities with their environmental objectives, offering investors a way to support eco-friendly projects while achieving traditional bond market returns. The International Capital Market Association's Green Bond Principles offer a voluntary framework that assists issuers in ensuring the environmental sustainability of the financed projects and the transparency of fund allocation. However, as the market has grown, so too have concerns about greenwashing, where the environmental benefits of a green bond's proceeds are overstated. This has resulted in calls for stricter standards and heightened transparency to ensure that green bonds genuinely contribute to environmental sustainability (Financial Times, 2025; Financial Times, 2024). Despite these challenges, green bonds are regarded as essential for financing the global transition to a low-carbon economy, with significant adoption in regions like Europe, which boasts strong regulatory frameworks and considerable investor interest in sustainable assets (Flammer et al., 2020; Glavas et al., 2020).

#### **3.2. Green Bond Issuance and Stock Price Reaction**

The green bond market has swiftly emerged as a significant financial instrument for funding environmentally sustainable projects. Given the increasing interest in sustainable finance,

understanding how financial markets react to green bond issuance is crucial for both investors and firms. This literature review summarises recent studies investigating the stock market reaction to green bond issuance, concentrating on event study methodologies, stock price movements, and underlying theories.

Several studies have explored how stock prices respond to the announcement of green bond issuances, with most indicating positive abnormal returns. For instance, Baulkaran (2019) demonstrates that cumulative abnormal returns are positive and substantial around green bond issuance announcements, suggesting that investors perceive green bonds as value-enhancing. This positive response is often ascribed to the belief that green bond funds will be allocated to profitable environmental projects or to alleviate risks linked to environmental factors. Similarly, Flammer (2021) reveals that stock market reactions are generally favourable, particularly for first-time issuers and third-party-certified bonds, reinforcing the signaling hypothesis. Investors appear to regard these issues as credible indicators of corporate commitment to environmental sustainability. Furthermore, this positive response is frequently stronger for companies with higher environmental ratings and greater involvement in green projects.

However, not all findings are uniformly positive. Some studies, such as those by Lebelle et al. (2020), show that the market response can be negative, particularly when green bonds are perceived as a mere marketing tool or a form of greenwashing by companies attempting to enhance their environmental image without substantial changes to their operations. The research by Lebelle et al. (2020) also emphasizes that the market reaction to green bond announcements tends to be more negative for first-time issuers, especially in developed markets. Several factors can contribute to the varying market reactions to green bond issuances, including the type of issuer, the geographical location, and the bond's certification status. Research by Glavas (2020) highlights a significant change in investor perception after the Paris Agreement in 2015, suggesting that equity investors became more favourable toward green bonds following the international accord's emphasis on financing aligned with climate goals. The results show that the CAR for green bonds increased post-Paris Agreement, implying that international climate commitments can influence investor behaviour.

Moreover, the influence of firm-specific factors is crucial. Firms with strong corporate social responsibility (CSR) profiles or those operating in industries with high environmental impacts tend to experience a more positive market reaction to green bond announcements (Flammer 2021). Conversely, firms in less environmentally focused sectors might face scepticism from investors regarding the authenticity of their green initiatives. (Lebelle et al. 2020) Third-party certification of green bonds is another key factor influencing market reactions. Flammer (2021)

finds that certified green bonds elicit stronger positive reactions from the stock market, as the certification signals the legitimacy of the environmental claims associated with the bond. Issuers who are first-time participants in the green bond market tend to experience a stronger reaction, which can be explained by the market's excitement about new, credible entrants into the sustainability space. Additionally, the behavior of investors plays a critical role. Green bonds often attract long-term and socially responsible investors, which could explain why the issuance of green bonds is positively correlated with an increase in long-term institutional ownership post-issuance. This investor base is more likely to value the long-term benefits of sustainable projects, as opposed to those seeking short-term financial returns.

Recent empirical studies offer further insights into the stock market's reaction to green bond issuance across different regions. Verma and Bansal (2021) analyse the Indian market and find that while stock prices display a negative return on the announcement day, the cumulative abnormal returns (CAR) over a 10-day window are positive. This indicates that initial investor scepticism is outweighed by longer-term confidence in the sustainability benefits and financial viability of green bonds. The study underscores the necessity for increased corporate participation in green finance within India and highlights the importance of regulatory support to bolster market confidence.

Similarly, Wang et al. (2020) examine the Chinese market and document a distinct pricing premium for corporate green bonds in comparison to conventional bonds. They find that stock prices respond positively to green bond issuance, especially for firms with strong corporate social responsibility (CSR) reputations. This supports the stakeholder value maximisation theory, indicating that sustainable financing can enhance firm value over the long term. Furthermore, the study highlights the role of institutional investors in driving demand for green bonds, suggesting that long-term investors prioritise corporate commitments to sustainability. In contrast, Laborda and Sánchez-Guerra (2020) focus on the European market, where green bonds are more established. Their results show that green bond issuance generally leads to an increase in share prices, supporting the idea that investors reward companies for their environmental commitments. However, they also warn of the risk of greenwashing and stress the need for credible third-party certification and transparency in the use of bond proceeds. Their study underlines the role of regulatory frameworks in ensuring that green bonds serve their intended environmental purpose and maintain investor confidence.

Khiari et al. (2024) provide a broader, global perspective by examining the stock market response to the issuance of green bonds from 29 companies in various countries. They utilise a multidimensional scaling approach and clustering techniques to identify a complex interplay of

factors that influence stock price movements. Their findings indicate that factors such as company size, issue size, total number of green bond issues, geographical location, GDP per country, and governance indicators like the Corruption Perceptions Index play a significant role in shaping investor reactions. This methodological innovation presents a fresh perspective on the diverse factors affecting green bond market performance beyond conventional financial indicators.

The literature suggests that the stock market typically reacts positively to green bond announcements, with the strongest responses noted for first-time issuers and certified bonds. Key factors driving these positive responses include the issuer's perceived commitment to environmental issues, the certification of the bonds, and the wider market context, such as the Paris Agreement. Nevertheless, concerns regarding greenwashing or the actual environmental impact of the projects funded by the bonds may dampen market enthusiasm, particularly for companies with less robust environmental credentials.

### **3.3. Regulatory Differences between Europe and America**

The regulatory frameworks for green bonds and environmental, social, and governance (ESG) investments vary significantly between Europe and the United States, primarily because of differing regulatory priorities and institutional contexts.

#### **3.3.1. Europe's Comprehensive Approach**

Europe has created a strong regulatory structure to encourage green investments and connect financial markets with overarching climate goals. At the heart of this system is the EU Taxonomy, which offers a comprehensive classification of environmentally sustainable economic activities. This framework ensures that financial products like green bonds adhere to strict environmental standards. In 2020, the EU also launched the Green Bond Standard (GBS), which establishes voluntary guidelines for issuers, improving the credibility and transparency of green bonds. Furthermore, regulatory initiatives like the Sustainable Finance Disclosure Regulation (SFDR) require financial entities to communicate how they incorporate sustainability risks into their investment practices. These regulations strive to combat greenwashing and boost investor trust, aligning closely with the Paris Agreement's aim to restrict global warming.

### **3.3.2. United States' Voluntary Framework**

In contrast, the U.S. lacks a cohesive regulatory framework comparable to the EU's Taxonomy. Green bond regulation in the U.S. largely relies on voluntary guidelines from the International Capital Market Association (ICMA), specifically the Green Bond Principles. These principles suggest how to use and report proceeds, but compliance is not mandatory. The U.S. Securities and Exchange Commission (SEC) has recommended improvements to ESG disclosure standards. Yet, these proposals have not been implemented, raising concerns about potential greenwashing due to the lack of enforceable green definitions.

### **3.3.3. Impact of Regulatory Differences**

These regulatory differences have implications for the green bond markets in both regions. Europe's structured regulations offer clear guidelines that bolster investor confidence and ensure that green bonds adhere to strict environmental criteria, positioning Europe as a global leader in the green bond market. In contrast, the U.S.'s dependence on voluntary standards creates a more uncertain environment for investors, which could inhibit market growth and expose them to risks related to inconsistent standards.

Overall, Europe's approach demonstrates a proactive and comprehensive regulatory stance on sustainable finance. In contrast, the U.S. is still developing its regulatory framework, which is largely driven by market-based initiatives and actions at the state level.

## **3.4. Signaling Theory**

In financial markets characterized by information asymmetry, firms use various mechanisms to communicate their credibility and long-term commitments to investors. Signaling theory (Spence, 1973) provides a framework for understanding how green bond issuances can signal a firm's sustainability intentions. Given that investors do not always have complete information about a company's environmental commitments, issuing a green bond can serve as a strategic tool to reduce uncertainty and reinforce the firm's alignment with sustainable finance principles.

However, for a signal to be effective, it must be both credible and costly to imitate (Riley, 1979). In the case of green bonds, credibility is often determined by factors such as third-party certification, compliance with stringent regulatory standards, and transparency in fund allocation. Companies that genuinely integrate sustainability into their business models should be willing to incur these costs, distinguishing themselves from firms that merely capitalise on sustainability trends without substantial operational changes - a phenomenon known

as greenwashing (Lyon & Montgomery 2015). The empirical literature provides mixed evidence on whether green bonds serve as a credible signal to investors. Research by Flammer (2021) finds that green bond issuances can be associated with positive abnormal returns, particularly for firms with high ESG scores and external certification. This suggests that investors perceive certified green bonds as a strong signal of long-term commitment to environmental responsibility. Conversely, studies by Lebellet et al. (2020) highlight instances where green bond issuances lead to negative stock price reactions, particularly when investors suspect greenwashing or when firms lack a proven track record of sustainability practices.

Signaling theory, applied to green bonds, illustrates how firms can use financial instruments to raise capital and communicate their strategic commitments to sustainability. This dual function helps mitigate information asymmetry and enhances firm value by aligning investor perceptions with corporate environmental strategies.

#### **4. Data**

For my analysis, I utilised data from various sources. Firstly, I applied specific filters to compile my dataset for all green bond announcements in Europe and America from Refinitiv Workspace. I accomplished this using the Corporate Bond Search function in Workspace, setting the filters to Green Bond = Yes. I also extracted Green Bond Issue Announcement Dates exclusively from publicly traded companies, covering the period from 01.01.2015 to 31.12.2024. Subsequently, I sorted the data in Excel and removed announcement dates related to banks, financial institutions, and government entities to maintain focus on corporates in my analysis. The decision to exclude banks, financial institutions, and government entities is strategic, as the study specifically targets corporate issuers. This exclusion stems from the fact that these entities frequently issue bonds for broader financial management or regulatory purposes, which may not align with the specific environmental objectives of green bonds. In contrast, corporate issuers tend to use green bonds primarily to finance projects with direct environmental benefits. This narrower focus ensures that the analysis concentrates on evaluating the impact of green finance where it is expected to significantly influence environmental strategies, thereby providing clearer insights into the effectiveness of green bonds in promoting sustainability within the corporate sector. I made further adjustments to my dataset based on the availability of historical stock prices, as some companies were either private or delisted. In contrast, others lacked accurate historical share price data. After refining my dataset and retrieving the stock price data from Refinitiv Workspace, I was left with a dataset comprising 41 announcement

dates in the US and 54 for Europe. In total, I managed to analyse 95 Green Bond Issue Announcement Dates. In addition to the announcement dates and the corresponding share prices, I also required the performance figures of the respective country indices for the event study. I selected the S&P 500 Index for my American sample and the MSCI Europe for Europe. I also acquired this data from Refinitiv Workspace. I sourced the risk-free interest rate from the Fama-French website to calculate the excess returns of the indices in my event study, as well as the excess returns in my respective market model. I obtained the daily risk-free interest rate, once for America and once for Europe. Using this data, I calculated my cumulative abnormal returns. However, I also took market- and firm-specific data to analyse these in the regression. I utilised the Daily 5FF data from Fama and French for the market-specific data. I filtered the relevant daily Market Risk Premium (MRP), Small minus Big (SMB), High minus Low (HML), Robust minus Weak (RMW), and Conservative minus Aggressive (CML) key figures for each date of a Green Bond Issue Date for both Europe and America, incorporating them into my panel set. Regarding company-specific variables, I once again utilized the Refinitiv Workspace database. I selected firm-specific control variables for each company issuing green bonds in my sample. I selected a total of 9 financial indicators per company, including the ESG rating, the market capitalization, the operating profit margin, the return on equity, the return on assets, total debt, total assets, leverage and the market value to book value. I have selected the control variables to match the company that issued the green bond and the year in which the green bond was issued.

## **5. Methodology**

I employed an event study methodology to investigate the impact of Green Bond issuance announcements on stock price performance. The foundational premise of the event study is that financial markets are semi-strongly efficient; thus, stock prices should promptly reflect new public information. In this context, the study explores whether a Green Bond issuance announcement results in statistically significant abnormal stock returns, assessed across various event windows.

The sample comprises publicly traded firms that have issued Green Bonds between 2015 and 2024, encompassing both the United States and Europe. Data pertaining to Green Bond announcements were extracted from Refinitiv Workspace using specific keyword filters that I previously discussed in my Data section, while ensuring that only firms with available historical price data were included. With this data, I commenced the event study. The expected returns

for each firm were estimated using the Capital Asset Pricing Model (CAPM). The CAPM posits that the expected return on a firm's stock is a function of its sensitivity to market returns. Formally, the model is expressed as:

$$E(R_{it}) = \alpha + \beta_m(R_{mt} - RF_t) \quad (1)$$

where  $E(R_{it})$  represents the expected return for the firm  $i$  on the day  $t$ ,  $\alpha$  is the firm-specific intercept,  $\beta_m$  is the market beta indicating the firm's sensitivity to market movements,  $R_{mt}$  is the market return (derived from the S&P 500 or MSCI Europe index), and  $RF_t$  is the risk-free rate on the day  $t$ . An estimation window of 100 trading days prior to the event date was employed to estimate the parameters. Using the Excel functions  $= Slope()$  and  $= Intercept()$  Ordinary least squares (OLS) regression was performed on the firm's excess returns, defined as the actual return minus  $(R_{it})$  the risk-free rate  $(RF_t)$ , compared to the market's excess returns (MRP), which was calculated as follows:

$$MRP = R_{it} - RF_t \quad (2)$$

Once the CAPM parameters had been obtained, the expected return for each day in the event window was calculated using the CAPM formula. The abnormal return (AR) for each company on each event day was subsequently determined as the difference between the actual return and the expected return:

$$AR_{it} = R_{it} - E(R_{it}) \quad (3)$$

To capture the overall effect of the event, cumulative abnormal returns were calculated by summing the abnormal returns over specified event windows. In this study, I derived three cumulative abnormal returns for each firm in each region: one for the window of two days prior to the announcement until two days afterwards, one for two days prior to the announcement until five days afterwards, and one for five days prior to the announcement until five days afterwards. The CAR for a given event window is defined as:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it} \quad (4)$$

To assess the statistical significance of the Cumulative Abnormal Returns (CARs) associated with the announcement of Green Bonds, I conducted t-tests in Microsoft Excel. The following steps describe the methodological approach of these t-tests to ensure a systematic assessment of whether the observed CARs are significantly different from zero.

The first step in performing the t-test was calculating the sample mean  $\bar{X}$  of the CARs for each event window. This measure represents the average effect of the green bond announcement on the share prices of all companies in the sample and is defined as

This measure represents the average impact of the green bond announcement on the share prices of all companies in the sample and is defined as:

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i \quad (5)$$

Where  $X_i$  represents the CAR for firm  $i$ , and  $n$  is the total number of firms in the sample.

The second step in conducting the t-test is to calculate the standard deviation, which measures the dispersion of the CARs around their mean. This provides insight into the variability of returns across different firms following the Green Bond announcements:

$$STDEV = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n - 1}} \quad (6)$$

This calculation shows the dispersion of the CARs, which is essential for grasping the consistency of market reactions.

The standard error of the mean (SE) was calculated to estimate the precision of the sample mean as an estimate of the expected value of CARs. The SE is derived from the standard deviation and is crucial for determining the reliability of the mean CAR in representing the population mean:

$$SE(\bar{X}) = \frac{s}{\sqrt{n}} \quad (7)$$

This step is crucial because it affects the t-statistic calculation and the statistical significance evaluation.

The t-statistic was computed to test the null hypothesis that the mean CAR is zero ( $\mu = 0$ ) and is calculated as follows:

$$t = \frac{\bar{X} - \mu}{SE(\bar{X})} \quad (8)$$

In this formula,  $\bar{X}$  represents the sample mean,  $\mu$  denotes the hypothesised mean of the population (set at zero), and  $SE(\bar{X})$  indicates the standard error. The t-statistic measures the number of standard errors the sample mean is from the hypothesised mean.

Finally, the p-value associated with the t-statistic was calculated using Excel's =T.DIST.2T function. This function is designed to provide the two-tailed p-value for a t-distribution, which is appropriate when the hypothesis test evaluates whether the sample mean is significantly different from the hypothesised mean, whether higher or lower. The formula was employed as follows:

$$p - value = T.DIST.2T(|t|, df) \quad (9)$$

where  $|t|$  is the absolute value of the calculated t-statistic, and  $df$  denotes the degrees of freedom, typically  $n - 1$  where  $n$  is the sample size. A  $p - value$  less than the chosen significance level indicates that the null hypothesis (which states that the mean CAR is zero) can be rejected, suggesting a statistically significant difference caused by the Green Bond announcements.

The systematic approach utilised in Excel facilitated a comprehensive analysis of the statistical significance of the CARs. By calculating the mean, standard deviation, standard error, t-statistic, and p-value, this study assessed the impact of Green Bond announcements on the stock prices of the sample firms. This thorough methodology provides clear and reliable insights into the market's perception of the economic impact of green bonds. It plays an important role in the broader research on the financial response to corporate environmental action.

Following the t-test analysis, I conducted a comprehensive regression analysis by using R to examine the determinants of abnormal returns. I ran separate regressions for each CAR of each region. Some for the (-2/2) event window, some for the (-2/5) event window, and some for the

(-5/5) event window. In these regressions, the dependent variable is the CAR corresponding to the respective event window.

I conducted the regression analysis by using three model specifications for each CAR measure across different regions. In the first specification, the regression model included only the market risk premium (MRP) as the independent variable, following the Capital Asset Pricing Model (CAPM) framework. This approach enabled a clearer understanding of the direct relationship between overall market movements and abnormal returns, isolating the influence of market volatility on the returns generated by green bonds.

$$CAR_{it} = \gamma_0 + \gamma_1 \cdot MRP_t + \varepsilon_{it} \quad (10)$$

In the second specification, the model was expanded to include the additional Fama-French five factors like Small Minus Big (SMB), High Minus Low (HML), Robust Minus Weak (RMW) and Conservative Minus Aggressive (CMA) along with Market Risk Premium.

$$CAR_{it} = \gamma_0 + \gamma_1 \cdot MRP_t + \gamma_2 \cdot SMB_t + \gamma_3 \cdot HML_t + \gamma_4 \cdot RMW_t + \gamma_5 \cdot CMA_t + \varepsilon_{it} \quad (11)$$

In the third version of my regression model, I gradually added each of my control variables. I tested how these control variables affected my adjusted  $R^2$ , reflecting my model's explanatory power. By adding the variables to my model one by one, I am able to see each variable's separate effect on my model and thus recognise which control variables had the greatest impact on explaining the abnormal returns.

The company-specific control variables I included were extensive and ranged from ESG ratings, which reflect a company's environmental, social and governance performance, to financial metrics such as market capitalisation and operating profit margins.

I selected these variables to capture different company characteristics that could influence the market's reaction to green bond announcements. By systematically adding variables such as total debt, total assets, and leverage, I was able to analyse the financial profile of each company further and examine how these aspects correlated with stock market performance in the context of green bond issuance. This in-depth investigation helped me identify the variables that improved the model's fit and provided important insights into the factors driving market reactions.

This structured approach to developing the regression model ensures that the analysis remains robust and focuses on variables that genuinely contribute to understanding the dynamics at play in corporate green bond issuance announcements. It permits a more nuanced interpretation of the interaction between company-specific characteristics, market perceptions, and investor behaviour in the area of sustainable finance. The extended regression model is therefore specified as follows:

$$\begin{aligned}
CAR_{it} = & \gamma_0 + \gamma_1 \cdot MRP_t + \gamma_2 \cdot SMB_t + \gamma_3 \cdot HML_t + \gamma_4 \cdot RMW_t + \gamma_5 \cdot CMA_t + \gamma_6 \cdot ESG_{it} + \gamma_7 \\
& \cdot Mcap_{it} + \gamma_8 \cdot OPM_{it} + \gamma_9 \cdot ROE_{it} + \gamma_{10} \cdot ROA_{it} + \gamma_{11} \cdot TotA_{it} + \gamma_{12} \cdot TotD_{it} \\
& + \gamma_{13} \cdot Lev_{it} + \gamma_{14} \cdot MVTB_{it} + \varepsilon_{it}
\end{aligned} \quad (12)$$

To assess the determinants of the cumulative abnormal returns (CARs) following green bond issuance announcements, I extended my baseline regression model by incorporating firm-specific control variables, industry dummy variables, and a market-level risk factor. This model enables me to untangle the effects of general market conditions, individual firm characteristics, and industry-specific factors on the stock price reaction. The model is specified as follows:

$$\begin{aligned}
CAR_{it} = & \gamma_0 + \gamma_1 \cdot MRP_t + \gamma_2 \cdot ESG_{it} + \gamma_3 \cdot Mcap_{it} + \gamma_4 \cdot OPM_{it} + \gamma_5 \cdot ROE_{it} + \gamma_6 \cdot ROA_{it} + \gamma_7 \\
& \cdot TotA_{it} + \gamma_8 \cdot TotD_{it} + \gamma_9 \cdot Lev_{it} + \gamma_{10} \cdot MVTB_{it} + \sum_{j=1}^J \delta_j \cdot D_{j,it} + \varepsilon_{it}
\end{aligned} \quad (13)$$

I selected "Utilities - Other" as the baseline category for the industry dummies. This choice was made because this sector had one of the largest representations in my dataset. Using an industry with a higher number of firms as the reference category ensures a more stable comparison across other sectors and improves the reliability of the regression estimates. Additionally, selecting a well-represented sector as the baseline helps mitigate potential biases that could arise from choosing a smaller or less diverse industry as the reference point. This approach clarifies how other industries differ from a widely represented and relatively neutral sector benchmark. The dependent variable (CAR) represents each company's cumulative abnormal return over the specified event window in these regression models. The independent variables include market-wide risk factors, firm-specific controls, and industry dummy variables. Using multiple model specifications allows for a thorough examination of the factors influencing abnormal returns following green bond announcements and allows for comparative analysis between the US and European samples.

## **6. Empirical Results**

Examining Cumulative Abnormal Returns of the announcement of Green Bond issuances delivers important insights into the impact of these events on stock prices in different markets. I will start by focusing on the cumulative abnormal returns obtained from my event study. After this part, I will focus on the t-tests I performed in Excel. I performed one-sample t-tests that were utilized to evaluate the hypothesis that the average CARs are significantly different from zero. The results are provided separately for European and American companies over various event windows.

As shown in the graphs, the cumulative abnormal returns (CARs) for the European and US markets reflect distinct market behaviors surrounding the announcement of green bonds. In the European market (Figure 1), there is a notable peak just before the announcement day, followed by a sharp decline on the day itself. This pattern suggests that initial expectations regarding the announcements were high, but perhaps the actual details prompted a swift reassessment by investors. Following the announcement, the recovery in CARs indicates that the market may have adopted a more measured view of the announcement's implications.

The pattern is markedly different in the US (Figure 2). The significant dip two days before the announcement might suggest that investors reacted to rumors or preliminary information ahead of the official release. The volatility continues post-announcement with significant ups and downs, which implies a more turbulent market reaction. This might reflect a less clear-cut perception of the announcements' implications or differing investor sentiments about green finance in the US market.

These visual trends from the CAR graphs highlight the nuanced responses of investors to green bond announcements across different regions. They indicate that while the response to such announcements is characterized by initial volatility, the nature and timing of these reactions can differ significantly between the US and Europe. This variability provides insights into regional differences in perceptions of environmental finance and can inform strategies for issuers and policymakers seeking to enhance the effectiveness of green bonds as a tool for sustainable finance.



Figure 1: Cumulative Abnormal Returns Europe



Figure 2: Cumulative Abnormal Returns US

### 6.1. T-Test Results for Green Bond Announcements in Europe

To analyze the Cumulative Abnormal Returns after Green Bond announcements in Europe, I performed a series of t-tests across three different event windows to evaluate their impact on stock prices. The tests produced significant results for some CARs. I will discuss my results in more detail below. Table 1 summarizes the one-sample t-test results for the cumulative abnormal returns (CARs) following green bond announcements in both European and US markets. For each of the three event windows (-2/2) days, (-2/5) days, and (-5/5) days, the average CAR is provided followed by the corresponding t-value in parentheses. The significance levels are denoted as follows: \* indicates significance at the 10% level, \*\* at the 5% level, and “n.s.” indicates a non-significant result.

### T-Test Results (Average CAR, t-value, Significance)

Note: n.s. = not significant; \* = significance at 10% level; \*\* = significance at 5% level.

Event Window	Europe	USA
(-2/2) Days	-0.0107, -1.879, *	-0.0088, -1.193, n.s.
(-2/5) Days	-0.0107, -1.518, n.s.	-0.0156, -1.794, *
(-5/5) Days	-0.0127, -1.495, n.s.	-0.0202, -2.091, **

Table 1: T-Test Results

Overall, the t-test results indicate that in Europe, a significant negative market reaction to green bond announcements is observed only in the (-2/2) event window, whereas the longer event windows (-2/5) and (-5/5) show no statistically significant effects. In contrast, the US market demonstrates a progressively increasing negative response over time. Although the reaction is not significant in the (-2/2) window, it approaches significance in the (-2/5) window and becomes statistically significant at the 5% level in the (-5/5) window. This suggests that initial investor reactions in the US may be mixed but could turn increasingly negative as the implications of green bond financing are further evaluated. These findings highlight a significant regional difference: US investors seem to be more critical of green bond announcements than their European counterparts, particularly over extended timeframes. The results reflect varying market perceptions and dynamics regarding sustainable financial instruments, with US investors potentially demonstrating greater scepticism or concern about the financial and strategic impact of green bond issuances.

### 6.2. Regression Analysis

Building on the insights derived from the t-tests, regression analyses were performed to further investigate the underlying factors influencing the observed Cumulative Abnormal Returns following Green Bond announcements. These analyses explore how these announcements interact with various market and firm-specific variables, such as market risk, firm size, profitability, and ESG criteria. This comprehensive approach provides a nuanced understanding of the financial ecosystem's reactions across different event windows, offering crucial insights into effective financial communication and strategic planning for issuing firms in Europe and the USA.

The regression models gradually incorporated more variables to capture a wider range of influences that may modulate these reactions. This systematic inclusion clarifies dynamics that are not obvious from the t-tests alone and highlights factors that could mitigate or exacerbate

market reactions to Green Bond announcements. Through this thorough exploration, the regression analyses enhance our understanding of the strategic and communicative measures needed to navigate the complexities of Green Bond issuances effectively.

At first, each regression model included the Market Risk Premium to assess the fundamental market impact. Next, variables like SMB (Size), HML (Value), RMW (Profitability), and CMA (Investment) were added to account for wider financial factors. Lastly, various control variables such as the ESG Score, Market Capitalization (Mcap), Operating Profit Margin (OPM), Return on Equity (ROE), Return on Assets (ROA), Total Assets (TotA), Leverage (Lev), and Market Value to Book Value (MVTB) were included based on their effectiveness in improving the models' explanatory power, as indicated by changes in the Adjusted R-square.

This systematic improvement of the regression models aids in understanding both the individual and combined impacts of these variables on the Cumulative Abnormal Returns. It offers a detailed perspective on how the financial landscape reacts to Green Bond announcements. By transitioning from simpler to more complex models, we can perform a nuanced analysis of each additional variable's contribution to explaining the fluctuations in stock prices after the announcement. This approach provides richer insights into the factors influencing market reactions in various contexts.

The regression analyses explore the stock price implications of Green Bond announcements across various markets, thereby enhancing our understanding through a progressive model-building approach. Variables were added stepwise to investigate not only the immediate market reactions, initially assessed through t-tests but also to comprehend the wider, multifaceted impacts of financial and firm-specific factors over different event windows.

### 6.3. US Market Regression Results

#### (-2/2) Event Window US

	Dependent variable:		
	(1)	(2)	(3)
MRP	-0.013* (0.006) t = -1.978 p = 0.056	-0.015** (0.006) t = -2.393 p = 0.023	-0.016** (0.006) t = -2.608 p = 0.014
SMB		0.002 (0.012) t = 0.131 p = 0.897	0.007 (0.012) t = 0.611 p = 0.546
HML		0.007 (0.012) t = 0.554 p = 0.584	0.005 (0.011) t = 0.435 p = 0.667
RMW		0.026** (0.012) t = 2.215 p = 0.034	0.028** (0.011) t = 2.573 p = 0.015
CMA		-0.028* (0.016) t = -1.780 p = 0.084	-0.026 (0.015) t = -1.678 p = 0.104
OPM			0.074 (0.070) t = 1.066 p = 0.295
ROA			-0.187** (0.081) t = -2.321 p = 0.027
Lev			-0.077 (0.053) t = -1.450 p = 0.157
Constant	-0.012 (0.007) t = -1.602 p = 0.118	-0.011 (0.007) t = -1.617 p = 0.115	0.014 (0.026) t = 0.523 p = 0.605
Observations	41	41	41
R <sup>2</sup>	0.091	0.283	0.413
Adjusted R <sup>2</sup>	0.068	0.180	0.266
Residual Std. Error	0.045 (df = 39)	0.043 (df = 35)	0.040 (df = 32)
F Statistic	3.913* (df = 1; 39) (p = 0.056)	2.762** (df = 5; 35) (p = 0.034)	2.813** (df = 8; 32) (p = 0.018)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 2: (-2/2) Event Window US

In my regression analysis for the (-2/2) event window in the United States, I examined how various market and firm-specific factors influence the Cumulative Abnormal Returns (CARs) associated with green bond announcements. I developed three models, each including an increasing number of variables, which significantly enhanced the explanatory power, as demonstrated by the increased adjusted R-squared values from 0.068 to 0.266. This inclusion helped to deepen my understanding of the factors influencing my CARs. A consistent

observation from my analysis was the importance of the Market Risk Premium (MRP), which showed increasingly significant negative coefficients in all models. This trend suggests that increased market risk at the time of announcements is linked to lower CARs, indicating a negative market reaction to growing risk perceptions. We see here significance levels for the MRP ranging from 10% for the first model to a level where we can say that the MRP is at a 5% level significance, with p values of 0.023 for the second model and 0.014 for the third model. Furthermore, the profitability measure (RMW) gains importance in the more complex models, suggesting that companies with higher profitability can mitigate some of the negative reactions to green bond announcements due to their stronger financial health. This measure is in the second and the third model significant at a level of 5%. In addition, the Return on Asset measure (ROA) also significantly impacts the CAR in the most comprehensive model, with higher ROA correlating with more negative CARs. This relationship highlights investors' concerns about the return on companies' assets. Another important aspect of my analysis is the role of the intercept. Statistically, the intercept represents the expected value of CARs when all independent variables are zero. It provides a baseline against which the impact of all other variables is measured. Although the intercept values vary slightly in the models I have developed, they generally indicate a baseline negative CAR in the absence of other influencing factors. This may indicate a fundamental market skepticism towards green bond announcements, independent of specific financial metrics or market conditions. However, in this model, we cannot accurately determine whether a negative correlation truly exists between the Green Bond Issue Announcements and the Abnormal Returns, as the intercept is not significant at the normal levels in any of the models.

(-2/5) Event Window US

<i>Dependent variable:</i>			
	CAR(-2/5)		
	(1)	(2)	(3)
MRP	-0.015* (0.008) t = -1.995 p = 0.054	-0.017** (0.008) t = -2.274 p = 0.030	-0.019** (0.007) t = -2.733 p = 0.011
SMB		0.001 (0.014) t = 0.042 p = 0.967	0.015 (0.014) t = 1.055 p = 0.300
HML		0.003 (0.014) t = 0.210 p = 0.835	0.004 (0.013) t = 0.296 p = 0.770
RMW		0.034** (0.014) t = 2.523 p = 0.017	0.039*** (0.013) t = 3.039 p = 0.005
CMA		-0.028 (0.019) t = -1.521 p = 0.138	-0.031* (0.018) t = -1.719 p = 0.096
OPM			0.083 (0.081) t = 1.027 p = 0.313
ROE			0.066 (0.043) t = 1.532 p = 0.137
ROA			-0.085 (0.092) t = -0.922 p = 0.364
TotA			-0.022 (0.016) t = -1.372 p = 0.181
MVTB			-0.003*** (0.001) t = -3.004 p = 0.006
Constant	-0.019** (0.009) t = -2.217 p = 0.033	-0.019** (0.008) t = -2.323 p = 0.027	0.141 (0.123) t = 1.152 p = 0.259
Observations	41	41	41
R <sup>2</sup>	0.093	0.300	0.510
Adjusted R <sup>2</sup>	0.069	0.200	0.347
Residual Std. Error	0.054 (df = 39)	0.050 (df = 35)	0.045 (df = 30)
F Statistic	3.979* (df = 1; 39) (p = 0.054)	2.995** (df = 5; 35) (p = 0.024)	3.125*** (df = 10; 30) (p = 0.008)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 3: (-2/5) Event Window US

Expanding the event window to 2 days before the announcement until 5 days after, I Found quite different dynamics influencing the Cumulative Abnormal Returns. The sequence of models, enhanced with a broader set of variables, showed a notable progression in our understanding of the market's reaction. The negative coefficient of the market risk premium,

which intensified from -0.015 to -0.019 is statistically significant in all my three models, ranging from a threshold of 10% for my first Model specification, to a 5% threshold for the second and third model. This highlights significant market aversion during the period, suggesting that investors react negatively to the perceived risks associated with Green Bond announcements. The regression analysis for the (-2/5) event window in the US assesses the impact of various market and firm-specific variables on the cumulative abnormal returns associated with green bond announcements. The significance of the constant is particularly evident. The constant is statistically significant at the 5% level in the first two models, with p-values of 0.033 for the first and 0.027 for the second model, indicating that there is a significant baseline response independent of the variables considered. This indicates a negative reaction to the green bond announcements, irrespective of the specific market and company conditions. The negative value of the intercept may reflect a cautious or sceptical attitude among investors towards green bond announcements, possibly due to worries about the actual environmental effectiveness or financial impact of these projects. The third model shows no significant intercept, suggesting that when a more comprehensive set of control variables is taken into account, the initial negative baseline response is no longer significant. This could indicate that the initial concerns could be mitigated by other positive aspects included in the additional variables of the third model. Furthermore, the adjusted r-squared values improved significantly, from 0.069 in the first model to 0.347 in the third model. This indicates that including more variables significantly enhances the model's explanatory power. The increase in R squared demonstrates how additional factors help to explain the variations in the CARs better, emphasizing the complex nature of market reactions to Green Bond announcements.

(-5/5) Event Window US

	Dependent variable:		
	(1)	CAR(-5/5)	(3)
MRP	-0.017** (0.008) t = -2.075 p = 0.045	-0.019** (0.008) t = -2.244 p = 0.032	-0.021*** (0.007) t = -2.782 p = 0.010
SMB		0.004 (0.016) t = 0.277 p = 0.784	0.018 (0.015) t = 1.246 p = 0.222
HML		-0.006 (0.016) t = -0.369 p = 0.715	-0.002 (0.014) t = -0.120 p = 0.905
RMW		0.036** (0.015) t = 2.309 p = 0.027	0.042*** (0.014) t = 2.983 p = 0.006
CMA		-0.028 (0.021) t = -1.317 p = 0.197	-0.035* (0.019) t = -1.811 p = 0.080
ROE			0.076 (0.046) t = 1.658 p = 0.108
ROA			-0.146 (0.100) t = -1.458 p = 0.155
TotA			-0.026 (0.017) t = -1.514 p = 0.141
MVTB			-0.004*** (0.001) t = -3.116 p = 0.004
Constant	-0.024** (0.009) t = -2.542 p = 0.016	-0.024** (0.009) t = -2.602 p = 0.014	0.190 (0.132) t = 1.435 p = 0.162
Observations	41	41	41
R <sup>2</sup>	0.099	0.272	0.512
Adjusted R <sup>2</sup>	0.076	0.168	0.371
Residual Std. Error	0.059 (df = 39)	0.056 (df = 35)	0.049 (df = 31)
F Statistic	4.304** (df = 1; 39) (p = 0.045)	2.613** (df = 5; 35) (p = 0.042)	3.619*** (df = 9; 31) (p = 0.004)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 4: (-5/5) Event Window US

With the expansion to a longer event window of 5 days prior to the announcement until five days after the announcement for the United States, this provides a more comprehensive view of how various market- and firm-specific factors influence Cumulative Abnormal Returns following green bond announcements over time. This analysis unfolds through three increasingly detailed models, each incorporating a broader set of variables to deepen our understanding of the interactions affecting CARs. In all models, the market risk premium

(MRP) significantly and consistently negatively impacts CARs, with coefficients ranging from -0.017 to -0.021. This trend indicates that higher perceived market risks are closely associated with negative abnormal returns, suggesting that concerns about the risks associated with green bonds increase over time. MRP's enduring impact on various models highlights its essential role in influencing investor views regarding green bond offerings. The analysis also highlights the role of profitability, as indicated by the robust minus weak (RMW) factor, which becomes significant in the later models, with a p-value of 0.027 for the second version of my model, demonstrating the statistical significance of the RMW factor at a threshold of 5%, and a p-value of 0.006 for the third specification of my regression model, which shows strong significance for the RMW factor at a threshold of 1%.

The intercept in these models is initially significantly negative, with a value of -0.024 for each model. In those models, the intercept is significant at the 5% level, with p-values of 0.016 and 0.014, respectively, suggesting a strong baseline negative perception. However, in the third model, the significance of the intercept diminishes, with a p-value of 0.162, indicating that as more variables are included, the impact of baseline sentiment lessens and is not statistically significant at the standard thresholds. This highlights the complexity of the factors influencing investor responses as the model accounts for more specific attributes. As the models evolve, the adjusted R-squared values increase significantly, from 0.076 in the first model to 0.371 in the third model. This demonstrates that including additional variables provides a better explanation of the variation in CARs. This improved model fit, along with the enhanced F-statistics, confirms the robustness of the analysis and the relevance of the included variables in explaining investor responses. Overall, this detailed examination of the (-5/5) event window reveals that investor reactions to US green bond announcements are influenced by a complex interplay of perceived market risks, firm profitability, and investment strategies. These findings suggest that companies planning to issue green bonds should carefully consider these factors in their strategic planning and investor communications to manage market expectations and mitigate potential negative reactions effectively. This approach will support successful green bond issuance and contribute to the broader goals of sustainable financial practices.

## 6.4. Europe Market Regression Results

### (-2/2) Event Window EU

	Dependent variable:		
	(1)	CAR(-2/2) (2)	(3)
MRP	0.010 (0.006) t = 1.525 p = 0.134	0.022** (0.010) t = 2.177 p = 0.035	0.015 (0.009) t = 1.655 p = 0.106
SMB		0.025 (0.022) t = 1.154 p = 0.255	0.007 (0.021) t = 0.309 p = 0.759
HML		-0.016 (0.017) t = -0.930 p = 0.358	-0.0001 (0.015) t = -0.008 p = 0.995
RMW		0.021 (0.033) t = 0.622 p = 0.537	0.018 (0.030) t = 0.623 p = 0.537
CMA		0.039 (0.028) t = 1.424 p = 0.162	0.037 (0.025) t = 1.479 p = 0.148
ESG			0.0005 (0.0004) t = 1.186 p = 0.243
OPM			-0.017 (0.025) t = -0.666 p = 0.510
ROE			-0.003 (0.139) t = -0.021 p = 0.984
ROA			-0.416 (0.303) t = -1.370 p = 0.179
Lev			-0.032 (0.029) t = -1.099 p = 0.279
Constant	-0.010* (0.006) t = -1.770 p = 0.083	-0.007 (0.006) t = -1.150 p = 0.256	-0.009 (0.029) t = -0.321 p = 0.751
Observations	54	54	50
R <sup>2</sup>	0.043	0.095	0.447
Adjusted R <sup>2</sup>	0.024	0.001	0.305
Residual Std. Error	0.041 (df = 52)	0.042 (df = 48)	0.035 (df = 39)
F Statistic	2.327 (df = 1; 52) (p = 0.134)	1.005 (df = 5; 48) (p = 0.425)	3.152*** (df = 10; 39) (p = 0.005)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 5: (-2/2) Event Window Europe

Coming from the US Regression, I will now give an overview of my findings for the EU Region. I will start with the shortest of my event windows, the window ranging from 2 days before the announcement to 2 days after the announcement. The Market Risk Premium (MRP)

initially shows a non-significant positive impact on CARs in the first Regression model but gains statistical significance in the second model with a coefficient of 0.022 and a p-value of 0.035. This suggests a unique investor sentiment in the EU, where Green Bonds are a beneficial initiative despite broader market uncertainties.

Traditional financial metrics such as size (SMB) and value (HML) did not significantly influence the CARs across the models. This indicates that responses to Green Bond announcements might hinge more on market risk perceptions and specific firm characteristics rather than general financial attributes like size or value. Notably, factors like profitability (RMW) and investment style (CMA) alongside the environmental, social, and governance (ESG) score do not show significant impacts, underscoring that these elements may not be primary considerations for investors during this event window. The intercept, or constant term, shows significant behaviour in the first model, where it is significant at the 10% level with p-values of 0.083. However, by the second and third models, the intercept's significance decreases to a p-value of 0.256 in the second model and a p-value of 0.751 in the third, suggesting that as the model incorporates a broader range of variables, the unexplained baseline shift attributed to the constant becomes less pronounced. Each progressive model shows an improvement in explanatory power, with adjusted R-squared values increasing from 0.043 in the first model to 0.447 in the third. This increase, alongside the solid F-statistics, confirms the models' robustness in detailing the dynamics influencing CARs around Green Bond announcements.

(-2/5) Event Window EU

	Dependent variable:		
		CAR(-2/5)	
	(1)	(2)	(3)
MRP	0.016** (0.008) t = 2.140 p = 0.038	0.034*** (0.012) t = 2.905 p = 0.006	0.026** (0.010) t = 2.565 p = 0.015
SMB		0.026 (0.026) t = 1.014 p = 0.316	0.001 (0.022) t = 0.031 p = 0.976
HML		-0.036* (0.020) t = -1.807 p = 0.078	-0.013 (0.016) t = -0.795 p = 0.432
RMW		0.007 (0.039) t = 0.181 p = 0.858	0.012 (0.031) t = 0.394 p = 0.697
CMA		0.075** (0.032) t = 2.296 p = 0.027	0.074*** (0.026) t = 2.817 p = 0.008
ESG			0.0001 (0.0005) t = 0.242 p = 0.810
Mcap			0.004 (0.012) t = 0.308 p = 0.760
ROE			0.020 (0.150) t = 0.133 p = 0.895
ROA			-0.628* (0.322) t = -1.951 p = 0.059
Lev			-0.093** (0.039) t = -2.370 p = 0.023
MVTB			0.013* (0.008) t = 1.782 p = 0.083
Constant	-0.009 (0.007) t = -1.386 p = 0.172	-0.005 (0.007) t = -0.666 p = 0.509	-0.011 (0.075) t = -0.144 p = 0.887
Observations	54	54	50
R <sup>2</sup>	0.081	0.176	0.624
Adjusted R <sup>2</sup>	0.063	0.090	0.515
Residual Std. Error	0.050 (df = 52)	0.049 (df = 48)	0.037 (df = 38)
F Statistic	4.581** (df = 1; 52) (p = 0.038)	2.044* (df = 5; 48) (p = 0.090)	5.724*** (df = 11; 38) (p = 0.00003)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 6: (-2/5) Event Window Europe

By expanding the event window to two days before the announcement and continuing until five days after, we can observe some differences compared to the model with the short event window. The Market Risk Premium is notably significant, presenting a positive coefficient of

0.016 with a p-value of 0.038, suggesting that an increase in market risk perceptions might correspond with slight improvements in CARs. This significance is maintained and slightly strengthened in subsequent models, with coefficients of 0.034 and 0.026 in the second and third models respectively, with corresponding p-values of 0.006 and 0.015. Which are both significant, one at a 1% level, the other at a 5% level. This pattern could indicate that investors in the European market may perceive Green Bonds as stabilizing investments during times of higher market volatility. The environmental, social, and governance (ESG) factor, however, is shown to be non-significant in the third model with a p-value of 0.810 contradicting initial expectations. It appears that, unlike other contexts, the ESG factor do not significantly sway CARs in this specific setting, suggesting that investor decisions may be influenced more by market risk perceptions than by corporate sustainability practices.

The MVTB ratio is significant in the third model with a p-value of 0.083, as well as the return on asset factor with a p-value of 0.059. Both are statistically significant at a level The MVTB ratio is significant in the third model, with a p-value of 0.083, as is the return on asset factor, which has a p-value of 0.059. Both are statistically significant at a level of 10%, underscoring their potential impact on investor reactions to those firm-specific variables. The leverage factor of firms demonstrates a significant effect at the 5% level, with a p-value of 0.023 variables. The Leverage factor of firms shows a significant effect at a 5% level with a p-value of 0.023.

Notably, the constant across all models remains non-significant, indicating that there is no inherent baseline shift in CARs independent of the included variables. This absence of significance suggests that the intercept does not contribute explanatory power to the models, focusing the analysis more directly on the specific variables chosen. The models exhibit increasing explanatory power, as evidenced by the adjusted R-squared values growing from 0.063 in the first to 0.090 in the second to 0.515 in the third model. This increase demonstrates that including a broader range of variables offers a more comprehensive understanding of the dynamics at play.

This nuanced analysis underscores the complexities of market reactions to Green Bond announcements in the EU. It suggests that while market risk assessments carry weight,

traditional financial metrics and even ESG considerations may be less influential in this specific context.

(-5/5) Event Window EU

	<i>Dependent variable:</i>		
	(1)	(2)	(3)
		CAR(-5/5)	
MRP	0.015 (0.009) t = 1.544 p = 0.129	0.036** (0.015) t = 2.453 p = 0.018	0.033** (0.015) t = 2.221 p = 0.033
SMB		0.047 (0.032) t = 1.454 p = 0.153	0.034 (0.032) t = 1.038 p = 0.307
HML		-0.047* (0.025) t = -1.926 p = 0.061	-0.018 (0.024) t = -0.747 p = 0.460
RMW		-0.002 (0.048) t = -0.050 p = 0.961	0.004 (0.046) t = 0.077 p = 0.940
CMA		0.081** (0.040) t = 2.031 p = 0.048	0.090** (0.038) t = 2.368 p = 0.024
ESG			-0.00002 (0.001) t = -0.028 p = 0.978
Mcap			0.002 (0.023) t = 0.102 p = 0.920
OPM			-0.059 (0.039) t = -1.495 p = 0.144
ROE			0.049 (0.215) t = 0.227 p = 0.822
ROA			-0.619 (0.467) t = -1.327 p = 0.193
TotA			0.008 (0.019) t = 0.433 p = 0.668
Lev			-0.087* (0.051) t = -1.714 p = 0.095
Constant	-0.012 (0.008) t = -1.382 p = 0.173	-0.005 (0.009) t = -0.541 p = 0.592	-0.015 (0.116) t = -0.130 p = 0.898
Observations	54	54	50
R <sup>2</sup>	0.044	0.141	0.462
Adjusted R <sup>2</sup>	0.025	0.052	0.287
Residual Std. Error	0.061 (df = 52)	0.061 (df = 48)	0.054 (df = 37)
F Statistic	2.384 (df = 1; 52) (p = 0.129)	1.576 (df = 5; 48) (p = 0.185)	2.648** (df = 12; 37) (p = 0.012)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 7: (-5/5) Event Window Europe

In the longest event window, ranging from five days before the announcement to five days after it in the European Union, a longer assessment period offers deeper insights into the factors influencing the Cumulative Abnormal Returns following green bond announcements. The

Market Risk Premium (MRP) consistently shows a positive relationship with CARs across all models, starting with a coefficient of 0.015 in the first model and increasing to 0.033 in the third model. This suggests that when market risks are perceived to be higher, green bonds may be viewed as more attractive investments, highlighting their perceived safety or alignment with investors' values during volatile periods. Notably, the environmental, social and governance (ESG) factor does not achieve statistical significance, as indicated by a p-value of 0.978. This implies that ESG factors, while relevant, may not exert a direct impact on CARs within the context of this specific event window, or that other variables may overshadow their effect. The leverage factor (Lev) in the third model stands out with a p-value of 0.095, indicating significance at the 10% level. This implies that investors may have approached companies with higher leverage with more caution during the period analysed. Additionally, in the context of the Five Factor Model (5FF), only the High Minus Low (HML) and Conservative Minus Aggressive (CMA) investment style factors are significant in the second model. HML is significant at the 10% level with a p-value of 0.061, while CMA is significant at the 5% level with a p-value of 0.048. This indicates that specific investment styles and company valuations do influence investor reactions within this event window.

Across the models, the adjusted R-squared values increase significantly from 0.025 in the first model to 0.287 in the third model, indicating that the explanatory power increases as more variables are included. This progression underscores the complexity of the factors influencing market reactions to green bond announcements and the robustness of the analysis. The intercept is not statistically significant in any of the models, demonstrating that there isn't a consistent inherent baseline effect of Green Bond announcements on stock prices over the period analyzed. This lack of significance in the constant term suggests that specific variable effects, rather than a general market reaction to Green Bond announcements, drive the observed changes in CARs. This analysis underlines the importance of market risk perceptions, investment styles, and financial structures in shaping investor responses to EU Green Bond announcements over time. It highlights the need for issuers to consider these factors in their strategic planning and communications to manage investor expectations and increase the effectiveness of Green Bond offerings.

### **6.5. Firm Controls and Industry Dummies**

In this section, I present my regression results incorporating firm-specific control variables and industry dummies while excluding broader market risk factors. The baseline category for industry dummies is "Utilities - Other," allowing for a comparative assessment of sector-

specific effects. The results highlight key differences in how firm characteristics and industry affiliations influence cumulative abnormal returns (CARs) following green bond announcements in both the US and European markets.

### **6.5.1. US Market**

The regression results for the US sample indicate a moderate explanatory power, with the adjusted R<sup>2</sup> values ranging from 0.069 for the (-2/2) window to 0.185 for the (-5/5) window. This suggests that including firm controls and industry dummies improves the model's ability to explain variations in CARs over longer event windows.

Among the firm-specific controls, ESG scores show a negative and significant relationship with CARs in the (-2/2) and (-2/5) event windows at the 5% and 10% levels, respectively. This implies that investors may be sceptical about the added value of green bond issuances by firms possessing strong ESG credentials. Additionally, market-to-book value (MVTB) is significantly negative at the 5% level in the (-2/5) and (-5/5) windows, suggesting that firms with higher valuation multiples experience stronger negative reactions to green bond issuances.

Leverage (Lev) shows a positive and weakly significant effect in the (-5/5) window ( $p = 0.076$ ), suggesting that highly leveraged firms might experience slightly better stock performance after issuing green bonds, possibly due to investor expectations of improved financial discipline.

Industry effects reveal statistically significant positive CARs for automotive manufacturers, beverage/bottling companies, telecommunications, and media firms, suggesting that investors in these industries perceive green bond issuance as a credible sustainability commitment. The chemical and pharmaceutical sectors also show positive and significant CARs at the 5% level in longer event windows, reinforcing the idea that industries with high environmental impact benefit more from sustainability-linked financing. The constant term is not statistically significant across any event window, indicating that there is no systematic baseline shift in CARs independent of the included firm- and industry-level factors.

## Firm Controls and Industry Dummies US

	<i>Dependent variable:</i>		
	CAR(-2/2)	CAR(-2/5)	CAR(-5/5)
	(1)	(2)	(3)
MRP	-0.018 (0.012) t = -1.473 p = 0.158	-0.012 (0.014) t = -0.873 p = 0.395	-0.020 (0.015) t = -1.350 p = 0.194
ESG	-0.004* (0.002) t = -1.986 p = 0.063	-0.004 (0.002) t = -1.699 p = 0.107	-0.003 (0.002) t = -1.457 p = 0.163
Mcap	-0.101* (0.058) t = -1.743 p = 0.099	-0.101 (0.067) t = -1.512 p = 0.148	-0.128* (0.072) t = -1.788 p = 0.091
OPM	0.204 (0.163) t = 1.250 p = 0.228	0.096 (0.190) t = 0.505 p = 0.620	0.031 (0.202) t = 0.155 p = 0.879
ROE	0.017 (0.069) t = 0.243 p = 0.812	0.003 (0.080) t = 0.039 p = 0.970	-0.009 (0.086) t = -0.105 p = 0.918
ROA	-0.173 (0.132) t = -1.309 p = 0.207	-0.151 (0.153) t = -0.990 p = 0.336	-0.199 (0.163) t = -1.218 p = 0.239
TotA	0.080 (0.068) t = 1.177 p = 0.255	0.083 (0.078) t = 1.058 p = 0.305	0.116 (0.084) t = 1.382 p = 0.184
TotD	-0.000 (0.000) t = -1.300 p = 0.211	-0.000 (0.000) t = -1.587 p = 0.131	-0.000* (0.000) t = -1.869 p = 0.079
Lev	0.160 (0.246) t = 0.650 p = 0.524	0.264 (0.285) t = 0.925 p = 0.368	0.273 (0.305) t = 0.897 p = 0.382
MVTB	-0.002 (0.002) t = -0.988 p = 0.337	-0.005* (0.003) t = -1.891 p = 0.075	-0.005 (0.003) t = -1.545 p = 0.140
IndustryAutomotive Manufacturer	0.259** (0.117) t = 2.203 p = 0.041	0.305** (0.136) t = 2.239 p = 0.039	0.343** (0.146) t = 2.359 p = 0.030
IndustryBeverage/Bottling	0.274** (0.114) t = 2.399 p = 0.028	0.320** (0.132) t = 2.420 p = 0.027	0.332** (0.141) t = 2.352 p = 0.031
IndustryCable/Media	0.174 (0.120) t = 1.454 p = 0.164	0.239 (0.139) t = 1.720 p = 0.103	0.243 (0.148) t = 1.635 p = 0.120
IndustryChemicals	0.100 (0.069) t = 1.456 p = 0.163	0.139* (0.080) t = 1.736 p = 0.100	0.147 (0.085) t = 1.724 p = 0.102
IndustryContainers	-0.095 (0.061) t = -1.548 p = 0.140	-0.079 (0.071) t = -1.105 p = 0.284	-0.070 (0.076) t = -0.913 p = 0.374
IndustryElectronics	0.164 (0.102) t = 1.613 p = 0.125	0.201 (0.118) t = 1.695 p = 0.108	0.186 (0.126) t = 1.472 p = 0.159
IndustryPharmaceuticals	0.157 (0.146) t = 1.080 p = 0.295	0.329* (0.169) t = 1.943 p = 0.068	0.307 (0.181) t = 1.701 p = 0.107
IndustryRailroads	0.123 (0.072) t = 1.703 p = 0.106	0.192** (0.084) t = 2.281 p = 0.055	0.215** (0.090) t = 2.390 p = 0.029
IndustryReal Estate Investment Trust	0.092* (0.049) t = 1.880 p = 0.077	0.126** (0.057) t = 2.224 p = 0.040	0.130** (0.060) t = 2.159 p = 0.045
IndustryRetail Stores - Other	0.282* (0.151) t = 1.873 p = 0.078	0.326* (0.175) t = 1.862 p = 0.079	0.337* (0.187) t = 1.805 p = 0.088
IndustryService - Other	0.146 (0.112) t = 1.305 p = 0.209	0.172 (0.130) t = 1.326 p = 0.202	0.135 (0.138) t = 0.975 p = 0.343
IndustryTelecommunications	0.296* (0.148) t = 2.001 p = 0.061	0.394** (0.172) t = 2.294 p = 0.035	0.458** (0.183) t = 2.497 p = 0.023
Constant	0.244 (0.353) t = 0.693 p = 0.498	0.196 (0.410) t = 0.478 p = 0.639	0.142 (0.438) t = 0.325 p = 0.750
Observations	41	41	41
R <sup>2</sup>	0.605	0.621	0.648
Adjusted R <sup>2</sup>	0.123	0.158	0.218
Residual Std. Error (df = 18)	0.044	0.051	0.055
F Statistic (df = 22; 18)	1.255 (p = 0.316)	1.340 (p = 0.267)	1.508 (p = 0.190)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 8: Firm Controls and Industry Dummies US

### **6.5.2. European Market**

The adjusted R squared values for the European sample are generally higher than those for the US, with values of 0.221 for (-2/2), 0.481 for (-2/5), and 0.350 for (-5/5). This suggests that industry and firm-level characteristics explain a greater proportion of the variation in CARs in Europe compared to the US. Unlike in the US, ESG scores do not exhibit statistical significance in any event window, suggesting that European investors do not react to green bond issuances based on a firm's ESG profile. Instead, financial indicators such as operating profit margin (OPM) and return on assets (ROA) are significantly negative at the 5% level in longer event windows, implying that firms with stronger financial performance experience weaker market reactions to green bond issuances. In contrast to the US, market-to-book value (MVTB) is weakly positive and significant at the 10% level in the (-2/5) window. This suggests that European investors might interpret green bond issuances by highly valued firms more favorably than their US counterparts. Regarding industry effects, real estate investment trusts (REITs), leasing firms, and service sector companies show significantly positive CARs at the 5% level, suggesting that investors view green bond issuances favorably in industries where sustainability-related investments align with long-term value creation. Notably, the home building sector exhibits strong significance at the 1% level in longer event windows, reflecting investor confidence in green finance for sustainable construction. As in the US sample, the constant term is not statistically significant, reinforcing that there is no inherent upward or downward bias in CARs unrelated to firm-specific or industry-related characteristics.

## Firm Controls and Industry Dummies EU

	<i>Dependent variable:</i>		
	CAR(-2/2)	CAR(-2/5)	CAR(-5/5)
	(1)	(2)	(3)
MRP	0.001 (0.007) t = 0.114 p = 0.911	0.004 (0.007) t = 0.599 p = 0.555	0.002 (0.010) t = 0.207 p = 0.838
ESG	-0.001 (0.001) t = -1.135 p = 0.267	-0.001 (0.001) t = -1.198 p = 0.242	-0.001 (0.001) t = -1.001 p = 0.327
Mcap	-0.0004 (0.035) t = -0.010 p = 0.992	-0.009 (0.035) t = -0.259 p = 0.798	-0.035 (0.048) t = -0.726 p = 0.475
OPM	-0.045 (0.093) t = -0.481 p = 0.635	-0.199** (0.094) t = -2.115 p = 0.045	-0.349** (0.127) t = -2.740 p = 0.011
ROE	0.147 (0.249) t = 0.592 p = 0.559	0.245 (0.252) t = 0.976 p = 0.339	0.660* (0.341) t = 1.935 p = 0.064
ROA	-0.588 (0.494) t = -1.189 p = 0.246	-0.778 (0.500) t = -1.555 p = 0.132	-1.513** (0.678) t = -2.231 p = 0.035
TotA	0.043 (0.036) t = 1.193 p = 0.244	0.051 (0.036) t = 1.410 p = 0.171	0.058 (0.049) t = 1.177 p = 0.251
TotD	-0.000 (0.000) t = -0.930 p = 0.362	-0.000 (0.000) t = -0.890 p = 0.382	-0.000 (0.000) t = -0.794 p = 0.435
Lev	0.040 (0.076) t = 0.527 p = 0.603	0.006 (0.077) t = 0.076 p = 0.941	0.010 (0.104) t = 0.094 p = 0.926
MVTB	0.012 (0.012) t = 1.047 p = 0.305	0.021* (0.012) t = 1.769 p = 0.089	0.013 (0.016) t = 0.795 p = 0.435
IndustryBanking	0.061 (0.069) t = 0.876 p = 0.389	0.081 (0.070) t = 1.161 p = 0.257	0.091 (0.095) t = 0.965 p = 0.344
IndustryBuilding Products	0.030 (0.074) t = 0.397 p = 0.695	0.020 (0.075) t = 0.270 p = 0.790	0.023 (0.102) t = 0.228 p = 0.822
IndustryConglomerate/Diversified Mfg	0.077 (0.079) t = 0.985 p = 0.334	0.080 (0.079) t = 1.013 p = 0.321	0.157 (0.108) t = 1.455 p = 0.158
IndustryElectronics	0.0004 (0.051) t = 0.008 p = 0.994	-0.041 (0.052) t = -0.794 p = 0.435	0.002 (0.070) t = 0.025 p = 0.981
IndustryFinancial - Other	0.023 (0.066) t = 0.340 p = 0.737	0.017 (0.067) t = 0.257 p = 0.800	0.089 (0.091) t = 0.972 p = 0.341
IndustryFood Processors	0.069 (0.053) t = 1.316 p = 0.200	0.063 (0.053) t = 1.184 p = 0.248	0.090 (0.072) t = 1.240 p = 0.227
IndustryHome Builders	0.013 (0.046) t = 0.286 p = 0.777	0.130** (0.046) t = 2.819 p = 0.010	0.198*** (0.063) t = 3.153 p = 0.005
IndustryIndustrials - Other	0.130* (0.072) t = 1.789 p = 0.086	0.082 (0.073) t = 1.124 p = 0.272	-0.038 (0.099) t = -0.380 p = 0.707
IndustryLeasing	0.067 (0.047) t = 1.435 p = 0.164	0.123** (0.047) t = 2.615 p = 0.015	0.178*** (0.064) t = 2.780 p = 0.010
IndustryLife Insurance	-0.031 (0.063) t = -0.494 p = 0.626	-0.079 (0.064) t = -1.243 p = 0.226	-0.094 (0.086) t = -1.088 p = 0.287
IndustryReal Estate Investment Trust	0.032 (0.042) t = 0.757 p = 0.456	0.092** (0.043) t = 2.161 p = 0.041	0.130** (0.058) t = 2.255 p = 0.033
IndustryService - Other	0.070 (0.059) t = 1.185 p = 0.247	0.140** (0.060) t = 2.329 p = 0.028	0.225** (0.082) t = 2.757 p = 0.011
IndustryTelecommunications	0.045 (0.043) t = 1.051 p = 0.303	0.041 (0.043) t = 0.939 p = 0.357	0.078 (0.059) t = 1.325 p = 0.197
Constant	-0.277 (0.277) t = -1.002 p = 0.326	-0.253 (0.280) t = -0.906 p = 0.374	-0.103 (0.379) t = -0.271 p = 0.789
Observations	50	50	50
R <sup>2</sup>	0.571	0.718	0.642
Adjusted R <sup>2</sup>	0.191	0.469	0.326
Residual Std. Error (df = 26)	0.038	0.039	0.052
F Statistic (df = 23; 26)	1.505 (p = 0.157)	2.880*** (p = 0.006)	2.029** (p = 0.042)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 9: Firm Controls and Industry Dummies Europe

### **6.5.3. Comparison of US and European Results**

The regression results highlight notable differences between the US and European markets in how firm and industry characteristics influence investor responses to green bond issuances. Adjusted  $R^2$  values are higher in Europe, suggesting that firm and industry-level variables explain stock price reactions more effectively in this region. ESG scores play a role in US stock price reactions but not in Europe, indicating that US investors are more sensitive to greenwashing concerns. Conversely, European investors focus more on traditional financial indicators, such as OPM and ROA, when assessing green bond issuances. Industry effects are significant in both regions, but sectoral patterns differ. In the US, high-carbon industries (automotive, chemicals, pharmaceuticals) see positive CARs, while in Europe, sectors with long-term sustainability investments (REITs, leasing, and home builders) benefit the most. These differences reflect regional variations in investor expectations and the perceived credibility of green bond issuances across industries.

## **7. Conclusion**

In my dissertation, I have examined stock price reactions to green bond issuances in Europe and the United States. I applied an event study methodology to assess cumulative abnormal returns around green bond announcement dates. Comparing these two regions has provided valuable insights into how investors perceive green bond issuances and how market dynamics and regulatory environments shape their responses.

The empirical results indicate distinct differences between Europe and the U.S. While both regions exhibit negative abnormal returns following green bond issuances, these reactions' magnitude and statistical significance vary. In the U.S., the negative stock price reaction is more pronounced over longer event windows, suggesting that investors perceive green bond issuances more critically. This may be due to regulatory uncertainties, scepticism regarding the financial benefits of sustainability-oriented investments, or concerns over potential greenwashing. In contrast, the European market shows a less severe reaction, with negative abnormal returns observed in shorter event windows but no statistically significant impact over extended periods. This suggests that European investors are more accustomed to and accepting green finance instruments, possibly due to the region's well-established regulatory framework governing green bonds.

A deeper analysis through regression modeling further underscores the key drivers of these stock price movements. One of the most striking findings is that market risk perceptions

dominate abnormal returns, particularly in the United States. The Market Risk Premium (MRP) consistently shows a significant negative impact, indicating that heightened market risk leads to more pronounced negative reactions to green bond issuances. This suggests that in the U.S., investors may perceive green bonds as riskier financial instruments, possibly due to the voluntary nature of sustainability regulations and persistent concerns about greenwashing.

In contrast, European investors appear to rely more on firm-specific financial metrics such as leverage and valuation ratios when assessing green bond issuers. The leverage factor (Lev) and Market-to-Book Value (MVTB) show significant relationships with cumulative abnormal returns, suggesting that financial stability plays a greater role in shaping stock price reactions than the sustainability aspect alone. This highlights the structured regulatory environment in Europe, where green finance is more institutionalized, leading investors to assess issuers based on traditional risk metrics rather than ESG credentials alone.

Interestingly, ESG scores do not significantly impact stock price reactions in either market. Despite the increasing emphasis on ESG in corporate finance, investors appear to prioritize profitability, leverage, and market risk exposure when evaluating green bond issuances. This finding challenges prior research (e.g., Flammer, 2021) that suggests strong ESG performance enhances investor confidence. Instead, it indicates that while sustainability initiatives are gaining importance, they may not yet be a primary driver of short-term stock price movements. These findings align with signaling theory, which suggests that green bond issuances signal a firm's commitment to sustainability. However, for this signal to be effective, investors must perceive it as credible. The results indicate that the regulatory environment largely determines credibility. In the U.S., where green bond issuance standards are more fragmented and voluntary, investor skepticism may dilute the intended positive signaling effect. Conversely, in Europe, where green bonds are subject to rigorous regulatory standards, investors may be more inclined to interpret green bond issuances as legitimate sustainability commitments rather than mere marketing tools.

### **7.1. Implications for Corporate Issuers, Investors, and Policymakers**

These results have important practical implications for corporate issuers, investors, and policymakers. Understanding regional investor expectations and market dynamics is crucial for corporate issuers when structuring green bond issuances. Companies operating in the U.S. may need to invest more in transparency and third-party certifications to strengthen the credibility of their sustainability commitments. In Europe, issuers can benefit from the existing regulatory

framework, which fosters greater investor confidence in green bonds, but they should remain aware of firm-specific financial factors that influence stock price reactions.

This study underscores the need for investors to consider both financial fundamentals and regulatory environments when evaluating the impact of green bond issuances. While sustainability is an increasingly relevant investment criterion, the results indicate that investors still prioritise profitability, leverage, and valuation metrics when assessing firm value. This suggests that green bond issuance alone may not be sufficient to drive positive stock price reactions unless strong financial fundamentals accompany it.

For policymakers, the contrasting market reactions in Europe and the U.S. highlight the critical role of regulatory frameworks in shaping investor perceptions. The results suggest that a more structured and standardized regulatory framework in the U.S. could reduce investor scepticism and encourage more positive stock market reactions to green finance instruments. Strengthening green bond standards, enhancing mandatory disclosure requirements, and promoting greater oversight of ESG commitments could be steps toward increasing investor confidence in sustainable finance.

## **7.2. Future Research**

The findings of this study reveal several promising avenues for future research. First, sector-specific differences in stock price reactions to green bond issuances remain an area that warrants further investigation. Certain industries, such as energy, manufacturing, or technology, may experience different investor reactions based on the perceived environmental impact of their operations. A sector-based comparative study could provide deeper insights into how industry characteristics influence the financial effects of green bond issuance.

Second, future research could expand the geographical scope of the analysis by examining emerging markets such as China or Latin America, where green finance is evolving rapidly but under different regulatory conditions. Investigating whether emerging market investors respond differently to green bond issuances could provide valuable insights into global variations in sustainable finance trends.

Third, refining the methodological approach could enhance the robustness of future studies. While this study applied an event study methodology, alternative asset pricing models, such as the Fama-French three-factor or five-factor models, could offer additional insights into the expected and abnormal returns associated with green bond issuances. Furthermore, incorporating alternative data sources, such as sentiment analysis of investor reactions on social

media or analyst reports, could provide qualitative insights into how green bond announcements influence market perceptions.

This thesis contributes to the growing literature on sustainable finance by offering a comparative perspective on how financial markets react to green bond issuances in two of the world's largest economies. The results provide valuable insights for companies, investors, and regulators navigating the transition toward a more sustainable financial system. By addressing both financial and regulatory dimensions, this study helps bridge the gap between sustainability commitments and investor expectations, ultimately contributing to a more informed and transparent green finance ecosystem.

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