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"Is there an association between firm's green bond issuance and their financial performance?"

By

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GRA 19703 Master Thesis

Study Program:

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Mert Erinc

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Abstract

This thesis explores the relationship between green bond issuance and financial and environmental performance. The study utilizes a panel dataset consisting of 832 conventional bonds and 81 green bonds that were issued during the period 2016 to 2021. For the purpose of gaining an overview of the financial analysis of capital structure and how green bond affects profitability and firm's performance, we have explored the relationship between green bonds issuance and profitability in American firms. A fixed effects model is used to examine the relationship between green bond issuance and both financial and environmental performance. The aim is to determine if there is a positive association between these factors. The main finding of our thesis is that green bond issuance is not positively associated with financial performance. However, the results indicate that green bond issuance is positively associated with environmental performance, which is consistent with our hypothesis.

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1.0 Introduction

Climate change endangers the lives and livelihoods of billions of people and has become one of the most pressing issues of our time. As a response, sustainability has become a top priority on the agendas of politicians, society, and organizations. At the United Nations Climate Change Conference (COP21), 195 countries signed the Paris Agreement, agreeing to limit global warming to below two degrees Celsius above pre-industrial levels (Kedia & Joshipura, 2022). The agreement requires all participating countries to regularly report on their emissions and progress towards meeting their targets. As a result, governments worldwide are adopting more stringent regulations to protect the environment and promote sustainability.

The challenges related to climate change require a scale of environmental, social, and economic change that cannot be achieved by governments alone. It is crucial that the companies and the governments follow through on their commitments. As stated by the United Nations Secretary-General António Guterres, "Government or private sector commitments to net-zero cannot be a mere public relations exercise" (United Nations, 2022). Emphasizing the importance of collective action to reduce the dreadful effects of climate change. Organizations face growing pressure to address these issues due to a combination of factors. These include concern about climate change, increased public awareness, changing consumer preferences and regulatory changes. As the pressure is growing, organizations are forced to act. A solution is to transition their operations sustainably, which will reduce greenhouse gas emissions. Financing and investment instruments are essential to support a shift towards more sustainable operations.

Large-scale investments are essential to support the transition to low-carbon and climate-resilient economies. According to McKinsey, the Network for Greening the Financial Systems' (NGFS) net zero 2050 scenario will require an investment of $275 trillion in physical assets over the next three decades (Krishnan et al., 2022). A significant portion of this investment will likely originate from private sector entities. This emphasizes the importance of economic and societal adjustments for accomplishing global decarbonization.

Financial markets play an important role in allocating more capital to low-carbon projects worldwide. Bonds are suggested as an ideal source of funding because they are low-cost and long-term, and green investments often require significant upfront capital and have long development periods (OECD, 2015). The issuance of green bonds has become increasingly prevalent over the years since the first green bond was issued in 2008 by the World Bank (CFI Team, 2023). Green bonds are helpful for financing sustainable projects, advancing environmental progress and mobilizing capital toward a greener and more sustainable future. Green bonds are identical to conventional bonds in terms of financial characteristics. The main difference is that green bonds are designated to finance or re-finance climate and environmentally eligible projects (OECD, 2015).

The market for this type of bond is still relatively small compared to the conventional bond market, accounting for about 3 to 3.5 % of the total bond issuance. Although the green bond market has experienced exponential growth over the last five years to 2021, with an average growth rate of 70% (Natixis, 2022), various obstacles and barriers still hinder the market's growth. The committee of the European Economic and Monetary Affairs identified "(i) lack of agreement on a common definition of green projects and green bonds; (ii) often complex review procedures for green bonds; and (iii) lack of investable projects and assets" as main barriers to the green bond market (Spinaci, 2021). The challenges presented are commonly cited and threaten the evolution and the potential of an upscale green bond market. Currently, it does not exist standardized requirements for issuing green bonds and the regulation and enforcement of issuing green bonds are still under development. Potential issuers might refrain from the market due to costly verification and disclosure processes compared to conventional bonds.

1.1 Problem Definition

Expanding the green bond market is essential to achieve the goals outlined in the Paris Agreement. Green bonds are considered one of the main tools within green finance and are critical for the transition towards climate-resilient economies. Considering the pertinence of the green bond market and its current challenges, it is essential to increase knowledge of the green bond market. To ensure the growth of the green bond market, OECD highlights education on the benefits of green bonds related to issuance and investment and the awareness of international green bond standards and disclosure requirements (OECD, 2017). Empowering issuers and investors with research on green bonds compared to conventional bonds could foster informed decision-making and promote active engagement in sustainable finance.

This research paper examines the potential benefits of issuing green bonds, that is, scrutinizing whether there exist financial incentives to issue green bonds. Therefore, this paper aims to answer the following research question:

> *"Is there an association between firm's green bond issuance and their financial performance?"*

1.2 Contribution to Literature

In terms of research, the academic literature on green bonds is still limited, and many areas require further investigation. Existing research has addressed topics such as how green bonds differ from conventional bonds regarding information asymmetry, investor behavior and preferences, and the impact of green bonds on the environment. However, the majority of the academic studies on green bonds focus on the pricing discussion and the stock market performance related to green bond issuance (Flammer, 2021; Larcker & Watts, 2020).

Several arguments support that the issuance of green bonds increases profitability. First, the cost of capital argument involves that companies will issue green bonds to achieve cheaper debt financing. Also, previous studies suggest that issuing green bonds has a positive reaction on a firm's stock price (Flammer, 2021; Krueger, 2014; Tang & Zhang, 2020). However, there are a few arguments against the notion that issuing green bonds directly increases profitability. The

costs associated with obtaining green certifications and implementing environmentally friendly projects can be significant, potentially undermining financial benefits. Another argument is that shifting from traditional business models to sustainable practices can involve significant costs. These transition costs can put pressure on the financial performance of sustainable projects, impacting their overall profitability.

This thesis aims to explore whether there exist financial incentives to issue green bonds, that is, whether the issuance of green bonds versus conventional bonds has any incremental profitability implications. Investigating the economic benefits of issuing green bonds regarding profitability measurement fills a gap in the literature, as the previous academic literature focuses on price discussion. This study contributes to the literature on incentives to issue green bonds and whether it is preferable to conventional bonds.

1.3 Structure

This paper is structured as follows. Chapter two presents the green bond market, the definition of green bonds, and its principles. Chapter three provides an overview of relevant published literature. Followed by the literature review, chapter four presents the hypotheses for this study. Chapter five covers the empirical approach and description of the data. In chapter six, the findings and results are presented. In chapter seven, we have conducted the analysis based on the results presented in chapter six. Chapter eight concludes and highlights the main findings from this research. Finally, chapter nine provides recommendations for further research.

2.0 Background

The second section of our paper covers some background information on relevant topics regarding green bonds. First, we will briefly introduce the development in the green bond market worldwide and in the US. We further present information on the green bond principles. Lastly, we will outline the advantages of debt financing and capital structure.

2.1 The Green Bond Market

Green bonds are a type of bond instrument where the proceeds or an equivalent amount will be exclusively applied to climate and environmental eligible Green Projects (ICMA, 2021). Green bonds are defined by the International Capital Market Association (ICMA) as a loan instrument that enables capital raising and investment, in new and existing projects, which promote environmental benefits. Comparable to conventional bonds, green bonds are issued by a company, a bank, a municipality, or a country. However, a green bond differs from a conventional bond in that the funds should be used to finance environmentally friendly projects. These projects are related to renewable energy, energy efficiency, prevention and prevention of pollution, clean transport, and climate adaption (ICMA, 2021).

The green bond market was first developed by the World Bank Group, through the World Bank and International Finance Corporation (IFC). The first green bond was issued in 2008, and in 2013 the green bond market went from niche to mainstream when the World Bank had issued $1 billion in green bonds. As the World Bank and IFC have been market leaders in introducing a high number of first-time investors to green bonds, they also play a significant role in defining the market's best practices for reporting and transparency. IFC is also included as a founder of the International Capital Market Association (ICMA), responsible for Green Bond Principles (The World Bank, 2021).

"The growth of green bonds in the capital markets has been explosive and is increasingly attracting attention from investors" (The World Bank, 2021). During the last few years, it is clear that investors have changed their attitudes toward sustainable investing. This is a result of increasing awareness of the risk of climate change. Also, stakeholders are concerned about the enhanced focus on ESG policies. Green bonds introduce investors to a platform involving good

practices and further influencing bond issuers to seize a more sustainable business strategy (The World Bank, 2021).

Value of green bonds issued worldwide from 2014 to 2021 (in billion U.S. dollars)

Year	Value
2014	37
2015	46.1
2016	84.5
2017	159.5
2018	172.5
2019	269.3
2020	298.2
2021	508.8
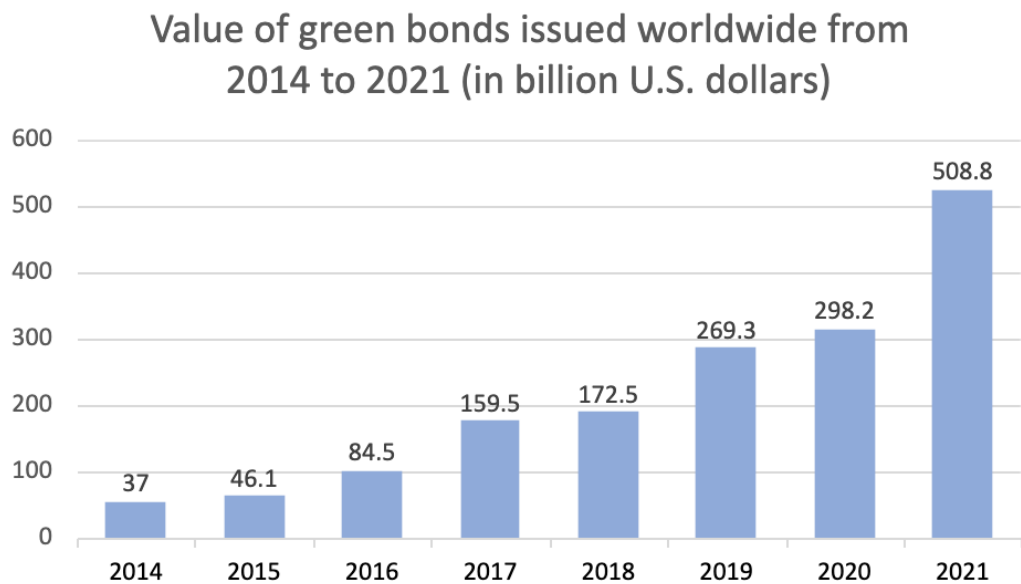
Figure 1 - Green bonds issued worldwide
         (Statista, 2022)

Green bonds are utilized worldwide, and the green bond market is rapidly growing in popularity. Currently, green bonds represent a small percentage of both the overall bond and ESG markets. However, preparing the market for future growth of sustainable projects is central to its success. Globally, the issuance of green, social, and sustainability (GSS) bonds reached a large volume in 2020, with $298 billion issued. The overall increase in the green bond market from the first issued green bonds in the late 2000s has grown rapidly in recent years, reaching $509 billion in 2021. This has been a considerable increase from the amount of $37 billion in 2014 (Statista, 2022).

Leading countries in terms of value of green bonds issued worldwide in 2021 (in billion U.S. dollars)

Country	Value
Hong Kong SAR	9.3
Canada	10.6
Japan	11.5
Norway	12
South Korea	12.5
Sweden	16.2
Italy	19.6
Spain	22
Netherlands	23.4
United Kingdom	33.9
France	36.3
Germany	63.2
China	68.1
United states	81.9
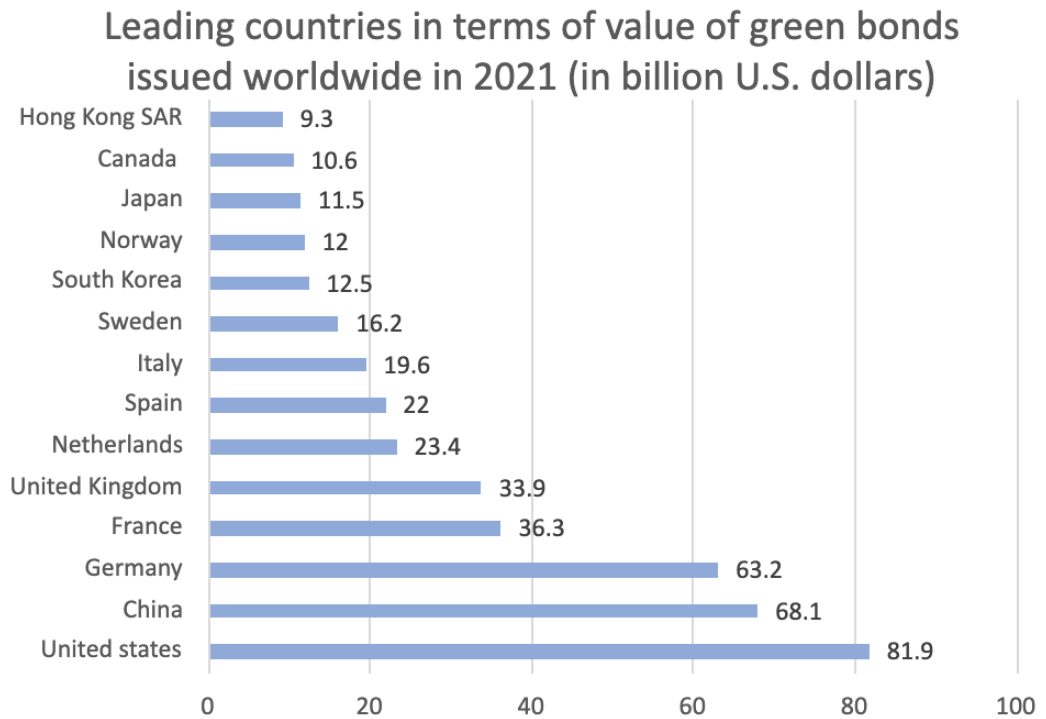
Figure 2 - Global green bond market value in 2021 by country
 (Statista, 2022)

Value of green bonds issued in the United States from 2014 to 2021 (in billion U.S. dollars)

Year	Value
2014	5.9
2015	11.6
2016	20.4
2017	44.6
2018	35.4
2019	52.9
2020	50.3
2021	81.9

Figure 3 - Value of green bonds issued in the US
 (Statista, 2022)

According to The Forum for Sustainable and Responsible Investments, more than 25% of professionally managed assets were invested in sustainable strategies in the US in 2018 (Milken Institute, 2020). The green bond market in the US has

grown rapidly in the last several years, with a positive increase every year since 2014. The amount of issued green bonds has increased dramatically from $5,9 billion in 2014 to $81,9 in 2021. According to Statista (2022), the US is considered the leading country worldwide in terms of the value of green bonds issued, with a v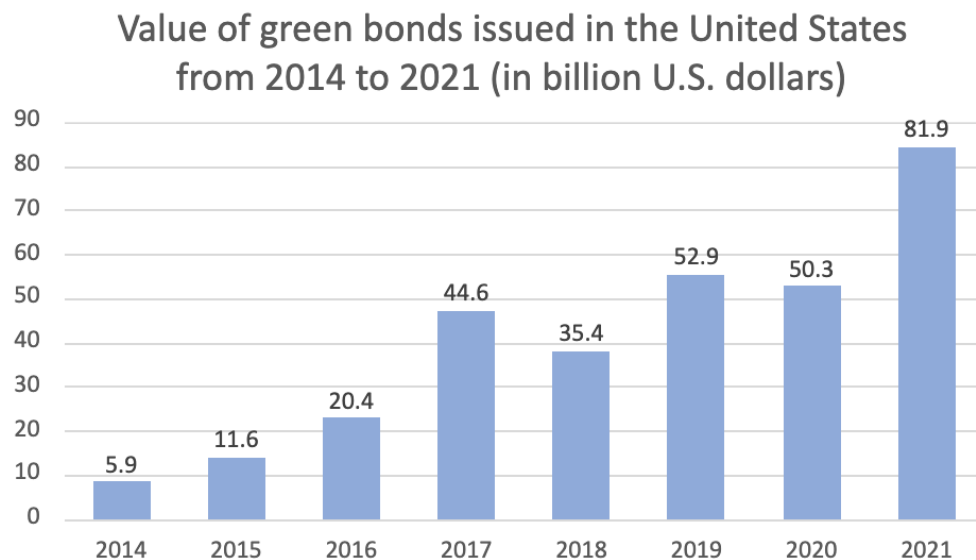alue of $81,9 billion in 2021. Regarding the high value of green bond issuance in the US, we find it interesting to explore whether the issuance of green bonds impacts the profitability of American firms.

2.2 Green Bond Principles

"Green Bond Principles" (GBP) was established in 2014 through a collaboration between several investment banks and has since been transferred to the independent organization ICMA. The principles represent a voluntary framework to ensure transparency and promotion of the global debt market's role in sustainable financing. The standard facilitates investors to be able to more easily identify projects or assets, that qualify for the green label (ICMA, 2021). The principles are based on the four following components:

1. Use of Proceeds
2. Process for Project Evaluation and Selection
3. Management of Proceeds
4. Reporting

The use of proceeds (1) obtained through the issue represents the very cornerstone of a green bond. It must describe a qualified green project and what the proceeds are for financing or refinancing. Further, the issuer of a green bond must also communicate to the investors (2) which processes are the basis for identifying qualified green projects. Through management of the proceeds (3), they must be tracked by the issuer in an appropriate way and confirm that the proceeds are linked to investment in qualified green projects. Through reporting (4), the issuer must publicly communicate what the proceeds have financed and consequently ensure transparency in the market for green bonds. When issuing green bonds, ICMA also bases a recommendation on developing a green framework. It must clearly state the company's proposed use of the proceeds from the bond. In addition, the issuer should obtain an external verification of the framework and current projects (ICMA, 2021).

2.3 ESG Investing

Sustainable finance refers to investment decisions that involve ESG consideration (Bakken, 2021). In recent years, ESG considerations have gained increased importance in the investment process as well as traditional financial analysis, where investors, to a larger degree, want to integrate an evaluation of both ESG risks and opportunities. ESG involves environmental, social, and governance criteria and is a framework that helps stakeholders understand how an organization manages risks and opportunities (Bakken, 2021).

The US does not have a clear regulatory framework specifically focused on ESG factors. However, there are some various regulations that firms may take into account. ESG regulations involve attention regarding the environmental, social, and governance impacts of investment opportunities within the financial industry. The key aspects of the US ESG regulations are as follows: Securities and Exchange Commission (SEC), Department of Labor (DOL), State-level Regulations, and Industry Initiatives.

SEC focuses on ESG disclosures and includes guidelines related to public companies' disclosure of ESG information. DOL has issued guidance in order to clarify the responsibilities of retirement plan sponsors regarding ESG investments. This guidance emphasizes that financial interest should be prioritized and should not sacrifice returns or risks for ESG objectives. Lastly, Industry initiatives involve that industry organizations have voluntary ESG reporting frameworks and guidelines which provide standards and recommendations for companies to disclose ESG-related information. These regulations are dynamic and are developing continuously (OECD, 2020).

2.4 Bonds and Capital Structure

Bond issuance raises a firm's leverage, which in turn impacts the organization's capital structure. Researchers in the field of financial studies have tried to find the optimal capital structure, which could maximize the value of the company. However, there is a gap in the field of research on how types of bond influence firm performance. A bond represents a debt security that borrowers use to generate funds from investors who are willing to lend money for a specified

duration (Mishkin & Eakins, 2018, p. 43). Corporations issue bonds to finance their daily operations, new endeavors, or mergers and acquisitions.

Issuing bonds offers several advantages for firms. Firstly, when a funding line from a bank or other creditors is insufficient, the public market can be leveraged to raise additional funds. This is particularly beneficial for firms in risky positions that require higher creditworthiness or have exhausted their existing credit lines. Secondly, issuing bonds offers greater flexibility in securing finances as there is no fixed limit on the amount or rate at which a firm can raise funds. The market dictates the lowest interest rate and the level of investor interest. Another advantage is that bond issuance enables firms to easily buy back their bonds and cancel the debt (Mishkin & Eakins, 2018, p. 318).

Due to factors such as higher upfront costs, longer payback periods, and regulatory constraints, sustainable projects often face challenges in generating substantial profits short term compared to conventional projects (Lee et al., 2013; Rizos et al., 2016). As a result, developers and organizations rely heavily on external financing to bridge the profitability gap and support the realization of these initiatives. Green bonds play a crucial role in addressing this problem by lowering the cost of debt for sustainable projects. By issuing green bonds, companies attract investors committed to sustainable investing. As a result, the demand for green bonds increases, which can lead to lower borrowing costs for the issuers.

3.0 Literature Review

Chapter three provides an overview of previously published literature within the field of green bonds. This research paper aims to examine if issuing green bonds provides financial benefits for the issuing firm.

3.1 Environmental Management and Financial Performance

ESG is a framework that measures a company's environmental, social, and governance aspects of investments and operations. Previous studies show that ESG disclosure and activities can affect firm performance positively. De Lucia et al. (2020) conducted a case study of public companies and analyzed whether a company's ESG activities influence financial performance. They found a positive association between ESG activities and financial performance with respect to ROE and ROA.

In a recent study conducted by Carnini Pulino et al. (2022), the authors examine the impact of ESG disclosure and its three pillars on firm performance of Italian listed firms. The results indicate that the ESG score positively affects a firm's performance (Carnini Pulino et al., 2022). Furthermore, they found that social and environmental pillars significantly impacted firm performance, whereas the governance pillar had no significant impact. Similar conclusions have been reached by Xie et al. (2019). However, they found a nonnegative relationship for environmental, social, and governance activities.

Various studies have assessed the relationship between ESG and financial performance, and the findings indicate a significant correlation between ESG score and financial performance (Friede et al., 2015; Velte, 2017; Yoo & Managi, 2022). The results suggest that firms benefit financially from being transparent about their commitments and activities regarding sustainability. Moreover, studies that analyze each ESG pillar and its impact on financial performance tend to have more conflicting results (Ahmad et al., 2021; Carnini Pulino et al., 2022; Xie et al., 2019).

ESG has become an increasingly used tool to measure an organization's efforts concerning sustainability. Prior research focusing solely on green initiatives'

impact on financial performance indicates conflicting results (Li et al., 2017). The contradicting results indicate that the relationship between a firm's environmental activities and financial performance is a relevant topic of discussion.

3.2 Advantages and Disadvantages of Issuing Green Bonds

The need for climate change solutions is forthcoming as the issuance of green bonds is increasing in prevalence. "Green financing is expected to reduce global coal consumption to 2,5% below business-as-usual in 2030" (Alonso-Conde & Rojo-Suárez, 2020). The issuance of green bonds may imply benefits that can help incentivize green investment. However, previous studies suggest that the market is still developing and that there are some limitations that could hinder the issuance of green bonds.

Flammer (2021) exhibits three potential rationales for issuing corporate green bonds. The first rationality is that green bonds serve as a credible signal of the company´s environmental commitment. Issuing green bonds allows companies to signal that they are committed to undertaking investments in green projects, as well as improving their environmental footprint. The issuance of green bonds may also be a form of "greenwashing", which refers to companies making unsubstantiated or misleading information about the company´s environmental commitment. Lastly, if green bonds investors focus on societal benefits rather than financial returns, companies will obtain cheaper financing. The following sections present findings from previous academic literature addressing these rationales, which could impact financial performance directly or indirectly.

3.2.1 Greenium

The Green Bond Premium (Greenium) is considered an important incentive for issuers to issue more green-labeled bonds. Greenium leads to a lower yield for the investors, and a reduced interest rate for the issuer (Sergei & Alesya, 2022). The greenium can be defined as "the yield differential between a green bond and its counterfactual conventional bond after controlling for their difference in liquidity" (Zerbib, 2018). Despite the fact that there is increasing evidence of the relationship between ESG and CSR activities on security pricing, it is limited knowledge regarding whether ESG factors may affect asset prices. Prior literature comprises mixed evidence reflecting if there exists a potential greenium for green

bonds. Also, the question of whether ESG investments provide value to investors connected to a security's expected risk and return attributes is considered significant (Larcker & Watts, 2020).

Previous studies on green bonds have focused on whether green bonds are priced at a premium compared to conventional bonds (Baker et al., 2018; Mandel & Karpf, 2017; Zerbib, 2018). These studies investigated the yield term structures of green and conventional bonds from the US American municipal bond market. First, Mandel & Karpf (2017) states that even though conventional bonds have higher returns than green bonds, on average, a positive yield spread between green and conventional bonds indicates a green bond "premium". The yield spread can be explained by the distinction in the mean characteristics between conventional and green bonds.

Moreover, Baker et al. (2018) also found a green bond premium supporting the prediction that there exists a "Greenium"; green bonds have lower yields relative to conventional bonds. The authors state that pricing effects are considered stronger for green bonds. Another study by Zerbib (2018) found a small negative premium of 2 basis points, whereas the yield of a green bond is lower compared to a conventional bond. The existence of a greenium would suggest that issuers can expect a lower yield relative to conventional bonds due to the proceeds will be exclusively applied to fund sustainable projects.

Furthermore, previous studies indicate that there is an absence of greenium for green bonds compared to conventional bonds (Larcker & Watts, 2020; Sergei & Alesya, 2022). Several studies report that investors are willing to give up financial benefits in order to invest in environmentally or socially responsible assets (Larcker & Watts, 2020). Larcker & Watts (2020) investigated whether investors are willing to trade off wealth for societal benefits and found little evidence due to a price difference between green and conventional bonds. They found that the result conducted from this study puts the greenium equal to zero (Larcker & Watts, 2020).

Martin & Moser (2015) provide evidence suggesting that investors and managers tend to value green investments involving societal benefits. The study states that although green investments are independent of future cash flow and risk, investors respond positively. "Firms often undertake activities that do not necessarily

increase cash flows (e.g., costly investments in corporate social responsibility or CSR), and some investors value these non-cash activities (i.e., they have a "taste" for these activities)" (Friedman & Heinle, 2016).

Additionally, studying the pricing of corporate green bonds, Flammer (2021) and Tang & Zhang (2020) examine the cost of capital argument. This argument involves that green bond investors are willing to trade off financial returns for societal benefits. Hence, companies will issue green bonds to achieve cheaper debt financing. These studies suggest that there are no pricing differences between green bonds and conventional bonds by the same issuer, which is inconsistent with the cost of capital argument. Moreover, Sergei & Alesya (2022) explored the existence and determinants of greenium in Europe. Overall, the results from the study indicate that there exists a greenium of 4 basic points in the European market. At the same time, there are no findings suggesting green bond premium regarding the markets in the UK, France, Germany, and the Netherlands. These findings reveal contradictory results regarding a greenium in the market, which raises the question if there are other economic benefits of issuing green bonds.

3.2.2 Green Bonds Impact on Financial Performance

A few previous studies analyze the impact of green bonds on financial performance. A study conducted by Ley (2017) tests the relationship between green bonds and financial performance using the Fama-French model. The results indicate that green bond issuance positively impacts the expected financial performance (Ley, 2017). These findings are consistent with the study conducted by Zhou & Cui (2019). The authors implemented propensity score matching method and DiD methods to estimate the effect of green bond issuance (Zhou & Cui, 2019). This research suggests that issuing green bonds enhances profitability, operational performance, and innovation capacity.

Moreover, Alonso-Conde and Rojo-Suárez (2020) conducted a scenario analysis to study whether there are financial incentives for issuing green bonds (Alonso-Conde & Rojo-Suárez, 2020). The conclusions from this study indicate that shareholders' internal rate of return (IRR) is considered higher when issuing green bonds than obtaining bank loans to finance investments. In addition, in the majority of the study, the issuance of green bonds results in higher average debt

service coverage ratios. Hence, this study suggests that the financing of green bonds comprises a strong financial incentive for sponsors.

According to Maltais & Nykvist (2020), there are other relevant strategic incentives that need to be considered. Based on the information from in-depth interviews, the authors analyzed the incentives for engagement in the green bond market in Sweden. The authors highlight the reduction in the cost of capital and better access to capital as financial incentives for issuing green bonds (Maltais & Nykvist, 2020). However, they concluded that there is stronger evidence in favor of business-case incentives, citing advantages such as attracting customers and employees and broader signaling effects rather than direct financial incentives.

Yeow and Ng (2021) explored the association between green bonds and corporate financial performance using the propensity score matching method and DiD. The authors utilize ROA and asset turnover to examine whether the issuance of green bonds contributes to better operating performance and corporate efficiency (Yeow & Ng, 2021). The result indicates that green bonds are nearly equivalent to conventional bonds in terms of financial benefits.

3.2.3 Signaling Effect

Previous findings suggest that the stock market responds positively to companies issuing green bonds and climate-friendly behavior (Flammer, 2021; Krueger, 2014; Tang & Zhang, 2020). Tang and Zhang (2020) examined the relationship between green bonds and shareholder value. The authors aim to investigate whether issuing green bonds has a positive impact on a firm's stock price and if the impact is greater for firms with high environmental performance (Tang & Zhang, 2020). They conclude that issuing green bonds positively corresponds to the stock price, particularly for firms with high environmental performance.

In order to investigate environmental performance, Flammer (2021) analyzes the firm-level outcomes due to the issuance of green bonds. The findings indicate that green bond issuers improve their environmental performance by observing decreased CO_2 emissions and increasing the company's environmental rating. Also, findings suggest that green bond issuers achieve an increase in ownership by green investors post issuance and long-term investors. These findings support

the idea that green bonds provide a credible signal of the firm's environmental commitment.

The conclusions from these papers indicate a positive reaction from the stock market, which illustrates that investors are positive about including climate friendly projects in their portfolios. Moreover, the articles indicate that better ESG performance improves access to finance. However, the lack of regulatory enforcement regarding green bond issuance creates uncertainty of the credibility of the green bond. Further, the external certification has been suggested as an effective tool to identify credible green bonds from green bonds with a higher risk of greenwashing, which signals to investors the transparency of the bonds (Yeow & Ng, 2021). This type of certification can verify the use of proceeds and reduce information asymmetry. Academic literature has identified a correlation between certified green bonds and environmental performance (Flammer, 2021; Yeow & Ng, 2021), which supports the credibility of a certified green bond. However, obtaining such credentials is still a matter of a firm's governance.

3.2.4 Greenwashing

Green bonds have faced criticism for the absence of standardization and the possibility of greenwashing (Berrone et al., 2015; Flammer, 2021; Lyon & Montgomery, 2015; Marquis & Toffel, 2016). "Greenwashing encompasses a range of communications that mislead people into adopting overly positive beliefs about an organization's environmental performance, practices, or products" (Lyon & Montgomery, 2015). In this practice, companies would issue green bonds, sending a credible signal that they are environmentally responsible, but without taking substantial actions.

Concerning the responsibility of the natural ecosystem, companies strive to improve their greener practices and gain the approval of their stakeholders. Hence, environmental actions are considered effective means for firms to achieve social acceptance (Berrone et al., 2015). Moreover, Lyon & Montgomery (2015) conducted a study including a theoretical framework that captures the internal and external drivers of greenwash; lax regulatory environment, weak political pressure, low visibility, and being "relatively" green. According to Lyon & Montgomery (2015), varieties of "misleading" communication appear in especially organization theory, economics, and marketing. Typical mechanisms of

misleading behavior may be disconnected between structures and the activities of an organization, disconnect between promises and actions, and the inability to evaluate individual attributes apart from an overall impression (Lyon & Montgomery, 2015).

Yeow & Ng (2021) found that certified green bonds positively impact a firm's environmental performance as opposed to non-certified green bonds. These results indicate uncertainty as to whether green bonds encourage green investment or if they simply identify investments that would have been made using conventional bonds regardless. The lack of regulatory requirements for issuing green bonds poses as an opportunity for firms to signal their commitment to addressing environmental issues without proven results. Additionally, due to the lack of a regulatory framework for green bonds, some green bonds may not be invested in green projects, leading to trends of greenwashing or misguiding the green label in the sustainable finance industry.

4.0 Hypotheses

Since there is little to no research regarding whether green bonds affect a firm's financial performance and environmental performance, we are interested in identifying how the issuance of green bonds affects profitability in American firms. In order to investigate a firm's profitability, we will identify several accounting-based performance measures such as ROE, ROA, and OCF. Additionally, we will identify the following environmental performance measures: ESG Score and Environmental Pillar Score (EPS). Surely, the question of whether to issue a green bond relative to a conventional bond is crucial for an issuer of a firm. In this paper, we will investigate whether green bonds issuance positively affects both the accounting and environmental figures.

Initially, we have presented literature and previous studies examining the connection between green bonds and financial and environmental performance, which is the basis of our hypotheses. Hence, we will test the following two hypotheses in this paper to answer our research question:

1. Green bond issuance is positively associated with financial performance.
2. Green bond issuance is positively associated with environmental performance.

5.0 Methodology

This thesis uses a quantitative method based on the descriptive characteristics of this research question. The chapter provides an extensive description of the method applied to answer the research question and the data collection procedure.

5.1 Data Collection

We started by extracting conventional and green bonds from Refinitiv Eikon to construct the dataset. The downloaded data includes bond characteristics such as issuer, region of incorporation, issue date, issue price, coupon, amount issued, and maturity date. Refinitiv Eikon provides a green bond identifier that utilizes a green bond indicator with a value of "Yes" to distinguish between conventional and green bonds. Additionally, we included green bonds from Bloomberg's fixed income database to ensure that we had encompassed all the green bonds issued in the US between 2016 to 2021. The ESG scores were retrieved from Refinitiv Eikon. Based on reported data in the public domain, Refinitiv Eikon has compiled ESG scores for more than 12,500 companies worldwide (Refinitiv, 2022). ESG Score is presented as a rating between 0 to 100, where a score of 100 indicates perfect sustainability. Furthermore, the database also provides a score for each of the three pillars; environmental, social, and governmental, that are included in the dataset. EPS is the weighted sum of resource emissions and environmental innovation category scores.

The accounting data in our sample are obtained from Standard & Poor's Compustat. We utilized Compustat North America to retrieve accounting information for US companies. Compustat comprises detailed accounting data for each firm, along with firm identifiers such as ISIN, Cusip, ticker, sector, and country of incorporation. The main accounting data obtained for each firm are total assets, total liabilities, EBIT, EBITDA, retained earnings, stockholders' equity, and net income. The values obtained were all book values. Based on the accounting details, we derived the main variables ROA, ROE, and OCF for our analysis. ROA is a financial ratio that measures how profitable a firm is in relation to its total assets. ROA is calculated as the ratio of net income to total assets. Second, ROE measures financial performance by dividing net income by shareholders' equity. Moreover, OCF measures the cash generated by a firm's regular business operations. OCF is calculated as operating activities net cash

flow divided by total assets. To mitigate the impact of outliers on the analysis, the ratios are winsorized.

In order to include both bonds and accounting data in our dataset, we merged the data for bonds and accounting details, primarily using year and firm identifiers such as Cusip and ticker, to assemble the datasets. This resulted in certain conventional and green bonds having incomplete data concerning their related accounting figures. To prevent the exclusion of firms with missing values from our observations, we supplemented them with accounting details obtained from financial analysis in Bloomberg.

We have identified all green bonds in the US from 2016 to 2021. The dataset includes a sample of 832 conventional bonds and 81 green bonds for both governments and corporations in the US. As we have chosen to focus on the US market, only the currency in USD is used throughout the dataset, as well as ISIN-code with country identification "US". There are many firms that issue multiple bonds in the same year. Therefore, we removed duplicates to achieve a dataset that is at a firm-year level, that is, one observation for each firm-year. Then, we ended up with a panel data set, including a sample of 81 green bonds. As we examined the effect on ROA, we have excluded some non-profit organizations as these entities do not operate to generate profit for their owners.

The dataset has a quantitative approach consisting of panel data. "A panel data set has multiple entities (N), each of which has repeated measurement at different time periods (T)" (Park, 2011). Since our dataset includes a few periods (years) and relatively many corporations in the US, it is called a short panel. However, we do not have measurements for all corporations and for all years (periods). The panels are unbalanced as the data has some computation and estimation issues due to the fact that entities are observed a different number of times. Still, our dataset is able to handle this type of data (Park, 2011).

Year	Conventional Bonds	Green Bonds
2016	92	5
2017	135	3
2018	192	7
2019	194	21
2020	219	28
2021		17
Total	832	81

Table 1 - Distribution of bonds in our dataset

5.2 Evaluation of Data

Multiple linear regression is a method used to understand the relationships between several explanatory variables and a dependent variable. As we use panel data in our data set, there are several problems that we need to address to ensure valid and reliable results. Heteroskedasticity and endogeneity are among some of these problems that might occur. In order to address these challenges regarding panel data, it is essential to conduct tests to determine whether or not these problems occur.

5.2.1 Breusch Pagan test

A well-known problem that often occurs in regression is heteroscedasticity. To determine whether or not heteroskedasticity is present in our regression models, we have conducted a Breusch Pagan test. This test assumes that the error terms are normally distributed. Our null hypothesis presents homoscedasticity; the residuals are distributed with equal variance, while our alternative hypothesis presents heteroscedasticity; the residuals are not distributed with equal variance. Our result of this test indicates a p-value of 0.0000 for the dependent variables ROA, ROE, OCF, and EPS. Hence, we can reject these null hypotheses and conclude that there is sufficient evidence that heteroscedasticity is presented in these four regression models. However, the dependent variable ESG Score has a p-value of 0.3503 and is not significant at any level. Therefore, we cannot reject the null hypothesis, and we can confirm that homoscedasticity is presented in this regression model.

5.2.2 Hausman test

We have conducted a Hausman specification test to decide whether a fixed effect model is the most relevant and significant in our panel data. This test compares fixed and random effect models. "A fixed effect model asks how heterogeneity from group and/or time affects individual intercepts, while a random effect model hypothesizes error variance structures affected by group and/or time" (Park, 2011). The purpose of this test is to examine the Hausman null hypothesis; the individual effects are not correlated with other regressors (Park, 2011). Our result of this test indicates a p-value of 0.0000 for the dependent variables ROA, ROE, ESG Score, and EPS and a p-value of 0.0001 for the dependent variable OCF. All these p-values are significant at a 1% level. Hence, we can reject the Hausman null hypothesis and confirm that a fixed effect model is the most appropriate to use in our analysis. To deal with heteroskedasticity, we will use clustered standard errors by firm level. Implementing these measures will mitigate potential errors and biases that may affect the obtained results, thereby enhancing the internal validity of the analysis.

5.3 Fixed Effects Model

In order to test our hypothesis, we employed a fixed effect regression model with a varying number of included variables. The fixed effects model is used to estimate the effect of intrinsic characteristics of individuals in a panel data set (Park, 2011). As we have used panel data with observations of the same individuals over time, we have concluded that a fixed effect model is the most appropriate to use. In our analysis, it is important to understand what impact the estimation used in our regression models in Stata had on the output produced. Fixed effects are preferred as our data involves that N is large relative to T.

We have included fixed effects for industry and year. Including the fixed effects will provide more robust and reliable estimates by controlling for unobserved heterogeneity and time-specific shocks. Further, the fixed effects help address potential endogeneity concerns. Endogeneity may arise due to unobserved factors affecting the dependent and independent variables (Hill et al., 2018). Including the fixed effects mitigate potential endogeneity issues by capturing unobserved factors that may be correlated with the independent variables.

Identifying the appropriate performance measures for our population poses a challenge, as there is no definitive answer as to which measures are the most suitable. However, we chose return on assets (ROA), return on equity (ROE), and operating cash flows (OCF) to measure how financial performance is impacted. ROA and ROE are common measurements for profitability and are commonly used by investors to evaluate the financial health of a firm. Additionally, we wanted to include OCF to determine whether the issuance of green bonds influences another financial metric that captures the operation activities. To test the hypothesis concerning financial performance, we employed the following regression models:

$$ROA_{i,t} = \beta_0 + \beta_1 * GreenBonds_{i,t} + \beta_2 * Size_{i,t} + \beta_3 * Leverage_{i,t} + \beta_4 * BM_{i,t} + \beta_5 * Loss_{i,t} + \varepsilon \qquad 1$$

$$ROE_{i,t} = \beta_0 + \beta_1 * GreenBonds_{i,t} + \beta_2 * Size_{i,t} + \beta_3 * Leverage_{i,t} + \beta_4 * BM_{i,t} + \beta_5 * Loss_{i,t} + \varepsilon \qquad 2$$

$$OCF_{i,t} = \beta_0 + \beta_1 * GreenBonds_{i,t} + \beta_2 * Size_{i,t} + \beta_3 * Leverage_{i,t} + \beta_4 * BM_{i,t} + \beta_5 * Loss_{i,t} + \varepsilon \qquad 3$$

Further, to measure whether green bond issuance impact environmental performance, we have chosen ESG Score and EPS as dependent variables. The following regression models are used to examine the hypothesis regarding environmental performance:

$$ESG_{i,t} = \beta_0 + \beta_1 * GreenBonds_{i,t} + \beta_2 * Size_{i,t} + \beta_3 * Leverage_{i,t} + \beta_4 * BM_{i,t} + \beta_5 * Loss_{i,t} + \varepsilon \qquad 4$$

$$EPS_{i,t} = \beta_0 + \beta_1 * GreenBonds_{i,t} + \beta_2 * Size_{i,t} + \beta_3 * Leverage_{i,t} + \beta_4 * BM_{i,t} + \beta_5 * Loss_{i,t} + \varepsilon \qquad 5$$

GreenBonds is a dummy variable, an indicator variable equal to 1 if the bond is labeled Green and 0 if the bond is not. *Size* refers to the natural logarithm of the book value of total assets. *Leverage* is the ratio of debt to the book value of total assets. *Book-to-market ratio* (BM) is a financial metric that evaluates a firm's current market value relative to its book value. To calculate BM, we have used the book value of equity (CEQ) divided by the market value of equity.

The *Loss* variable is a dummy variable that takes a value of 1 if the income before extraordinary items is less than zero, and it takes a value of 0 otherwise. All variables, except for *GreenBonds* and *Loss*, are winsorized to prevent outliers from significantly impacting the analysis.

6.0 Results

This section presents our empirical results. First, we show the summary statistics and the distribution of our variables to achieve a broader understanding of the results. Further, we present the results from the tests. Lastly, we determine whether the hypothesis can be rejected or not, and whether green bonds affect financial and environmental performance.

6.1 Univariate Results

To determine whether the variables we use in the regression model differ significantly between conventional bond issuers and green bond issuers, we have conducted a t-test. In order to determine whether or not we can reject the null hypotheses that they are the same across two groups, we have concluded that a t-test is suitable.

	Conventional Bonds	Green Bonds	Diff	pvalue
ROA	-0.19	0.03	0.2171	0.1442
OCF	-0.06	0.05	0.1120	0.0637
ROE	0.01	0.07	0.0623	0.5966
Environmental Pillar Score	47.64	75.11	27.5491	0.0000
ESG Score	54.93	77.12	22.1942	0.0000
Size	8.55	9.73	1.1773	0.0006
Leverage	1.24	1.36	0.1204	0.7246
BM	0.54	0.54	-0.0054	0.9657
Loss	0.28	0.12	-0.1566	0.0023

Table 2 – Difference of means and t-test comparing conventional and green bonds.

Table 2 presents the respective means, the differences in means, and the corresponding p-values from the t-test comparing conventional and green bonds. The comparison is based on financial and environmental indicators. For the variable ROA, the p-value is slightly larger than the significance level of 10%, suggesting that the difference in ROA between the groups is not statistically significant. Further, OCF has a p-value of 0.0637, indicating that the variable is statistically significant at a 10% level. The p-value for ROE is 0.5966, indicating

that the difference in ROE between the groups is not statistically significant at any level. The table indicates that green bonds have a higher average OCF in comparison to conventional bonds. This suggests that the issuance of green bonds generates a slightly positive operating cash flow. In contrast, the issuers of conventional bonds have, on average, a negative return on assets and operating cash flow. However, ROA and ROE are not statistically significant at any level, indicating that green bonds do not have a higher average ROA and ROE than conventional bonds.

The p-value for the EPS and ESG score is 0.0000, which indicates a highly significant difference in the variables relevant to conventional and green bonds. The same interpretation applies to the variables' size and loss, as their p-values are 0.0006 and 0.0023, respectively. The table indicates that green bonds have a higher average ESG Score and EPS in comparison to conventional bonds. This suggests that the issuance of green bonds generates a better performance in areas related to the environment, social responsibility, and corporate governance and better environmental performance, on average, relative to conventional bonds.

The p-value for leverage is 0.7246, which exceeds the significance level of 10%. This suggests that there are no significant differences between the groups in terms of leverage. Finally, the p-value of the BM is 0.9657, suggesting that the variable is not statistically significant. Based on the results of the t-tests, it is evident that there are significant differences for several of the variables included relevant to the groups' conventional and green bonds. Consequently, we proceed with the regression model to examine the relationships further.

6.2 Regression Model

This section presents our results from the regression models using a fixed effect model. In order to test how green bonds affect financial performance and environmental performance, we use the fixed effects *industry* and *year*, including several control variables.

6.2.1 Results Financial Performance

The tables 3, 4, and 5 show the results of OLS estimates of the models presented in Equations 1, 2, and 3, respectively. Model (1) within each table includes *GreenBonds* as the independent variable without incorporating fixed effects.

However, the model considers clustering at the firm level, which is consistent for all the three models. Additionally, model (2) includes *GreenBonds* as the independent variable and fixed effects on industry and year. Lastly, model (3) in each table shows the regression of ROA, ROE, and OCF, including fixed variables using the complete sample of bond issuers. The models include fixed effects on industry and year.

| | Dependent variable: | | |
| | ROA | | |
	(1)	(2)	(3)
GreenBonds	0.229***	0.075**	-0.012
	(0.000)	(0.047)	(0.874)
Size			0.168***
			(0.001)
BM			0.327**
			(0.042)
Leverage			-0.032**
			(0.049)
Loss			-0.085
			(0.355)
Constant	-0.200***	-0.186***	-1.744***
	(0.000)	(0.000)	(0.001)
Industry FE	No	Yes	Yes
Year FE	No	Yes	Yes
Observations	911	911	844
R^2	0.002	0.069	0.241

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 3 - ROA regression results with varying fixed effects.

Table 3 illustrates how green bond issuers perform in terms of ROA. Model (1) shows that the *GreenBonds* coefficient is statistically significant, implying that the issuance of green bonds positively affects ROA. Model (2) and (3) indicate a decrease in the coefficients, while the coefficient in Model (2) still is statistically significant at a 5% level. Model (3) shows that *GreenBonds* are not statistically significant, indicating that the issuance of green bonds is not positively associated with ROA. The R-squared measures the goodness-of-fit of the regression model,

whereas higher R-squared values indicate a better fit of the model to the data (Adkins & Hill, 2011, p. 126). In this table, the R-squared for model (3) is 24,1% showing a very low level of correlation between *GreenBonds* and ROA.

	Dependent variable:		
	ROE		
	(1)	(2)	(3)
GreenBonds	-0.060	-0.025	-0.042
	(0.239)	(0.696)	(0.576)
Size			0.049*
			(0.072)
BM			0.000
			(0.998)
Leverage			0.042*
			(0.067)
Loss			-0.394***
			(0.000)
Constant	0.004	0.015	-0.437
	(0.932)	(0.738)	(0.148)
Industry FE	No	Yes	Yes
Year FE	No	Yes	Yes
Observations	584	584	555
R^2	0.000	0.065	0.139
Note:	*** $p<0.01$, ** $p<0.05$, * $p<0.1$		

Table 4 - ROE regression results with varying fixed effects.

Table 4 shows how green bond issuers perform in terms of ROE. Neither model (1), (2), and (3) indicate that *GreenBonds* is positively associated with ROE, as they are not statistically significant. However, model (3) indicates that green bond issuance is not positively associated with ROE. The R-squared is very low for all the models, but slightly higher for model (3) with 13.9%, implying a low correlation between *GreenBonds* and ROE.

	Dependent variable:		
	OCF		
	(1)	(2)	(3)
GreenBonds	0.112***	0.043**	-0.003
	(0.000)	(0.023)	(0.909)
Size			0.071***
			(0.000)
BM			0.111*
			(0.051)
Leverage			-0.011*
			(0.058)
Loss			-0.068*
			(0.060)
Constant	-0.058***	-0.052***	-0.685***
	(0.008)	(0.009)	(0.000)
Industry FE	No	Yes	Yes
Year FE	No	Yes	Yes
Observations	911	911	844
R^2	0.004	0.095	0.311
Note:	*** p<0.01, ** p<0.05, * p<0.1		

Table 5 - OCF regression results with varying fixed effects.

Table 5 illustrates how green bond issuance is associated with OCF. Model (1) and (2) indicate that green bond issuance is positively associated with OCF. The *GreenBonds* coefficients are statistically significant at a 5% level. The variable *GreenBonds* are not statistically significant in model (3), indicating that green bond issuance is not positively associated to OCF. The R-squared in model (3) is 31%, implying a slightly low correlation between *GreenBonds* and OCF.

6.2.2 Results Environmental Performance

Further analysis investigates the relationship between green bonds and environmental performance. The tables illustrate the results of the multiple regression models, including ESG and EPS as the dependent variables. In model (1), *GreenBonds* is the only independent variable, without any fixed effects. Model (2) is a fixed effect model as the independent variable *GreenBonds* includes the fixed effects; industry and year. The only difference between model (2) and (3) is that model (3) includes several independent control variables; *Size*, *BM*, *Leverage*, and *Loss*. The three models presented in the tables below are run on the entire data sample, including varying fixed effects.

	Dependent variable:		
	ESG Score		
	(1)	(2)	(3)
GreenBonds	22.182***	20.558***	16.631***
	(0.000)	(0.000)	(0.000)
Size			5.083***
			(0.000)
BM			0.845
			(0.584)
Leverage			-0.227
			(0.510)
Loss			-1.076
			(0.645)
Constant	54.935***	55.006***	6.928
	(0.000)	(0.000)	(0.253)
Industry FE	No	Yes	Yes
Year FE	No	Yes	Yes
Observations	527	527	513
R^2	0.045	0.110	0.389
Note:	*** $p<0.01$, ** $p<0.05$, * $p<0.1$		

Table 6 - ESG Score regression results with varying fixed effects.

Table 6 shows how *GreenBonds* is associated with ESG Score. Model (1) and (2) find a positive coefficient for the *GreenBonds* variable and are statistically significant at a 1% level. This indicates that the issuance of green bonds has a

greater ESG Score in comparison to conventional bonds at issuance. Moreover, the variable *GreenBonds* are statistically significant on all levels in model (3). This implies that a green bond does have a significant effect on its ESG Score. Model (3) indicates that GreenBonds is positively associated with ESG Score with a coefficient of 16.631. Model (3) has the highest R-squared of 38.9%, indicating that 38.9% of the variation is described through our multiple regression model. Hence, there is a slightly low correlation between *GreenBonds* and ESG Score.

	Dependent variable:		
	Environmental Pillar Score		
	(1)	(2)	(3)
GreenBonds	27.465***	26.072***	23.554***
	(0.000)	(0.000)	(0.000)
Size			7.154***
			(0.000)
BM			1.012
			(0.555)
Leverage			-0.240
			(0.570)
Loss			6.188*
			(0.055)
Constant	47.641***	47.741***	-23.725***
	(0.000)	(0.000)	(0.009)
Industry FE	No	Yes	Yes
Year FE	No	Yes	Yes
Observations	474	473	460
R^2	0.040	0.118	0.360
Note:		*** $p<0.01$, ** $p<0.05$, * $p<0.1$*	

Table 7 - Environmental Pillar Score regression results with varying fixed effects.

Table 7 illustrates how *GreenBonds* are associated with Environmental Pillar Score (EPS). Model (1), (2), and (3) has a positive coefficient on *GreenBonds*, indicating that green bond issuers have a greater EPS than conventional bonds. The *GreenBonds* variable in model (3) is statistically significant on all levels, implying that green bonds do have a significant effect on its EPS. Also, the R-squared in model (3) is 36%. This measure shows a low-level correlation between green bonds and EPS.

7.0 Analysis

This chapter analyses the results presented in the empirical section above. The purpose of this chapter is to analyze the data collected for the research paper and to examine whether our results support our hypothesis. In the first section, we will examine the results of the financial performance analysis, and further, in the second section, the results of the environmental performance analysis.

7.1 Financial Performance Analysis

The results in section 6.2.1 show whether we can conclude with our following hypothesis; *Green bond issuance is positively associated with financial performance.*

Financial performance involves the effectiveness and efficiency related to how a firm manages its financial resources and generates profits. In our analysis, we have used the following measures: ROA, ROE, and OCF, to examine how well American firms are performing financially related to the issuance of green bonds. By analyzing these measures, investors, stakeholders, and management can evaluate and make decisions about the firm's financial performance. The provided information in 6.2.1 includes regression analysis tables, which are commonly used in statistical analysis to examine the relationships between green bonds and the financial performance measures; ROA, ROE, and OCF.

Firstly, model (1) and (2), in table 3, suggest a significant relationship, but the significance disappears when we control for other firm characteristics such as Size, BM, Leverage, and Loss. Model (3) indicates that green bonds do not have a statistically significant impact on the dependent variable ROA. The associated p-value is higher than all significant levels, indicating that green bond issuance is not positively associated with ROA. Additionally, the R-squared at 24.1% indicates a low level of correlation between *GreenBonds* and ROA. Previous findings conducted by Yeow and Ng (2021) utilize ROA and asset turnover to examine whether green bonds affect financial performance. This result indicates that in terms of financial benefits, green bonds are nearly equivalent to conventional bonds. These findings support our result in that issuing green bonds does not necessarily lead to higher profits relative to conventional bonds.

Moreover, model (1), (2), and (3), in table 4, indicates that the issuance of green bond does not have a significant impact on ROE. Hence, this indicates that green bonds issuance does not have a positive association on ROE. Also, the R-squared is 13.9%, indicating a very low correlation between green bonds and ROE. Also, model (1) and (2), in table 5, suggests a significant relationship between green bonds and OCF. However, model (3) illustrates that the issuance of green bonds has no statistically significant impact on OCF as the p-values are higher than all significant levels. This indicates that green bonds do not have a positive association on OCF. In addition, the R-squared is 31%, implying a slightly low correlation between green bonds and OCF.

Furthermore, previous literature analyses the impact of green bonds on financial performance. Studies conducted by Ley (2017) and Zhou & Cui (2019) are both consistent with our hypothesis that green bonds actively contribute to enhancing profitability. These findings are inconsistent with our results as these findings support the hypothesis that green bonds positively affect financial performance.

The results from section 6.2.1 do not support our hypothesis as we do not find any evidence that there is an association between green bonds and ROA, ROE & OCF. Hence, we can reject our hypothesis and conclude that issuing green bonds does not have a positive association on financial performance.

However, as financing and investment instrument are essential to support a shift towards more sustainable operations, to support the transition to low-carbon and climate-resilient economics, the issuance of green bonds has become increasingly prevalent over the last years. As stated by OECD (2015), green investments often require significant upfront capital and have long development periods. Therefore, green bonds are expected to grow and correspondingly may contribute to increased profits in the long run. However, it is important to take into account that these results are based on statistical levels indicated in the table and that additional factors or considerations of this analysis do also influence the relationships between green bonds and the financial performance measures.

7.2 Environmental Performance Analysis

The results in section 6.2.2 determine whether we can conclude with our following hypothesis; *Green bond issuance is positively associated with environmental performance.*

The analysis consistently demonstrates a positive association between the issuance of green bonds and the ESG Score. As established in section 6.2.2, model (1), (2), and (3), in table 6, indicates that green bond issuance has a significant impact on the ESG Score as it is statistically significant on all levels. The results indicate a positive association between ESG Score and the issuance of green bonds. Green bonds are specifically designed to finance environmental projects, and their positive impact on the ESG score validates the effectiveness of this approach. Issuers can enhance their environmental, social, and governance performance by allocating funds towards environmentally friendly initiatives, ultimately contributing to sustainable development.

Further, the models in table 7 examine the relationship between green bond issuance and EPS, revealing a statistically significant and positive association. While the significance of the effect may vary slightly considering fixed effects variables, the overall findings support the notion that green bond issuance significantly impacts issuers' environmental performance. The result indicates that there is a positive association between green bond issuance and EPS. The result is anticipated since green bonds necessitate that issuers utilize the funds to support environmentally focused initiatives.

The R-squared varies across the models for the ESG Score regression and the EPS regression models. However, the R-squared for model (3) for both ESG Score and EPS is 38.9% and 36%, respectively, which is higher than the R-squared for model (1) and (2). The variation in R-squared values across the different models can be attributed to the inclusion of additional independent variables and fixed effects in the model. However, it is important to acknowledge that additional factors beyond the model's consideration may also influence the EPS.

The analysis provides strong evidence to support the hypothesis that green bond issuance is positively associated with environmental performance. The findings consistently demonstrate a positive association between the issuance of green

bonds and environmental performance. The findings validate the effectiveness of green bonds as a financing mechanism for promoting sustainable development. By channeling funds towards environmentally focused initiatives, companies can enhance their environmental, social, and governance performance, contributing to positive environmental outcomes.

As established, the ESG Score, and its pillars have become an increasingly used tool for assessing an organization's sustainability activities which investors use as a measurement for making investment decisions. Previous research has suggested that the stock market exhibits a positive response to companies' issuance of green bonds and their adoption of climate-friendly practices (Flammer, 2021; Krueger, 2014; Tang & Zhang, 2020). The increased ESG Score due to green bond issuance can enhance the company's reputation and attractiveness to investors who prioritize sustainability in their investment decisions.

8.0 Conclusion

Previous literature has examined various aspects of green bonds, including their pricing at issuance compared to conventional bonds, their impact on financial performance and environmental performance, and their signaling effect. This thesis has examined the following research question: *"Is there an association between a firm's green bond issuance and its financial performance?"* The main objective was to investigate whether the green bond issuance impacts profitability relative to conventional bonds. First, we analyzed the green bond market in American firms from 2016 to 2021. Second, we studied whether green bond issuance is positively associated with both financial and environmental performance.

The financial performance analysis provides results that do not support the hypothesis that green bond issuance is positively associated with financial performance. The study does not provide evidence of a significant and positive association between green bonds and ROA, ROE, and OFC. Due to the results provided in the analysis, there is a low correlation between green bond issuance and financial performance. Hence, we can reject the hypothesis and conclude that green bond issuance is not positively associated with financial performance. However, it is essential to acknowledge that green bond investments have long development periods and are forecasted to grow during the following years. Correspondingly, the issuance of green bonds may contribute to increased profits in the long run.

The environmental performance analysis supports the hypothesis that green bond issuance is positively associated with environmental performance. The results consistently demonstrate a significant and positive correlation between the issuance of green bonds, the ESG Score, and the EPS. These findings highlight the effectiveness of green bonds in financing environmentally focused initiatives and contributing to sustainable development. These results have important implications for investors, policymakers, and organizations seeking to incorporate sustainable practices and meet environmental targets.

9.0 Further Research

Our research investigates whether green bonds affect financial and environmental performance. The purpose of this master's thesis was to fill a knowledge gap that existed within the green bond theory and capital structure. We have examined how the issuance of green bonds affects capital structure and profitability in American firms relative to conventional bonds. Mainly how the issuance of green bonds affects a firm's performance. Another way to further investigate the issuance of green bonds could be to investigate other markets and populations to verify this study's results.

However, this study calls for future research. First, as green bonds are a relatively new financial instrument, the results are based on a small number of observations. Additionally, there is limited research on firm-level environmental information. As more data becomes available, future research could provide better large scale evidence of the long-term impact of green bonds on firm performance. The green bond market is expected to grow in the time ahead. As the market matures, it will be interesting to implement analysis with a broader sample. A larger sample may equalize further differences between green and conventional bonds.

References

Adkins, L., & Hill, R. (2011). *Using STATA For Principles of Econometrics.* John Wiley & Sons.

Ahmad, N., Mobarek, A., & Roni, N. N. (2021). Revisiting the impact of ESG on financial performance of FTSE350 UK firms: Static and dynamic panel data analysis. *Cogent Business & Management*.

Alonso-Conde, A.-B., & Rojo-Suárez, J. (2020). On the Effect of Green Bonds on the Profitability and Credit Quality of Project Financing. *Sustainability*.

Baker, M., Bergstresser, D., Serafeim, G., & Wurgler, J. (2018, April 27). Financing the Response to Climate Change: The Pricing and Ownership of U.S. Green Bonds. *Brookings Institution*, p. 38.

Bakken, R. (2021, August 09). *What Is Sustainable Finance and Why Is It Important?* Retrieved from Harward Extension School: https://extension.harvard.edu/blog/what-is-sustainable-finance-and-why-is-it-important/

Berrone, P., Fosfuri, A., & Gelabert, L. (2015, August 19). Does Greenwashing Pay Off? Understanding the Relationship Between Environmental Actions and Environmental Legitimacy. *Journal of Business Ethics*, 17.

Carnini Pulino, S., Ciaburri, M., Magnanelli, B. S., & Nasta, L. (2022). Does ESG Disclosure Influence Firm Performance? *Sustainability*.

CFI Team. (2023, January 12). *Green Bond*. Retrieved from Corporate Finance Institute: https://corporatefinanceinstitute.com/resources/esg/green-bond/#:~:text=In%202008%2C%20the%20World%20Bank,grown%20considerably%2C%20as%20shown%20below.&text=Today%2C%20more%

20than%2050%20countries,source%20of%20green%20bond%20issuance
s.

De Lucia, C., Pazienza, P., & Bartlett, M. (2020). Does Good ESG Lead to Better
Financial Performances by Firms? Machine Learning and Logistic
Regression Models of Public Enterprises in Europe. *Sustainability*.

Environmental Finance. (2021). *Trends in sustainable bonds issuance and a look
ahead to 2021*.

Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics*.

Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance:
aggregated evidence from more than 2000 empirical studies. *Journal of
Sustainable Finance & Investment*.

Friedman, H., & Heinle, M. (2016, May 13). Taste, information, and asset prices:
implications for the valuation of CSR. *Review of Accounting Studies*, p.
28.

Hill, R. C., Griffiths, W. E., & Lim, G. C. (2018). *Principles of Econometrics*.
Wiley Custom.

ICMA. (2021, June). *Green Bond Principles*. Retrieved from International Capital
Market Association:
https://www.icmagroup.org/assets/documents/Sustainable-finance/2022-
updates/Green-Bond-Principles_June-2022-280622.pdf

Kedia, N., & Joshipura, M. (2022). Green bonds for sustainability: current
pathways and new avenues. *Managerial Finance*.

Krishnan, M., Samandari, H., Woetzel, J., Smit, S., Pacthod, D., Pinner, D., . . .
Imperato, D. (2022, January 25). *The economic transformation: What
would change in the net-zero transition*. Retrieved from McKinsey
Sustainability: https://www.mckinsey.com/capabilities/sustainability/our-

insights/the-economic-transformation-what-would-change-in-the-net-zero-transition

Krueger, P. (2014, September 17). Corporate goodness and shareholder wealth. *Journal of Financial Economics* , p. 26.

Larcker, D., & Watts, E. (2020, March 6). Where's the greenium? *Journal of Accounting and Economics*, p. 26.

Lee, S., Lee, B., Kim, J., & Kim, J. (2013). A Financing Model to Solve Financial Barriers for implementing Green Building Projects. *Scientific World Journal*.

Ley, L. W. (2017). *A comparative study on the financial performance of Green bonds and their conventional peers.*

Li, S., Ngniatedema, T., & Chen, F. (2017). Understanding the Impact of Green Initiatives and Green Performance on Financial Performance in the US. *Business Strategy and the Environment* .

Lyon, T. P., & Montgomery, A. (2015, March 23). The Means and End of Greenwash. *Organization & Environment*, p. 27.

Maltais, A., & Nykvist, B. (2020). Understanding the role of green bonds in advancing sustainability. *Journal of Sustainable Finance & Investment*.

Mandel, A., & Karpf, A. (2017, February 25). Does it pay to be green? *Social Science Research Network*, p. 16.

Marquis, C., & Toffel, M. W. (2016, March). Scrutiny, Norms, and Selective Disclosure: A Global Study of Greenwashing. *Organization Science*, p. 29.

Martin, P., & Moser, D. (2015, September 7). Managers' green investment disclosures and investors' reaction. *Journal of Accounting and Economics*, p. 16.

Milken Institute. (2020). *Growing the US Green Bond Market: Lab 2*.

Mishkin, F. S., & Eakins, S. G. (2018). *Financial Markets and Institutions.* Pearson.

Natixis. (2022). *Green Bonds Review 1Q22: The green & sustainable bond market starts to mature.* Natixis.

OECD. (2015). *Green Bonds.* OECD.

OECD. (2017). *Mobilising Bond Markets for a Low-Carbon Transition.* OECD.

OECD. (2020). *ESG Investing: Progress and Challenges*. Retrieved from https://www.oecd.org/finance/ESG-Investing-Practices-Progress-Challenges.pdf

Park, H. (2011, October). Practical Guides to Panel Data Modeling: A Step by Step Analysis Using Stata. *International University of Japan*, p. 53.

Refinitiv. (2022, May). *Environmental, social and governance scores from refinitiv.* Retrieved from Refinitiv: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf

Research Synergy Institute . (2019, November 19). *Finding out the Novelty of the Research*. Retrieved from https://rsi.or.id/finding-out-the-novelty-of-the-research/

Rizos, V., Behrens, A., Van der Gaast, W., Hofman, E., Ioannou, A., Kafyeke, T., . . . Topi, C. (2016). Implementation of Circular Economy Business Models by Small and Medium-Sized Enterprises (SMEs): Barriers and Enablers. *Sustainability*.

Saunders, M. N., Lewis, P., & Thornhill, A. (2019). *Research Methods for Business Students.* Pearson.

Sergei, G., & Alesya, B. (2022, December 8). In Search of Greenium. Analysis of Yields in the European Green Bond Markets. *Procedia Computer Science*, p. 8.

Spiliakos, A. (2018, October 2018). *What does "sustainability mean in business?* Retrieved from Harward Business School: https://online.hbs.edu/blog/post/what-is-sustainability-in-business

Spinaci, S. (2021). *European green bonds.* European Parliamentary Research Service.

Statista. (2022). *Green bonds in the U.S. .*

Stuart, E. (2010, October). Matching Methods for Casual Inference: A Review and a Look Forward. *institute of Mathematical Statistics*, p. 22.

Tang, D. Y., & Zhang, Y. (2020). Do shareholders benefit from green bonds? *Journal of Corporate Finance*.

The World Bank. (2017, December 1). *Green Bonds*. Retrieved from The World Bank: https://www.worldbank.org/en/results/2017/12/01/green-bonds

The World Bank. (2021, December 8). *What You Need to Know About IFC´s Green Bonds*. Retrieved from The World Bank: https://www.worldbank.org/en/news/feature/2021/12/08/what-you-need-to-know-about-ifc-s-green-bonds

United Nations. (2022, 11 08). *Secretary-General's remarks at launch of report of High-Level Expert Group on Net-Zero Commitments*. Retrieved from United Nations: https://www.un.org/sg/en/content/sg/speeches/2022-11-08/secretary-generals-remarks-launch-of-report-of-high-level-expert-group-net-zero-commitments%C2%A0

Velte, P. (2017). Does ESG performance have an impact on financial performance? Evidence from Germany. *Journal of Global Responsibility*.

Xie, J., Nozawa, W., Yagi, M., Fujii, H., & Managi, S. (2019). Do environmental, social, and governance activities improve corporate financial performance? *Business Strategy and the Environment*.

Yeow, K. E., & Ng, S.-H. (2021). The impact of green bonds on corporate environmental and financial performance. *Managerial Finance*.

Yoo, S., & Managi, S. (2022). Disclosure or action: Evaluating ESG behavior towards financial performance. *Finance Research Letters*.

Zerbib, O. (2018, October 25). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. *Journal of Banking & Finance*, p. 22.

Zhou, X., & Cui, Y. (2019). Green Bonds, Corporate Performance, and Corporate Social Responsibility. *Economic and Business Aspects of Sustainability*.