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Course of Advanced Corporate Finance

Does ESG rating affect the stock market reaction to a
green bond issuance?

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1. Introduction

ESG – environmental, sustainability and governance – factors are becoming key drivers of corporate policies and strategies (Hart & Zingales, 2017). ESG is a common term used by investors to evaluate the externalities produced by the company using the three aforementioned dimensions. In fact, although financial factors remain the first criteria ruling the decision in an economic agent's behavior, investors are becoming more and more interested in non-financial factors to assess risks and opportunities linked to an investment (Lebelle, Jarjir & Sassi, 2020). In particular, environmental sustainability is becoming of primary importance due to the increasing relevance of long-term shifts in global temperature and changing weather patterns, i.e., climate change. (Baulkaran, 2019).

Green bonds are considered the most innovative financial instruments of the last decade (Kapraun, Latino, Scheins & Schlag, 2021). “*Green Bonds are any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible green projects and which are aligned with the four core components of the Green Bond Principles (GBP), namely, the use of proceeds, the process for project evaluation and selection, the management of proceeds, and reporting*” (ICMA, 2018). In other words, they can be defined as plain-vanilla fixed income securities whose proceeds are committed to finance environmental and climate-friendly projects like renewable energy, green buildings, or resource conservation. Green bonds were primarily issued by supranational agencies - such as the European Investment Bank (EIB) or the World bank who were the two pioneers of this type of debt instruments with issuance respectively in 2007 and 2008 -, and federal, local and municipal governments to fund projects that aim at mitigating global warming and supporting countries in their climate change adaptation plans. (Pineiro-Chousa, Lopez-Cabarcos, Cabi & Sevic, 2020). Recently, with the increasing importance of ESG factors, corporates are starting to issue green bonds as well to build a “green image” which brings real value for firms (Hamilton & Eriksson, 2011).

Regarding the green bond market, the literature agrees that the roots of the green bond market can be traced back to 2007 when the European Investment Bank (EIB) issued for the first time a green bond with nominal value of USD 807.2 million. The market started kicking off in 2013 and in December 2020 it reached the cumulative issuance of USD 1 trillion.

In 2021 a new milestone was reached in the green bond market, indeed, the annual issuances at global level ended up with USD 522.7 bn¹, a 75% increase on 2020.

¹ Climate bond initiative data platform

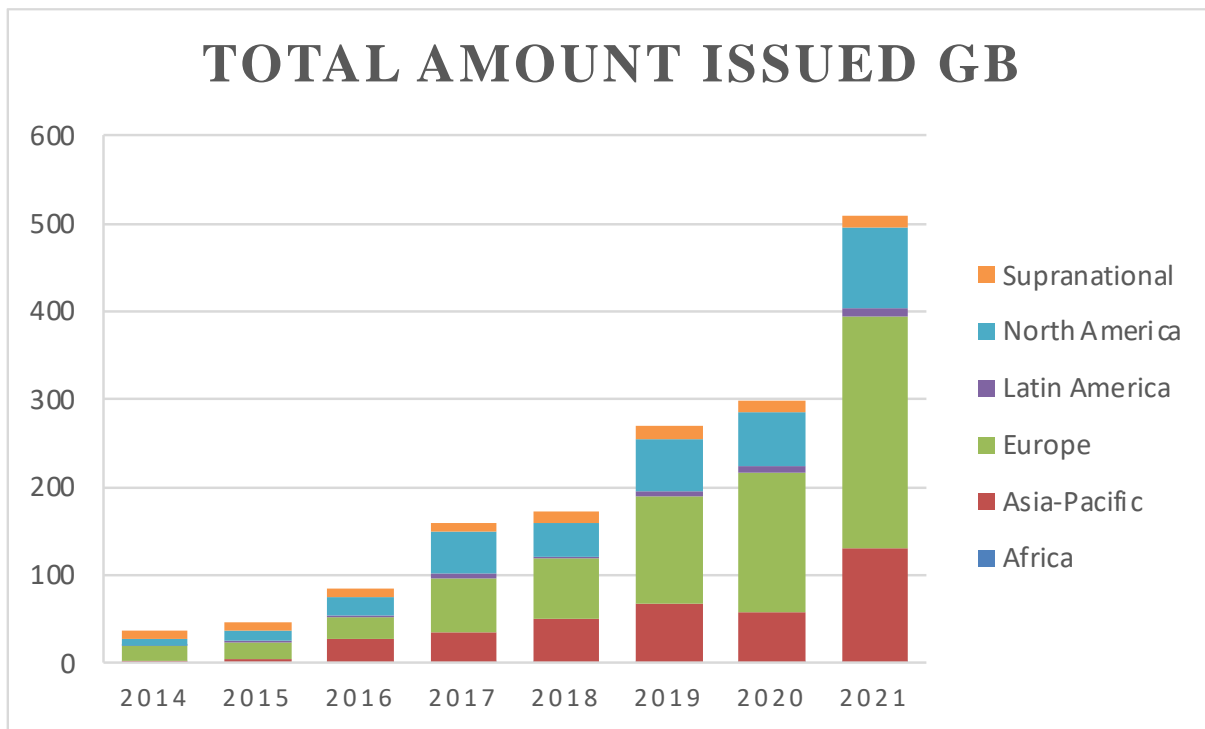


Figure 1, Total Amount issued by region, source: climate bond initiative 2022

If the attention is focused on the geographical breakdown of the issuances, it's possible to notice that Europe is the leading region, followed by North America and Asia-Pacific. The latter experienced the strongest annual growth (129%). In 2021, Europe was the most prolific issuance region, while Asia-Pacific experienced the strongest annual growth (129%). The main currency in which green bonds are issued are EUR, USD and CNY that accounted for 81% of the total issuance of green bonds. At a country level, the USA maintained its leading position as a source of green bonds, with volumes increasing by 63% to USD 81.9 bn. The USA's cumulative total stands at USD 304 bn, more than 50% larger than China which is the second largest country (USD199bn).

Moreover, most of the 2021 green volume came from developed markets while 21% was originated from emerging markets, this data is significant if compared with the one of 2017, 17%. Indeed, there has been an exponential growth from development banks (378%), financial (324%) and non-financial corporate (278%) issuers.

Another important aspect that should be considered is the issuance by issuer type.

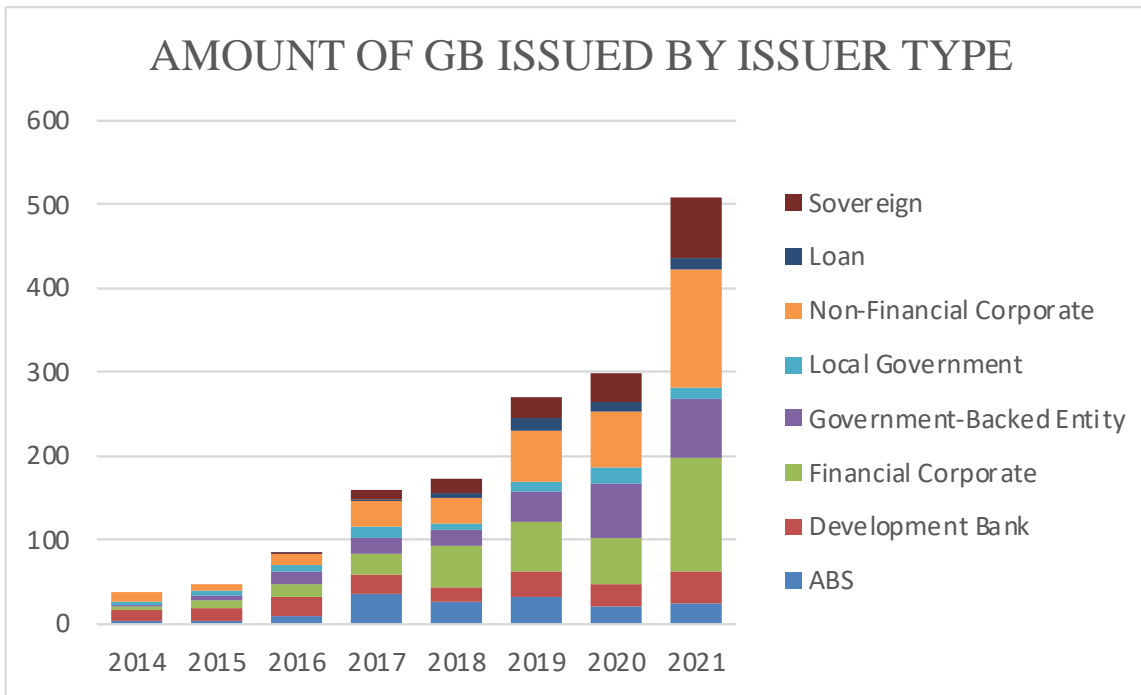


Figure 2, amount of GB issued by issuer type, source: climate bond initiative

As it can be seen in the chart (Figure 2), The private sector, driven by financial and non-financial corporates, represents an important portion of the total issuance. Private Sector accounted for 44% of the total green bond issuances in 2021. On the other hand, sovereigns have experienced a significant growth from 2020 and represents the 10% of the total volume. Market trend will be better discussed in the third chapter.

Not only the market has grown, in fact the themes of ESG and green bonds have gained importance between academics as confirmed by the increasing number of annual publications. As it can be noticed from figure 3, the number of publications on ESG has grown exponentially in the 5 years.

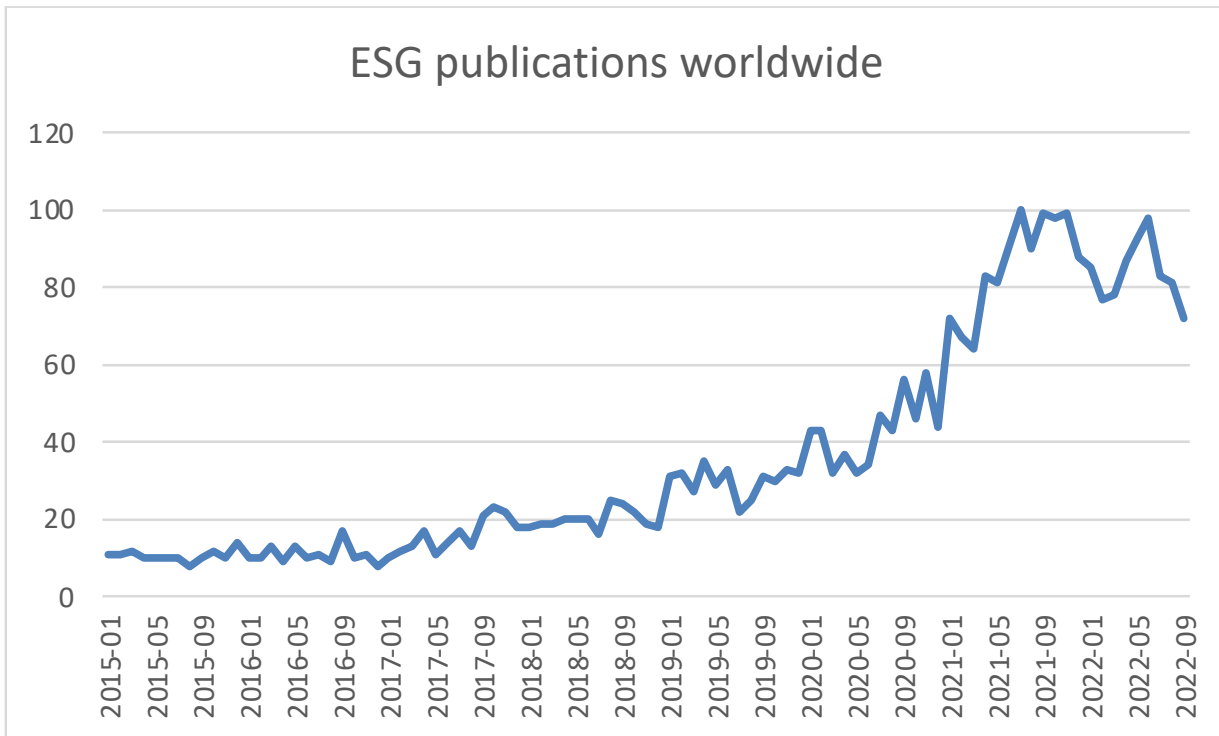


Figure 3, ESG Publication worldwide, Source: Scopus

Focusing on green bonds, instead, the increasing trend has been less exponential but still constant, the average number of publications has been quite high in the last decade, and it peaked in 2012, 2015 and 2021.

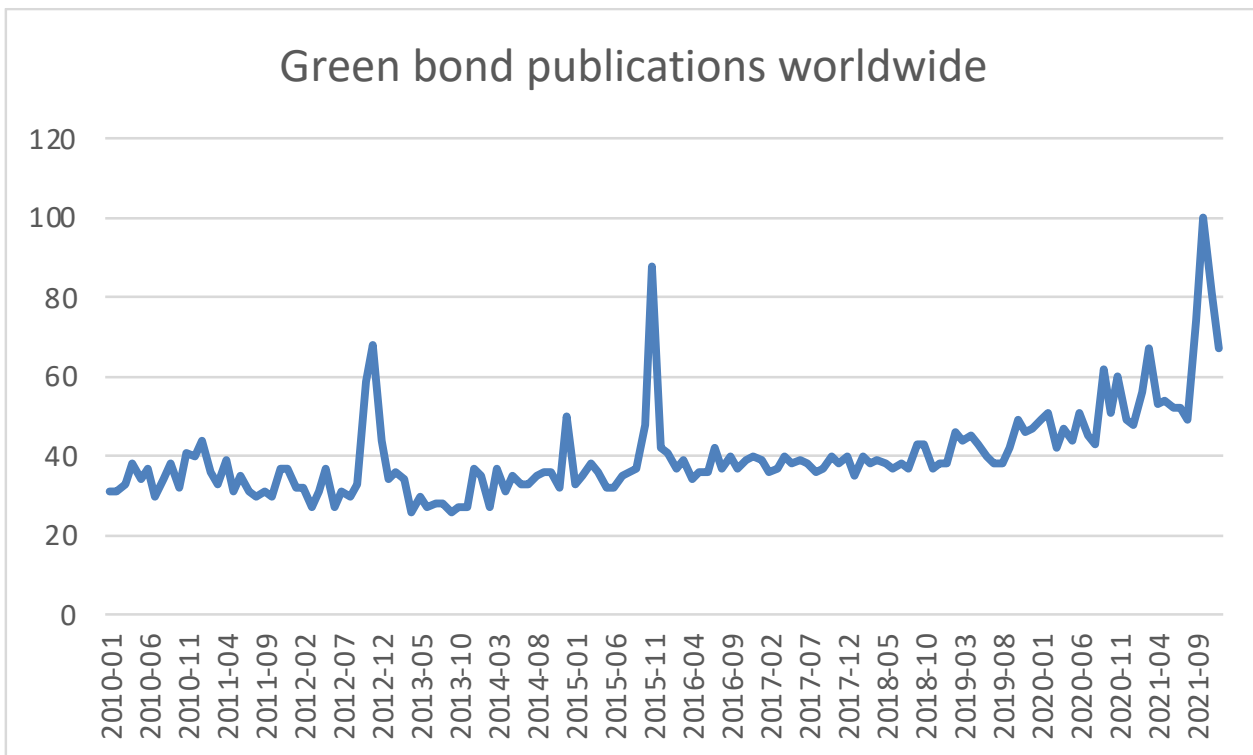


Figure 4 Green Bonds publications worldwide, Source: Scopus

The explanation to the increasing interest in green bonds can be found in the fact that this theme is of great importance for both managers and policymakers. From the point of view of the latter, green bonds will boost sustainable economic growth, increase global GDP, and significantly decrease greenhouse gas emissions (Maltais and Nykvist, 2020; Tuhkanen and Vulturius, 2020). This last aspect is of primary interest to policy makers, especially considering the many pledges and efforts by governments to tackle the issue of global warming and the EU ambitious program of reaching climate neutrality by 2050. The IEA report “Net Zero by 2050: A Roadmap for the Global Energy Sector ” quantified US \$ 5 trillion per year by 2030 as the investment needed for the energy transition, this amount would represent 4.5% of global GDP. After 2030, an additional \$ 4.5 trillion per year of investments will be required to achieve the zero-climate impact goal by 2050. Therefore, the ecological transition cannot only be sustained by public resources but must necessarily be the result of a collaboration with private financiers, with the international financial sector playing a leading role in providing credit and support for projects linked to the green revolution. Thus, green bonds can contribute to achieving the Paris Agreement and the Sustainable Development Goals (Tolliver, Keeley & Managri, 2019).

From the point of view of managers, green bonds can be considered very relevant for several reasons. First of all, a green bond issuance can signal the company’s commitment towards the environment (Flammer 2021). Indeed, by using this type of financing companies do commit a certain amount – on average 0,26 billion USD for public firms - of money to promote green projects. The signal can result even more powerful if the bond has a green certified label by third parties such as the Climate Bonds Standards by Climate bond Initiative (CBI). The certification guarantees that the proceeds of the bonds are effectively used to fund a green project. A great example of the signaling theory is the green issuance of Unilever during which the CEO affirmed that “the green bond was another step intended to demonstrate to the financial community the centrality of sustainability to the group’s business model”. Another important point is the positive effect of issuing green bonds on the cost of capital. Indeed, it has been proved that investors are willing to accept lower yields when investing in green projects (Flammer, 2021), thus lowering the cost of capital. In fact, the decrease in cost of capital is due to different reasons (Zhang, Li & Liu, 2021):

- A company that issues green bonds has to provide more information to the public lowering the information asymmetry between investors and bond issuer
- A company that issues a green security reduces the perceived risk

In light of the considerations above and as shown by the growing number of papers published, a deeper knowledge on the phenomenon is needed. As of today, a set of studies analyzed the effect of the macroeconomic context on green bonds markets (Coche et al. 2016) and on its determinants (Jun

et al. 2016), others underlined the connection between national development contributions and green bond issuance volumes (Tolliver et al. 2020). Martin and Moser (2016) investigated whether investors prefer the quality of the information in their investment decisions. Other studies analyzed the interconnection between green bonds and other financial instruments. For example, Reboredo (2018) explored the relationship between four international green bond indexes with other non-green financial indexes, Broadstock and Cheng (2019) studied the relationship between the US green bond market and the US conventional bond one, Liu et al (2021) explained the co-movements of green bonds and clean-energy stock market indexes. Another set of studies focused on the pricing of green bonds and on the existence of a greenium, which is a premium paid by investors to buy green securities. This is the case of Zerbib (2019), Patridge and Medda (2020), Gianfrate and Peri (2019) and Bachelet et al (2019). On the other hand, Chiesa and Barua (2019) analyzed the supply side. Finally, a niche of this studies based their studies on stock market reaction to green bond issuance. Roslen et al (2017) investigated how the announcement of the issuance influences the stock price of the issuer the following day. They found a negative CAR linked to the negative investor view of the increase of the issuer's indebtedness. Baulkaran (2019) found out that using a 21-day window the CAR was positive by 1.48%; the positive reaction was confirmed by Zhou and Cui (2019) as well. Other evidence of positive stock market was given by Jabunik and Uguz (2021), Wang et al (2020) and Tang and Zhang (2020). Anyway, none of them has studied the stock market reaction in relation with the ESG rating of the issuer.

In light of this, my study aims at understanding whether the stock market reaction to green bond issuance is affected by the ESG rating of the issuer. Therefore, the research question is “Does the ESG rating affect the stock market reaction to a green bond issuance?”.

The structure of the paper is divided as it follows: in the second chapter, the increasing importance of ESG starting from the passage from the shareholder theory to the stakeholder one. As it will be explained, this change of view has been an important boost for ESG. After this brief excursus, I will define ESG highlighting its effects on firm performance.

The third chapter regards green bonds. First, I will give some definitions of green bonds and I will better explain the exponential growth of the market. After that, I will investigate the drivers and the benefits of a green bond issuance.

In the fourth chapter I will develop the hypothesis needed to answer to my research question “*Does the ESG rating affect the stock market reaction to a green bond issuance?*” by explaining the rationale behind a positive/negative of the ESG rating on the stock market reaction.

Finally in the fifth chapter I will perform a quantitative analysis based on an event study (Faccio and Stolin, 2006; Mc Namara and Baden-Fuller, 2007) which is a wide use methodology by academics

and professionals to study the impact of an event on the stock price. The primary assumption of his methods is that capital markets are considered efficient (Fama, 1970) meaning that every public information has an effect – positive or negative - on the stock market prices. Thus, the issuer's stock market capitalization can be considered as a good proxy of its underlying value, which is affected by the spreading out of new information (Cappa, Oriani, Pinelli, De Massis, 2019).

Thus, to assess the impact of green bonds in relation to the ESG rating, I analyzed the stock market reactions to the issuance measured by the cumulative abnormal return (CAR), i.e., the stock market return in excess of the expected return in the days around the announcement (Liu et al., 2014). Then I used an OLS regression to study the relationship between the CAR and the ESG rating.

Finally, the sixth chapter presents the results.

The outcome of the analysis can be considered relevant for managers and practitioners that would like to use green bonds to finance their projects. In addition to advance the scientific understanding of the phenomenon and to provide useful indications to managers and policymakers, this research also paves the way for future research. This study is not exempt from limitations. In fact, it is set in the USA, while future studies should extend the context considered. Moreover, the data used relates to period 2018-2021 while future studies can also consider additional years.

The results of the analysis highlighted that companies that are already committed to ESG as highlighted by higher ESG ratings tend to have higher CARs. The reason could be that companies that are already committed to ESG results to be more credible from the lens of the investor. In fact, even though an issuance made by a company with a bad ESG rating could be sensational since it may represent the first step in its commitment, it could be perceived by investors as a greenwashing practice. On the other hand, a company that already has a positive ESG rating has already demonstrated its commitment, relies on a stronger reputation, and has already generated positive externalities

2. ESG

2.1 From the shareholder to the stakeholder theory

As explained in the introduction, ESG is a theme of growing importance. Sustainability is one of the most significant trends in financial markets for decades. Whether in the form of investors' desire for sustainable responsible investing (SRI), or corporate management's focus on corporate social responsibility (CSR), the content, focusing on sustainability and ESG (environmental, social and governance) issues, is the same.

On 19 August 2019, a group of CEOs from large companies in the U.S. signed a new Statement on the Purpose of the Corporation, in which they maintained that the purpose of a corporation is no longer to act in the sole interest of the shareholders but to create value for all the stakeholders (statement of purpose of a corporation, 2019). A shareholder can be defined as anyone who owns at least one share in the company. Shareholders typically receive declared dividends if the company does well and succeeds. On the other hand, a stakeholder according to Freeman (1984) is "any group or individual who can affect or is affected by the achievement of the organization's objectives". Thus, customers, suppliers, regulators, employees and also competitors can be stakeholders of a company. It's generally acknowledged that shareholders are always stakeholders in a corporation, but stakeholders are not always shareholders. According to academics there are two different competing theories on how a company should be run. On one side, the shareholder theory affirms that "There is one and only one social obligation of business and that is to utilize its resources and participate in activities geared to maximize its profits so long as it... engages in open and free competition, without deceit or fraud"(Friedman, 1970); on the other side the stakeholder theory states that the interest should satisfy the interest of different stakeholders (Freeman, 1984).

In the past the shareholder approach was dominant (Bottenberg et Al. 2016), recently, the stakeholder theory has become more and more shared.

Stakeholder theory places a strong emphasis on the necessity for managers to consider how people and organizations can either help or hinder an organization's goals (Phillips et al. 2007). In other words, the effectiveness of an organization depends on how successfully it manages its relationships with the major organizations that can have an impact on its goals (Freeman and Phillips 2002). According to the stakeholder theory, management has a moral obligation to all stakeholders "because business decisions affect different stakeholders negatively or favorably, or because stakeholders have rights, or because stakeholders should be involved in decisions that have a real impact on their lives"

(Gilmartin and Freeman 2002, pg. 56). In other words, the stakeholder theory merely asserts that it is advantageous for the management on both a practical and ethical level to consider the groups and people who are impacted by or have the potential to influence the organization's goals and purposes (Freeman et al. 2004).

The emergence of sustainability, discussed in the introduction, is accompanied by the rising of the stakeholder's theory in recent years. In fact, under this theoretical lens, it is evident the advantages that can derive from an approach towards sustainability, such as, for example, benefiting all stakeholders. Indeed, it's easy to check that both ESG and stakeholder theories reveals that both emphasize the significance of integrating social concerns into company operations. According to the stakeholder theory, ESG has become the primary strategic focus of businesses, allowing them to adopt socially and environmentally responsible activities while still pursuing their economic goals, taking into consideration all stakeholders and attempting to generate value for them. The idea posits that stakeholders control a variety of vital firm resources, and that the organization's interaction with them is intended to ensure revenue and profit. ESG has become a reliable approach for corporations to cultivate relationships with their stakeholders. Specifically, this link generates market possibilities and price increases, while reducing transaction costs and enhancing consumer satisfaction. All of these beneficial consequences contribute to the financial performance of the company.

2.2 ESG description

Modern civilizations are being affected by environmental and human rights issues more and more, which is causing significant social changes (Surana et al., 2020). In fact, businesses are responding to demand from stakeholders and society at large to rethink their operations in order to keep up with the changes that our society is undergoing (Bogers et al., 2020). As a result, in recent years, business strategy and academic discussions have been more and more influenced by the environmental, social, and governance (ESG) concerns (Durand et al., 2019; Raimo et al., 2020). (Nirino Santoro Miglietta Quaglia)

ESG it's an acronym for Environmental, Social and Governance and it has become a top priority for businesses that aim at boosting their competitiveness, by enhancing their reputation, at adhering to local laws and regulations, and at being consistent with their established corporate values (Aguilera et al., 2007; Becker-Olsen et al., 2006; Campbell, 2007; Del Giudice et al., 2017).

The development of products and services that incorporate social, environmental, and governance factors - commonly referred to as ESG (environmental, social, and governance) by financial operators

- has increased in recent years, supporting the notions of "ethical finance" and "responsible finance." The inclusion of ESG factors in creditworthiness presents traditional financial operators with an opportunity to assess a company's capacity to create value and respond to social and environmental risks that may adversely affect its operations and, ultimately, its capacity to repay credit, in more detail.

Milton Friedman asserts that a company's primary duty is to maximize returns for its shareholders. Most businesses, which have been concentrating on profit maximization, have not considered environmental, social, and governance (ESG) duties for decades. ESG duties were viewed as not only having no impact on financial performance but also as a possible burden on it due to potential cost rises.

In the past two decades, however, environmental, social, and governance challenges have demonstrated their impact not only on the profitability, but also on the financial viability of a number of businesses. (Billio, Costola, Hristova, Latino, Pelizzon 2021)

The term ESG was formally defined in 2004 when the UN Global Compact Initiative published the study "Who Cares Wins" (UN, 2004). It established the lofty objective of consolidating the three fundamental pillars of ethical finance: environmental, social, and governance. Each one of them entails distinct challenges.

The environmental pillar is concerned with principles regarding climate change, deforestation, air and water pollution, land exploitation, and biodiversity loss. Consequently, it examines a company's energy efficiency, greenhouse gas emissions, waste, water, and resource management activities. Therefore, a significant portion of the literature has naturally attempted to define the connection between environmental and financial performance. Derwall et al. (2004) shown that eco-friendly companies enjoyed greater stock returns than their less eco-friendly competitors. Even after a number of methodological controls, the significance of these findings remains unchanged. Manrique and Mart-Ballester (2017) draw comparable results based on a sample of 2,982 big companies from both developed and developing nations.

The social pillar, instead, encompasses elements such as gender policy, protection of human rights, labor standards, workplace and safety, public health, and wealth distribution; all of them influence the employee condition. According to Edmans (2011), there is a strong correlation between employee happiness and long-term stock return.

Lastly, the governance pillar includes factors that attain to corporate governance such as the independence of the board of directors, shareholders' rights, managers' compensation, control methods and anti-competitive behaviors, and the observance of the law. Several research, including Gompers et al. (2003), Tarmuji et al. (2016), and Velte (2017), emphasized the strong favorable

influence of these activities (2017). On one hand Tarmuji et al. (2016) examined Malaysian and Singaporean corporations, while, on the other hand, Velte (2017) focused on German businesses, while Gompers et al. (2003) examined American corporations. These three evaluations illustrate the positive influence that greater governance procedures have on the profitability of businesses.



Figure 5 ESG Breakdown, Source: Investopedia

As of today, ESG are currently three essential components for contemporary investors and entrepreneurs, as well as three metrics for assessing the business commitment towards these themes or the externalities of an investment.

As a direct consequence of the growing importance of ESG criteria, early in 2005, Kofi Annan, the secretary-general of the United Nations, invited some of the biggest institutional investors in the world to participate in the process of creating the Principles for Responsible Investment (PRI).

The PRI is the foremost advocate of ethical investing in the world. It works to comprehend the effects of environmental, social, and governance (ESG) aspects on investments and to assist its global network of investor signatories in include these elements in their ownership and investment decisions. The six Principles for Responsible Investment are a series of voluntary and aspirational investment guidelines that provide potential steps for integrating ESG concerns into investment practice. As it follows:

- “Principle 1: We will incorporate ESG issues into investment analysis and decision-making processes.
- Principle 2: We will be active owners and incorporate ESG issues into our ownership policies and practices.
- Principle 3: We will seek appropriate disclosure on ESG issues by the entities in which we invest.
- Principle 4: We will promote acceptance and implementation of the Principles within the investment industry.

- Principle 5: We will work together to enhance our effectiveness in implementing the Principles.
- Principle 6: We will each report on our activities and progress towards implementing the principles”²

Thus, sustainable investing is a method of investing that incorporates ESG factors with traditional investment strategies during the process of building and managing a portfolio. The Global Sustainable Investment Alliance (GSIA) claims that a number of techniques have become the industry's international standards. The following categories can be used to group the key sustainable investing strategies:

1. *Negative/exclusionary screening*. Exclusion of particular unsavory or contentious industries, businesses, or organizations whose actions might harm the environment or society. This has been the most often used approach for open-end funds, according to the Global Sustainable Investment Review (GSIA, 2018), which gathered \$19.8 trillion in assets under management. This accomplishment may be attributable to the simplicity with which a method based on the identification and exclusion of the so-called "nonESG" stocks may be implemented.
2. *Positive/best-in-class screening*. Choose, all other factors being equal, the firms that perform the best in terms of environmental, social, and governance factors. It is equivalent to the exclusion of businesses that fall short of predetermined performance standards.
3. *Sustainability themed investing*. Investments that are specifically aimed at just supporting the specified theme (clean energy, pollution reduction, low carbon emissions, water resources management, sustainable agricultural activities etc.).
4. *Impact/community investing*. Private funds allocated to certain initiatives addressing social and environmental problems, such as the use of renewable energy sources and the development of social housing, etc.
5. *ESG integration*. ESG considerations are explicitly and systematically included in financial analyses. ESG rating firms play a critical role given the qualitative and arbitrary nature of this kind of evaluation.
6. *Corporate engagement and stock activism*. Using shareholder rights in order to communicate directly with business management and submit proposals in an effort to influence corporate conduct.
7. *Norm-based screening*. Investing solely in equities that adhere to international standards for minimal ethical corporate conduct.

² <https://www.unpri.org/about-us/about-the-pri>

As seen by the preceding explanation, these investment strategies are sophisticated and need information availability and a comprehensive examination of the companies involved. Despite this complexity, global sustainable investment assets amount for thirty trillion dollars invested via these techniques and continue to rise (GSIA, 2018). This suggests a substantial need for information on a company's compliance with ESG characteristics and, thus, the requirement for ESG ratings.

In addition, there has been a substantial increase in sustainable and responsible investment (SRI) during the past decade. Investors, shareholders, governments, and businesses have benefited from this development because they now require accurate information not only about financial performance but also about environmental, social, and governance (ESG) aspects, which has become an integral part of their competitive strategy (Galbreath, 2013). These considerations have necessitated the establishment of ESG rating firms (Escrig-Olmedo, Fernández-Izquierdo, Ferrero-Ferrero, Rivera-Lirio, Muñoz-Torres, 2019).

ESG ratings are 'evaluations of a company based on a comparative assessment of their quality, standard or performance on environmental, social or governance issues' (SustainAbility 2018, p. 4). It is generally acknowledged that an increasing number of firms are being evaluated on environment, social, and governance (ESG) criteria by sustainability rating agencies (SRAs) (Clementino, Perkins, 2020). Sustainability rating agencies (SRAs) evaluate firms, and provide data, on specific attributes. SRAs analyze businesses and provide data on certain E, S, and G aspects, such as pollution emissions, human rights, and management (Avetisyan and Hockerts 2017). Invariably, they also give an overall evaluation of a company's performance based on a composite score of ESG problems. Many agencies also generate ESG- and/or sustainability-themed indexes, which include lists of firms that fulfill particular ESG standards and are picked from a larger universe of rated companies. The Dow Jones Sustainability Index (DJSI), the FTSE4Good Index, and the MSCI ESG Indices are notable examples (Searcy and Elkhawas 2012).

Among other reasons, SR investors pay rating agencies for ESG rankings to eliminate knowledge asymmetry (Cho et al. 2013; Cui et al. 2016). This information, coupled with financial criteria, is then utilized as the basis for an investment choice (e.g., ESG data are necessary for best-in-class or ESG integration strategies).

Typically, rating agencies base their assessments on publicly accessible information (e.g., mandated non-financial disclosures), third-party research, corporations' sustainability/integrated reports, and company websites (Jackson et al. 2019). Some agencies, such as RobecoSAM, send questionnaires to businesses, while others allow businesses to see and comment on profiles prior to their finalization. SRAs deploy between 70 and 1000 indications for various concerns (Abramskiehn et al. 2015). Indeed, each ESG rating organization has its unique technique for assessing the company

sustainability. Diverse techniques appear related to a market-driven differentiation strategy (Saadaoui, Soobaroyen, 2018) and cultural and ideological issues (Sandberg, Juravle, Hedesstrom, Hamilton, 2009). However, in the various assessment processes of these ESG rating agencies, three aspects of measurement are always taken into account: the high-level categories evaluated (environmental, social, and governance) and the positive criteria included in each category; the controversial activities and practices evaluated; and the process by which the industry normalizes their ratings (Chatterji, Durand, Levine, Touboul, 2016).

Consequently, ESG rating agencies impact not just the behavior of financial market participants (Slager, Gond, Moon, 2012) , but also the institutionalization of sustainability management in corporations, and are viewed as "institutional entrepreneurs" (Elbasha, Avetisyan, 2018). Consequently, the duty of ESG rating agencies extends beyond the purview of financial markets, since the repercussions of dynamic changes in business sustainability evaluations by ESG rating agencies influence the entire society.

Investors use ESG ratings in a variety of ways, including as monitoring and controlling their exposure to ESG-related risks and communicating with investee firms. Similarly, sustainability indexes are frequently used to evaluate the performance of responsible enterprises relative to a larger group of comparable peers and to develop responsible investment products (Slager et al. 2012).

There are a number of issues to be resolved as a result of the multiplicity of these rating organizations and the variety of their evaluation processes, including:

- Transparency issues. The criteria and evaluation procedure used by ESG rating firms to measure the company sustainability performance are not fully disclosed to the public. This makes it challenging to comprehend what ESG rating firms are assessing and to compare them (Escrig-Olmedo, Muñoz-Torres, Fernandez-Izquierdo, 2010; Scalet, Kelly, 2010; Saadaoui, Soobaroyen, 2018; Chatterji, Levine, 2006)
- Commensurability. The same notion may be measured in several ways by ESG rating firms. Therefore, the predicted advantages of CSR cannot happen if the evaluations of ESG ratings are inconsistent, which includes evidence of poor commensurability (Chatterji, Durand, Levine, Touboul, 2016).
- Trade-Offs among criteria. Higher scores in one category may be offset by extremely poor scores in another using ESG ratings systems (Windolph, 2011; Delmas, Blass, 2010; Escrig-Olmedo, Muñoz-Torres, Fernández-Izquierdo, Rivera-Lirio, 2014)
- Lack of an overall score. The majority of ESG rating organizations give environmental, social, and governance ratings to each area, but they do not offer a total score for the performance of corporate sustainability (Liern, Pérez-Gladish, 2018)

- Stakeholders' preferences. The acceptance and utility of ESG rating agencies are impacted by the fact that they do not take into account the expectations of the various stakeholders in their evaluation procedures (Windolph, 2011; Escrig-Olmedo, Muñoz-Torres, Fernández-Izquierdo, Rivera-Lirio, 2017)

These flaws urge care when interpreting the results of ESG rating agencies.

ESG ratings have been met with a mixed response. For its proponents, ratings resolve information asymmetries by providing exhaustive, systematized, and comparable data for a substantial number of publicly traded companies. Consequently, they play a significant role in assisting stakeholders to comprehend, analyze, and manage the increasingly complex and multifaceted nature of corporate ethics and sustainability (Cappucci 2018). However, ratings have also been subject to severe criticism. One group of criticisms has centered on the quality of the underlying data (Doyle 2018; Drempetic et al. 2019). Others have questioned the validity of ESG ratings, with research revealing non-trivial discrepancies in how various SRAs conceptualize E, S, and G, and the weights used to calculate scores (Chatterji et al. 2016; Semenova and Hassel 2015). More basic criticisms have centered on how ratings establish, naturalize, or enforce a standard paradigm for measuring social and environmental responsibility (Chelli and Gendron 2013).

The majority of SR investors rely largely on the ESG ratings offered by sustainability rating organizations that have become established in the market as intermediaries since they are unable to independently evaluate the sustainability of firms.

In conclusion, given the researchers' examination of environmental, social, and governance issues, a wide range of ethical perspectives and issues are reflected in investing. The literature highlighted ESG issues can theoretically impact a company's value in a number of ways, including not only direct impacts like cost savings associated with energy efficiency or revenue growth from sales of more sustainable products, but also indirect impacts like improved risk management, reputation, and employee satisfaction. Based on this, different investor types make different investment judgments and implement their investment decisions in different ways.

Moreover, positive stakeholder involvement is encouraged by an effective ESG strategy, which is increasingly recognized as a key value creator.

2.3 Impact of ESG on firm value

Researchers and managers are starting to examine the advantages that sustainable practices may have on a company's performance as well as the value that is produced for all the stakeholders (Fiandrino et al., 2019; Li et al., 2019). In reality, research has shown that ESG initiatives and CSR tactics have

a favorable influence on company performance, including financial success, employee dedication, innovation, and corporate reputation (Ghouri et al., 2019; Inigo and Albareda, 2019; Liu et al., 2014; Rettab et al., 2009; Sanchez et al., 2020). However, the discussion in the literature is more complicated when it comes to the impact of CSR policies on financial success because some studies also indicate unfavorable or minor consequences (Kim et al., 2018; Nirino et al., 2019).

According to the literature, ESG issues can theoretically have a variety of effects on a company's value, including indirect effects like better risk management, reputation, employee engagement, or customer loyalty, as well as direct effects like cost savings from energy efficiency or revenue growth from sales of more sustainable products.

Among all the research, a significant portion of the literature that is currently available has concentrated on the effect of ESG disclosure on the performance of the business or on how one particular ESG pillar influences the performance of the firm (Han, Kim, Yu, 2016; Smith, Yahya, Marzuki Amiruddin 2007; Barnett, Salomon, 2012). Each pillar may have a distinct effect on the company and with a varied degree of intensity. For instance, Cek and Eyupoglu (Cek, Eyupoglu, 202) demonstrate how the social and governance pillars have a favorable and considerable influence on the business's financial performance, mostly due to the value they provide for shareholders over the long term. Along the same lines, Paolone et al's (Paolone, Cucari, Wu, Tiscini, 2022) analysis revealed that the governance pillar's impact on a firm's market performance is significantly greater than that of the other two pillars.

The widely acknowledged "cost of capital" reduction idea in SRI is one of the explanations for why ESG should boost a company's profitability. According to the majority of experts, a company's capital cost will fall, offsetting the expenditures associated with establishing a socially responsible structure inside it. The "information impact" of residual risk is another widely held theoretical stance around ESG and corporate performance. Low residual risk for these firms in comparison to the market would be shown by high ESG ratings. A reputation risk concern based on ESG criteria might lower a company's stock price or possibly cause it to fail. Reputation risk is one of the biggest dangers facing businesses today.

Porter and Kramer similarly said in their essay from 2006 that *"CSR may be much more than a cost, a restriction, or a charity deed—it can be a source of opportunity, innovation, and competitive advantage"* when analyzing the problem from a strategic management viewpoint. Numerous studies have shown a favorable correlation between ESG and nonfinancial performance indicators, such as process efficiency and lower material and energy usage. These factors also motivate employees, draw them to the company, and help them develop bonds that help build consumer loyalty.

It is well known that a strong ESG offer enables businesses to penetrate new markets and increase their market share in existing ones. Governmental bodies are more willing to provide corporations the access, permissions, and licenses that present them with fresh development prospects when they have their confidence.

The proper implementation of ESG may help facing growing operational expenditures, which, according to a McKinsey study, can have a 60 percent negative impact on operating profits. ESG can also significantly reduce costs. Additionally, a strong ESG proposal may assist businesses in attracting and keeping top talent, enhancing employee engagement, and boosting overall productivity. Shareholder returns and employee happiness are positively connected.

Some academics contend that ESG policies just add costs to a business, not genuine benefits, which has a negative impact on performance. Others, however, have highlighted how a company's sustainable behavior has a favorable impact on its financial success. In fact, a company's environmental and social concerns may have positive effects across a range of sectors, including tax reduction, operational risk reduction, improved capacity to reach more favorable contract agreements, customer retention, and improved reputation.

An important factor in improving financial success is the company's reputation. Customers who identify with a company's great image show devotion to it, which over time results in value development. In contrast, every stakeholder may maintain a neutral or favorable opinion of a corporation simultaneously.

ESG investments have been shown in several studies to have a favorable impact on a company's financial performance, and their adoption enables businesses to gain a competitive edge.

Going into the financial benefits of CSR and ESG, companies can directly measure the effects of certain CSR strategies in action. The literature has demonstrated that a company's costs of financing are directly impacted by the standard of its corporate social responsibility (CSR) policies, social policies, environmental management practices, and corporate governance frameworks. The research has demonstrated that CSR may directly affect a corporation's cost of equity and debt. It has been suggested that environmental externalities subject firms to specific risks, including reputational, financial, and lawsuit risks (Bauer and Hann, 2010).

The actual data on how CSR affects a corporation's cost of financing is fairly extensive. In order to begin, Bauer and Hann (2010) look at more than 2,200 bond issues in the United States to see how corporate social responsibility affects bond spreads. The authors show a substantial and inverse association between effective environmental management practices and a firm's loan spread using KLD scores as their primary data source for CSR ratings. On the other hand, they show a strong and favorable correlation between a company's loan spread and its environmental concerns. After

adjusting for a number of company and sector factors, findings suggest that businesses with higher environmental management standards in place have smaller loan spreads and, thus, display lower costs of debt.

A number of studies looked into the connection between a company's cost of funding and its social responsibility. Chava (2011) examines 5,879 credit facilities issued to 1,341 US-based companies and draws results that are comparable to those of Bauer and Hann (2010). He discovers that lenders charge much higher interest rates on loans to companies with environmental problems. In a similar vein, Goss and Roberts (2011) find that companies with CSR issues pay on average 7 to 18 basis points more than those without CSR issues. According to the authors, banks view CSR issues as risk factors and as a result, provide those businesses "less appealing loan contract conditions" (Goss and Roberts, 2011: 1807).

The impact of direct pollution on the loan spreads of businesses engaged in the US pulp and paper and chemicals sectors are examined in another research similar to this one by Schneider (2011). He demonstrates the strong and favorable correlation between toxic emissions and corporate loan spreads and claims that "environmental performance provides a considerable negative risk in future cleaning and compliance expenditures." These expenses may be so high as to make it difficult for polluting businesses to make their regular payments to creditors (Schneider, 2011: 1558).

Regarding the influence of CSR on the cost of debt financing, the research has not only concentrated on the environmental aspect of ESG. In addition, the influence of corporate governance quality on the cost of debt financing, company credit ratings, and yields has been explored.

Bhojraj and Sengupta (2003) analyze the possible association between corporate governance measures and bond ratings and yields for the first time. Specifically, they investigate the impact of institutional ownership and the proportion of outside directors on bond ratings and rates. According to their findings, these two processes have a negative impact on bond yields and a favorable impact on bond ratings. It is stated that these data point to the risk-reducing impact of shareholder governance systems, which bondholders appreciate but shareholders presumably do not.

Similarly, although in a somewhat different context, Chava, Livdan, and Purnaanandam (2009) examine how shareholder rights — a key governance instrument — affect the cost of bank loans to firms. Their findings indicate that enterprises with fewer antitakeover mechanisms pay much larger average spreads on bank loans.

Overall, it is thought that the research on the connection between CSR and a company's cost of debt points to a negative correlation between the two. To put it another way, higher CSR standards, particularly in the areas of environmental management and corporate governance, can result in

reduced debt costs, whether in the form of lower bond spreads or lower loan spreads for credit facilities.

In theory, the research on CSR has not just focused on how it affects the cost of debt financing, but also on how CSR regulations and ESG behavior affect the cost of equity financing. On the basis of the findings on the cost of debt financing, we generally assume that one may anticipate that the characteristics of adequate CSR requirements that decrease risk also lower the cost of equity financing due to a reduced firm-specific risk. Ashbaugh-Skaife, Collins, and LaFond show evidence that the cost of equity financing lowers with a corporation's level of corporate governance (2004). The cost of equity financing is 136 basis points lower for well-governed firms compared to poorly-governed counterparts when just controlling for governance is taken into account, according to the authors' analysis of the economic impact of corporate governance attributes on the implied cost of equity of corporations. The impact difference between well- and poorly-governed enterprises is still 88 basis points after accounting for the frequently utilized risk indicators of size, market-to-book, and market risk. These results, in our opinion, show that excellent corporate governance practices result in lower equity financing costs. Similar findings are made by Derwall and Verwijmeren (2007), who found that from 2003 to 2005, improved corporate governance generally results in reduced equity capital costs.

Ghoul, Guedhami, Kwok, and Mishra (2011) study the effects of total CSR quality on the equity cost of equity capital in US publicly-traded businesses from 1992 to 2007 in contrast to the preceding two studies that concentrate on the governance element of ESG. The authors discover that enterprises with higher CSR quality typically have lower equity financing costs. This outcome is, however, influenced by individual CSR subcategories, particularly the company's employee relations, environmental management, and product quality. Additionally, Ghoul et al. (2011) demonstrate that some contentious industries are particularly impacted by CSR quality: companies in the tobacco and nuclear power industries show a strong correlation between their cost of equity capital and CSR quality. This, in our opinion, emphasizes the multifaceted nature of CSR. It is important to emphasize that improved CSR quality appears to not only correlate with reduced equity financing costs but also with an increase in business value (Ghoul et al., 2011; Derwall and Verwijmeren, 2007).

Overall data from academic literature on ESG and costs of corporate finance suggests that ESG has a negative impact on the price of debt and equity capital. In other words, organizations that adhere to high standards of corporate governance and corporate social and environmental responsibility typically have lower financing costs because they are less likely to face reputational, financial, or legal risks as a consequence of ESG crises or difficulties.

Focusing on the environmental theme, the impact of corporate environmental performance on financial performance of firms is the subject of several studies. Russo and Fouts (1997) discover a favorable and strong relationship between environmental and corporate operational performance as assessed by the firm's return-on-assets ratio in an effort to examine if environmental ratings of firms have an impact on CFP. Going a step further, they look at how the industry growth of the firm affects this link and come to the conclusion that in high-growth sectors, the correlation between environmental success and financial performance is even higher.

Similarly, Hart and Ahuja (1996) discovered that even while low-polluting enterprises may have had pollution control plans in place for years, the most polluting firms might gain the most in terms of financial performance. Hart and Ahuja (1996) contend that in order to further reduce emissions, the companies with the greatest environmental records must increase their investments.

With an emphasis on the idea of "ecoefficiency" as a measure of corporate environmental performance, the key study by Derwall et al. (2005) examines the stock market performance of eco-efficient and non-eco-efficient corporations. Derwall et al. (2005) demonstrate that from 1995 to 2003, the most eco-efficient companies outperform the less eco-efficient ones in terms of returns.

This significant discovery is said to indicate a favorable correlation between corporate environmental performance and financial performance. Indeed, according to Galema et al. (2008), corporate environmental performance, among other things, significantly lowers book-to-market ratios, suggesting that the return differences between high- and low-CSR stocks are created through the book-to-market channel because "SRI results in lower book-to-market ratios, and as a result, the alphas do not capture SRI effects" (Galema et al., 2008: 2653). Guenster, Derwall, Bauer, and Koedijk (2011) analyze the connection between corporate financial success between 1997 and 2004 and eco-efficiency in more recent research. According to the study's findings, improved eco-efficiency greatly raises a company's operating performance as shown by its return on assets.

Jacobs, Singhal, and Subramanian (2010) find a negative market response to the announcement of voluntary emission reduction program participation, which is consistent with the prior results. The authors employ two distinct types of environmental performance to illustrate their claim. Corporate Environmental Initiatives (CEIs) are a part of the first one, and they "give information regarding self-reported corporate initiatives to minimize, reduce, or offset the environmental impacts of the firm's goods, services, or activities" (Jacobs et al., 2010: 430). The material on "Environmental Awards and Certifications (EACs)" in the second category provides details on external acknowledgment of company environmental performance (p.430). The market does not respond to announcements in the combined CEI and EAI categories, according to the authors' research. As a result, the writers also look into current sub-categories of environmental performance, such as "recycling," "eco-friendly

goods," and "environmental business strategies." Around the announcement of the involvement in environmental efforts, they observe considerable anomalous stock price fluctuations for certain of those categories. There is evidence from other research that there is a poor correlation between company environmental performance and financial performance. For instance, Brammer, Brooks, and Pavelin (2006) show that UK corporations tend to do worse than their counterparts with lower CSR ratings, and they ascribe this result to the environmental variables that drove it. In order to have a clear picture of how corporate social behavior affects returns, the authors conclude that "different components of corporate social behavior must be evaluated independently" (Brammer et al. 2006: 114).

The majority of studies that use actual environmental ratings, carbon emissions, or eco-efficiency as proxies for corporate environmental performance find that the better a corporation performs environmentally, the better its financial performance - however measured. This concludes this section on the impact of corporate environmental on CFP. It is not clear from the studies if there is always a causal relationship between the two constructs (environmental and financial success) or whether the financial markets are still unable to accurately price environmental policy.

3. Green Bonds

This section is dedicated to the study of the phenomenon of green bonds. In order to have a comprehensive knowledge of the phenomenon the chapter will start with some formal definition of green bonds. After that, I will present the historical trends of the market and I will cut the latest data given by some institutions such as the CBI and the ICMA to have information about different aspects such as the different geographies, the issuer type and the average duration of the securities. In the second paragraph the potential driver for a green bond issuance will be discussed.

3.1 Green bond definition and market

As the world is facing several challenges such as climate change, resource scarcity, overpopulation, and biodiversity loss a solution needs to be found. Anyway, the transition towards a more sustainable development requires significant investment of economic resources (Berensmann, Dafe, Lindenberg, 2018), IPCC (2018) estimated that the needed financial flow needed to face global challenges will amount to \$2,4 trillion before 2035. Focusing on the environmental side of the issue, climate change has become a pressing theme, especially following the COP21 climate change agreement of Paris (2015). As a matter of fact, the agreement required sovereigns and companies to adopt a more sustainable growth model towards the environment. In particular, it committed to limit the global temperature to 1.5/2.0 C° and to implement a set of targets for the full decarbonization of the global economy, by the end of the 21st century (Shishlov et al., 2016). In this scenario, green bonds have emerged as a key financial instrument to increase the share of green investments (Daubanes, Mitali, Rochet, 2021).

Even though green bonds lack a universal definition, it's possible to find some given by different parties. A fitting definition of green bonds could be the one given by KPMG international in 2015. It states that a *“green bond is, like any other bond, is a fixed-income financial instrument for raising capital through the debt capital market. The bond issuer raises a fixed amount of capital from investors over a set of time period, repaying the capital when the bond matures and paying an agreed amount of interest (coupons) along the way”*. Alternatively, green bonds are defined by the World Bank (2015) as a *“debt security that is issued to raise capital to support climate-related or environmental projects”*. therefore, a green bond is a fixed income security used to finance eco-sustainable projects that result in environmental benefits (Hyun, Park, Tian 2019). In substance, green bonds unlock private capital for sustainable investments and give investors the opportunity to make an informed decision to invest in green projects.

Thus, the complexity of the instrument stands in the fact that green bonds may require major disclosure of the asset or project that will be financed before the issuance but also an activity of monitoring and reporting on the use of the proceeds after the issuance (Shishlov, 2016).

Even though green bonds proceeds are used for specific projects, the repayment is not dependent on its success. Indeed, the risk of the project remains on the issuer rather than on the investor (Doronzo, Siracusa, Antonelli, 2021).

The origins of green bonds can be traced back to 2007 when the European Investment Bank (EIB) issued its first Climate Awareness Bond. Since then, the market has continued to grow at a double-digit pace. The market has, indeed, snowballed from a relatively slow start to an impressive growth rate over 50% in the last five years (CBI, 2022). Indeed, after EIB, several other supranational institutions such as the World Bank and other entities started to issue this type of fixed income securities. The market started to blossom after the introduction of the ICMA Green bond Principles in 2014 that constituted a boost for the market by increasing transparency for both investors and issuers (Reichelt, Keenan, 2017). At the dawn of 2016 the cumulative green issuances at global level amounted to \$104 billion, only two years later, in November 2017 the market counted the volume of issuance overcame the threshold of \$100 billion for the first time. At the end of 2020, the green bond market reached a cumulative value of \$1 trillion and in the same month of the following years this data grew to \$1,5 trillion with an annual volume of \$517 billion. The market is forecasted to pass the milestone of \$5 trillion by 2025 (CBI, 2022).

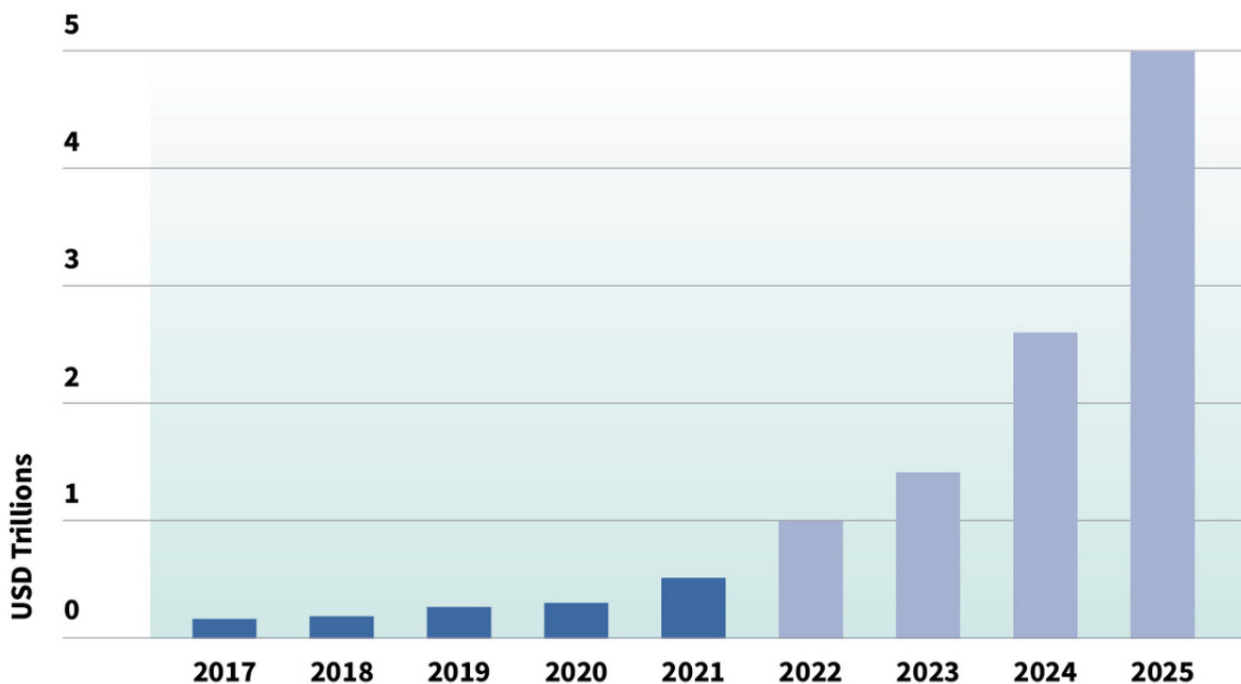


Figure 6, Green Bond Market volumes, Source: CBI 2022

Analyzing the market composition, according to the ICMA 2022 report, there are almost nine thousand active securities issued in 24 nations and 33 currencies, highlighting an extensive fragmentation. The United States is the largest issuer by nation (USD 334 billion), followed by China (USD 250 billion) and Germany (USD 189 billion). Europe as a continent is the largest market for green bonds with an annual issuance of 265 billion in 2021.

For what concerns the type of issuer as we can see in figure 7 financial and non-financial corporates account for 45% of the market followed by government related entities representing 15% of the market.

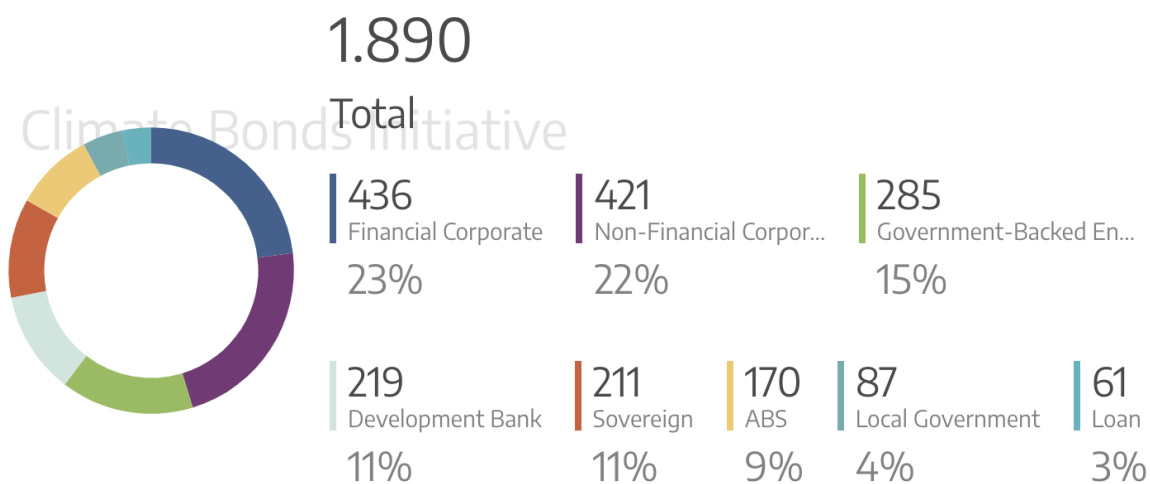


Figure 7 GB Issuer type, Source: CBI 2022

Moreover, as of today, 85% of the issuances have a maturity of less than 10 years, while 40% have a maturity of less than 3 years. The average duration is 6.3 years, slightly less than the one of government bonds (6.7 years). In contrast, sovereigns often issue GBs with maturities between 10 and 20 years. Moreover, green bonds tend to be rated as investment-grade: 90% of them belong to this subset and two-thirds of the market is concentrated in the upper clusters (AAA/A).

When it comes to the use of proceeds, energy, buildings, and transport remained the three largest use of proceeds categories, collectively contributing 81% to the total volume.

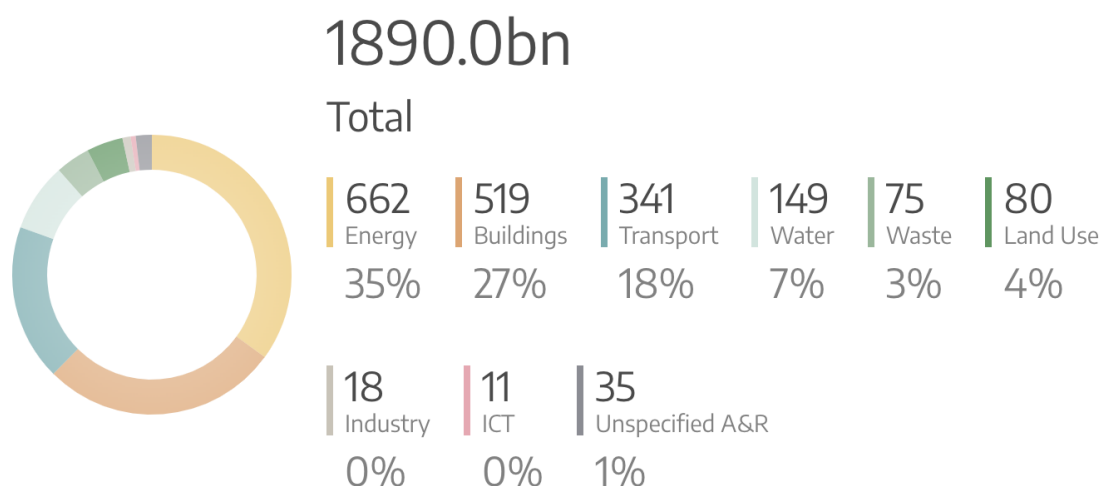


Figure 8 GB Use of proceeds, Source: CBI 2022

3.2 Rationale behind a green bond issuance

In this paragraph I will discuss some of the potential rationales for issuing green bonds.

Issuing a green bond is costly for the company. So why should they issue a green bond when they could simply finance their green project using a conventional bond? being profit-maximizing entities, corporates and financial institutions would not issue green bonds if they were not compensated by some forms of benefits. According to the OECD (2015) green bonds could help the issuer to diversify its investor base by reaching ESG sensitive investors that would have not tapped otherwise, doing so the company could lower its exposure to bond demand fluctuations.

According to Flammer (2020) there are three main drivers:

- Signaling: issuing a green bond could represent a reliable message for investors about the company's commitment toward the environment
- Greenwashing: green bond can be seen as an instrument to act as environmentally responsible even though not taking real actions
- Cost of Capital: green bonds can lower the cost of financing.

The underlying concept behind the first argument is the information asymmetry between the issuer and the investors. The term information asymmetry refers to one party knowing more information than the other in an economic transaction (Dierksen, 1991). Under the signaling theory the aforementioned problem creates some additional transaction costs for investors for identifying preferable companies (Williamson, 1985). As a consequence it's convenient for the issue to lower information asymmetries by sending some sort of signal to investors. In the case of green bonds, since

investors lack knowledge about the real company's commitment towards the environment, they can serve as a credible signal for investors to assess best-in-class companies from the defective ones (Lyon and Maxwell, 2011; Lyon and Montgomery, 2015). The signal can be considered credible from the point of view of investors for several motivations. Indeed, the average size of corporate green bonds for public companies is \$0,26 billion, meaning that issuing a green bond represents a great financial effort of the company towards the environment (Flammers, 2020). Moreover, if the bond is certified by some institutes such as the climate bond initiative or the ICMA, the certification can serve as a guarantee of the fact that the proceeds are going to be used for the project promoted in the bond prospectus. Furthermore, on one hand receiving a certification is very time consuming and requires a lot of managerial efforts, on the other hand not honoring a certified green bond is very costly as well (CBI, 2020). A great example of this theory regards Unilever. When the famous consumer goods' company issued a green bond for £250 million in 2014, the CFO affirmed that it was meant to demonstrate to the financial community the crucial role of ESG in the group's strategy (Daneshkhu, Bolger, 2014). As a consequence of the first argument, a green bond issuer should be able to demonstrate its green credential, to display its commitment towards the development and sustainability of the environment and therefore to enhance its investors base by attracting an additional investor clientele that is sensitive to ESG matters.

The second reason for issuing green bond is the so-called greenwashing (Berrone et al., 2017). In this case, the issuer sends a misleading message to investors about its commitment towards the environment. Anyway, as stated above, issuing a green bond is often very costly for the firm, as a consequence other methods seem to be more appropriate for this aim. Anyway, Sophia Grene in her article "The dark side of green bonds" (2015) discusses the main criticalities of green bonds, wondering whether green bonds really impact the number of green projects or not. Anyway Flammer (2020) found out an increase in environmental performance of the companies (e.g. volume of CO2 emission) that issue green bonds. For this reason, this argument seems to be not really supported by evidence.

The third potential reason to issue green bonds regards the cost of capital. Several studies started to analyze whether ESG securities and, in particular green bonds, can bring any kind of pricing benefit for the issuer. Basically, the no arbitrage theory affirms that securities that have the same risk and return should price identically (Larcker, Watts, 2019). Different academics stated that green bonds are issued with a premium, namely "greenium", over their conventional counterparts (Partridge and Medda, 2018). In particular the greenium can be defined as a negative yield spread between green bonds and plain vanilla ones (Wan, Lau, Sze, Wong, 2022). This means that some investors could be willing to trade off their wealth in exchange for a superior goal which is the protection of the

environment. Also, green bonds can bring other monetary and non-monetary benefits. Among the first category we could mention government incentives, subsidies to obtain the green certification and tax deduction for green issuers. Non-monetary benefits, instead, are those who come from been recognized as a green firm, meaning a better reputation or image that could bring to a lower cost of bank borrowings or higher stock prices and, therefore, to an overall lower cost of capital (Goss and Roberts 2011; Muller and Wikstrom 2016; Norton Rose Fulbright 2016; Ibrahim et al. 2017; ThriveHive 2017; Tang and Zhang 2018; Krebbers 2019a; LaMarco 2019).

However, there is limited evidence to suggest that governmental (municipal) Green Bonds offer any pricing benefits over traditional governmental (municipal) bonds. An argument in support of a pricing benefit for Green Bonds over traditional bonds is that over time, increased investor demand is likely to contribute to better pricing for the issuer. However, there are also potential costs as regards to issuing Green Bonds. Those costs include costs of issuance, administrative burden, and reputational risk (Mark, 2015).

4. Theoretical Expectation

Green bonds have been studied from many perspectives. Existing literature has shown unanimous results about stock market reaction to green bond issuance, though, none of them has studied the relationship with the ESG rating.

In general, academics have verified the signaling effect of a green bond issuance on investors and issuer shareholders' wealth (Cortellini and Panetta, 2021). The pioneer of this type of study were Roslet et Al. (2017) who discovered a positive reaction with a CAR of 1.66% on the day following the issuance. Two years later, Baulkaran (2019) discovered a CAR of 1,48% using a sample of 54 sel-labeled green bonds using an event window of 21 days, considering 10 days before and 10 days after the issuance. I used the same event window.

The positive relationship was, then, confirmed by Zhou and Cui (2019) who, focusing on the Chinese market, discovered also that green bonds attract new investors by signaling a real issuer commitment which is often followed by increased environmental performance. Therefore, academics agree on the positive impact of green bonds' issuance on the firm share price. This is a peculiarity of green bonds, indeed, when a firm issues a conventional bond the share price often decreases (Damn and Mikkelson, 1984).

In developing the theoretical expectation for the analysis it's necessary to consider two different effects. The first one is the stock market reaction to the issuance, and the second one is the reaction in relationship to the ESG rating.

Starting from the market reaction to green bonds' issuance, there are two possible outcomes: investors could perceive the green bond issuance positively contributing to a positive cumulative abnormal return or they can perceive it in a negative way. Indeed, according to Reboredo (2018) there is a spill over between the green bond market and stocks. For this reason, I do assume that the company's bond announcement will sort some effect on the stock price. In addition to that, according to the literature mentioned above, investors perceive green bonds as a means of value-added financing. As a consequence, I do believe that a green issuance will allow the company to attract more investors; therefore, it should influence positively the stock price and therefore the cumulative abnormal return. This aspect will be reflected in the alpha of the model. A positive alpha will highlight a positive cumulative abnormal return for all the companies that have issued green bonds. Thus, the first hypothesis will be:

Hypothesis 1 (H1): *Green bond issuance has a positive impact on the stock price of the issuing company*

The second step will be to analyse whether the ESG factor influences significantly cumulative abnormal returns. As mentioned in the previous chapter, green bonds can serve as a signal of a firm commitment toward the environment (Flammer, 2020) or they can be seen as a greenwashing practice. This implication is crucial to develop the theoretical results of the analysis.

In fact, even though an issuance made by a company with a bad ESG rating could be sensational since it may represent the first step in its commitment, it could be perceived by investors as a greenwashing practice. On the other hand, a company that already has a positive ESG rating has already demonstrated its commitment, relies on a stronger reputation, and has already generated positive externalities; this leads to the second hypothesis of the work:

Hypothesis 2 (H2): *Companies with bad ESG ratings have lower cumulative abnormal returns*

5. Data and Methodology

5.1 Dataset construction

To test my research question, “Does ESG rating affect the stock market reaction to green bond issuance” I downloaded the data from Eikon Refinitiv, online software used by professionals and academics to gather financial information. I downloaded data regarding ESG bonds issuance in the US in the timespan 2019-2021. The platform extracted data regarding 263 issuances for the period. This initial data set was composed of different categories of fixed income securities:

- *Sustainability linked bonds*
- *Sustainability bonds*
- *CBI Aligned green bonds*
- *CBI certified green bonds*
- *Self-labeled green bonds*
- *Social bonds*

In addition to that, for each bond I downloaded several information regarding the issuance such as name of the issuer, whether the company was public or not, issue size, ISIN and RIC code, coupon type, use of the proceeds, company sector. After that I started screening my dataset by keeping only CBI aligned and certified green bonds and by eliminating private companies. In fact, in order to study the market reaction in the afterward of an issuance the company should be traded on the market.

After that, my dataset included 110 issuances.

Then, I downloaded from Eikon the ESG rating for each company. The ESG rating is computed starting from the ESG score: The latter is calculated by Eikon at the end of each fiscal period, it is designed to measure relative ESG performance a company’s transparently and objectively across ten themes (emissions, environmental product innovation, human rights, shareholders, etc.) based on company reported data. At the end of the analysis an ESG score is assigned to the company. The ESG score is then converted to ESG rating on the basis of the following table:

Score Range	Grade
0.0 <= score <= 0.083333	D -
0.083333 < score <= 0.166666	D
0.166666 < score <= 0.250000	D +
0.250000 < score <= 0.333333	C -
0.333333 < score <= 0.416666	C
0.416666 < score <= 0.500000	C +
0.500000 < score <= 0.583333	B -
0.583333 < score <= 0.666666	B
0.666666 < score <= 0.750000	B +
0.750000 < score <= 0.833333	A -
0.833333 < score <= 0.916666	A
0.916666 < score <= 1	A +

Figure 9. ESG score conversion table, source: Eikon

Where D- is the worst possible rating while A+ is represents the best one.

5.2 Stock market reaction

In order to analyze the different impact that a green bond issuance could have on corporates with different ESG ratings I conducted an event study (Faccio and Stolin, 2006; Mc Namara and Baden-Fuller, 2007) by studying the stock market reaction to green bond issuance. Event studies are a useful practice in finance to assess the impact of an event on the firm value; this type of analysis relies on the idea that stock prices instantly reflect the impact of such an event (MacKinlay, 1997). Therefore, this methodology rests on the assumption that capital markets are efficient (Fama, 1970), implying that publicly available information on firms is reflected in their stock market prices. Under this assumption, the firm's stock market capitalization may be considered a reasonable proxy of its underlying value, which changes only if new information affecting the firm's future profits is released. Thus, to assess the impact of the announcement, I studied the stock market reactions to the issuance measured by the cumulative abnormal return (CAR), i.e., the stock market return in excess of the expected return in the days around the announcement (Liu et al., 2014). Generally CARs can be considered unbiased assessment of the impact that the event has on a firm's market value (Brown and Warner, 1985, Fama et al., 1969, MacKinlay, 1997, McWilliams and Siegel, 1997).

5.3 Methodology

The method used to analyze the research question “does ESG score affect the stock market reaction to a green bond issuance?” is the OLS regression. The acronym OLS stands for "ordinary least squares" and minimizes the sum of squared differences between the observed and predicted values. This technique estimates the coefficients of a linear regression equation that describe the relationship between one or more independent variables and a dependent variable. The method finds its application with the formula of linear regression:

$$Y_i = \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_n X_{in} + \varepsilon_i$$

The rationale is to check whether the independent variable, namely ESG Rating influences the credibility of the green bond issuances measured through the cumulative abnormal return.

I developed two identical models that only differ for the dependent variable: the first one is run using as dependent variable CAR -10 +10 while the second one, it's a robustness test made on CAR -9 +9. Descriptive statistics comprehensive of all the variables and correlation matrix are reported in Table 1 and 2 respectively.

5.4 Dependent variable

To assess the impact of ESG rating on the credibility of the green bond issuance I studied the stock market reaction to the issuance. To do so, I used as a dependent variable the cumulative abnormal returns (CARs), a variable that captures the stock market return in excess to the expected return in the days around the issuance, in other words the abnormal fluctuations of the stock returns.

The cumulative abnormal returns are defined as the cumulative sum of a stock's abnormal return (ARs). Since ARs are a comparative measure meaning that they do reflect the magnitude of extraordinary - positive and negative - returns of a security in relation to a benchmarked average return. Usually, the entire market is used as a benchmark, as it will be explained, in this study the S&P 500 index is considered the standard for estimating ARs and, consequently, CARs (Mac Kinaly, 1977). To obtain the CAR of each stock, I first calculated the ARs as it follows:

$$AR_i = R_i - \beta_i R_m$$

where AR_i is Abnormal return of the stock i ; R_i is the observed return of stock i , R_m is the market return and β_i is the sensitivity of stock i to market-wide factors.

In order to build this variable, I followed the following steps: first I created a table with the daily stock prices of companies 250 days prior to the issuance and 10 days after the event (i.e. day 0). Thus,

I obtained a table with 110 rows and 260 columns. Then, I computed the daily effective returns by using the following formula:

$$\frac{(Stock\ Price_t - Stock\ Price_{t-1})}{Stock\ Price_{t-1}}$$

In addition, it was necessary to compute the expected daily returns (Martynova and Renneboog, 2011) through the market model using the S&P 500 stock index as a market benchmark (Beaves and Ream, 2018). I chose the S&P 500 index since my study is based on US issuers, thus using a market-capitalization-weighted index of 500 leading publicly traded companies in the U.S. appeared as the best solution.

Once I gathered this data, I computed the beta coefficient as the slope of a linear regression between the daily stock returns and the S&P 500 index returns relying on the time span from -250 to -30 days to the event.

Finally, I computed the ARs using the aforementioned formula, thus calculating the difference between effective and estimated returns.

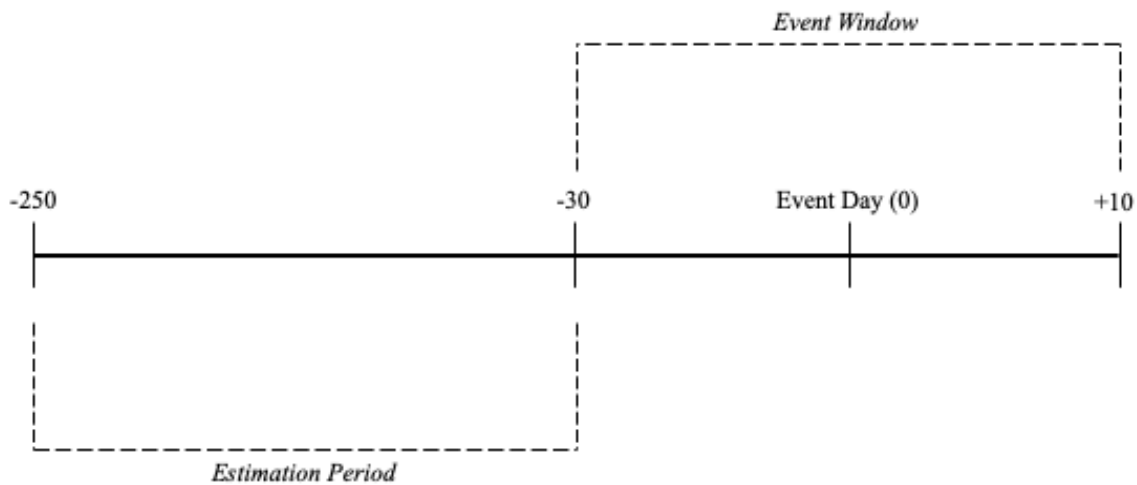


Figure 10. Estimation period & event window, source: self-elaborated

After computing the ARs in the event window -30 days prior to the issuance and +10 days subsequent to the issuance, I computed CARs - which is the independent variable of my model - for each stock during the -10 to 10 days of the event (Lee and Connolly, 2009). CAR where calculate as the sum of the ARs in the considered time span for each company:

$$CAR_{-10 +10} = \sum_{-10}^{+10} AR_i$$

Moreover, an additional model using CAR -9 +9 was run in order to check for the robustness of the results.

In the following table, it's possible to appreciate some descriptive statistics of CAR -10 +10. As we can see there are 110 observations, with a mean value of 0,00942 and a standard deviation of 0,08031.

TABLE 1. DESCRIPTIVE STATISTICS OF DEPENDENT VARIABLE - CAR -10 +10

	<i>Percentiles</i>	<i>Smallest</i>		
1%	-.1218129	-.365422		
5%	-.0945497	-.1218129		
10%	-.0656768	-.1218129	<i>Obs.</i>	110
25%	-.0233304	-.1106543	<i>Sum of Wgt.</i>	110
50%	.010972		<i>Mean</i>	.0094217
		<i>Largest</i>	<i>Std. Dev.</i>	.0803072
75%	.03019	.130513		
90%	.0762926	.1450284	<i>Variance</i>	.0064492
95%	.1236404	.3753342	<i>Skewness</i>	.7413568
99%	.3753342	.3753342	<i>Kurtosis</i>	12.99299

5.5 Independent variable

The independent variable of the model is ESG Rating. The ESG rating measures the ESG compliance, performance and efficacy of a company based on its reported data. The ESG rating is computed on the basis of the ESG score assigned by EIKON. The software - that has been introduced in the previous paragraphs - offers one of the most comprehensive ESG databases, covering 80% of the global market capitalization. Specifically, ratings from 12000 companies are available with data traced back to 2002. The score keeps into consideration different parameters regarding ESG themes such as the company externalities on the environment and society and assess the quality of governance practices.

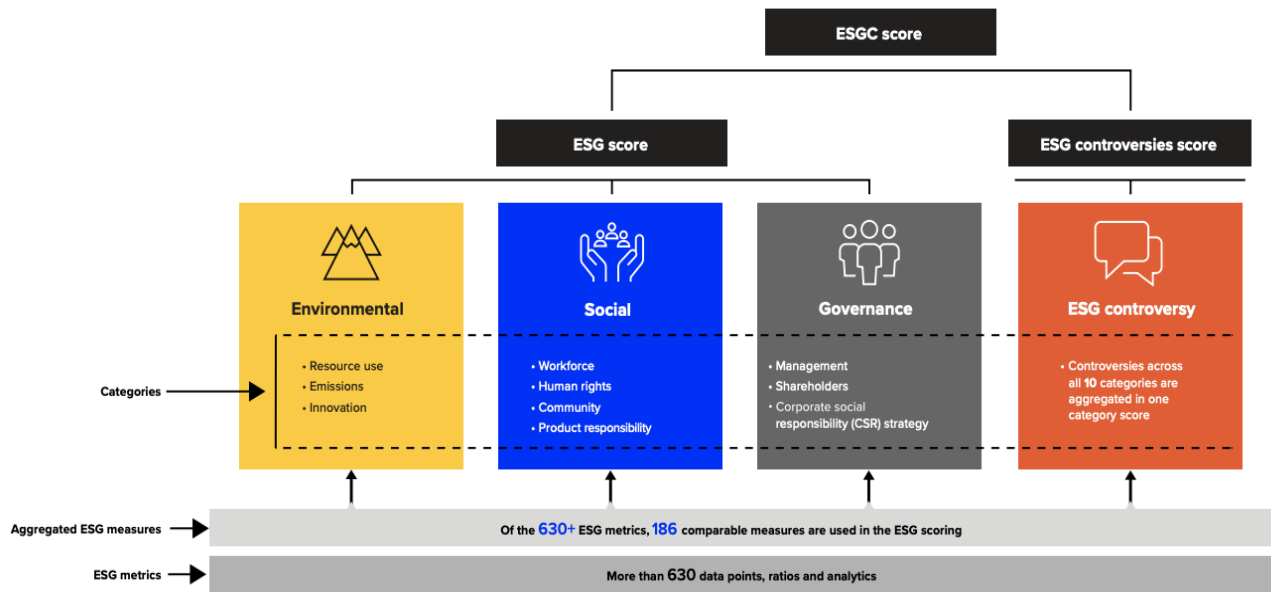


Figure 11. ESG score, source: Eikon

ESG ratings range between D to A+ where D represents the ESG laggards while A+ the ESG leaders. The variable ESG rating is a dummy variable that ranges from one to eleven: lower values represent better ESG rating while higher values stand for worse ratings. The conversion rationale can be appreciated in Table three.

TABLE 3. ESG RATING CONVERSION

1	A+
2	A
3	A-
4	B+
5	B
6	B-
7	C+
8	C
9	C-
10	D+
11	D

TABLE 3. DESCRIPTIVE STATISTICS OF INDEPENDENT VARIABLE - ESG RATING

	<i>Percentiles</i>	<i>Smallest</i>		
1%	2	1		
5%	3	2		
10%	3	2	<i>Obs.</i>	110
25%	3	2	<i>Sum of Wgt.</i>	110
50%	5		<i>Mean</i>	5.172727
		<i>Largest</i>	<i>Std. Dev.</i>	2.145441
75%	7	10		
90%	8	10	<i>Variance</i>	4.602919
95%	8	10	<i>Skewness</i>	.4297252
99%	10	11	<i>Kurtosis</i>	2.302491

5.6 Control Variables

To test the hypothesis, I inserted three control variables in the model that may affect the relationship between the dependent and the independent variables (CAR and ESG Rating): Total Debt, Turnover and Debt-to-Equity ratio.

The first one, Total Debt is a variable that accounts for the average total debt funding of each company during the issuance period. It's calculated in million USD. The variable Turnover, instead, is the sum of the value of all trades during the market day. it's calculated in million USD as well. Last, the debt-to-equity ratio measures the company's financial leverage, specifically it expresses whether it finances its operations using debt or equity. In general terms, the debt-to-equity tend to converge to the industry average.

TABLE 4. OVERALL DESCRIPTIVE STATISTICS

<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev</i>	<i>Min</i>	<i>Max</i>
<i>CAR -10 +10</i>	110	.0094217	.0803072	-.365422	.3753342
<i>CAR -9 +9</i>	110	.0038759	.0717138	-.3264499	.2794317
<i>ESG Rating</i>	110	5.172727	2.145441	1	11
<i>Total debt (\$/mln)</i>	110	54174.72	118242.9	109.8	548939
<i>Turnover (\$/mln)</i>	110	257.2294	464.3279	6.48	2600
<i>D/E</i>	110	1.824241	1.965458	.01627	9.475

TABLE 5. CORRELATION MATRIX

	<i>CAR -10 +10</i>	<i>ESG Rating</i>	<i>Total Debt</i> <i>(\$/mln)</i>	<i>Turnover</i> <i>(\$/mln)</i>	<i>D/E</i>
<i>CAR -10 +10</i>	1.0000				
<i>ESG Rating</i>	-0.3419	1.0000			
<i>Total debt (\$/mln)</i>	-0.0010	0.2995	1.0000		
<i>Turnover (\$/mln)</i>	-0.0685	0.3050	0.5074	1.0000	
<i>D/E</i>	0.0149	-0.0320	0.0551	0.0040	1.0000

6. Results

In this chapter, the results of the analysis are presented. I run two different regression models.

The first one is the bulk of the study, and it's finalized to understand whether the ESG rating impacts positively or negatively the stock price after a green bond issuance. Specifically, I checked if the ESG rating impacts the dependent variable, namely CAR -10 +10.

First, I checked for potential issues in the model by verifying multicollinearity problems and normality. I performed the VIF test and the Shapiro-Wilk test on the model; the positive results highlighted no criticalities with the variables as the result is below the value of ten (1,23 on average). Indeed, in general terms a VIF higher than ten highlights high correlation between the variables.

TABLE 6. VIF TEST

Variable	VIF	1/VIF
<i>Total debt (\$/mln)</i>	1.40	0.716057
<i>Turnover (\$/mln)</i>	1.40	0.716605
<i>ESG Rating</i>	1.14	0.876877
<i>D/E</i>	1.01	0.994030
<i>Mean VIF</i>	1.23	

As it can be appreciated from table 6, the model is significant at all the thresholds. Indeed, the p-value for the variable ESG Rating is equal to zero. The control variables do not impact in a statistically significant way the model. At the aggregate level, the whole model results significant with a p-value associated with the F value of 0,0061. Consequently, it's possible to affirm that the independent variable can reliably predict the dependent variable. The adjusted R-squared results in a value of 0,1284, meaning that the model explains about 13% of the observations. Another interesting parameter is the root mean squared error (Root MSE), that can be noticed to be close to zero, underlying a good fit of the model.

The alpha coefficient of the model is equal to 0,07871, meaning that all the entities that issue green bonds regardless of their ESG rating generate a positive stock market reaction resulting in a positive CAR of 7,8%. In addition, the beta coefficient of the variable ESG rating is equal to -0,0139. This estimate highlights those issuers with higher ESG ratings generate a higher cumulative abnormal return. In particular, it's possible to say that issuer with a negative ESG rating produces a significant adverse effect on the CAR. For example:

- The additional CAR for an issuer with an ESG rating of D, which is represented by the value of 11 in the analysis, will be: $0,07871 - 0,01394 * 11 = -0,07463$

- The additional CAR for an issuer with an ESG rating of C, which is represented by the value of 8 in the analysis, will be: $0,07871-0,01394*8= -0,03281$
- The additional CAR for an issuer with an ESG rating of B, which is represented by the value of 4 in the analysis, will be: $0,07871-0,01394*4= 0,02295$
- The additional CAR for an issuer with an ESG rating of A, represented by the value of 2 in the analysis, will be: $0,07871-0,01394*2= 0,05083$

Thus, the results show a positive correlation between CAR and ESG rating, meaning that the worse the ESG rating, the lower is the CAR.

TABLE 7. OLS REGRESSION WITH CAR -10 +10 AS DEPENDENT VARIABLES

<i>Number of obs</i>	110
<i>F (4, 104)</i>	3.83
<i>Prob > F</i>	0.0061
<i>R-squared</i>	0.1284
<i>Adj R-squared</i>	0.0948
<i>Root MSE</i>	.07639

<i>CAR -10 +10</i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>T</i>	<i>P> t </i>	<i>[95% Conf. Interval]</i>	
<i>ESG Rating</i>	-.0139405	.0036542	-3.81	0.000	-.0211869	-.0066941
<i>Total debt (\$/mln)</i>	8.07e-08	7.38e-08	1.09	0.277	-6.56e-08	2.27e-07
<i>Turnover (\$/mln)</i>	-2.55e-06	.0000187	-0.14	0.892	-.0000396	.0000345
<i>D/E</i>	-.000143	.003737	-0.04	0.970	-.0075537	.0072677
<i>_cons</i>	.0787153	.0206482	3.81	0.000	.0377692	.1196614

I also conducted the same analysis using as dependent variable CAR -9 +9. This model has been used as a robustness model to back test the validity of the first one. As it can be seen in table 7, the second model confirms the results of the previous one. Once again, the overall model is statistically significant at all the thresholds, as indicated by the p-value associated with the F value of the overall model, which equals 0,0079. In this case, the adjusted R-squared highlights that the model explains 9% of the observations. The alpha of the model is equal to 0,0688753 while the variable ESG rating shows a p-value of zero and a beta coefficient of -0,0119393.

In this case, the influence of the ESG rating on CARs would be:

- The additional CAR for an issuer with an ESG rating of D, which is represented by the value of 11 in the analysis, will be: $0,06887-0,01193*11= -0,06236$
- The additional CAR for an issuer with an ESG rating of C, which is represented by the value of 8 in the analysis, will be: $0,06887-0,01193*8= -0,02657$
- The additional CAR for an issuer with an ESG rating of B, which is represented by the value of 4 in the analysis, will be: $0,06887-0,01193*4= 0,02115$
- The additional CAR for an issuer with an ESG rating of A, represented by the value of 2 in the analysis, will be: $0,06887-0,01193*2= 0,054501$

TABLE 8. OLS REGRESSION WITH CAR -9 +9 - ROBUSTENESS CHECK

<i>Number of obs</i>	110					
<i>F (4, 104)</i>	3.66					
<i>Prob > F</i>	0.0079					
<i>R-squared</i>	0.1233					
<i>Adj R-squared</i>	0.0896					
<i>Root MSE</i>	.06853					

<i>CAR -9 +9</i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>T</i>	<i>P> t </i>	<i>[95% Conf. Interval]</i>	
<i>ESG Rating</i>	-0.0119303	.0032782	-3.64	0.000	-.0184311	-.0054295
<i>Total debt (\$/mln)</i>	5.12e-08	6.62e-08	0.77	0.441	-8.01e-08	1.82e-07
<i>Turnover (\$/mln)</i>	-4.30e-06	.0000168	-0.26	0.798	-.0000376	.000029
<i>D/E</i>	-.0024786	.0033525	-0.74	0.461	-.0091267	.0041695
<i>_cons</i>	.0688753	.0185234	3.72	0.000	.0321426	.105608

7. Conclusions

The theme of ESG has acquired great relevance over the last decades. Investors are willing to consider environment, sustainability and governance related aspects when evaluating a business. Specifically, environmental sustainability is becoming a key aspect to mitigate economic, regulatory and reputational risk (Baulkaran, 2019). Under this perspective, green bonds have come out as an innovative financial instrument for companies and investors (Kapraun, Latino, Scheins and Schlag, 2021). Green bonds are defined by the World Bank (2015) as a “*debt security that is issued to raise capital to support climate-related or environmental projects*”. While different studies have already studied different aspects of green bonds (Zerbib, 2019; Chiesa and Barua, 2019; Liu et Al.,2021) and have underlined the positive impact of a green bond issuance announcement (Roslen, 2017; Baulkaran, 2019), the literature is still ambiguous on whether the ESG rating of the issuer influences the stock market reaction to the issuance. Thus, the influence of the ESG score on the effect of green bond issuance on firms’ performance is a topic that remains unaddressed. Therefore, this work focused on analyzing whether the green bond issuance effect on the stock price of publicly traded companies is affected by the ESG rating of the issuer. To pursue this objective, I adopted an event study (Faccio and Stolin, 2006; Mc Namara and Baden-Fuller, 2007) which is a wide use methodology by academics and professionals to study the impact of an event on the stock price. The primary assumption of his methods is that capital markets are considered efficient (Fama, 1970) meaning that every public information has an effect – positive or negative - on the stock market prices. Thus, the issuer’s stock market capitalization can be considered as a good proxy of its underlying value, which is affected by the spreading out of new information (Cappa, Oriani, Pinelli, De Massis, 2019). To assess the impact of the announcement on the stock price, I calculated the cumulative abnormal returns (CARs) in the afterwards of the announcement as illustrated in chapter five and then, I studied the influence of the ESG rating using an OLS regression that considered the variables CARs and ESG rating as, respectively, dependent and independent variable. The outcome of the analysis was positive and statistically significant.

The event study was conducted on a time window of ten days before and after the event (20-days event window), while the robustness check was calculated with an 18-days event window (9 days prior and 9 days after the announcement),

The results presented in chapter six, more precisely in Table seven, shows that the positive effect of the announcement gets lower as the issuer’s ESG ratings worsen. In first place, the results of the regression confirm the general positive impact of a green bond issuance on the stock performance. This result can be observed by looking at the alpha constant of the model which is equal to 0,07871

meaning that all the companies that issue green bonds get, on average, a positive CAR equal to 0,07871. This first point confirms the first hypothesis of the study “*Green bond issuance has a positive impact on the stock price of the issuing company*” and it validates the studies of Baulkaran (2019), Glavas (2020) and Roslen (2017). Indeed, a green bond issuance is generally perceived as a value-creating event that mitigates environmental, regulatory, and reputational risk. From a managerial point of view, this result can be considered relevant. In fact, since investors positively react to eco-friendly actions taken by the firms, companies should issue green bonds to finance sustainable projects in order to signal their commitment and to improve their own environmental performance.

Concerning the regression results, I also validated the second hypothesis: “*Companies with bad ESG ratings have lower cumulative abnormal returns*”. This point can be analysed by considering the beta coefficient of the model which is equal to -0,0139 for the main model and -0,0119 for the back testing one. From a mathematical point of view, the beta represents the slope of the model, consequently it tells us about the relationship between the dependent and the independent variable. In this case, it’s possible to say that CARs get lower as the ESG rating worsen. Indeed, as specified in chapter five, the variable ESG rating is a dummy that takes values from one to eleven where one represents the A-rating while eleven is the D-rating. Thus, this result addresses the research question: “*Does ESG rating affect the stock market reaction to a green bond issuance?*”. Based on the results, the answer to the research question is that the stock market reacts positively to the issuance, companies with worse ESG rating perform poorly if compared to the best-in-class issuers. The theoretical explanation is that green bond issuance by companies that are usually not involved in eco-sustainable practices could be perceived by investors as a greenwashing practice. On the other hand, investors seem to believe more in companies with better ESG ratings that have already demonstrated their commitment and can rely on a stronger reputation.

Moreover, advancing the scientific knowledge of the phenomenon, the findings of this study can be considered relevant for professionals and policy makers. In fact, this study offers useful insights for managers that want to boost the competitiveness of their company by increasing their commitment towards the environment. Indeed, while it’s true that a green bond issuance can signal the company’s commitment towards the environment (Flammer 2021), I have demonstrated that investors consider more credible an issuance made by ESG compliant firms. On the other hand, the work can be valuable for policymakers since green bonds represent a boost for a more sustainable economic growth, increasing global GDP, and significantly decreasing greenhouse gas emissions (Maltais, Nykvist, 2020, Tuhkanen, Vulturius, 2020). This last aspect is of primary interest for policymakers,

considering the many pledges and effort made s by governments to tackle the issue of global warming and the EU ambitious program of reaching climate neutrality by 2050.

Finally, my study is not exempt from limitations, and it opens to the possibility of furthers analysis. Indeed, from a geographical the scope of this work is narrow and limited since it considers only publicly traded companies based in the US. Future studies may further investigate the phenomenon and validate the results of this research by expanding the analysis to other markets. Alternatively, it could be interesting to add more control variables to the analysis such as number of employee or R&D investments.

Anyway, this research can be considered a starting point for future papers that want to deepen the topic by analyzing, as above, other markets and other variables.

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9. Summary

The theme of ESG has acquired great relevance over the last decades. Investors are willing to consider environment, sustainability and governance related aspects when evaluating a business. Specifically, environmental sustainability is becoming a key aspect to mitigate economic, regulatory and reputational risk (Baulkaran, 2019). In fact, although financial factors remain the first criteria ruling the decision in an economic agent's behavior, investors are becoming more and more interested in non-financial factors to assess risks and opportunities linked to an investment (Lebelle, Jarjir & Sassi, 2020). In particular, environmental sustainability is becoming of primary importance due to the increasing relevance of long-term shifts in global temperature and changing weather patterns, i.e., climate change. (Baulkaran, 2019).

Under this perspective, green bonds have come out as an innovative financial instrument for companies and investors (Kapraun, Latino, Scheins and Schlag, 2021). A complete definition of green bonds is the one given by the International Capital Markets Association (ICMA) in 2018: *“Green Bonds are any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible green projects and which are aligned with the four core components of the Green Bond Principles (GBP), namely, the use of proceeds, the process for project evaluation and selection, the management of proceeds, and reporting”*.

The origins of green bonds can be traced back to 2007 when the European Investment Bank (EIB) issued its first Climate Awareness Bond. Since then, the market has continued to grow at a double-digit pace. The market has, indeed, snowballed from a relatively slow start to an impressive growth rate over 50% in the last five years (CBI, 2022). Indeed, after EIB, several other supranational institutions such as the World Bank and other entities started to issue this type of fixed income securities. The market started to blossom after the introduction of the ICMA Green bond Principles in 2014 that constituted a boost for the market by increasing transparency for both investors and issuers (Reichelt, Keenan, 2017). At the dawn of 2016 the cumulative green issuances at global level amounted to \$104 billion, only two years later, in November 2017 the market counted the volume of issuance overcame the threshold of \$100 billion for the first time. At the end of 2020, the green bond market reached a cumulative value of \$1 trillion and in the same month of the following years this data grew to \$1,5 trillion with an annual volume of \$517 billion. The market is forecasted to pass the milestone of \$5 trillion by 2025 (CBI, 2022).

While different studies have already studied different aspects of green bonds (Cochu et al. 2016; Jun et al. 2016; Zerbib, 2019; Chiesa and Barua, 2019; Tolliver et al. 2020; Liu et Al.,2021) and have

underlined the positive impact of a green bond issuance announcement (Roslen, 2017; Baulkaran, 2019), the literature is still ambiguous on whether the ESG rating of the issuer influences the stock market reaction to the issuance. Thus, the influence of the ESG score on the effect of green bond issuance on firms' performance is a topic that remains unaddressed. Therefore, this work focused on analyzing whether the green bond issuance effect on the stock price of publicly traded companies is affected by the ESG rating of the issuer. Therefore, the research question is “*Does ESG rating affect the stock market reaction to a green bond issuance?*”.

To test the hypothesis, I adopted an event study (Faccio and Stolin, 2006; Mc Namara and Baden-Fuller, 2007) which is a wide use methodology by academics and professionals to study the impact of an event on the stock price. The primary assumption of his methods is that capital markets are considered efficient (Fama, 1970) meaning that every public information has an effect – positive or negative - on the stock market prices. Thus, the issuer's stock market capitalization can be considered as a good proxy of its underlying value, which is affected by the spreading out of new information (Cappa, Oriani, Pinelli, De Massis, 2019). To assess the impact of the announcement on the stock price, I calculated the cumulative abnormal returns (CARs) in the afterwards of the announcement as illustrated in chapter five and then, I studied the influence of the ESG rating using an OLS regression that considered the variables CARs and ESG rating as, respectively, dependent and independent variable. The outcome of the analysis was positive and statistically significant.

The event study was conducted on a time window of ten days before and after the event (20-days event window), while the robustness check was calculated with an 18-days event window (9 days prior and 9 days after the announcement).

Coming back to the preliminary work, I built up the database by downloading data regarding ESG bonds issuance in the US in the timespan 2019-2021. Then, I linked each issuer to its the ESG rating. After that, I created the different variables for the regression: I used as a dependent variable the cumulative abnormal returns (CARs), a variable that captures the stock market return in excess to the expected return in the days around the issuance, in other words the abnormal fluctuations of the stock returns. The cumulative abnormal returns are defined as the cumulative sum of a stock's abnormal return (ARs).

The independent variable of the model is ESG Rating. The ESG rating measures the ESG compliance, performance and efficacy of a company based on its reported data. ESG ratings range between D to A+ where D represents the ESG laggards while A+ the ESG leaders. The variable ESG rating is a dummy variable that ranges from one to eleven: lower values represent better ESG rating while higher values stand for worse ratings. The conversion rationale can be appreciated in Table three.

I also added three control variables in the model that may affect the relationship between the dependent and the independent variables (CAR and ESG Rating): Total Debt, Turnover and Debt-to-Equity ratio.

The results shows that the positive effect of the announcement gets lower as the issuer's ESG ratings worsen. In first place, the results of the regression confirm the general positive impact of a green bond issuance on the stock performance. This result can be observed by looking at the alpha constant of the model which is equal to 0,07871 meaning that all the companies that issue green bonds get, on average, a positive CAR equal to 0,07871. This first point confirms the first hypothesis of the study "*Green bond issuance has a positive impact on the stock price of the issuing company*" and it validates the studies of Baulkaran (2019), Glavas (2020) and Roslen (2017). Indeed, a green bond issuance is generally perceived as a value-creating event that mitigates environmental, regulatory, and reputational risk. From a managerial point of view, this result can be considered relevant. In fact, since investors positively react to eco-friendly actions taken by the firms, companies should issue green bonds to finance sustainable projects in order to signal their commitment and to improve their own environmental performance.

Concerning the regression results, I also validated the second hypothesis: "*Companies with bad ESG ratings have lower cumulative abnormal returns*". This point can be analysed by considering the beta coefficient of the model which is equal to -0,0139 for the main model and -0,0119 for the back testing one. From a mathematical point of view, the beta represents the slope of the model, consequently it tells us about the relationship between the dependent and the independent variable. In this case, it's possible to say that CARs get lower as the ESG rating worsen. Indeed, as specified in chapter five, the variable ESG rating is a dummy that takes values from one to eleven where one represents the A-rating while eleven is the D-rating. Thus, this result addresses the research question: "*Does ESG rating affect the stock market reaction to a green bond issuance?*". Based on the results, the answer to the research question is that the stock market reacts positively to the issuance, companies with worse ESG rating perform poorly if compared to the best-in-class issuers. The theoretical explanation is that green bond issuance by companies that are usually not involved in eco-sustainable practices could be perceived by investors as a greenwashing practice. On the other hand, investors seem to believe more in companies with better ESG ratings that have already demonstrated their commitment and can rely on a stronger reputation.

Moreover, advancing the scientific knowledge of the phenomenon, the findings of this study can be considered relevant for professionals and policy makers. In fact, this study offers useful insights for managers that want to boost the competitiveness of their company by increasing their commitment towards the environment. Indeed, while it's true that a green bond issuance can signal the company's

commitment towards the environment (Flammer, 2021), I have demonstrated that investors consider more credible an issuance made by ESG compliant firms. On the other hand, the work can be valuable for policymakers since green bonds represent a boost for a more sustainable economic growth, increasing global GDP, and significantly decreasing greenhouse gas emissions (Maltais, Nykvist, 2020, Tuhkanen, Vulturius, 2020). This last aspect is of primary interest for policymakers, considering the many pledges and effort made s by governments to tackle the issue of global warming and the EU ambitious program of reaching climate neutrality by 2050.

Finally, my study is not exempt from limitations, and it opens to the possibility of furthers analysis. Indeed, from a geographical the scope of this work is narrow and limited since it considers only publicly traded companies based in the US. Future studies may further investigate the phenomenon and validate the results of this research by expanding the analysis to other markets. Alternatively, it could be interesting to add more control variables to the analysis such as number of employee or R&D investments.

Anyway, this research can be considered a starting point for future papers that want to deepen the topic by analyzing, as above, other markets and other variables.