

GREEN BONDS AND SHAREHOLDER VALUE - THE ANNOUNCEMENT EFFECT OF CORPORATE GREEN BONDS

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ABSTRACT

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Abstract <p>The aim of this master's thesis is to find out, whether companies' efforts to raise capital in the form of Green bonds, are essentially shareholder value creating activities. Shareholder value creation has been studied by measuring the short-term market reactions on a share of an issuer around Green Bond announcements. Short-term stock reactions have been estimated by using cumulative abnormal returns in several different time periods using methods specific to Event Study approach. The data sample consist of 159 European Green bond announcements between the years of 2013-2019. With this sample I was able to demonstrate positive and statistically significant CARs around the Green bond announcements. The results are in line with previous studies that are conducted with similar approach. This study provides further confirmation that the Green bond label is beneficial to use as from the shareholder's perspective. These results along with the compiled theoretical framework, are providing more insight into the emerging of the Green bond market. I have also expressed my concern about the challenges and limitations that this approach and used method includes.</p>	
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Tiivistelmä <p>Tämän pro gradu -tutkielman tavoitteena on selvittää, onko yritysten pyrkimys hankkia pääomaa markkinoilta vihreiden joukkovelkakirjojen muodossa pohjimmitaan omistaja-arvoa luovaa toimintaa. Arvonluontia on tutkittu mittamalla liikkeeseenlaskijayrityksen osakkeen lyhyen aikavälin kumulatiivisia epänormaaleja tuottoja vihreän joukkovelkakirjalainan julkistamisen yhteydessä. Lyhyen aikavälin markkinareaktioita on tutkittu useammassa eri aikaikkunassa tapahtumatutkimukselle ominaisia menetelmiä hyödyntäen. Tutkimuksen aineisto koostuu 159 eurooppalaisen vihreän joukkovelkakirjalainan julkistuksesta vuosina 2013-2019. Kerätyn aineiston pohjalta pystyttiin osoittamaan tilastollisesti merkitseviä epänormaaleja tuottoja Green Bond -julkistuksen yhteydessä useammalla eri aikaikkunalla tarkasteltuna. Tulokset ovat pitkälti linjassa muiden vastaavien tutkimusten kanssa ja näin ollen antavat lisävahvistusta Green Bond -viitekehysten tuottamasta lisäarvosta omistajan kannalta tarkasteltuna. Saadut tulokset yhdessä kerätyn kirjallisuuskatsauksen kanssa antavat lisää ymmärrystä vihreän joukkovelkakirjalainamarkkinan viime vuosien merkittävän kasvun taustalle. Tutkimuksessa on otettu myös kantaa valitun aihepiirin ja menetelmän eri haasteisiin ja rajoitteisiin liittyen.</p>	
Asiasanat Vihreät joukkovelkakirjalainat, Vastuullinen sijoittaminen, Epänormaalit tuotot, Tapahtumatutkimus, Omistaja-arvo	
Säilytyspaikka Jyväskylän yliopiston kirjasto	

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1 INTRODUCTION

1.1 Background

Since the climate change has been recognized as global issue that yet remains unsolved, sustainability and responsibility have become more and more significant requirements for companies and their operations. Along the environmentally conscious consumers who demand more transparency, also governments and global institutions are actively pursuing towards more established standards and regulations. In 2015, The Paris Climate Agreement gave even more momentum on this trend, as 195 different countries came into agreement on unitary ambition mitigating climate change (UN, 2015). This agreement introduced a warning level of 2 °C global warming. By exceeding this threshold, severe problems are more likely to become reality. This globally addressed threat is widely reflected on the pressure that is set on the decarbonization of companies' operations, also known as "Green transition" (European Commission, 2020).

As companies need to take account of environmental issues in their various operational activities, this will also alter the requirements and the nature of collected accounting information. In addition to the traditional concepts of accounting, many sustainability related frameworks and measures have been established so that the environmental impact could be measured, reported and analyzed more accurately and transparently. This trend is highly visible among current scientific publications in accounting journals that are covering the objectives of CSR-reporting and ESG-issues (Gray 2002; Gray, Owen & Adams 1996). As of today, companies are being analyzed and scored, not only with their financial performance, but also with the set of different sustainability criteria.

Although the framework and reporting requirements on corporate social responsibility have evolved significantly, the subject is still relatively fresh and undeveloped. A further problem is to distinguish real and significant responsible impact from empty promises and so-called greenwashing.

The influence of this notable trend is strongly visible from the perspective of investors too. Straight investments in shares can now be scored by the set of different ESG criteria and actively managed mutual funds can be picked by their investment philosophy based on Socially Responsible Investing (SRI). Index providers have begun to offer indices with sustainability classifications and as a continuum of this, many different vehicles such as ETFs following these benchmarks. Especially high-profile institutional investors (e.g., pension insurance companies in Finland) have boldly set an example by taking responsibility as one of the essential criteria when making investment decisions (Haura, 2018). In addition to just determining portfolio exclusions and inclusions, large entities have the opportunity to play an active role in corporate governance through different impact investing schemes.

From the company's perspective, potential operational risks are increasing when the core values of the company differ significantly from what is generally considered as responsible. Legitimacy theories suggest that the level of CSR-disclosure is due to this 'social contract' between the company and surrounding world (Patten, 1991). To mitigate this legitimacy gap, companies can enhance the level of CSR disclosure to provide more transparent view of their social or environmental impact. If the legitimacy gap goes too wide, the whole existence of the company may be in danger (Branco & Rodrigues 2006). One empirical finding that confirms this theory is the Exxon Valdez oil spill in 1989 and its impact on the company's environmental reporting. After the crisis, the company had strong need to rebuild the trust and reduce the legitimacy gap by increasing the level of environmental impact disclosure (Patten, 1992).

There are various ways to communicate the enhanced legitimacy of a company towards its stakeholders. These options are not limited to improvements in CSR-reporting only. In addition, different marketing and PR campaigns can be raised, or different certification schemes to be used for evaluating environmental impact. From the investor's perspective, different sustainable finance schemes may be implemented so that the portfolio composition is surely aligned with the set values. One notable tool for environmentally conscious investors and issuers is recently launched financial instrument called Green bond.

This relatively new fixed-income instrument gives investors an opportunity to invest in environmentally friendly projects among the vast bond market. From the issuer point of view, the label means that the issued capital is earmarked to be used as financing or refinancing projects that will help to mitigate climate change (ICMA, 2019a). In fact, Green Bond market has grown rapidly since the label was initially introduced to the public in 2008. Many academic journals have already covered this subject from different angles, thus enabling a meaningful topic to study further on this thesis.

1.2 Research objectives

In this paper, I will be presenting the emergence of the Green bond framework and the current market situation. I will clarify the challenges relating to undeveloped framework brought up in earlier studies. I will also explain the incentives for green bonds both from the investor, and the issuer point of view. Previous research findings have shown that the Green bond issuers benefit from responsible operations by getting cheaper financing for their operations, as the bonds issued with green bond label tend to be priced little higher than conventional bond counterparts (Zerbib, 2019; Baker, Bergstresser, Serafeim & Wurgler, 2018; Ehlers & Packer, 2017). Despite the relatively immature framework and expressed fear of greenwashing, some evidence is already implicating that by issuing Green bonds, the funds are effectively allocated to both sustainably effective and financially profitable projects (Flammer, 2020). However, this additional label does not come for free, as this framework imposes costs on the company and requires significant increase in resources to measure, analyze and report its own environmental impact. Thus, the main question behind this research is as it follows: Does the issuance of Green bonds really add value to shareholders?

More recently, some preliminary evidence linking Green bond announcements with positive abnormal returns have been already established (Tang & Chang, 2018; Flammer, 2020). Since these studies are missing the most recent data and the geographical focus is different, I wanted to continue this approach by focusing exclusively on the Green bond announcements of European listed companies. This approach gives the benefit of coherent regulation as the whole sample consists of only Green Bond Principle (GBP) aligned bonds. By gathering up-to-date sample of 153 different Green bond announcements made between the years of 2013-2019, I am able to provide more scientific confirmation on a relevant and fresh topic.

In line with previous studies, I approach the research question by using methods specific to Event Study. I have measured short-term stock reactions around the Green bond announcements by estimating cumulative average abnormal returns on different length event windows. The purpose of this study is to get gain more evidence, whether the issuance of green bonds is an event that creates shareholder value. If scientifically significant abnormal returns are prominent in this sample, it gives more valuable evidence that committing in green projects are indeed creating shareholder value. On the contrary, if the positive abnormal returns are not present or if they even tend to be on the negative side, it gives the implication that green label is not so valued by the shareholders after all. A comprehensive review of the relevant literature and common frameworks provides an in-depth understanding for analyzing the obtained results and to draw possible conclusions.

2 SUSTAINABLE FINANCE

Sustainable finance has become big trend in financial industry during last two decades. Sustainability and corporate responsibility have been widely accepted as relevant factors alongside more traditional financial variables, when evaluating risk and return of investment object. The availability of the sustainability related data and tools has been improved significantly and at the same time, new types of responsibility themed instruments are constantly being pushed into the market. On closer inspection of the subject, one will easily notice that a considerable number of different terms and acronyms arise around this theme. Sustainability and responsibility cover a wide range of ethical issues that sometimes overlap and therefore the comparison between more narrowed concepts and approaches can turn out to be confusing. To improve the understanding around this broad, and even slightly confusing subject, I will next introduce most common concepts and frameworks around sustainable finance and evaluation of environmental sustainability.

2.1 ESG-framework

As the responsibility itself is quite vast subject, categorizing different approaches can be seen as beneficial. Most commonly the different forms of responsibility are being observed through three-dimensional framework called ESG (Lamberton, 2005). The acronym refers to environmental, social and governance related practices of an investment that may have significant impact on the risk to return-ratio. By implementing the use of ESG factors, the investors can use these non-

financial ethical parameters along the more traditional factors to estimate fair value of the investment in question (Schoenmaker & Schramade, 2018).

Basically, by including the ESG factors on the analysis, the investors are more thoroughly addressing the externalities that may have material effect on future profits (Schoenmaker & Schramade, 2018). Many credit rating agencies and financial data providers have been introducing their own evaluation schemes for different sets of ESG factors, so that the investments can be scored by their level of responsibility. As the investors can now rank their possible investments by their responsibility, they can now set their own thresholds for company exclusions or inclusions. By conducting ESG screening, the investors are being able to align their portfolio with their ethical values if that is something they want to pursue. ESG data can also be effective tool if one would like to take opposing view and invest low ESG score companies. The use of ESG variables in financial analysis means only that the responsibility factors have been considered, but there is no direct link to investor's commitment on responsibility. This example highlights the fact that other frameworks than ESG is needed to evaluate true responsibility of investing.

Environmental	Social	Governance
<ul style="list-style-type: none"> •Climate change mitigation •Conservation of biodiversity •Energy efficiency •Circular economy •Environmental standards and certifications •Pollution, waste production •The use of natural resources 	<ul style="list-style-type: none"> •Human rights •Stakeholder & employee relations •Child and forced labour •Health & Safety •Consideration of the local community 	<ul style="list-style-type: none"> •Independence of the board •Quality of management •Executive compensation •Conflicts of interest •Anti-corruption measures •Transparency & disclosure

GRAPH 1 ESG-framework and possible concerns by each standpoint

2.2 Socially Responsible Investing (SRI)

By taking one step further from simple ESG scoring approach, Socially Responsible Investing (SRI) refers to investment activity where the assessment of ESG issues have been implemented in the investment processes so that the return and risk profile of the portfolio is improved (Finsif, 2021). In order to clarify the difference between these two concepts, the investors can include ESG variables in their analysis and select the content of their portfolios based on different exclusions and inclusions. However, this is not directly meaning that the investor in

question is committed responsibility on any level, but rather that the different ESG variables have been utilized in the decision-making. Meanwhile, the SRI contains a presumption that the investor is committing responsibility the way their ethical goals are aligned.

Depending on the values and aspirations of the investor, all the dimensions of the ESG framework can be incorporated in SRI, or the investor can focus primarily on one particular dimension of responsibility. By focusing primarily on environmental themes, this approach is often referred as environmental investing. Since the main topic of this paper is leaning towards more on the environmental side of responsible investing, this term will be often referred. On the contrary, if the main focus is to gain social benefit the approach is called social investing. Naturally, these themes often collide in the real world, and when there are multiple externalities to be considered simultaneously, the broader term, sustainable investing, is often used. (Schoenmaker & Schramade, 2018.)

2.3 Impact Investing

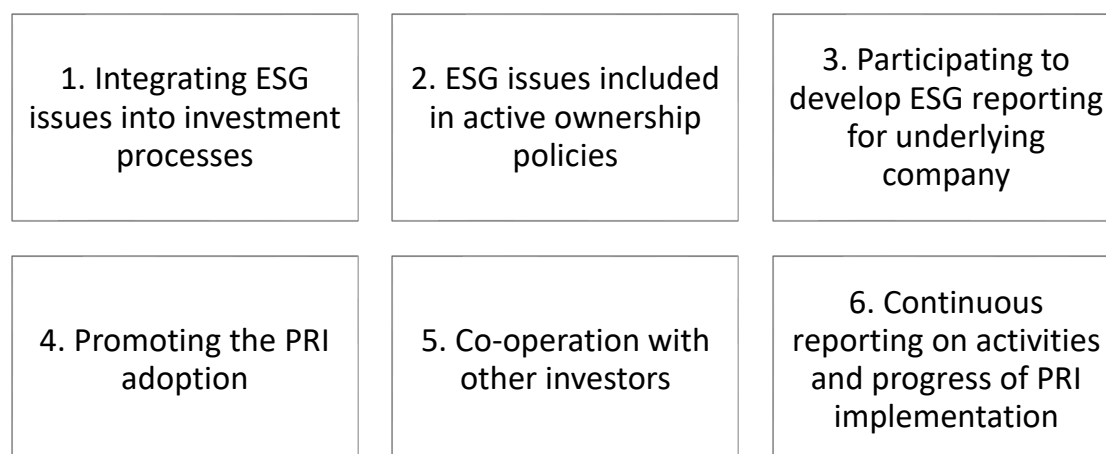
Impact investing takes the SRI approach even little further. SRI itself does not determine the level of ownership activity. In socially responsible investing, the decisions and portfolio construction must be aligned with the ethical values, but active ownership and pursuit of changing the behavior of the investment object is not specifically required. On the contrary, impact investing includes the idea of gaining measurable and material impact on ESG related non-financial issues by using active measures, while not compromising financial returns more than is necessary (Höchstädter & Scheck 2015). For reputable and big institutional investors more active approach is more plausible as the relative ownership in underlying company gets bigger, and the contribution in board meetings is more significant. Correspondingly, the means for retail investors to pursue non-financial goals directly are naturally way more limited. Thus, it makes more sense to many smaller players to focus on investing through responsible themed instruments and conducting more passive exclusions/inclusions -strategies instead.

2.4 UN Principles for Responsible Investing (PRI)

According to Finsif, there is no universal approach to perform responsible investing, and each investor must therefore choose the right tools to fit their overall investment strategy (2021). Responsible investing can be conducted within all possible asset classes, so the approach could be whole different when comparing real estate investors to plain equity investors. Thus, the available resources vary along different investor groups, and it is naturally clear that big institutional investors have more options to carry out their perspirations when compared to smaller individual investors. The same difference applies, when the investors

have just their own capital under management, compared to a situation where clients' money is included, as is the case with mutual funds.

In order to improve the coherence of terminology and practices related to responsible investment, the UN has defined the principles for responsible investment (PRI). The investor who is committed to operating under the PRI has to follow these six principles (see Graph 2). The investor who has signed the PRI undertakes to make ESG assessment a concrete part of its investment processes and to describe its operating models in its investment policy. By signing PRI, the investor is also committed to the systematic use and development of ESG tools, analyzes and statistics. In addition, the investor must act as active owners so that the company in question is able to report measurable and effective improvements in the sustainability of their operations. PRI investors must also systematically develop CSR reporting to more transparent and precise direction. This work is by no means created without any interaction with others, and cooperation is highly encouraged to develop new standards and practices for the entire industry. Practical implementation of this framework should be systematically reported transparently in order to guarantee the reliability of the PRI framework. (Finsif, 2021).



GRAPH 2 PRI-framework (Finsif, 2021)

2.5 EU Taxonomy for sustainable activities

The assessment of environmental responsibility is relatively difficult task, because the overall evaluation of different operations can be quite complex, and overall impact on environment is not always clearly measurable. The actions taken to mitigate climate change may not be immediately visible, and the effects may not materialize for many years to come. So how do you define the actions

that can be considered environmentally responsible? Which technologies and innovations are really effective? What are even the actual goals and objectives that we are trying to establish? For helping to clarify these issues, common frameworks have been established to set out convergent market practices for estimating environmental sustainability.

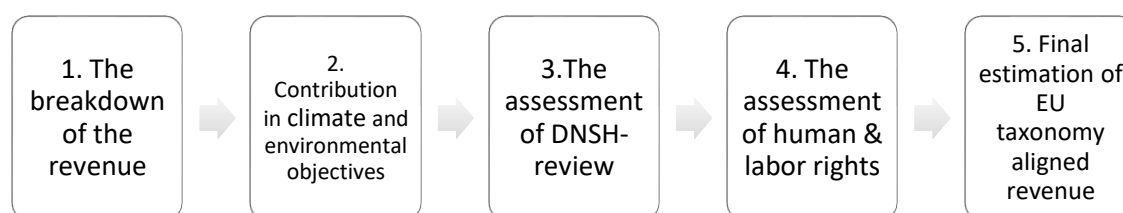
European Union has launched a department called “Technical Expert Group on Sustainable Finance” (TEG) to develop a common framework for environmental sustainability so that the set environmental and climate goals could be achieved. As a result of two years of work, TEG finally published this framework called EU taxonomy in March 2020. This classification system has been made for specifically three different segment groups in mind. First segment includes financial market participants and private investors that are operating from the EU zone. Second segment is for large companies that already need to disclose their business models, policies, performance, key risks and KPI-indicators from the perspective of possible ESG-issues. And lastly the third segment is directed more broadly towards the EU member countries and their local organizations, which guide public finances and set standards for different products and financial instruments. (European Commission, 2020.)

EU taxonomy is a tool to help investors, businesses, as well as EU Member States to plan and target funding towards the transition to low-carbon, resilient and resource-efficient operations. The purpose of the taxonomy is to create a common classification system throughout the European Union by setting measure-specific sustainability thresholds for different type of operations. Currently, the taxonomy covers about 70 different industry specific operations, but the aim is to extend the classification system further during following years. EU taxonomy defines six environmental objectives, of which the applicant company must be able to demonstrate a measurable benefit in promoting at least one objective without compromising the other objectives at the same time. These goals are as follows:

1. Climate change mitigation
2. Adaptation to climate change
3. Sustainable use and protection of water and other marine resources
4. Transition to a circular economy (waste prevention and recycling)
5. Pollution prevention and control
6. Protection of healthy ecosystems

(European Commission, 2020)

EU taxonomy also clearly defines industry and operation specific situations when the applying company cannot be declared eligible in any case. These situations include operations such as plantation cultivation, clearing of high-carbon land (eg. peat production in Finland), waste incineration and the transport of fossil fuels. Once the applicant company can be found eligible, the process will go through five different steps that are described in the below graph (GRAPH 3).



GRAPH 3 The process for applying EU taxonomy (European Commission, 2020).

The process begins with the breakdown of the revenue by different type of activities the company is performing. The company must clearly disclose what environmental activities their business consists of. Second phase is to estimate each activity in more detail to determine in which extent each activity is meeting the taxonomy requirements and thresholds. In the next step, measures that have passed the climate change mitigation criteria will be subject to a DNSH (Do Not Significant Harm) review, to ensure that the passed activities are not causing any harmful side effects at the same time. If all the criteria are met, the next step is to add the social perspective to evaluation. EU taxonomy requires that passed activities must also meet the requirements of UN, OECD and ILO for human and labor rights. After social responsibility approach, it is time to estimate final proportion of the revenue that is EU taxonomy aligned. (European Commission, 2020)

Even if the framework of EU taxonomy is a big step forward in assessing environmental sustainability, criticism has not been avoided. The incompleteness of the framework is still clearly visible, as the applicability to different industries and activities is still relatively limited. Finnish research unit, BIOS has published an article where they point out this issue by mentioning that the whole mining industry and large part of the other industrials are not yet covered in this framework (Lankinen, 2020). Lankinen also suggests that the framework would be more effective if the taxonomy would be extended from the “green” climate transit supporting activities to “brown” and “red” activities that are either neutral or interfering the climate transit (2020). This would be giving much more comprehensive view on environmental sustainability.

2.6 Financial performance

So, does it pay to be responsible or is it just giving charity on shareholders expense? When it comes to more traditional shareholder point of view approach, the companies have claimed to have only one goal to keep in mind and that is maximizing the value generated to its owners. This shareholder theory, also known as Friedman doctrine, states that the companies should exist only for their shareholders and by allocating resources for any social or environmental causes, they are behaving irresponsibly as their main purpose, generating shareholder value, will be compromised (Friedman, 1970). By leaning solely on this point of view, actions that companies are making to reduce their carbon footprint or improving working conditions are made on the expense of the shareholders.

Actually, there are some studies that are in line with Friedman's interpretation and are suggesting that by committing sustainability, investors are actually willing to accept lower returns for their investments (Boulatoff & Boyer, 2009). In addition to shareholder theory, these results are often explained with efficient market hypothesis. If the company is committing on sustainability, the risks of irresponsible actions is mitigated (Renneboog, Ter Horst & Zhang, 2010). For example, by reducing the use of fossil fuels, the company actually lowers its risk exposure for any undesired changes in taxation or regulation. Since the rational and risk averse investors are constantly trying to maximize returns while minimizing the risks, lower expected return can be justified if the risk exposure is simultaneously lower. On the contrary, by investing in irresponsible companies, the investor carries higher risk and therefore is expecting higher returns for the investment. Empirical evidence gives verification to this principle as so called 'sin stocks' are very often associated with higher cost of capital and finally higher expected returns for the shareholder (Hong & Kacperczyk, 2009).

As one might expect, Friedman's doctrine has faced extensive criticism as ESG parameters have gained well-established role in the assessment of different companies. In contrast, to shareholder theory, theories that allow social and environmental issues along many other externalities into equation receive more and more scientific attention. These so-called stakeholder theories state that Friedman doctrine is indeed inconsistent, as by contributing to company's different stakeholders, the shareholders can also benefit simultaneously. Actually, many studies have been able to find a link between high commitment in CSR and improved operational performance (Oikonomou, Brooks & Lee, 2012). Thus, it is no wonder that some other studies have provided evidence on the positive linkage between sustainability and increased risk-adjusted stock returns (Cheung, Tan, Ahn Zhang, 2010). This view is further supported by the results of positive stock price reactions around the announcements that indicate strong social, environmental or governance related commitment (Konar & Cohen, 2001).

Due to complex nature of this issue, straight and comprehensive conclusions between financial performance and responsibility are difficult to draw.

Even if many studies are suggesting that companies are truly gaining shareholder value when committing more strongly towards responsibility, there is a long way to implement this responsibility factor effectively on decision making processes. Even harder seems to be modelling of consistent strategies where risk-adjusted returns exceed the conventional, not-so-responsible, counterparts. Brammer, Brooks & Pavelin pointed out on their article that the possibility of better operational performance increases when committing CSR, but still on the portfolio level catching abnormal returns seems to be problematic (2006). Brammer et al. explained this by referring to efficient market hypothesis and its core principles. When using different ESG-measures for screening possible investments, the pool of possible investments becomes narrower, and the efficiency of the portfolio is compromised. This leads to new equilibrium where committing sustainability is engaged and that is why the ESG-screening should not have positive effect on portfolio performance, at least theoretically speaking. Some empirical observations backing up this assumption have been substantiated. Schröder examined vast set of SRI mutual funds and did not find any significant differences on risk-adjusted returns when compared to a control group formed from conventional funds (2004). Thus, the investment universe that is being restricted with ESG exclusions, does not have a detrimental effect on the expected returns, but on the other hand, does not promise better returns either.

It is also essential to ask how well these non-financial indicators based on the level of responsibility can even explain the improvements in financial performance? Although the commitment on sustainability have often been linked to either better or lower returns, there are usually more traditional factors that better explain the returns. Indeed, one recent study takes a position on this and questions the newsfeed that is suggesting that strong ESG-scores are explaining the share price resilience after COVID-crisis (Demers, Hendrikse, Joos, Lev, 2021). In fact, their results show that different ESG-measures actually explain the returns very weakly and more substantial explanatory factors are mainly accounting based measures, such as investments in intangible assets (Demers et al. 2021). Thus, although the stock returns and operational performance seem to correlate to some extent with the level of responsibility, it is difficult to draw absolute conclusions about the causality.

3 GREEN BONDS

3.1 Key determinants and market situation

In essence, Green Bonds are debt instruments, whose issued capital must be allocated to finance or refinance environmentally sustainable projects (ICMA, 2018a). Green Bonds provide investors efficient way to participate in financing projects through conventional fixed income instruments that are helping climate change mitigation and adaptation (Bachelet et al. 2019). As impact investing is usually viewed through three-dimensional universe, where the objectives can be distributed to environmental, social and governance dimensions (ESG framework), such allotment is present with sustainable debt instruments as well. The International Capital Market Association (ICMA) has published separate guidelines for Green, Social and Sustainable bonds. While Green bonds are focusing on the projects that try to mitigate climate change, Social bonds are respectively focusing primarily on creating social benefits, such as building affordable housing or infrastructure for the populations below poverty levels (ICMA, 2018b). It is clear that some green projects tend to have social benefits as well, but according to ICMA, the correct label should be chosen based on primary objectives of the underlying project. For those cases, where social and green objectives are purposefully mixed, there are also Sustainability Bond guidelines available (ICMA,2018c). In this study, I will be focusing on Green bond label, as it has currently the most established markets one among these three labels.

To this date, ICMA has established four different types for Green Bonds and even more could emerge as the Green bond market develops (ICMA, 2018a). Most of the Green Bonds are standard “resource-to-the-issuer” debt obligations

that are following the use of proceeds format. The Green project, where the issued capital will be allocated, should meet the requirements that are introduced in Green Bond Principles (See Chapter 3.2.1.). Therefore, paid interest and bond principal are derived from overall cashflows of the issuer, not just from the project in question. Meaning that, by investing in standard Green bond, the investor is carrying the credit risk of the whole issuer, instead of the project where the issued funds are allocated. This separates standard use of proceeds Green bonds from the Green project bonds, as in the latter, the investors are carrying the risk from project profitability. Along these two types, Green revenue bonds and Green securitized bonds are identified in GBP. Green revenue bonds differentiate by its credit exposure and green securitized bonds are used when there might be several underlying green projects or other vehicles (e.g. ABS and MBS) than bonds related. (ICMA, 2018a.)

Other factor that is distinctive for Green bonds is that they are self-labelled at the moment of issuance, meaning that the issuer can label the bond as green, without any external assessments made (ICMA, 2018a). That is why concerns have raised, as it is not always so easy to declare the use of proceeds to be truly green or not. Several researchers have pointed out that the undeveloped guidelines and legislation increases the probability of green washing (Bachelet et al. 2019). The problem is even more plausible if further examinations made by an external and independent counterparty are not used (Ehlers & Packer, 2017).

Interesting point is, that the issuer itself does not even have to be identified as “green company” for issuing green bonds. Current guidelines consider only the allocation and the impact of the underlying green project. For example, energy companies can issue bonds under Green label if the project in question meets the requirements. Despite the fact that most of their revenue comes from fossil fuels. This is also problematic for some ESG investors, since they might have set exclusion criteria for certain companies or industries. Therefore, not all green bonds are suitable for every ESG portfolio. (Barclays, 2019.)

Despite these concerns and possible shortcoming of the framework, the total number of Green bond issuances have been soaring from the date they were first introduced in 2007 (Reboredo, 2018). First Climate aligned bond was actually issued by European Investment Bank in 2007 and first issue under the Green bond name, that distantly resembles current framework was published in 2008 by World Bank (OECD, 2015). From its early years, the annual total amount issued for labelled Green Bonds reached \$37 Billion in 2014 (CBI, 2017a). According to latest market report from Climate Bond Initiative, new records were set in 2019 as the total value issued reached \$257.7 Billion with 51% growth of from the last year. Behind this total amount were 1788 new green bonds from 496 different issuers and 250 of them were first time issuers under the Green Bond label. (CBI, 2020.)

3.2 Standards and Regulations

As the main foundation of current Green bond framework, the Green Bond Principles (GBP), is based on its voluntary nature, many market driven additional guidelines and regulations have been introduced to keep up with the exponentially growing market for green bonds (Bachelet et al, 2019). Unfortunately, these overlapping certification schemes and national taxonomies are creating regional inconsistencies in terms of what makes a bond eligible to green bond label (Ehlers & Packer, 2017). Most noticeable, the People's Republic of China has implemented their own national taxonomy for green bonds. Likewise, in 2018, European Commission started to act as it gathered a team of experts to work with European green bond standard (European Commission, 2019). Domestic certifications can be seen as reasonable for large economic regions, but it puts international harmonization at risk by limiting the value of certification in question and constricting potential investor base (Ehlers & Packer, 2017). Despite the several initiatives made by the regulators, there are not yet coherent international standards or certification schemes for Green bonds, and that is why the concerns on the integrity have been raised. (Ehlers & Packer, 2017).

3.2.1 Green Bond Principles (GBP)

Green Bond Principles (GBP), founded by The International Capital Market Association (ICMA) in 2014, has become leading and global framework for the Green Bonds. The ICMA is European non-profit organization that act as a self-regulatory organization in the European capital markets (ICMA 2018a). To this date, most of the Green Bonds have been issued under GBP framework (Shishlov, Morel & Cochran 2016). GBP consist voluntary guidelines that are meant to increase the creditability of Green Bond label among all the stakeholders involved. These guidelines help issuers to establish trustworthy Green Bonds for environmentally cautious investors. Available and transparent information on the use of proceeds gives investors important tools to evaluate the environmental impact of the project. Eventually the underwriters benefit as the whole Green Bond market evolves and transaction volumes increase. GBP consists of four key principles:

1. Use of Proceeds
 2. Process for Project Evaluation and Selection
 3. Management of Proceeds
 4. Reporting
- (ICMA, 2018a.)

First principle of GBP, use of proceeds, is determining in which kind of projects the issued funds can be utilized under the Green bond label. Environmental impact of the project should be thoroughly explained, and if possible, quantified. This should be documented with the information on possible share of refinancing. Most common goals listed on GBP are pollution prevention and control, Biodiversity conservation and adaptation on climate change. There are also more detailed examples of eligible green projects, that are introduced in GBP, but ICMA still wants to make clear that the purpose of GBP is not to advocate any specific green standard nor technology. For that matter, there are different national and international counterparties, who are improving the comparability of eligible projects by mapping different green projects and by creating new taxonomies. (ICMA, 2018a.)

To be aligned with the GBP, the issuer must communicate clearly the process for project evaluation and selection towards the potential investors. Investors must be carefully informed on the environmentally sustainable objectives of the project and how the underlying project meets the requirements of the GBP. The ultimate goal is to ensure the integrity of the Green bond issuing process. (ICMA, 2018a.)

Thirdly, the management of proceeds is emphasized as being valuable tool for enhancing transparency with tracking the legibility of use-of-proceeds format. Issuer is advised to handle the cashflows of the green project as separate accounts, so that the net proceeds could be precisely tracked. ICMA recommends the use of the auditor or other third-party verification for internal tracking, so that the data can be considered trustworthy. (ICMA, 2018a.)

GBP highly advises the Green Bond issuers to provide reporting at least on annual basis. The report should consist capital allocation on all the underlying projects, updates on environmental impact estimates and other information that is beneficial for the investors. It is also important that the issuer makes a disclosure on methodology and used assumptions behind the calculations. (ICMA, 2018a.)

3.2.2 CBI's Climate Bonds Standard and Certification

Other important backbone of global Green bond framework is definitely the Climate Bonds Standard (CBI) that was first introduced by Climate Bonds Initiative (CBI, 2017b). Climate Bond Initiative is international non-profit organization that has the aspiration to promote legitimate bond markets for climate change solutions. CBI is updating the requirements for their standard and additional certification on periodical basis and it has also acted as a unifying force between different market regulations in sustainable finance (CBI, 2019).

Whereas the GBP remains in remarkably general terms, CBS offers more detailed framework, where the eligible projects for each sector have been carefully determined and the measurability of the impact is essential (Ehlers & Packer, 2017). To tackle investors' concerns on the credibility of the plain Green

bond label, Climate Bond Standard requires issuers to contract an approved verifier to confirm that the bond meets all the requirements mentioned in the standard (CBI, 2019). The standard also includes a set of pre-issuance requirements that need to be addressed, if the issuer wants to acquire Climate Bond Certification for extra assurance (CBI, 2017b). To getting a bond certified, issuer must also carry out several post-issuance requirements that are listed in Climate Bonds Standard (CBI, 2017b). To get a “Certified Climate Bond” title, issuer must choose assurance report provider that is verified by CBI. This report should provide enough details for Climate Bonds Standards Board to decide whether the bond meets the requirements set in the standard or not. According to CBI, certified bonds are easier to find by investors and potential investor base is broader as the bond is suitable for even more demanding investors. The certification costs have also mentioned to be lower compared to second party opinions (CBI, 2019).

3.2.3 External reviews

While it is not mandatory, ICMA is recommending the issuers to use at least one approved external reviewing scheme for gaining an outside and independent view (ICMA, 2018a). The purpose of this recommendation is to provide more creditability on the estimated environmental impact and to allow better comparability between different GBP aligned Green Bonds. The use of external reviews is also making the capital allocation of the issued funds more transparent. ICMA identifies these external review providers as four different groups divided by their characteristics and approach:

1. Second-party opinions (SPOs)
2. Third-party verifications
3. Certifications
4. Ratings and scorings (ICMA, 2018a.)

The main difference between the Second party opinions (SPOs) and Third-party verifications is the scope of the assessment report (Ehlers & Packers, 2017). Third-party verifications are assurance reports made by some independent party and the purpose of this report is to assess the alignment of the issuance with the reputable Green bond framework that is used such as GBP or CBS. Instead, the SPOs are taking more applied approach in the assessment, as the focus is more in the environmental impact analysis of the project in question. Since the SPOs have more analytical approach, most of the service providers are focused on producing different market analysis and research. As for the Third-party verifications, many big audit companies are often used (CBI, 2019).

The CBI’s certification for climate aligned bonds, that was discussed on the last chapter is one notable example of different certification schemes. The nature of this category is that if the requirements are met, the issue can obtain and

keep the certification. A good feature on certification schemes is that their validity can be subject to continuous requirements, for example in the form of periodical reporting obligation. (Ehlers & Packers, 2017). As the binary nature of these certification schemes are noted to be the deficiency for Green Bond framework, also scales that allow granularity has been later introduced (Ehlers & Packers, 2017). The schemes that have implemented these granular scales for the evaluation of environmental impact are referred in the fifth category of ratings and scorings. These are often performed by different rating agencies, most notable examples being the Standards & Poor's green evaluations and Moody's Green Bond Assessments (Ehlers & Packers, 2017)

As the use of external reviews is not set as mandatory in the GBP framework, many issued Green bonds are still trading without any independent assessment on the true environmental impact nor the capital allocation. Fortunately, the empirical findings of this thesis shows that Green Bonds without any sort of external review are a clear minority in European market as such cases were present only less than 7% of the whole sample of 159 Green bond issuances (See Chapter 4.2.).

3.2.4 Green Bond Database and Index providers

Without constantly updated Green bond databases, the "greenness" would be just one individual feature among other bond characteristics. By grouping bonds under the same database by their characteristics, the analysis and comparability is easier for potential investors. It is also important to bear in mind that database definitions also reinforce more generalized standards and frameworks, while weakening those that for some reason are not so established. Consequently, the databases play an important role in the development of the Green Bond Framework and inevitably affect the legitimacy of existing standards and regulations.

ICMA has carried out a survey of the green bond databases in operation and has aggregated their relative differences that are summarized on Table 1. At the time of their survey, Bloomberg was clearly the biggest database if compared with total number of Green bonds. However, the number is not directly comparable as the calculation method differs slightly between different databases. Bloomberg calculates all different tranches, pools and bonds as separate units and on the contrary CBI's database calculates multi-tranche and multi-bond deals as one deal (ICMA, 2018d). Despite the differences on calculation methods, these two are the most comprehensive databases currently.

Bloomberg database on green bonds is available for all the Bloomberg Terminal users and full access of CBI database is for the member of its partnership program only (ICMA, 2018d). Both of the databases have the start date set at the inception of the green bond market, but CBI created the database itself in 2013 and Bloomberg its own year later. Bloomberg, CBI and Cbonds all have set GBP alignment as mandatory element, while Dealogic and Environmental finance

have slightly looser requirements when it comes to regulation. Since the Bloomberg database seems to be clearly among the most comprehensive in content, while staying conservative when it comes to regulation requirements, it was obvious choice for obtaining the data sample for this study.

TABLE 1 Comparison between different Green Bonds databases (ICMA, 2018d).

	<i>Bloomberg</i>	<i>Climate Bond Initiative</i>	<i>Cbonds</i>	<i>Dealogic</i>	<i>Environmental Finance</i>
<i>Database created</i>	2014	2013	2015	2015	2015
<i>Start date of the data</i>	2007 (since the inception)	2007 (since the inception)	2007 (since the inception)	2007 (since the inception)	2007 (since the inception)
<i>Interface</i>	Bloomberg Terminal API, Excel Add-in	Internet browser	Internet browser, Mobile application, Excel Add-in	Internet browser	Internet browser
<i>GBP alignment</i>	Mandatory	Mandatory	Mandatory	Optional	Optional
<i>Indicator for the use of external reviews</i>	Yes	Yes	Yes	No	No
<i>Provided documentation</i>	Final terms, Prospectus, Bond frameworks, External reviews	External reviews, frameworks, links to press releases and articles	Prospectus, Final terms, Tender Offer, Press releases	Final terms, Prospectus, SPOs, Frameworks	Investor presentations, Frameworks, SPOs, Press releases, Final terms, Prospectus, Assurance statements, Deal flashes

In addition to Green Bond databases, also index providers play at least as important a role in forming the common framework and market practices for the Green Bonds. To this date Bank of America Merrill Lynch, Barclays MSCI, Standard & Poor's and Solactive are the only providers that have introduced global Green bond indices in their product category (Ehlers & Packer, 2019; ICMA, 2018e). Index compositions vary by different bond characteristics, such as issue size, liquidity and coupon payment type (ICMA, 2018e). More complex debt instruments as inflation linked bonds, convertible bonds, ABS, MBS and other structured securities are often excluded from these indices, while more simple plain vanilla bonds are preferred (ICMA, 2018e).

All these providers are using GBP or CBI's Climate Bonds Standard alignment at least to some extent, when assessing bond's environmental eligibility. To be more exact, Solactive and S&P are trusting on CBI's expertise and therefore they make the index inclusions on the basis of the green labeling on CBI's database (ICMA, 2018e). ICMA's summary states that the bonds included in Bank of America Merrill Lynch indices have met their own set requirements regarding use of proceeds and eligible projects (2018e). However, further details of their methods are not opened in the summary (ICMA, 2018e).

Barclays MSCI seems to be the most transparent and precise among these index providers. They are the only provider that is stated to have continuous monitoring for issuer reporting. They have also set their own "MSCI defined eligible environmental categories" which are aligned with the GBP. As an inclusion criterion, at least 90 % of issued funds needs to be allocated on these categories and the issuer must provide annual reporting on use of proceeds. If the requirements for eligible use of proceeds or reporting are not met, the security in question will be removed from the index. (ICMA, 2018e.)

As the index providers are making the decision on what bonds to include and what to exclude from the indices, they are in important role on developing a framework for green bonds. Still, relatively big differences on index inclusions can be addressed. However, it remains to be determined how promptly the index providers will manage this monitoring role for environmental issues (Ehlers & Packer, 2017).

3.3 Previous research findings on Green bonds

3.3.1 Green bond premium

Recent academic literature on corporate social responsibility (CSR) highlights the effects on financial performance and prevailing change in investor behavior. Sharfman and Fernando have found a link between improved environmental risk management and lower cost of capital (2008). Similarly, a high CSR score has been addressed to decrease the cost of capital and to improve credit ratings (Bauer & Hann, 2010; Ghoul, Guedhami, Kwok & Mishra, 2001). On the contrary, banks have been noted to be reluctant participating in loan syndicates where the issuer performs environmentally unethically (Chava, 2014). There are also scientific implications that investors with social or environmental mandate, are willing to accept lower financial performance from their investments (Renneboog, Horst, Zhang, 2008).

In addition to effective way of channeling investments into environmentally friendly projects, green bonds must serve the interests of investors and issuers. Despite the short age of Green label, several research papers on Green bond

pricing are already published. Many studies have found evidence for the higher prices and thus lower yields for green bonds when comparing to otherwise identical conventional counterparts (Zerbib, 2019; Febi et al. 2018; Baker et al. 2018; Flammer, 2020; Ehlers & Packer, 2017). This so-called green bond premium signifies that investors are willing to pay more for a bond with green label than they would pay for conventional bond, *ceteris paribus* (Zerbib, 2019).

When examining green bond yields at the moment of issuance and comparing them to the equivalent conventional bonds from the same issuer, even as 18bps lower yields has been discovered (Ehlers & Packer, 2017). Similar results have been reported as the trading on green bonds start at the secondary bond markets. Zerbib matched 110 green bonds and their credit spreads with conventional ones in the secondary markets and discovered 2bps lower yields as on average (2019). The used dataset was gathered from July 2013 to December 2017 and his sample was accounting for 24% of the total debt issued through Green Bond label (Zerbib, 2019). Even if the premium seems to be lesser on the secondary market, the results are still both statistically and economically significant and provide further confirmation that investors are putting value on this Green label (Zerbib, 2019).

As the value of green label has been widely recognized by the presence of green bond premium, it is also interesting to detect the possible linkage between increasing premia and use of external reviews and certifications. At least one study has been able to expose this dependency. Among US municipal and corporate green bond market the issues with CBI certifications traded remarkably higher at 26bps difference with conventional counterparties, whereas green bonds without any external verifications traded at 6bps premium (Baker et al 2018).

Other explaining factor for green bond premia was the issuer type as the issuers that have categorized to be as financial counterparties had bigger green bond premium (Zerbib, 2019). This might relate to the credit risk of the issuer, as green bond premium has been addressed to increase as the credit risk of the issuer increases and, on the opposite, if credit quality increases green bond premium tends to fade (Baker et al. 2018). In a study conducted by Zerbib, green bond premium was at lowest among the highest rating class of AAA at 0,9bps, whereas among the lowest credit rating in the sample BBB, it was even at 4.9bps (2019).

Unbalanced proportions on green bond supply and demand have been suggested as one possible reason for green bond premium. Zerbib suggests that as the label makes the investor base broader, more pressure for the buy side is being added (2019). Also, several low carbon initiatives from public and private sector might intensify investors' preference on the green label (Zerbib, 2019). As the green bond market is still relatively immature, the supply may have difficulties to keep up with the pace for increasing demand. Due to this imbalance, green bond premium has been argued to be a sign of differences on liquidity between green and conventional funds (Febi et al. 2018).

The rationale and mechanism behind Green bond premium still remains a puzzle, as opposing results have been also witnessed. Karpf and Mandel examined the yields of 1880 municipal bonds in US and witnessed higher yields of 7.8 bps for the bonds with green label (2017). Arguments on this opposing view has also suggested. One possible reason for higher yields could be higher operational risks on the underlying projects (Febi et al 2018). Green projects are often characterized by the implementation of new technologies and operating models and can thus be seen as more risky than traditional projects. That is why investors might find green bonds slightly more risky than same issuer's conventional bonds, therefore the opposing view on green bond premium can be justified (Febi et al. 2018). Also, the possible presence of information asymmetry problems (adverse selections costs, lemons problem) has been addressed as the current framework on green bonds still lacks the transparency and cohesion of regulations (Febi et al. 2018). As the sample used in Karpf and Mandel research consisted bonds only from non-corporate issuers, it is clear that applications from these findings are limited as they are not fully comparable with corporate issuers (Flammer, 2020).

As most of these studies are approaching the green bond issuers as the whole group, or they concentrate only on governmental side (cities, countries, supranational organizations) there is not yet much information on corporate green bonds. One reason of excluding corporate issuers from the spectrum, is that the corporate issuers have not issued green bonds as intensively as governmental issuers and that is why the sample sizes would have ended up remarkably small in earlier studies. Only one study on green bond premium has been carried out that restricts only on corporate green bonds and statistically significant premium was not found (Flammer, 2020). As the green bond issuance has been increased expressively, especially among the corporate issuers, incentive for future research focusing on corporate green bonds only is guaranteed.

3.3.2 Green bonds and operational performance

Along with the short-term signaling benefits and abnormal stock returns, also improvements in operating performance and therefore, improvements in long-term shareholder value have been established. Flammer conducted a sample of 368 corporate green bonds and discovered that on the long-term ROA (return on assets) and Tobin's Q (the market value of a company divided by its asset value) were improved more after green bond issuances compared to conventional bond issuance events (2020).

These findings on green bonds are consistent with numerous studies in a broader context of corporate responsibility. Comprehensive meta-analysis that combined 167 different studies over the years between 1972-2007 showed relatively weak, but still positive relationship between corporate social performance and financial performance (Margolis, Elfenbein & Walsh, 2007). More specifically illustrated, Klassen and McLaughlin have found evidence on that environmental

award announcements have positive impact on the share price of the company in question (1996). As the green bond announcements also can be seen as event that signal environmental commitment, these results are at least to some extent applicable.

3.3.3 Impact on ownership structure

Also, significant changes in ownership structure have been addressed as the share of institutional shareholders is increased substantially around the green bond announcement (Tang & Zhang, 2018). To be more precise, domestic investment advisers and pension funds have been recognized as most prevalent investor groups inducing these results. These investor groups have most often implemented responsibility as a part of their investment processes, and they also show significant shareholder engagement for longer periods when the set criteria on sustainability is met (Flammer, 2020).

3.3.4 Announcement effect and shareholder value

To sum up the research findings discussed above, it seems that green bonds are providing companies an access to cheaper cost of capital, while also these raised funds appear to be efficiently allocated to profitable projects. In addition to this, by committing to responsibility, the ownership base would seem to be expanding. Based on these implications it can be assumed that Green bonds are indeed creating shareholder value. Despite the short history of Green bonds, this angle of the subject has already gained some scientific evidence. Couple of event studies have been conducted, where the positive stock reactions for the issuer's stock have been discovered around the green bond announcements (Flammer, 2020; Tang & Zhang, 2018). For instance, Tang and Zhang found average cumulative abnormal return of 1.4 % around green bond issuance announcement using 21 days long event window (2018). Similar results by their magnitude (CAR 1,14 %) have been detected even by using longer event period of 41 days (Flammer, 2020).

The greatest abnormal returns were observed when the issuer was issuing green bond for the first time and it became less significant as later issuances were announced (Tang & Zhang, 2018). This difference between initial issuance announcements, to more seasoned ones, is indicating that the bond issuance itself is not the event that causes abnormal stock returns, as it is rather an indication on environmental commitment that has positive impact on shareholder value (Flammer, 2020). This is also in line with earlier studies made on emmision announcements, as the positive stock reactions are limited to equity emissions (IPOs and SEOs) while new bond emissions actually tend to have negative stock reactions if any (Eckbo, 1986).

As the green bond premium is not too significant by its magnitude, there must be some other factors than lower cost of debt that is explaining the increase in shareholder value (Tang & Zhang, 2018). Behavioral aspects as increased media exposure was mentioned to be explaining abnormal returns on the short-term as the liquidity of the stocks (measured with bid-ask spreads and Amihud measure) goes up after the green bond announcement (Tang & Zhang, 2018). Tang & Zhang entails that the green bond announcements are signaling strong commitment in environmentally friendly projects and that the company is determined to enhance its ESG-profile (2019). The signal itself seems more important than the green bond issuance itself as the impact on share price is much bigger with first time issuers (Tang & Zhang, 2018).

3.3.5 Concerns on greenwashing

Since the ultimate purpose of green bonds is to efficiently allocate issued proceeds to projects that are helping to mitigate climate change, assumptions on their environmental impact are intriguing. As the green label itself is still relatively new, not much scientific data has been yet produced. Still, one of the rare studies on environmental performance of green bonds discovered promising results. After green bond announcements, CO₂ emissions dropped and also environmental ratings increased significantly (Flammer, 2020). Likewise, growth in the number of filed patents was significantly more than in those cases, where the bond was issued without green label (Flammer, 2020). This reinforces the claim that the issued capital has been spent effectively on research and development as the number of green innovations is increasing.

However, the concerns on greenwashing has been pointed out frequently. Greenwashing can be defined as an activity, where the company in question is giving too optimistic view from its actions to purposefully enhance its public image (Delmas & Burbano, 2011). For instance, such activity can be made through marketing initiatives which are too optimistic and do not reflect reality. As environmental issues and sustainable development has become more and more mainstream, greenwashing has become a more common phenomenon (Delmas & Burbano, 2011). As a result of fear of greenwashing, the customers are losing their trust on environmentally conscious companies and their products. More closely related to this paper, possible threat of greenwashing is raising doubts on real effectiveness of green bonds.

There is also one fundamental issue that has been addressed in the environmental requirements for green bonds. As the environmental requirements are concerning only the underlying project where the capital will be eventually allocated, the issuer itself do not have to operate on climate friendly industry or have a high environmental status. This raises the concerns on the potential greenwashing as green bond issuance is even possible for energy companies whose revenues are mostly from fossil fuels if they just decide to launch one project with renewable energy sources (Ehlers & Packer, 2017).

4 DATA AND METHODOLOGY

4.1 Eligible announcements and sample restrictions

Bloomberg provides a comprehensive database for green bonds, that has been widely used as a data source for green bond premia related studies (Zerbib, 2019; Flammer, 2020). All the data considering bond characteristics, announcement dates, issuer specifications are retrieved using fixed income search on Bloomberg terminal. Also, historical pricing data for issuers' shares and used benchmarks are gathered using Bloomberg terminal.

I first limited the search to consist only green bonds that have been issued in Europe during the years 2013-2019. I chose to include only the green bonds that have been labelled as green by use of proceeds in Bloomberg. The label guarantees the alignment with the Green bond principles (GBP) and therefore the risk of green washing is being minimized as the unlabelled climate aligned bonds are excluded (Febi et al., 2019). First green bond from public corporate issuer in Europe was issued in 2013 and the data consist all the later issuances that fits other criteria until the end of the year 2019.

As the pricing data for the issuers shares is needed to make this study, I narrowed the search to include only the green bonds from listed corporate issuers. That is how the data was narrowed down to 214 green bonds. As Bloomberg separates all different bond tranches in their database, there was some green bonds from the same issuer that was announced on the same date. After removing overlapping announcement dates, there were left 174 unique green bond announcement dates. As for some cases there was insufficient number of prior pricing dates, they were removed as they did not meet the requirements of estimation window length. At this point, the number of eligible events was 167 green bond announcements from 89 different issuers.

As this study is conducted with event study methodology, it is important to make sure that there are no other uncontrolled events that might degrade the quality of this research. To minimizing that issue, I have excluded all the cases where some on other relevant announcements were present during the chosen event window. Such announcements were other bond or equity issues, publications of earnings reports, ex-dividend dates, stock splits and other corporate actions that could have significant impact on the share price. I used Bloomberg terminal to identify these cases. I browsed information on Bloomberg corporate actions section (CACs) and related news (NEWS) within each issuer around chosen event date and excluded the events when necessary.

As one possible form of bond issuance is disclosing the information privately to potential investors via private placement, such cases (4 cases in this sample) had to been identified. These announcements were excluded as the market reactions for these events is difficult to measure (Tang & Chang, 2018). The final sample size after these determined restrictions is therefore 159 green bond announcements.

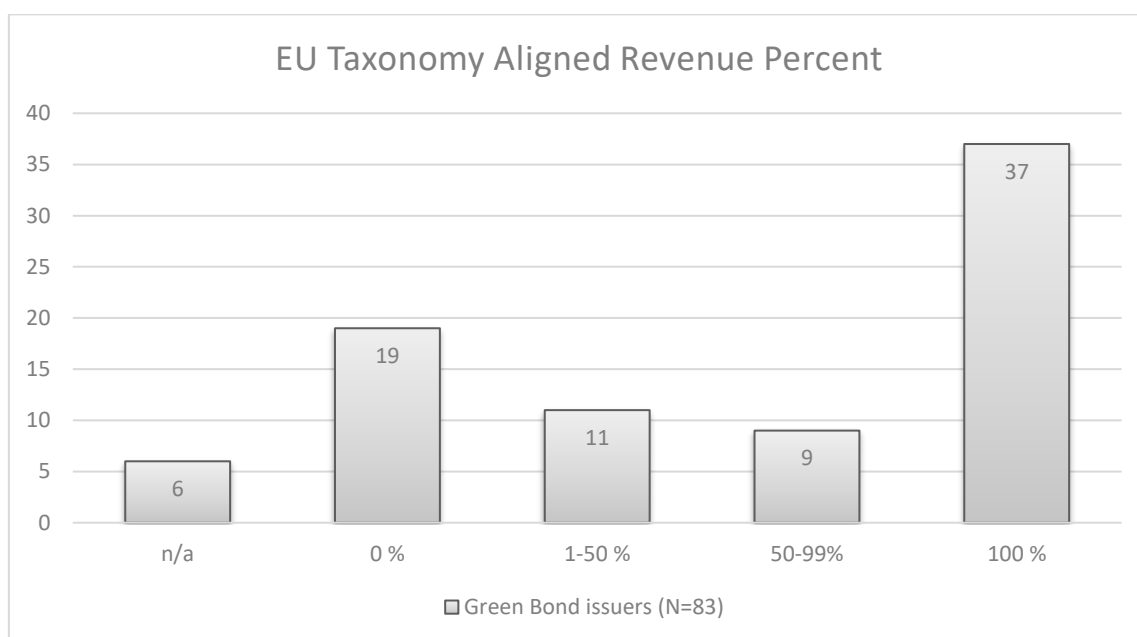
4.2 Sample description

Due to the fact that the framework for European corporate green bonds is still relatively fresh, the first eligible Green Bond announcement for this research was made in 2013. It can be seen from the selected sample, that the first years of corporate green bond market in Europe was quite moderate, but strong exponential growth were experienced soon after first couple of years (Table 2). However, most of the new issuances were made in 2019 as this individual year covers 46,5% of the sample.

TABLE 2 Sample distribution of Green bond issuances by the announcement year

Announce- ment year	Number of new GB issuances	Total amount issued in EUR (M€)	Years from 1 st settle date to ma- turity (Mean / Median)	
2013	1	1400,000	7,414	7,414
2014	7	2649,501	6,498	6,001
2015	7	2584,317	7,548	7,000
2016	9	2361,246	4,832	4,999
2017	22	6895,150	51,226	4,999
2018	39	13081,749	5,507	4,999
2019	74	26073,934	21,491	5,366
TOTAL	159	55045,898	19,441	5,002

As for the financial significance of this sample, 55 billion Euros were raised through these issuances as total. All these bonds were aligned with the Green Bond Principles, but also most of them were reviewed by some third party. Only 11 Green bonds were released without any external assurances. The median time from 1st settle date to final maturity was 5 years. On the other hand, the mean is not describing the sample very well, as some of the bonds were extremely long (even 100y) which is why the mean is very far from the median. There were also four perpetual bonds that was not included in this calculation.



GRAPH 4 The level of EU taxonomy aligned revenue for Green bond issuers

As discussed in detail previously in this paper, it is problematic that Green Bond framework does not take into account environmental sustainability on issuer level as a whole. Therefore, most of the revenue can be derived from unsustainable operations as long as the requirements concerning the use of proceeds, reporting are cleared. That is why it is also interesting to evaluate how widely the Green bond Issuers are truly implementing sustainability on their business models. Issuer level sustainability can be evaluated by using the measure of EU Taxonomy aligned revenue percent. This indicates how widely the sources of generated revenue are passing technical screening criteria for environmental sustainability set by the European Union. Graph 4. demonstrates how most of the issuers in this sample are actually fully aligned with EU Taxonomy as all of their revenue comes from the operations that can be seen as environmentally sustainable. However, there are also big group of issuers that meet the EU requirements only for a small part of their revenue, or even not at all. Also 6 issuers did not disclose this measure at all on Bloomberg. It should be noted that this measure is

defined by the company itself as a part of their CSR reporting and it is not calculated by Bloomberg.

Regarding the industry breakdown of the data, it should be mentioned that most new Green bonds were issued to fund businesses related to the Real Estate, Utilities and Banking (Table 3). Also many other sectors are covered on the sample as well, but these three sectors are still taking huge relative share from the sector distribution. I used Global Industry Classification Standard (GICS) to describe the sector distribution of this sample as it is globally and professionally recognized since it was first introduced in 1999 (MSCI, 2020).

TABLE 3 Sample distribution by Sector classification (GICS)

Industry group (GICS)	Number of new Green bond issues	Relative share (%)
Real Estate	60	37,74
Utilities	37	23,27
Banking	34	21,38
Renewable Energy	6	3,77
Insurance	3	1,89
Electric Equipment	3	1,89
Waste & Environmental Services & Equipment	2	1,26
Passenger Transportation	2	1,26
Consumer Products	2	1,26
Transportation & Logistics	1	0,63
Telecom	1	0,63
Specialty Finance	1	0,63
Retail - Discretionary	1	0,63
Medical Equipment & Devices	1	0,63
Manufactured goods	1	0,63
Home & Office Products	1	0,63
Forest & Paper Products	1	0,63
Engineering & Construction Services	1	0,63
Distributors - Consumer Staples	1	0,63

4.3 Building the hypothesis

If we assume that the capital markets are perfectly efficient, company's financing decisions should not have any impact on its market value (Fama & French, 1998). To be more specific, company value and the level of debt are independent from each other when the markets are efficient (Modigliani & Miller, 1958). In reality, it is clear that there are often several factors present that weakens the market efficiency. For that matter, Masulis has proven that stock price changes are positively related to changes in the level of used leverage (1983). That indicates that there are some imperfections such as tax incentives and financial distress costs that affects risk and return.

Even if the positive linkage between expected return and leverage has been found, the market responses on different kind of security offering announcements are not as straight forward. According to many academics, the announcements of new equity issues (SEOs) generate negative abnormal returns, even though initial public offerings (IPOs) tend to be underpriced and to generate short-term positive abnormal returns (Eckbo, Masulis & Norli, 2007; Ritter, 2003).

This kind of announcement effect has been researched also regarding the bond issuances (Ammann, Fehr & Seiz, 2006; Lee & Loughran, 1998; Miller & Rock, 1985; Myers & Majluf, 1984). If significant abnormal returns are witnessed during public bond announcements, they have been mostly found negative (Ritter, 2017). Especially among convertible and exchangeable bond announcements, the stock market reactions have been reported to be significantly negative (Ammann et al., 2006; Lee & Loughran, 1998). Possible reason why new external financing, such as bond announcements, tend to decrease company value is that they might signal unfavorable information to investors (Myers & Majluf 1984). Miller and Rock argue that by issuing external capital, the issuer is revealing negative information about future internal financing (1985).

Based on scientific evidence mentioned above, bond announcements itself cannot be declared as shareholder value enhancing event. If there is some recurrent effect on bond announcements, it is more likely to be negative. If the reactions on green bond announcements are indeed positive as it has been stated in earlier studies, there must be some distinguish factor behind the green label.

As it has been stated in earlier related studies, green bond announcement is seen as an event that combines two sets of information (Flammer 2020, Tang & Zhang, 2018). Firstly, it is an announcement of bond issuance, just like with conventional bonds. Secondly, the green bond label itself with possible certification and external reviews declare issuers' commitment towards green projects. Since conventional bond issuances have been revealed to have negative (or if any) response on the stock market, possible positive abnormal returns on green bond announcements are supposedly signaling issuer's commitment on environmentally friendly projects. If the green commitment is seen as value enhancing factor from the shareholder point of view, the response on the stock market should be positive. On the contrary if this signal is immaterial, when it comes to shareholder

value, green bond announcements should behave just as conventional bond announcements. Therefore, the null hypothesis for this study is as follows:

H0: Green bond announcements do not generate positive abnormal stock returns, or they generate negative abnormal returns

If the stock market responds positively on these events, it indicates that there might be a difference between conventional and green bond announcements. Hence, the green bond announcements can be seen as enhancing shareholder value on the short term. Positive abnormal stock returns on significant level would be a sign that the green label generates value to shareholders, since with conventional bonds the reactions are substantiated opposite. In that case, the null hypothesis could be rejected. This leads to main hypothesis of this research:

H1: Green bond announcements are creating value to shareholders through generating positive abnormal stock returns

As the earlier studies have explained, the possible difference between green and conventional bond issuances could be caused mostly due to signaling green commitment (Flammer, 2020; Tang & Zhang, 2018). This implicates that the possible positive reaction should be the most prevalent when the announcement is first of its kind for the issuer in question. Among seasoned green bond issuances, the effect should be milder. This is derived from the presumption that initial green bond announcements have the most valuable information content and as they lower the risk of asymmetric information, unfavorable stock price movement is limited (Myers & Majluf, 1986). This leads to second hypothesis of this study:

H2: Abnormal stock returns are profound among initial green bond announcements

4.4 Event study methodology

As the main objective of this research is to find out if there is a linkage between green bond issuance and shareholder value, issuer company's stock reaction near announcement can be considered convincing measurement for this occasion. Compared to lagging accounting data, the linkage between the chosen event and shareholder value could be easier to find when looking at daily stock market reactions.

Event time study is one of the most used method for catching market value effects in modern economics. The method has been widely used in accounting and finance studies since 1930s (MacKinlay, 1997). It has been proven to be ap-

plicable in many different company specific and economy-wide events (MacKinlay, 1997). One of the famous implementations of event study was conducted by Fama, Fisher, Jensen and Roll, whereas the linkage between stock splits and short-term stock performance was investigated (1969). The method contains a strong assumption on market efficiency and, in particular, that new information will be reflected in the share prices immediately after it is published (Fama et al., 1969).

MacKinlay have studied the applicability of the event study methodology and defined general composition for conducting an event study (1997). As in line with his composition, I have specified the research questions in the introduction section of this paper and the events are comprehensively defined as a part of the theoretical framework of this paper. I have also described thoroughly the selection process of used sample data in chapter 3.1. Definition of event window, expected return estimation, abnormal return calculations and eventually significance testing structure design are opened in more detail in the following chapters.

4.4.1 Definition of event window

Chosen time period around the event date during which the event study analysis is being performed is called the event window. In this research I have used several different event windows around the event date ($t=0$) to catch possible announcement effect for green bond issuances. As in line with the study performed by Tang & Zhang, full event window is set to be 21 days $[-10,10]$ and the shortest including only the announcement date and a day before $[-1,0]$ (2018). The purpose of using several event windows, is to capture possible fluctuations within different periods as comprehensively as possible. New information should be almost instantly reflected in the equity prices, therefore main focus will be estimating abnormal returns near the event date $t=0$. To control possible information leakage, one day before the announcement -1 is added to a window of $[-1,0]$, which also Flammer did in her study (2020). Other periods before $[-10,-6]$ $[-5,-2]$ and after $[2,5]$ $[5,10]$ green bond announcements are also added, so that all the possible connections within whole event window could be detected.

4.4.2 Stock returns

Daily stock prices were retrieved from Bloomberg Terminal. All share prices are imported to Excel in their original currencies. I used Excel to calculate daily returns and to arrange returns on event time order. Daily stock returns are calculated using this formula:

$$R_t = \ln\left(\frac{p_t}{p_{t-1}}\right) \quad (1)$$

Where p_t and p_{t-1} are representing the price of the stock on the selected date t and $t-1$. I used logarithmic returns since they are better than linear returns at showing less severe price increases than decreases (Hull, 2009). Logarithmic returns are useful due to the problem of asymmetric return distribution, since the downside for stock returns is limited to 100% but there is no limit on the upside.

Benchmark indices were chosen to match with the primary exchange of the underlying stock. I used the field "relative benchmark index" in Bloomberg terminal to determine the most suitable index for each stock (see Appendix 1). This approach guarantees clear comparison between individual daily stock return and market returns as the exchange's opening hours are the same. The market returns on index level have been computed using the same formula (1) as with singular stocks.

4.4.3 Estimation of expected returns

Many alternative ways for calculating expected returns have been introduced in the academic literature. The simplest way for expected return estimation is market return model. In this model the companies are not differentiated by their risk profile and therefore the equity beta is assumed to be 1 and alpha to be 0. With market return model, the abnormal returns (AR_{it}) are calculated simply by subtracting market return (R_{mt}) from the individual stock return (R_{it}) at the same time point. The formula is as follows:

$$AR_{it} = R_{it} - R_{mt} \quad (2)$$

Slightly more sophisticated model, market model, takes the variation of two parameters, beta and alpha, into account. This model consists of an assumption that there is linear relationship between the individual stock and market returns. Beta coefficient being the slope of the regression formula and alpha measurement being the intercept. This model is widely used, and it was first introduced by Sharpe (1963). Expected returns can be calculated by using following formula:

$$E[R_{it}] = \alpha_{it} + \beta_i * R_{mt} + \varepsilon_{it} \quad (3)$$

As the expected returns have been computed, the abnormal return of the stock i at the time t and be calculated as follows:

$$AR_{it} = R_{it} - E[R_{it}] \quad (4)$$

The main limitation of market return model is that it is not considering the level of risk-free rate. To implement the impact of risk-free rate fluctuations, capital asset pricing model can be used. Instead of using just market returns, CAPM uses equity market premium ($R_m - R_f$) that can be calculated by subtracting

risk free rate (R_f) from the market return (R_m). Like in market model, beta coefficient (β_i) stands for the slope of the regression. If the beta is more than 1, it basically means that the stock is more volatile than the market in general, so the expected return is bigger. On the contrary if the beta is less than 1, the stock is considered less risky and the expected return is smaller. Expected returns for are calculated using this formula:

$$E(R_{it}) = R_f + \beta_i(R_m - R_f) \quad (5)$$

In this research I used capital asset pricing model formula (5) for estimating expected returns as it is the most sophisticated model from these explained methods, and it will provide result that will be accurate enough. As a risk-free rate R_f , I have used the annual yield of Germany 10y government bond that was first converted to daily yield by dividing the value by 365 days. Since the risk-free rate has been relatively low, the impact on expected returns will be relatively mild.

Beta coefficient is calculated for each issuer's stock by using following formula (6). Where, $Cov(R_i, R_m)$ is the covariance between the daily stock returns and market return during the chosen estimation period, and $Var(R_m)$ is the variance of market return for the same period.

$$\beta_i = \frac{Cov(R_i, R_m)}{Var(R_m)} \quad (6)$$

Beta coefficient was measured using the same estimation period as in both earlier Green bond announcement effect event studies (Flammer, 2020; Tang & Zhang, 2018). The estimation period for calculating beta was chosen to be 200 days [-250; -50] to provide enough creditability. When choosing estimation period, it is important that the examined event is not included (MacKinlay, 1997). That is why I the estimation period is limited to 50days before the event. Even if some information leakage has been occurred, this should not have any effect on Beta estimations.

4.4.4 Calculation of abnormal returns

Abnormal returns can be defined as the difference between realized return of the controlled stock and the expected return for the same stock. See the formula below, where the R_{it} is representing actual return of the stock i at the time t . And $E(R_{it})$ is the expected return for the stock i at the time t .

$$AR_{it} = R_{it} - E(R_{it}) \quad (7)$$

As there might be many unidentified underlying factors behind daily stock market returns, it gives more reliability to the research if the abnormal returns are

calculated in cumulative form inside chosen event windows. This CAR is therefore calculated by using the sum of all abnormal returns by each day of the chosen event window.

$$CAR_{it} = \sum AR_{it} \quad (8)$$

4.4.5 Statistical testing

To find out whether the results are statistically significant, t-test statistics values are first calculated for single abnormal returns (AR) in each time point. As the null hypothesis has been stated to be $AR=0$, t-test statistic values can be computed as followed:

$$t_{AR} = \frac{AAR_t}{\sigma_{AR}/\sqrt{n}} \quad (9)$$

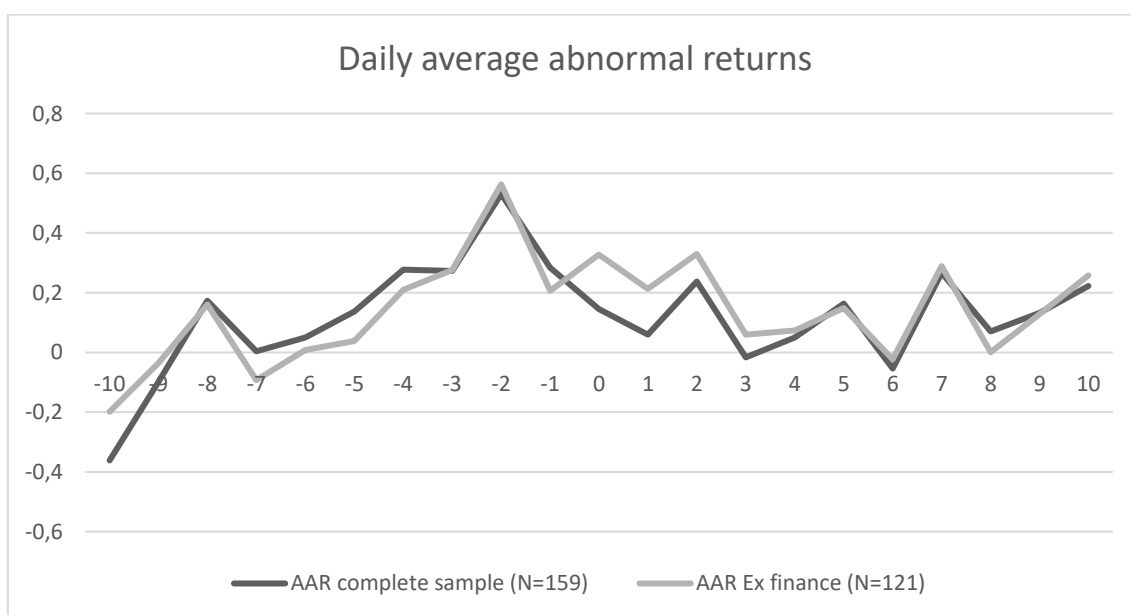
Where t_{AR} is the t-statistic, AAR_t is the average abnormal return at time t, σ_{AR} is the standard deviation of abnormal returns at time t; and n is the size of the sample. This same formula (8) is also implemented when calculating t-values for CARs in each selected event windows. By comparing t-values with critical values of the two-tailed t-test at significance levels 5 %, 1 % and 0,1 %, we can determine the significance of the obtained results.

Since the one sample t-test is having the assumption that the dependent variable is at least approximately following normal distribution, the measures of Skewness and Kurtosis are important to disclose. Skewness is a measure that tells if the data set is symmetrically distributed or not. If the skewness is low, the data looks the same to the left and right of the center point. Meanwhile, Kurtosis tells if the data is heavy-tailed or light tailed when compared to normal distribution. Acknowledging these two measures, the research might gain more reliability if the measures are favorable. On the contrary these measures can help us identifying false presumptions which could have made if the t-value is only examined.

5 RESULTS AND ANALYSIS

5.1 Overview of empirical results

If we look at the individual one-day average abnormal returns for complete sample of 159 different Green bond announcements, the magnitude of AAR on event date 0 does not stand out from the other individual dates during the whole event window of 21 days [-10,10] (Graph 5).



GRAPH 5 Daily abnormal returns for complete sample

The Abnormal return on announcement date was actually just +0,145% on average and it cannot be stated as statistically significant even at the lowest measured confidence level of 0.05. However, if we make the same robustness check as Flammer did in her study and try to remove Banks, Insurance and Specialty Finance companies from the sample, we can get the results that are both the positive and statistically significant (2020). This exclusion actually raises the event date abnormal return to +0.327% and it is statistically significant at the confidence level of 0.01 (Table 4).

The rationale behind the exclusion of the financial sector is that the fundamental nature of Green financing differs from the other sectors (Flammer, 2020). Normally, the issuer company is using the proceeds directly to its GBP-aligned operational purposes. However, when the banks are issuing Green bonds, they are truly investing the proceeds in individual Green loans. That is why the event itself might have whole different kind of dynamics and, thus the reaction is not necessarily the same. Even though the Real Estate sector is under the Financials on GICS-classifications, it is included on this restricted sample as this limitation does not concern those businesses.

TABLE 4 AAR, when the Finance sector without Real Estate is excluded (N=121)

Event date	AAR	min	max	stdev	t-value	skewness	kurtosis
-10	-0,198	-8,295	7,576	2,15	-1,015	0,2	3,484
-9	-0,035	-5,583	7,986	2,002	-0,194	0,445	1,841
-8	0,161	-4,077	11,636	2,039	0,868	1,824	8,185
-7	-0,093	-7,611	6,343	2,079	-0,49	-0,512	2,276
-6	0,008	-6,35	7,973	1,899	0,046	0,115	2,881
-5	0,038	-5,568	5,023	1,761	0,237	-0,461	1,645
-4	0,21	-4,599	4,283	1,74	1,328	-0,077	0,111
-3	0,277	-8,174	4,13	1,781	1,708	-1,016	3,646
-2	0,563**	-7,02	8,098	2,285	2,711	0,513	2,663
-1	0,206	-3,776	6,68	1,573	1,442	0,584	1,711
0	0,327**	-3,097	4,165	1,343	2,678	-0,138	0,298
1	0,213	-4,442	3,651	1,484	1,58	0,052	0,399
2	0,33*	-5,46	7,012	1,732	2,097	0,441	2,676
3	0,059	-5,377	5,774	1,725	0,379	-0,351	1,495
4	0,074	-4,365	5,428	1,67	0,486	-0,018	0,871
5	0,149	-4,537	4,673	1,778	0,921	-0,059	0,261
6	-0,023	-7,469	5,956	1,835	-0,137	-0,321	2,881
7	0,289	-7,99	4,321	1,637	1,942	-0,764	4,732
8	0,001	-5,19	4,065	1,742	0,008	-0,227	0,29
9	0,128	-6,784	5,017	1,707	0,828	-1,109	3,685
10	0,258	-7,792	9,758	2,017	1,406	0,469	6,018

*Critical value at 0.05 significance 1,9801

** Critical value at 0.01 significance 2,6178

***Critical value at 0.001 significance 3,3742

More meaningful analysis can be made as we move from individual one-day abnormal returns to cumulative event window approach. As discussed earlier, different length event windows were chosen so that the whole period of 21 days around the announcement date can be examined thoroughly. Three main periods for revealing possible announcement effect near the event date, being the [-1,0], [-1,10] and [-10,10]. The benefit for using several periods is that both the threat of possible information leakage and post-event drift are carefully considered. To add more robustness for this approach, 4 different control periods have been added to give more transparency on the possible CAAR fluctuations between different periods.

Cumulative average abnormal returns (CAAR) for complete sample are presented in Table 5. As for the complete sample of 159 announcements, two-day [-1,0] cumulative average abnormal return of +0,429% can be declared significant with the confidence level of 0.01. Similar results can be observed on longer period of 12 days [-1,10], where the CAAR is 1,022 with slightly compromised level of significance (0,05). Also, on the full 21-day window, the abnormal returns are still positive and significant. The results for different control periods are showing that no other statistically significant CAARs are present when the event date is not included in the event window. In this case, the chosen control periods did perform as intended and this information considerably mitigates the threat of the unrelated events having an impact on obtained results.

TABLE 5 Cumulative average abnormal returns for complete sample (N=159)

Event window	CAAR	min	max	stdev	t-value	skewness	kurtosis
[-1,0]	0,429**	-4,399	6,523	2,062	2,622	0,234	0,069
[-1,10]	1,022*	-16,909	19,369	6,280	2,052	0,055	0,843
[-10,-6]	-0,233	-14,555	15,976	4,680	-0,627	-0,036	0,921
[-5,-2]	0,086	-25,493	24,066	5,186	0,209	-0,085	7,393
[2,5]	0,435	-12,359	14,761	3,618	1,518	0,004	2,313
[6,10]	0,637	-23,459	16,233	4,824	1,665	-0,485	4,857
[-10,10]	1,414*	-23,515	25,431	8,472	2,105	0,028	0,750

*Critical value at 0.05 significance 1,9751

** Critical value at 0.01 significance 2,6075

***Critical value at 0.001 significance 3,3535

When performing the same sample restriction as with the AR approach, the results are staying quite similar (Table 6). Compared to complete sample, the restricted sample of 121 cases is showing slightly higher CAAR in 2-day event window of [-1,0], while significance is staying on the same confidence level. Flammer also made this same observation as the magnitude of CAAR in her sample increased when the banks were excluded (2020).

TABLE 6 CAAR, when Finance sector without Real Estate is excluded (N=121)

Event window	CAAR	min	max	stdev	t-value	skewness	kurtosis
[-1,0]	0,533**	-4,222	6,409	1,967	2,982	0,087	-0,034
[-1,10]	1,125*	-16,909	14,920	5,381	2,556	-0,224	0,518
[-10,-6]	-0,157	-12,664	15,976	4,583	-0,378	-0,036	0,921
[-5,-2]	-0,475	-25,493	24,066	5,186	-1,034	-0,085	7,393
[2,5]	0,612	-12,359	14,761	3,467	1,942	0,004	2,313
[6,10]	0,654	-23,459	14,068	4,653	1,545	-0,485	4,857
[-10,10]	1,379*	-23,515	25,176	5,058	2,105	0,028	0,750

*Critical value at 0.05 significance 1,9801

** Critical value at 0.01 significance 2,6178

***Critical value at 0.001 significance 3,3742

Based on these obtained results, the null hypothesis of this study can now be rejected, and we can accept the first hypothesis. Thus, the Green bond announcements appear to be shareholder value generating events, at least for the European listed companies. Also, the exclusion of financial sector makes this interpretation more reliable. Before making any statements regarding the second hypothesis of this research, we have to perform panel data analysis to highlight the possible differences inside the data sample.

5.2 Demonstration of the signaling effect

The second hypothesis stated that the most profound abnormal returns would be found among the initial announcements, while the reaction would be milder among the more seasoned ones. This hypothesis is based on the interpretation that the signaling of green commitment is primarily explaining the announcement effect for Green bonds (Flammer, 2020; Tang & Zhang, 2018). The event of raising debt capital through fixed income vehicle is not itself a shareholder value generating event, as the financial decisions of the company should not even be reflected on the valuation when the capital markets are efficient (Modigliani & Miller, 1958). Even if in reality some market imperfections might be present, the academic evidence on announcement effect for new emissions are indicating that positive abnormal returns are limited to equity issues only, while the issuance of new debt has a negative impact on the share price, if none (Myers & Majluf, 1984).

When distributing the whole sample into two categories of initial announcements and the seasoned ones, it can be clearly seen that the significant CAAR is only present among the first group (Panel A). If the issuer company have already issued Green bond, new issues seems to have milder reactions when announced. As a side note, it should be mentioned that as a result of this panel

data approach, the size of the data also decreased expressively and thus slightly reduces the reliability of the results. However, as the results are still statistically significant and in line with previous research results, also the second hypothesis can be accepted. The valuable information content seems to be strongest, when the issuer is announcing their first Green bond.

Once these results are also supporting the view, that Green bond announcements work as a tool for signaling green commitment, I wanted to refine this interpretation one step further. I chose two different measures for highlighting the differences in green commitment on issuer level. In Panel B, I have demonstrated the difference in the results if the environmental impact measures are extensively disclosed on company level. Additionally, Panel C is demonstrating the difference in the overall alignment of the issuer's revenue with EU taxonomy for sustainable activities. In both panels, significant abnormal returns were present only in the first category. Thus, the announcement effect did not exist if the issuer was still making notable share of their revenue from the operations that won't meet the requirements for environmental sustainability, or if the environmental measures were not disclosed on Bloomberg at the company level. While these are interesting findings, I personally think that more scientific evidence would be needed to make any plausible conclusions.

It would also have been interesting to include the use of external verifications in this panel data approach, but I had to exclude this demonstration, since there were only 11 Green bonds in this sample without any external verifications. With bigger sample, Flammer was actually able to show that the use of external reviews was linked to higher and statistically more significant abnormal returns (2020). Basically, this is indicating that the information content is more trustworthy when external reviews are present, and therefore it is more valuable for the shareholders despite the expenses from these assessments.

TABLE 7 Observed differences in the magnitude and significance of CAAR within the sample

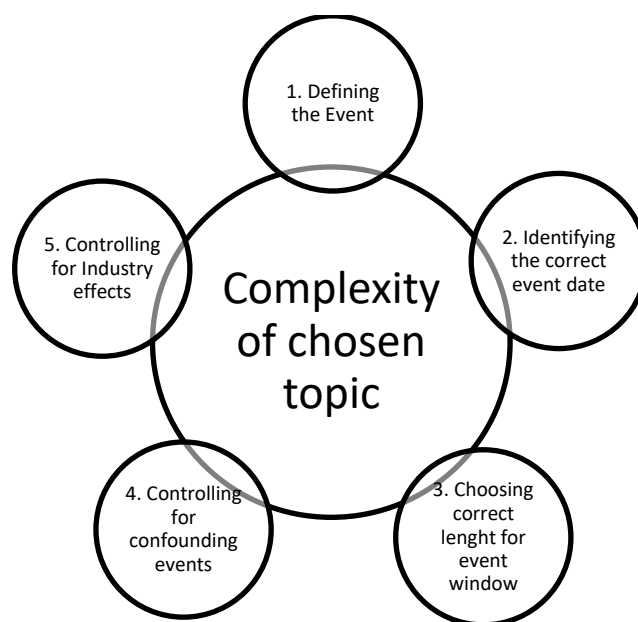
	Sample size (N)	CAAR [-1,0]	CAAR [-1,10]	CAAR [-10,10]
Panel A. Initial vs. seasoned announcements				
1. Initial announcements	78	0,479*	0,826	2,468*
2. Seasoned announcements	81	0,380	1,211	0,399
Panel B. Environmental disclosure on Bloomberg				
1. Environmental disclosure	93	0,567**	1,538*	1,002
2. No environmental disclosure	66	0,238	0,296	1,995
Panel C. EU Taxonomy eligible revenue				
1. High level of alignment (75-100% of revenue)	84	0,526*	1,572*	1,656*
2. Low level of alignment (0-25% of revenue)	57	0,251	0,255	1,400

5.3 Research limitations

McWilliams et al. have written an article on the challenges and limitations of the Event study methodology (1999). They have concluded their interpretation to five different difficulties that may lead to lack of robustness when using Event Study approach (See Figure X). Key point of their study is the observation that as the research question gets more complex, straight forward Event Study approach will not always guarantee the most reliable results. Particularly problematic is to make legitimate assumptions when studying the relationship between strategic managerial decisions and stock market reactions (McWilliams et al. 1999). And this is often the case with many recent CSR-related event studies, this thesis included.

When it comes to the results of this particular thesis, we should keep the limitations of this approach in mind before making too strong assumptions between Green bond announcements and share holder value. Even though the significant abnormal returns are indicating positive value, there are still many other stakeholders and factors to be considered. If the use of Green bond label is truly generating value for the shareholders in the long run, the environmental impact should be measured as well. Is the Green Bond scheme truly creating measurable

environmental benefit, or is it just plain greenwashing? Also, the investor's side is important as well. Why to invest in Green bonds instead of the conventional ones? Is this label truly beneficial tool for adjusting risk profile of the portfolio, or is it just the moral question and good PR? These questions should also be covered if strong assumptions between Green bonds and shareholder value are to be made.



GRAPH 6 Unifying factors undermining the robustness of Event Study -methodology (McWilliams, Siegel & Teoh, 1999)

First concrete challenge to encounter, is the definition of the event itself. On this research, Green bond announcement is quite complex event due to its two-fold qualities. Along with signaling green commitment, the event also gives the shareholder a message that they need to issue new debt to fund their operations. This event itself can be seen on positive or negative light depending on the financial position of the issuer company, the amount of financial distress costs, materiality of environmental issues to financial performance, difference in growth opportunities and so on. Due to complexity of the event determination itself, the possibility for distorted results increases (McWilliams et al. 1999). This should be acknowledged when obtained results are drawn into conclusions.

After the event has determined, also the exact event date has to be chosen. On this research I have used the official announcement date for Green bond issuances as this is the date when new information has been officially disclosed. Still the possible information leakage should be taken into consideration. It is also important to point out that possible rumors and expectations are often "priced in" much before the event is officially announced (McWilliams et al. 1999). In this

context, how likely the issuance of green bond would be before the official announcement? Were there any rumors on launching some new green projects? Has the company been already profiled with strong environmental commitment in other context than issuing green bonds? All these questions highlight the sensitivity of the Event date determination and its effect on the gained results.

Also, this methodology contains following built-in problem with a selection of most suitable event window length. McWilliams et al. demonstrated that as the event window gets longer, the magnitude of redundant “noise” increases, and the isolation of the chosen event gets more difficult (1999). This basically means that when the time period is longer, also the possibility of uncontrolled outliers impacting on the depended variable gets higher. In this research, the overall timeframe of 21 days is chosen to be somewhat short and it is also in line with the other relevant studies conducted on this same subject. Still the outliers must be identified as thoroughly as possible, even if it is not possible to eliminate this problem completely.

Even if the overall timeframe for this study is relatively short and thorough sample exclusions have been made, confounding events are never fully controlled. Along the singular company specific events that have an impact on market cap, also too homogenic sample may cause skewed results as there might be some industry or market wide effects that are not distinguished. Since the data sample for this study could not be selected at random, it is clear that the Green bond issuers may be united by some factor that distorts the results. One distorting factor being the industry distribution that is heavily clustered at Real Estate, Utilities and Banking. The reliability of this study could be improved if the results obtained were further tested with cross-sectional regressions with different company specific and industry wide variables.

6 CONCLUSIONS

The ultimate purpose of this thesis was to find out, whether the issuance of new debt through Green bond label is a commitment that is generating value for its shareholders, despite the fact it requires extra resources from the issuer as it must allocate the proceeds to environmentally sustainable projects, measure and disclose the details on environmental impact, pay the costs occurred from the label itself and from the voluntary external verifications. From the perspective of Shareholder theory, the ultimate purpose of existence for companies is to maximize the value for their owners, and thus committing in environmental sustainability at the expense of financial performance will be a waste of resources (Friedman, 1970). Yet many promising findings have been able to illustrate the linkage between the environmental sustainability and financial performance. Additionally, slightly lower cost of capital and positive changes in ownership structure further reinforces the incentives from shareholders perspective to use this framework (Flammer, 2020; Tang & Zhang, 2018).

As the announcement effect for Green bonds have already been exposed with earlier studies, I wanted to deliberately restrict the sample for the Green bond announcements to European listed companies only. By narrowing the scope, the sample size admittedly got smaller and thus weakens the applicability of these results. However, the strength of this approach is that all issued Green bonds in this sample shared the same underlying framework, as all of them were aligned with the Green Bond Principles. Most of them were also externally reviewed by at least one independent counterparty, which provides better reliability for claimed environmental impact. With this sample, I was able to demonstrate positive and statistically significant cumulative abnormal returns in different time periods of 2 days, 12 days and 21 days. These results are mostly in line with previous studies conducted with same type of methodology and study design.

Again in line with the previous studies, the abnormal returns were most profound among the initial announcements, while weaker and less significant among the issuers that have already issued Green bonds before. Like in earlier studies, this can be refined to an interpretation that Green bond announcements contain more information than just the issuance of new debt. If the shareholders are appreciating the announcement that gives a signal on the commitment towards environmental sustainability, it is obvious that the message is not as strong as when it was initially announced. From the standpoint of efficient market theory and asymmetric information, these signals are giving the investors more comprehensive environmental disclosure, and thus, the positive reaction can be justified (Tang & Zhang, 2018).

Since the environmental sustainability has become mainstream during last decade, the number of scientific publications around the theme is prosperous. One notable deficiency for Event study methodology used with CSR-related research questions will be the comprehensiveness of the subject itself (McWilliams et al. 1999). Event study methodology and stock reaction approach takes only the shareholder point of view in the consideration, while many of the studied topics are so complex that the study design should take other stakeholders in the consideration as well. In addition, the complexity of these strategic managerial decisions makes the method very vulnerable for the confounding events and outliers. Too long timeframe loses the sensitivity, and too short period does not take the possible information leakage and post-event drift into consideration. My own research has essentially all the same limitations and challenges as other similarly designed research that covers the same topic of Green bonds and shareholder value. The difference, however, is that I have openly addressed the problems in terms of research design and used methodology. During this research process, my criticism towards recent CSR-themed studies that are trying to explain financial performance with sustainability measures, increased significantly. In fact, according to one recent study, the strong recovery in equity prices after the COVID-crisis were not explained by the ESG-factors, although the media and analysts often suggests this (Demers et al. 2021). In reality, the returns were better explained by key figures derived from accounting and other traditional fundamentals. This study shows brilliantly how problematic it is to draw the link between sustainability and returns. Nonetheless, the analysis of different ESG-factors, including climate risk measures will most certainly have its place in the future as a tool for risk management, as long as the problem of climate change remains unsolved.

Although the popularity of green bonds as a debt instrument has increased dramatically in recent years, it is also important to highlight possible limitations on the continuity of increasing share of total bond market in the future. At some point, every company will come across a limit on how many green eligible projects can make sense financially. This is very industry-specific, and some companies are facing the limit sooner than the others (Zerbib, 2019). To iterate this thought forward, the more companies are getting involved in green projects, the more difficult it is to find new economically viable projects that also have

measurable environmental impact. Thus, the more common Green bonds are becoming, the more difficult it is for companies to generate enough shareholder value to cover the costs incurred at the same time. Despite to this limitation on future growth, I am personally think this framework has still potential to evolve and grow. As for the further research on this topic, it would be interesting to repeat this same study later with larger sample of European Green bonds. This would make more detailed analysis of the sample more meaningful. For better understanding, it would be important to perform cross-sectional regression analysis to reveal the relationships with different independent variables. Instead of relying solely on the Event study methodology, also more comprehensive approach with more qualitative setting might be effective way to gain understanding of different motives behind the decision to invest or issue Green bonds. All in all, the Green Bond framework will surely provide many interesting angles for academics to study as the market becomes more saturated and the regulations evolve.

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BENCHMARK INDICES

COUNTRY CODE	INDEX NAME	BBG TICKER	DESCRIPTION
AT	VIENNA STOCK EXCHANGE AUSTRIAN TRADED INDEX	ATX INDEX	THE AUSTRIAN TRADED INDEX IS A CAPITALIZATION-WEIGHTED INDEX OF THE MOST HEAVILY TRADED STOCKS ON THE VIENNA STOCK EXCHANGE. THE EQUITIES USE FREE-FLOAT ADJUSTED SHARES IN THE INDEX CALCULATION.
BE	BEL 20 INDEX	BEL20 INDEX	THE BEL 20 IS A FREE FLOAT MARKET CAPITALIZATION WEIGHTED INDEX THAT REFLECTS THE PERFORMANCE OF THE 20 LARGEST AND MOST ACTIVELY TRADED SHARES LISTED ON EURONEXT BRUSSELS, AND IS THE MOST WIDELY USED INDICATOR OF THE BELGIAN STOCK MARKET.
CH	SWISS MARKET INDEX	SMI INDEX	THE SWISS MARKET INDEX IS AN INDEX OF THE LARGEST AND MOST LIQUID STOCKS TRADED ON THE GENEVA, ZURICH, AND BASEL STOCK EXCHANGES.
DE	DEUTSCHE BOERSE AG GERMAN STOCK INDEX	DAX INDEX	THE GERMAN STOCK INDEX IS A TOTAL RETURN INDEX OF 30 SELECTED GERMAN BLUE CHIP STOCKS TRADED ON THE FRANKFURT STOCK EXCHANGE. THE EQUITIES USE FREE FLOAT SHARES IN THE INDEX CALCULATION.
DK	OMX COPENHAGEN 25 INDEX	OMXC25 INDEX	THE OMX COPENHAGEN 25 INDEX IS A MARKET VALUE WEIGHTED, FREE FLOAT ADJUSTED AND CAPPED INDEX. THE INDEX CONTAINS THE 25 LARGEST AND MOST TRADED SHARES ON NASDAQ COPENHAGEN.
ES	IBEX 35 INDEX	IBEX INDEX	THE IBEX 35 IS THE OFFICIAL INDEX OF THE SPANISH CONTINUOUS EXCHANGE. THE INDEX IS COMPRISED OF THE 35 MOST LIQUID STOCKS TRADED ON THE CONTINUOUS MARKET.
FI	OMX HELSINKI CAP INDEX	HEXP INDEX	THE HEXP INDEX IS A MODIFIED CAPITALIZATION-WEIGHTED INDEX THAT CONTAINS THE SAME CONSTITUENTS AS THE HEX INDEX. THE HEXP IS REBALANCED INTRADAY SUCH THAT ACOMPANY'S WEIGHT CANNOT EXCEED 10%.
FR	CAC 40 INDEX	CAC INDEX	THE CAC 40 IS A FREE FLOAT MARKET CAPITALIZATION WEIGHTED INDEX THAT REFLECTS THE PERFORMANCE OF THE 40 LARGEST AND MOST ACTIVELY TRADED SHARES LISTED ON EURONEXT PARIS, AND IS THE MOST WIDELY USED INDICATOR OF THE PARIS STOCK MARKET.
GB	FTSE 100 INDEX	UKX INDEX	THE FTSE 100 INDEX IS A CAPITALIZATION-WEIGHTED INDEX OF THE 100 MOST HIGHLY CAPITALIZED COMPANIES TRADED ON THE LONDON STOCK EXCHANGE. THE EQUITIES USE AN INVESTIBILITY WEIGHTING IN THE INDEX CALCULATION.
IT	FTSE MIB INDEX	FTSEMIB INDEX	THE INDEX CONSISTS OF THE 40 MOST LIQUID AND CAPITALIZED STOCKS LISTED ON THE BORSA ITALIANA. IN THE FTSE MIB INDEX FOREIGN SHARES ARE ELIGIBLE FOR INCLUSION.
LT	OMX VILNIUS INDEX	VILSE INDEX	OMX VILNIUS IS A TOTAL RETURN INDEX WHICH INCLUDES ALL THE SHARES LISTED ON THE MAIN & SECONDARY LISTS ON THE VILNIUS STOCK EXCHANGE.
NL	AEX-INDEX INDEX	AEX INDEX	THE AEX IS A FREE FLOAT MARKET CAPITALIZATION WEIGHTED INDEX THAT REFLECTS THE PERFORMANCE OF THE 25 LARGEST AND MOST ACTIVELY TRADED SHARES LISTED ON EURONEXT AMSTERDAM, AND IS THE MOST WIDELY USED INDICATOR OF THE DUTCH STOCK MARKET.
NO	OSLO STOCK EXCHANGE OBX INDEX	OBX INDEX	THE OBX INDEX IS A CAPITALIZATION-WEIGHTED INDEX OF THE LARGEST COMPANIES TRADED ON THE OSLO STOCK EXCHANGE. THE EQUITIES USE FREE-FLOAT SHARES IN THE INDEX CALCULATION.
PT	PSI 20 INDEX	PSI20 INDEX	THE PSI 20 IS A FREE FLOAT MARKET CAPITALIZATION WEIGHTED INDEX THAT REFLECTS THE PERFORMANCE OF THE 20 LARGEST AND MOST ACTIVELY TRADED SHARES LISTED ON EURONEXT LISBON, AND IS THE MOST WIDELY USED INDICATOR OF THE PORTUGUESE STOCK MARKET.
SE	OMX STOCKHOLM 30 INDEX	OMX INDEX	THE OMX STOCKHOLM 30 INDEX CONSISTS OF THE 30 MOST ACTIVELY TRADED STOCKS ON THE STOCKHOLM STOCK EXCHANGE AND IS A MARKET WEIGHTED PRICE INDEX. THE COMPOSITION OF THE OMXS30 INDEX IS REVISED TWICE A YEAR.