Universidade do Minho
Escola de Economia e Gestão

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Stock market reaction to issuance of green bonds

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This year has been, without a doubt, very different from what I am used to. On the one hand many obstacles, many complications, many restrictions, but on the other hand a lot of learning, a lot of personal growth, a lot of evolution both personally and professionally. All this path was successfully accomplished thanks to the great support and motivation of my supervisor, my parents, my friends and especially my girlfriend.

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration.

I further declare that I have fully acknowledged the Code of Ethical Conduct of the University of Minho.

Reação do mercado de ações à emissão de obrigações verdes

RESUMO

Esta dissertação estuda o impacto da emissão de obrigações verdes na rendibilidade das ações das empresas emitentes. O período de tempo selecionado para as obrigações verdes situa-se entre 4 de Novembro de 2016 e 14 de Dezembro de 2020. A amostra analisada inclui um total de 460 emissões de obrigações verdes de 229 emitentes diferentes. A data de 4 de Novembro de 2016 foi escolhida por ser uma data marcante para o mercado sustentável, o Acordo de Paris entrou em vigor. Para cumprir os requisitos das janelas de estimação e de evento, os valores das ações dos emitentes foram extraídos entre 1 de Setembro de 2015 e 29 de Janeiro de 2021.

A fim de analisar o impacto, foi efetuado um estudo de evento. Devido à falta de informação gratuita sobre as datas de anúncio, este estudo analisa a data de emissão como a data do evento. O modelo de mercado foi utilizado para estimar os parâmetros para os retornos esperados e assim foi possível calcular os retornos anormais e os retornos anormais cumulativos (que foram utilizados para analisar o impacto).

Os resultados empíricos mostram que o mercado reage positivamente em relação à emissão de obrigações verdes, especialmente antes da data do evento. Isto pode ser explicado devido ao facto de estarmos a analisar as datas de emissão em vez das datas de anúncio, onde a literatura encontra o maior impacto na data do evento (dia do anúncio). Estes resultados são consistentes com a literatura que indica que a informação pode já ser conhecida antes da data do evento. Em suma, é possível dizer que o mercado responde positivamente às boas notícias (neste caso, a emissão de um instrumento financeiro amigo do clima).

PALAVRAS-CHAVE

Estudo de evento; Mercado; Modelo de mercado; Obrigações verdes; Retornos anormais

Stock market reaction to issuance of green bonds

ABSTRACT

This dissertation studies the impact of the issuance of green bonds on stock market returns. The time period selected is between November 4th, 2016 and December 14th, 2020. The sample contains a total of 460 green bonds issued by 229 unique issuers. November 4th, 2016 was chosen because it was a remarkable date for the sustainable market, the Paris Agreement entered into force. To fulfil the estimation and event windows requirements, issuers' stock returns were extracted from September 1st, 2015 until January 29th, 2021.

In order to analyse the impact, we conduct an event study. Due to the lack of free information on announcement dates, this study analyses the issuance date as the event date. The market model was used to estimate the parameters for the expected returns and so it was possible to calculate the abnormal returns and cumulative abnormal returns (that were used to analyse the impact).

The empirical findings show that the market reacts positively in relation to the issuance of green bonds, specially before the event date. This can be explained due to the fact that we are analysing issuance dates instead of announcement dates, where the literature finds the biggest impact on the event date (announcement day). This results are consistent with the literature that indicates that the information may already be known before the event date. Overall, it is possible to say that market responds positively to good news (in this case, the issuance of a climate friendly financial instrument).

KEYWORDS

Abnormal returns; Event study; Green bonds; Stock market retums; Market model.

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LIST OF ABBREVIATIONS AND ACRONYMS

AR – Abnormal returns

CAB – Climate Awareness Bond

CAR – Cumulative Abnormal Returns

COP21 – Conference of Parties 2021

CSR - Corporate Social Responsibility

ESG - Environmental, Social and Governance

ESM - Event Study Method

GB – Green Bonds

GBP – Green Bonds Principle

GHG – Greenhouse Gas

ICMA - International Capital Market Association

OLS - Ordinary Least Squares

R – Returns

RI – Return Indices

SD – Standard Deviation

SRI - Socially Responsible Investing

UNFCCC - United Nations Framework Convention on Climate Change

US – United States

1. INTRODUCTION

Through the last decades, people started to concern more about the environment and the climate changes that would affect the future due to the problems that are appearing on our planet. These problems occur over the whole world, such as natural disasters - earthquakes, floods, cyclones, tsunamis, volcanic eruptions, etc. - and climate changes. In addition to causing immense death, these natural disasters have a major impact on the future of the planet because they destroy natural resources, thus reducing the sustainability of the planet for the following generations.

Investors are no different. More and more investors want to invest more effectively and considering sustainable finance. Companies are aware that they can contribute to a healthier and better world. With this, bonds that are associated to green and climate-friendly projects were invented, the green bonds.

Bonds are essentially an agreement where issuers borrow funds from investors and must repay investors at an agreed rate after a specified amount of time. This fixed income instrument is used by companies, municipalities, states, and sovereign governments to finance projects and operations. Owners of bonds are debtholders, or creditors, of the issuer. Issuing a bond was nothing new for the World Bank that has been issuing them since 1947 to raise financing from the capital markets for its development projects. But the concept of a bond that is dedicated to a specific kind of project had not been tested before.

In 2007, the Intergovernmental Panel for Climate Change - a United Nations agency that provides scientific data on climate change and its political and economic impacts - published a report (Climate Change 2007, Synthesis Report) that finds that "most of the global average warming over this past 50 years is very likely due to anthropogenic GHG increases and it is likely that there is a discernible human-induced warming averaged over each continent (except Antarctica)". According to the World Bank's impact report (2018), it was a Swedish pension funds group, in late 2007, who wanted to invest in projects that helped the climate and so, they came up with the idea of a financial instrument that would put both together, the green bonds. As they did not know how to find these projects, they called on the World Bank to help them. Less than a year later, the bank issued the first green bond (at the time it was labelled a Climate Awareness Bond (CAB)), creating a connection between financing from investors to climate projects.

Green bonds are used by governments, banks, municipalities or corporations to raise cash for new or existing projects that are associated with positive environmental and climate impacts. This type of bonds can cover energy, water management, building construction, water, land use and transport. The projects must be explicitly focused on energy efficiency, pollution prevention, sustainable agriculture, fishery and forestry, the protection of aquatic ecosystems, clean transportation and sustainable water management.

Besides the recent boom in the green bond market, there is still no consensus about the definition of this financial instrument. Green bonds are designated bonds intended to encourage sustainability and to support climate-related or other types of special environmental projects. Green bonds are a recent developed financial instrument with the objective of improving environmental impacts and social welfare, where the proceeds are committed to finance environmental and climate-friendly projects. Like a traditional fixed income security, companies can issue this type of bonds to increase their capital to finance their projects. Moreover, green bonds are intended to have a positive environmental benefit such as reducing CO_2 emissions and preventing pollution. To be qualified as green bonds, companies must follow some requirements that have to be verified by external companies to establish whether the proceeds will generate environmental benefits (Tang & Zhang, 2020). When issuing green bonds, companies should certify them through external entities to make the issuance more reliable and signal their commitment to the investment. If it is their first issuance, this process will certainly be costly, and the shareholders of the issuing firm should ask the benefits from that specific and more costly issuance (Tang & Zhang, 2020).

Since these bonds have become much more popular in recent years -Morgan Stanley (2017) refers to this evolution as the "green bond boom"-, it is important to examine the market reaction. At the Conference of Parties (COP21) in Paris on December 12th, 2015, parties from the United Nations Framework Convention on Climate Change (UNFCCC) reached a historic agreement to prevent climate changes and to enforce the actions and investments needed for a sustainable low carbon future. From this convention, The Paris Agreement emerged to unit all nations to a better future. This agreement is a legally binding international treaty on climate change. It was adopted by 196 parties, but it only entered into force on November 4th, 2016. As such, it constructs a new route in the global climate effort.
According to Climate Bonds Initiative reports, this market had a huge growth in recent years (in 2015 were issued $41.8 billion, in 2016 were issued $81 billion and in 2019 were issued a record of $257.7 bn) (Climate Bond Iniciative, 2016, 2017, 2020).

The purpose of this study comes from the fact that it is a topic that has attracted great attention due to the increased importance for society. With the growing concern for the environment, the green bond market is growing fast. Thus, this study aims to investigate the impact of these issuances on the value of the stocks of the issuer firm and how investors can benefit from it in the short term. This research also provides us information about how capital markets can play an important role fighting against climate change.

As this is a relevant topic in current days, many studies are appearing in relation to green bonds (Baulkaran 2019; Flammer, 2021; Tang & Zhang, 2020; Wang, Chen, Li, Yu & Zhong, 2020). Contrary to many studies that are only about certain continents or certain countries (Castro, Gutiérrez-López, Tascón & Castaño, 2021; Wang, Chen, Li, Yu, Zhong, 2020; Zhou & Cui, 2019), in this study, we conduct an event study and analyse the impact of worldwide issued green bonds in stock market returns for the respective issuers. As time goes on, more information is available and so, the period under analysis on this study is larger and more recent than those of previous studies. This study analyses the impact of green bonds issued by companies that are publicly traded in the stock market between November 4th, 2016, and December 15th, 2020. November 4th, 2016 was chosen because it was the date the Paris Agreement entered into force.

To empirically examine corporate green bonds, we extracted a dataset of green bonds from Datastream. The dataset includes all green bonds issued by public and private companies across the world. At first, the sample contained 2035 events from 808 unique issuers. Since the initial sample contains firms that were not issued by publicly traded firms and/or their issuer did not have an alive market stock at the time of the issuance, we needed to clean the sample in order to have the most accurate results according to the objectives. After the cleaning process, the final sample is composed by 461 events from 229 unique issuers. The analysis is divided in two parts. Firstly, an event study is conducted for all eligible green bonds (460 events) issued after November 4th, 2016, and then, only for first-time issuances for each issuer after the same date (229 events). The aim is to test if first time issuances outperform subsequent issuances or if the impact on the returns is sharper (Flammer, 2021).

Following Krueger (2015), we computed a 250-day estimation window ([-300; -50]). The main event window follows Baulkaran (2019) which adopted a 21-day event window ([-10; 10]). Besides this, as we are analysing issuance dates, rose the need to add additional event windows towards the past and future

in order to try to catch an early and/or a late reaction to the event. We than used a 16-pre-day event window, starting 25 days prior to the event and ending 11 days prior to it, a 20-pre-day event window, starting 45 days prior to the event and ending 26 days before it and a 10-post-day event window, starting 11 days after the event and ending 20 days after it.

In this study is also presented a significance test to analyse if have statistical significance CARs on the analysed variables. We chose the t-test on CAR because it is the one that better fit the available variables.

This dissertation is organized in six sections. After this section, the introduction, there is the literature review where the different types of studies on green bonds are explained and the results that the main ones presented in order to draw their conclusions. The third section refers to the models that were applied to the dataset in order to lead to reliable conclusions. The fourth section describes the data, how it was collected and how it was prepared for the study. The fifth section presents the main results obtained and the last section summarizes the main conclusions and what could be improved regarding the topic.

2. Literature Review

2.1 Green bonds definition

A Green bond is a fixed income financial instrument with the purpose of encouraging the financing of environmental-friendly projects, like renewable energy, whilst promoting social welfare (Tang & Zhang, 2020) or climate-related sustainable activities (Fatica, Panzica & Rancan, 2021), like sustainable water management. As mentioned before, a green bond, in concept, is not structurally different from a conventional bond. The only difference is that the proceeds from green bonds are committed to finance environmental and climate-friendly projects such as renewable energy, green buildings, pollution prevention and control, among others (Flammer, 2021).

With this, it is possible to say that there is no formal definition for green bond. The defining of green bonds is the utilization of the proceeds, which supports verifiable projects that are intended to alleviate climate or environmental impact. Since there wasn't a standard approach of designating a project as "green", in early 2014, a group of 13 banks created a set of voluntary instructions that recommend transparency and disclosure as well as to promote integrity in the development of the green bond market by clarifying the approach for issuance of a green bond. The Green Bond Principles (GBPs) has the following instructions: use of proceeds, process for project evaluation and selection, management of proceeds and reporting (ICMA 2018). There is although some guidance offered in the GBP by the International Capital Market Association (ICMA) where they define Green Bonds as "any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible Green Projects and which are aligned with the four core components of the GBP". There is another definition of green according to Green Bonds Initiative (2018), where they defend that it "differs around the world. The Climate Bonds Initiative uses the Climate Bonds Taxonomy, which features eight categories: energy, buildings, transport, water, waste /pollution control, land use, industry and ICT".

2.2 Green bonds studies

Although the literature on green bonds is still scarce there are three types of related studies. Below is presented a description and discussion of these related studies: studies that estimate and analyse the green bond premium/discount, defined as the difference in yield between a green bond and an equivalent synthetic conventional bond where it is possible to see that the premium or the discount depends on methodology and data used which bias the sample and can lead you either side; studies that analyse the

performance of bond portfolios that consider environmental criteria where findings show that in general, these studies find no significant differences between the financial performance of Socially Responsible Investing (SRI) funds and conventional funds; and studies that focus on analysing the impact of the issuance of green bonds on the company's financial returns where it is discussed if the issuance of this financial instrument has a positive, negative or no effect on the respective issuer's stock market value.

a) Studies that estimate and analyse the green bond premium/discount, defined as the difference in yield between a green bond and an equivalent synthetic conventional bond

Hachenberg and Schiereck (2018) defend that green bonds, on average, do not trade significantly tighter than their counterparts. However, pricing differentials are economically most obvious and show statistical significance for single A-rated bonds, with green bonds trading 3.88 bps (4.87%) tighter than comparable non-green bonds.

Baker, Bergstresser, Serafeim, and Wurgler (2018) defend that green bonds, particularly small or essentially riskless ones, are more closely held than ordinary bonds. These pricing and ownership effects are strongest for bonds that are externally certified as green. They find that green bonds indeed are issued at a premium, with yields lower by several basis points. According to their findings, the most natural explanation is that a subset of investors is willing to sacrifice some return to hold green bonds, which is consistent with other findings in the SRI literature. They were also able to prove that both the pricing and ownership effects, while apparent across green bonds, are stronger among bonds that are certified by external verifiers.

Zerbib (2019), analysing green bonds issued between 2013 and 2017 found that the yields of green bonds are on average two basis points (bps) lower than those of comparable conventional bonds. Contrary to Karpf and Mandel (2018), that registered a green bond discount on the secondary market, Baker, Bergstresser, Serafeim, and Wurgler (2018) found that green bonds are issued with a premium, on primary market, when compared to non-green bonds. This way, the empirical findings are not consensual. Later, Larcker and Watts (2020) revisit these studies and conclude that the incoherency in the results derive from a misspecification on the methodology and data used (Karpf and Mandel (2018) compared taxable and non-taxable securities which biases the estimates toward finding a green bond discount).

They also found that Baker, Bergstresser, Serafeim, and Wurgler, (2018) pooled fixed effects regression insufficiently accounts for differences between green and brown bonds, which biases the analysis toward finding a green bond premium. When Flammer (2021) uses Larcker and Watts's (2020) methodology, that match the green bonds to a similar brown bond, she concluded that there is no noticeable difference between the yields of green versus brown bonds (the median difference is exactly zero, p-value = 1,00).

b) Studies that analyse the performance of bond portfolios that consider environmental criteria

SRI have experienced remarkable growth in recent decades. With it, the number of SRI mutual funds has also grown substantially. These funds filter companies in order to select those who meet certain social criteria and to exclude those who are involved in undesirable activities or practices. At the empirical level, most studies conclude that SRI funds and conventional funds perform similarly (Capelle-Blancard & Monjon, 2012; Revelli & Viviani, 2015).

Corporate Social Responsibility (CSR) is a self-regulating business model that helps a company to be socially accountable (to itself, to its stakeholders, and to the public). There are many studies that argue that superior CSR performance leads to a better stakeholder engagement and the likelihood of short-term opportunist behaviour is limited.

According to Bénabou and Tirole (2010), there are three possible understandings of CSR: the adoption of a more long-term perspective, the delegated exercise of philanthropy on behalf of stakeholders, and insider-initiated corporate philanthropy. The latter two understandings build on individual social responsibility.

Ioannou and Serafeim (2015) concluded that there is a positive relation between CSR scores and analyst recommendations. They confirm that in the early 90's, analysts issued more pessimistic recommendations for firms with higher CSR ratings. With the time, they are becoming more optimistic. defended that high sustainability companies are more likely to have established processes for stakeholder engagement, to be more long-term oriented, and to exhibit higher measurement and disclosure of nonfinancial information and high sustainability companies significantly outperform their counterparts over the long term, both in terms of stock market and accounting performance.

Pereira, Cortez, and Silva (2019) also analyse SRI bond portfolio performance over time and find that with the exception of bond portfolios based on the Corporate Governance score, it was possible for investors to obtain abnormal returns by going long in bonds of high-rated companies and short in those of low-rated companies. However, this outperformance vanishes over time because the positive alphas of high-rated portfolios decrease over time, and the alphas of low-rated portfolios increase. Their results have shown that high-rated portfolios are mispriced due to errors in expectations and, according to Derwall, Guenster, Bauer and Koedijk (2011) it may arise because of the complexity of CSR.

According to Badía, Pina and Torres (2019), that analysed bond portfolios based on ESG criteria, high-rated portfolios outperform low-rated ones under any SRI level, although differences are not significant. Their findings are consistent with previous studies that have shown that SRI performs similarly to conventional investments. Also, other studies that analyse high and low-rated firms, through their CSR score, conclude that the differences between them are not significant (Mollet & Ziegler, 2014; Halbritter & Dorfleitner, 2015).

There are also some studies about the announcement effects of corporate news on environmental issues. Negative environmental news results in negative stock price reaction (Klassen, & McLaughlin, 1996; Hamilton, 1995; Dasgpta, Laplante, & Mamingi, 2001). A similar pattern has been shown by Klassen and McLaughlin (1996), who demonstrated that firms receiving environmental awards will have a significant positive abnormal return afterward (Klassen, & McLaughlin, 1996). Also, firms with a higher restricted environmental standard have more value (Dowell, Hart, & Yeung, 2000; Derwall, Guenster, Bauer, & Koedijk, 2005).

c) <u>Studies that focus on analysing the impact of the issuance of green bonds on the company's financial returns</u>

Baulkaran (2019) says that environmental sustainability is becoming either a driver of new business opportunities and/or a key consideration in mitigating economic, regulatory, and reputational risk. The findings are that the cumulative abnormal returns are positive and statistically significant.

A typical finding in this literature — consistent with the pecking order theory of Myers and Majluf (1984) — is that the stock market responds negatively to equity issues but shows no significant reaction to bond issues (Eckbo, Masulis, and Norli, 2007 for a survey of the empirical literature). Compared to regular bond announcements, green bond announcements blend two pieces of information: i) a bond issuance and ii) a signal of the company's commitment to the environment. Since the stock market is typically unresponsive to conventional bond issues, the positive stock market reaction to green bond issues is likely to reflect the latter — consistent with prior studies that show positive CARs in response to the announcement of companies' eco-friendly actions (Flammer, 2013; Klassen and McLaughlin, 1996; Krueger, 2015).

Tang and Zhang (2020) conclude that the issuers' stock prices increase significantly around the announcement of green bond issuance and stock market reactions are stronger for first-time issuers than for repeated issuers and stronger for corporate issuers than for financial institution issuers. They also found that institutional ownership increased, and stock liquidity improved with the issuance of green bonds. Their issuance also affected companies' exposition because issuing green bonds can attract more media exposure and be used by investors that are environmental sensitives.

According to Flammer (2021) investors respond positively to the issuance announcement, a response that is stronger for first-time issuers and bonds certified by third parties. The issuers improve their environmental performance post-issuance and experience an increase in ownership by long-term and green investors. Overall, the findings are consistent with the argument that companies credibly signal their commitment toward the environment when issuing green bonds. Tang and Zhang (2020) have shown that stock prices positively respond to green bond issuance. In conclusion, their findings suggest that the firm's issuance of green bonds is beneficial to its existing shareholders.

With respect to media attention literature, Ben-Rephael, Da, and Israelsen (2017) documents that post-earnings announcement drifts are driven by investor inattention to announcements and that institutional attention responds more quickly to major news events, leading retail attention. They also show that investors pay attention to the firm's green activities.

It is than possible to affirm that media plays a key role for a positive announcement return. Based on investor attention, green bond issuers should not benefit from the label effect after their first-time green

bond issuance. The argument is that after the company has successfully labelled a bond green and that information is disclosed to investors, there should not be found any positive effect for subsequent green bond issuance. So, we should only find a positive announcement return just for first-time bond issuances.

This third type of research is the one that presents most similarities to the main objectives of this event study, and, for that reason, it is the one that is described in more detail and in which the methodologies used are based to reach the objectives of the research.

3. METHODOLOGY

This section describes the event study method. As previously mentioned, the main goal of this event study is to examine the stock return behaviour as a reaction to the issuance of green bonds on the corresponding issuers.

An event study is an empirical investigation that analyses the effect of a market event, such as a merger, bond issuances, earnings announcement and distributions, etc. The results can have huge implications since they provide market information to individual and institutional investors, and they can provide information about market efficiency (Firth, 1979). Typically, this method is used to analyse possible abnormal returns around a specific event.

Coutts, Mills and Roberts (1994), defend that the event study method (ESM) has various opinions about the advantages and the applicability of the standard returns generating process, the single index market model. They also say that ESM is a familiar technique in the applied finance literature. This method emerged in the United States (US) (Beaver, 1968; Fama, Fisher, Jensen & Roll, 1969) and have been continuously spreading to other countries. After a few years, the method became popular in the United Kingdom (UK) (Firth, 1979; Dimson & Marsh, 1986). Coutts, Mills and Roberts (1994) also stated that the single index market model is an essential tool of the event study method as the equilibrium returns generating process. Fama, Fisher, Jensen and Roll (1969), which is the earliest and most influence event study, used the market model to examine abnormal returns on an event study. Armitage (1995) concluded that the market model was the most used model for expected returns in event studies and it was the best support for the evidence. He, who also tested several models in order to compare them with market model concluded that "market model is the most reliable in the sense that, across each of the range of circumstances tested, it is always at least as powerful as the best alternative" (Armitage, 1995, p. 33). Baulkaran (2019) and Flammer (2021) also use the market model to estimate the parameters of expected returns, the abnormal returns (AR) and the cumulative abnormal returns (CAR).

To implement the event study, we first had to create, clean and organize the necessary data (Appendix 1). Here, we created variables such as number of events per firm in order to expand the returns variable for those companies with more than 1 event and an id for each event per firm in order to merge with the corresponding market returns. As it is possible to observe on Appendix 2, we created a variable that would count the trading days starting from the event day (e.g., the event day is number 0, the previous

trading day is number -1, the following trading day is number +1 and so on). After it, all companies for which the event date could not be found in the returns' file were eliminated (here, 1 event is eliminated because its issuance date was on a Saturday and the returns' database only contain information for trading days, reducing the eligible events to 460).

According to Krueger (2015), there is the possibility that some information may have been known to the public prior to the issuance so we included the ten previous trading days and prevent the possibility of an amazed response the following ten trading days — that means that the reference event window is [–10; 10]. Following Flammer (2021), to study if there is any increase in stock prices prior and after the event window, other event windows were analysed and the intervals [–45; –26] and [–25; –11] prior to the event day and the time interval [11; 20] after it are considered. These windows analyse a bigger period towards the prior days because we are analysing issuance days and, most probably, the information about the issuance was already known before it happens.

Baulkaran (2019) states that the use of estimation windows of approximately 1 year prior to the event date to estimate the parameters of the market model is a common practice. For example, Klassen and McLaughlin (1996) used a 200-day estimation window. For the estimation window, we followed Tang and Zhang (2020) with a 250-day estimation window from [-300; -50][1].

To analyse the impact of the green bond issuance on the company's stock return, daily discrete returns were computed using the total return index series (obtained from Datastream) as follows:

$$R_{i,t} = \frac{RI_t - RI_{t-1}}{RI_{t-1}} \quad (1)$$

where, $R_{i,t}$ are the daily discrete returns,

The FTSE stock market indices for 30 countries and MSCI stock indices for 6 countries are used to obtain stock market returns[2]. Each green bond is associated with the market corresponding to their issuer's country.

[1] Firms with less than a certain number of observation were eliminated (window size – 1, e.g., in the 21-day window [-10; 10] all firms with less than 20 observations got deleted). Here, no firms were eliminated.

[2] The MSCI indices were used because the information for the remaining firms was not available on FTSE.

Armitage (1995) says that the most common approach is to estimate the connection among the stocks' returns and the market returns through an ordinary least squares (OLS) regression and use it to estimate the expected returns. With this, the market model for our sample is estimated for each firm based on daily returns from day -300 through -50 (where 0 is the green bond issuance date) through the following OLS equation:

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

where $\hat{R}_{i,t}$ are the expected daily return of firm i on day t, α_i and β_i are the regression coefficients, $R_{m,t}$ is the daily market return on day t, and $\varepsilon_{i,t}$ is the residual.

The assumption of the market model, expressed in equation (2), is that an individual stock return, $R_{i,t}$, is modelled by a systematic component linearly related to some market indices, $R_{m,t}$, and an unsystematic component, $\varepsilon_{i,t}$, which is assumed to be independent of $R_{m,t}$.

As a result, we computed the abnormal returns (AR) by:

$$AR_{i,t} = R_{i,t} - \hat{R}_{i,t} \quad (3)$$

By summing abnormal returns for various periods around the event it is possible to get the cumulative abnormal returns (CAR). These are estimated within the specific time window and reported for the time intervals [–45, –26], [–25, –11] and [11; 20] in addition to the event window [-10; 10] by

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

where, $\sum_{t_2}^{t_1} AR_{i,t}$ corresponds to the sum of daily abnormal returns from t_1 to t_2.

Based on CAR we investigate if the event had any significant effect on stock returns.

Baulkaran (2019) and Flammer (2021) tested CAR's significance to understand if the results were trustable. For a joint significance test, we also computed a regression for the CAR for all companies issued

after November 4th, 2016 (first-time issuances and for all issuances) in relation to a constant. This test is more reliable than the t-test because it allows to use robust standard errors.

To analyse if the impact on the stock returns is different for first time issuances, we perform the event study considering only the first issuance from each firm after November 4th, 2016 (a total of 229 events from 229 unique issuer).

4. DATA

This section presents the dataset and variables used in the study.

One crucial assumption is that capital markets are sufficiently efficient to react to new events/information. According to Flammer (2021), the announcement date is the relevant date for the event studies since it captures the day when the information is provided to the market. While searching for the data for the study, was noticeable the lack of free information for most of the green bonds in relation to their announcement date. Here, problems emerged on deciding the event date as the literature on the event studies are associated to the announcement date. Therefore, the decision was to use the issuance date as the event date. Even with this limitation, the main hypothesis aims to test if the issuance of green bonds causes positive or negative stock market returns remains.

For this research, the information about the green bonds issued (ISIN, issuance dates, issuers' type, issuers' names, issuers' nation and coupon) were attained through Refinitive Eikon Datastream. To compile a database of green bonds, it was collected a list of all green bonds, alive and dead, through a static request (for the constituent list GBIALL), issued between November 4th, 2016, and December 14th, 2020. The sample only contains green bonds issued after November 4th, 2016, because it is a special date with respect to green bonds. In Figure 1 it is possible to observe the exponential growth of green bond market after the Paris Agreement entered into force.

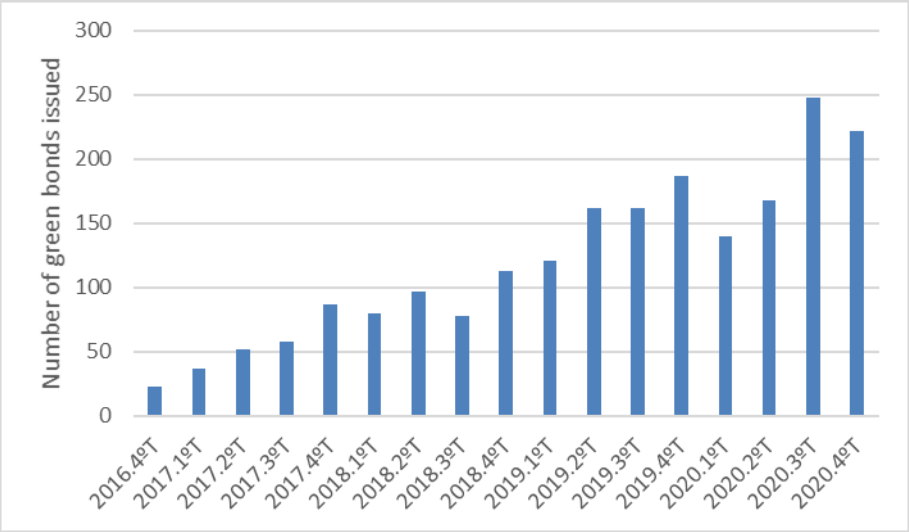

Figure 1 - Number of all green bond issued after November 4th, 2016

This search led to a total of 2035 green bonds from 808 unique firms. To be able to have a data window that would fit the estimation window ([-300; -50]), the stock's daily data was collected from September 1st, 2015, to January 29th, 2021. Daily data was collected in order to easily analyse the event windows relative to the event (issuance of the green bonds) for each stock because it is an event study with a small window size (being the smallest one a 10-day event window and the largest one a 21-day event window). All data was extracted in US dollars to be easier to compare the values. After obtaining the ISIN code for each bond, it was necessary to see if the bonds were associated to a publicly traded stock. Here, it surged the first need to clean the data (the main reasons for exclusion were firms that weren't publicly listed and firms that hadn't active stocks at the time of the issuance of the green bonds). By eliminating the non-eligible firms and their respective events, it was possible to reach a value of 461 events (only 460 events were eligible for the study because one was issued on a Saturday and the database only account for trading days) from 229 unique issuers. As it is possible to observe in Figure 1 and Figure 2, this financial instrument has been growing immensely since the Paris Agreement. For green bonds issued by publicly traded firms, on the quarter right after this event, the number of issued bonds rose 400%, and at an average of 38.57% per quarter for the rest of the periods. It is also possible to observe a decrease at the beginning of 2020 which is most certainly related to the appearance of Covid-19 pandemic which has affected the world economy.

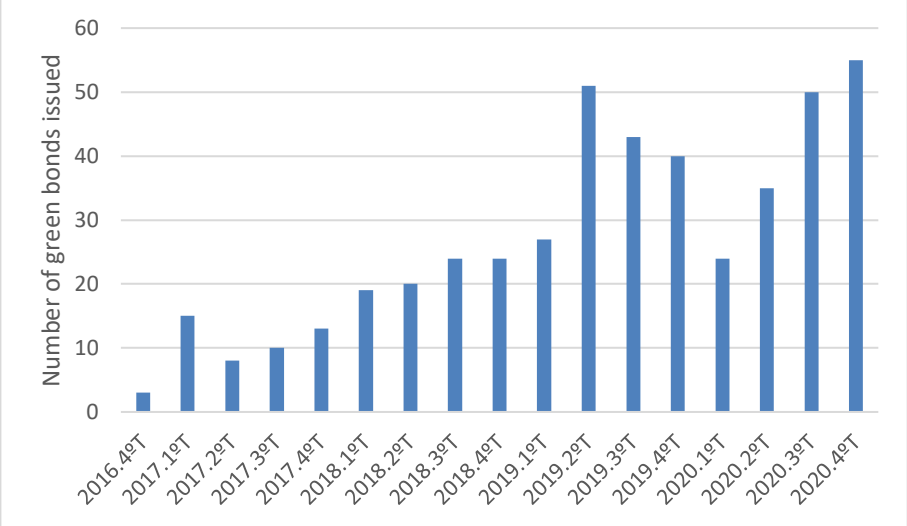

Figure 2 - Green bond issuance growth after November 4th, 2016 issued by a publicly traded firm that was alive at the time of issuance

Number of all green bonds issued after November 4th, 2016 that were issued by a publicly traded firm that was alive at the time of issuance (Detailed values in Appendix 3)

Following the growth of the number of issued bonds, the amount issued has also been increasing since November 4th, 2016, but not at a straight trend. By observing Figure 3 it is possible to notice a higher amount of issuance at the second half of each year compared to the first half. This can be explained by the fact that issuing bonds is a way to raise money, which can be good for financial year-end reports.

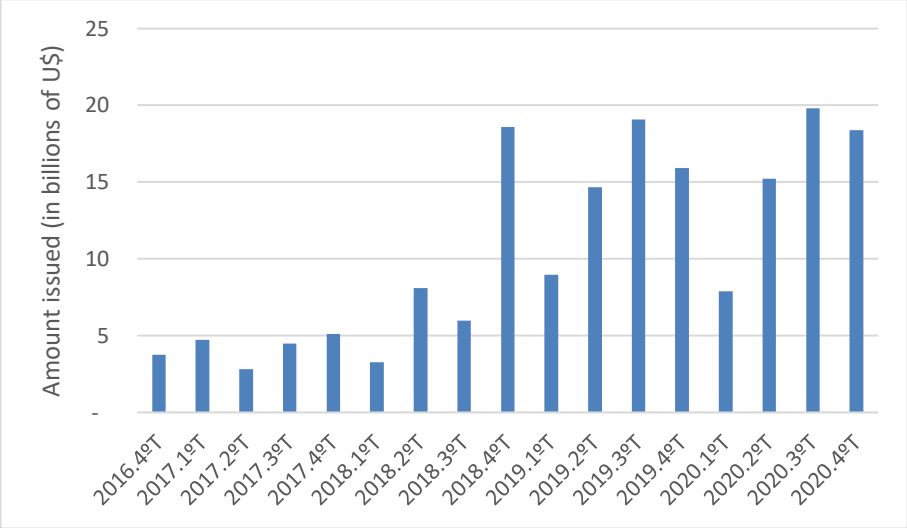

Figure 3 - Amount of U$ issued in bonds (in billions of U$)

(Detailed values in Appendix 4)

Considering the issuance of green bonds by country, as shown in Figure 4 is possible to conclude that this financial instrument is prevalent in Japan, United States and Europe (being Sweden, France and Germany the larger issuers in terms of quantity of bonds).

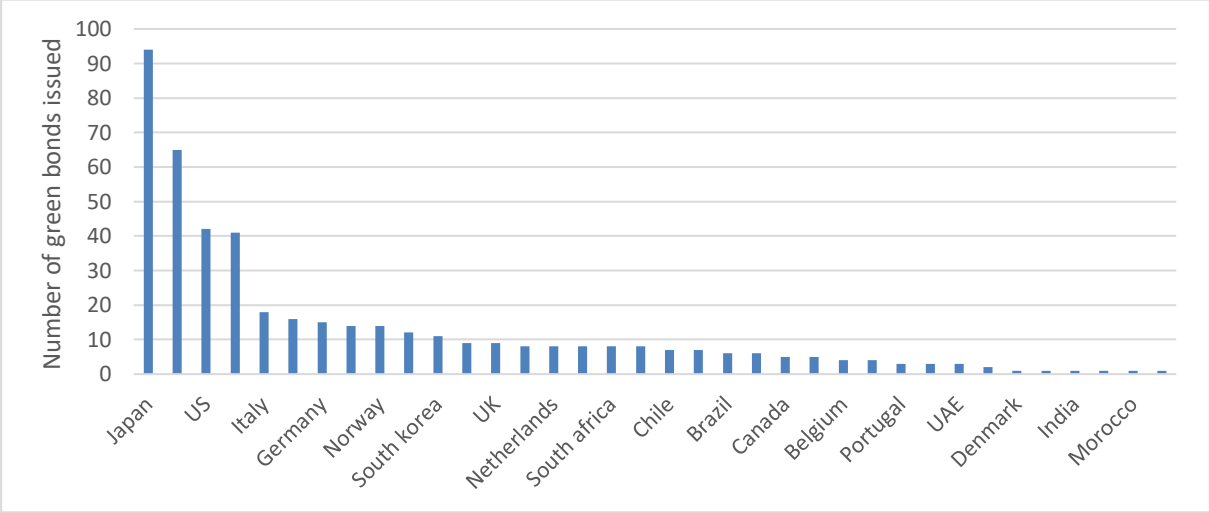

Figure 4 - Number of issued green bonds per country

In Figure 5 is possible to see that in terms of amount issued, it does not follow the same pattern. Here, in terms of amount issued, United States leads, followed by France and China. With this, we noticed that issuing more green bonds does not turn a certain country in the bigger issuer, it will always depend on the analysis that is being studied. In this case, we can observe that Japan is the country with the largest number of green bond issuances (44.6% more than Sweden that is the second bigger issuer in terms of number of green bonds) and is only the 5th bigger issuer in terms of amount issued. On average, the amount issued per bond, in this sample, is U$ 384.37M and the average amount issued per country is 4.91 billion of U$.

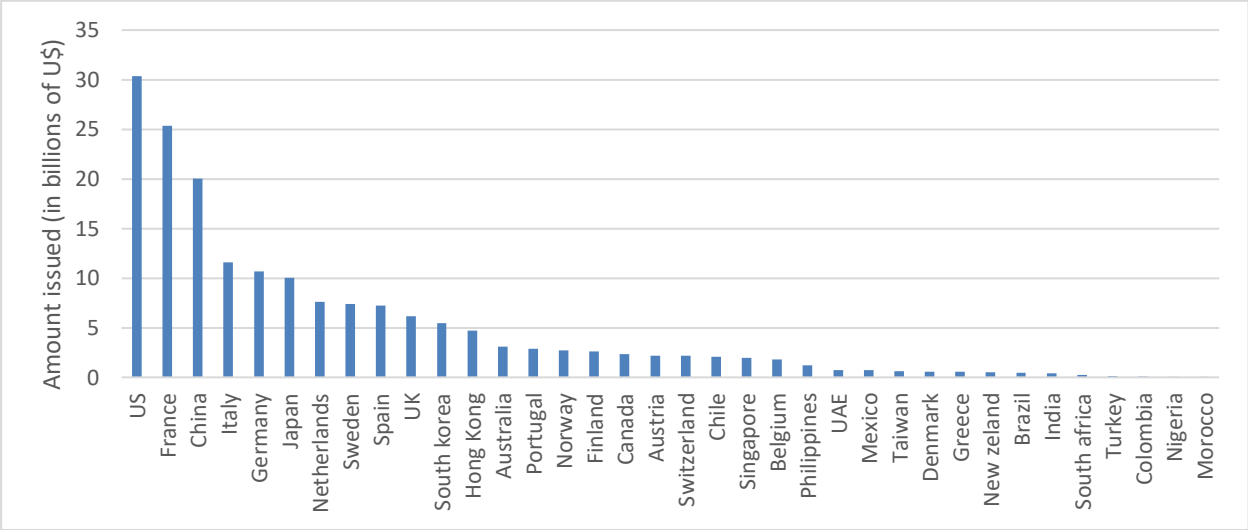

Figure 5 - Amount issued on green bonds (in billions of U$) per country

(Detailed information on Appendix 5)

Flammer (2021) reported an average maturity for green bonds of 7.7 years and an average coupon for fixed-rate bonds of 3.7%. In Table 1 we can see that, the average maturity for the issued green bonds is 8.42 years, being Portugal the country with the largest value (43.20 years) and Colombia the one with the lowest average maturity (4.06 years). The average annual coupon is 1.90%, being Nigeria the country with a higher annual coupon rate (15.50%) and Japan the country with the lowest annual coupon rate (0.49%).

	Mean	***Standard Deviation***	***Median***	***Max***	***Min***
Maturity (years)	8.42	6.49	6.62	43.20	4.06
Average Amount Issued (in Millions of $)	407.86	317.11	331.27	1,250.70	14.88
Coupon (%)	2.86	2.60	2.18	15.50	0.49

Table 1 - Bonds characteristics

This table reports the characteristics of the green bonds issued after November 4th, 2016 and whose issuers were a publicly traded firm

5. Empirical Results

This section presents the results obtained. To study the stock return reaction to the bond issuance, we firstly used the market model to estimate abnormal returns. For this, we used two samples of 460 events and 229 events (Appendix 6) corresponding to all green bonds issued after November 4th, 2016 and the issuer is a publicly traded firm that were alive at the time of issuance and to all first time issuances (for the same firms on the previous sample). As the sample contains green bonds from many countries, we used the indices of the stock market on which the issuer firm is listed to estimate the market model.

An estimation window from 300 trading days to 50 trading days before the issuance date is used to get the estimates for the market model and then to compute abnormal returns in the different event windows. The main event window is from 10 days before to 10 days after the issuance. As the event date corresponds to the issuance date and not to the announcement date, in addition to this event window, three other event windows are analysed as robustness checks, especially for the period before: 45 days prior to the event to 26 days prior to the event, 25 days to 11 days before the event and 11 days after the event to 20 days after it.

The results corresponding to the CAR's statistics for all issuances are presented in Table 2. Here it is possible to observe that only for the period right after the issuance, the CAR presented a negative value and that can be explained by a possible counter reaction to the expectation created around this green issuance and because market is not supposed to react positively for long time on subsequent issuances (Flammer, 2021). This can be proven in Table 3 where it is presented the biggest CAR in the whole study (0.88% for the period [-25; -11]. This effect is not present on the first-time issuance table because it is new information around certain firms, and this can last a few longer until market goes back to normal (this is late reaction on first-time issuances can, most probably, be explained by the fact that this issuance is value added to the firm because the green bonds represent a fund opportunity growth and/or reduction in risk). According to Baulkaran (2019) green bond issuing firms with growth opportunities elicit a stronger market reaction.

Event	*Event window*	*CAR Mean*	*CAR Std. Dev.*	*CAR Min*	*CAR Max*
ALL issuances	[11; 20]	-0.19%	4.55%	-18.71%	28.44%
ALL issuances	[-10; 10]	0.18%	5.54%	-21.04	25.54%
ALL issuances	[-25; -11]	0.51%	5.17%	-26.19%	28.38%
ALL issuances	[-45; -26]	0.55%	6.02%	-26.42	26.46%

Table 2 - CAR statistics for all green bonds issued on the sample

This table summarizes the CAR results for each period for all 460 issuances (Detailed information on Appendices 7 to 10)

Event	*Event window*	*CAR Mean*	*CAR Std. Dev.*	*CAR Min*	*CAR Max*
1st issuance	[11; 20]	0.13%	5.61%	-35.56%	31.63%
1st issuance	[-10; 10]	0.15%	5.94%	-20.29%	25.63%
1st issuance	[-25; -11]	0.88%	5.40%	-13.63%	25.78%
1st issuance	[-45; -26]	0.52%	6.88%	-27.76%	30.29%

Table 3 - CAR statistics for first time issued green bonds on the sample

This table summarizes the CAR results for each period for 229 events (first time issuances) (Detailed information on Appendices 11 to 14)

On Table 4 and Table 5 we observe the results of the regression that helped explaining if the CARs are or not statistically significant for each period for all issuances and also for first-time green bond issuances, respectively. We can see that the results considering the 21-day event window [-10; 10] for all 460 eligible issuances, show a small positive CAR (0.18%), but it is not statistically significant at the 5% level (p-value of 0.49). So, we cannot reject the null hypotheses that the CAR is not different from zero. For this window and this sample, the positive CAR is not sufficient to say that the market responded positively to the issuance of the green bond. This positive CAR could be justified as a normal behaviour of the market during the mentioned period. On the other hand, for the event windows [-25; -11] and [-45; -26] it is possible to conclude that the CAR has statistical significance once the p-value is <0.05 (0.037 and 0.049, respectively). For these periods it is possible to observe higher CARs, such as 0.51% and 0.55% respectively. This values are sufficient to say that the market responded positively to the issuance of the green bonds for the event window analysed.

As it is possible to observe on Table 2 and Table 4, on the interval [-25; -11] it presented a higher CAR of 0.51% than the main event window and a better statistical significance at the 5% level (p-value of 0.037). With such result, it is possible to say that the issuance of a green bond has a positive impact on the issuer's market value. It is also possible to observe a positive CAR on period [-45; -26] but this time with a lower statistical significance due to the fact that it is further away from the event date. This can be explained because the information of about the issuance of the green bond could have become public a few days prior to the issuance date (Krueger, 2015). The positive CARs suggest that the stock market responds positively to the issuance of green bonds.

Event	Event window	number of obs	Coefficient	Robust Std. Err.	T	P>|t|	95% confidence interval
ALL issuances	[11; 20]	460	-0.0019	0.21%	-0.91	0.365	[-0.0061; 0.0022]
ALL issuances	[-10; 10]	460	0.0018	0.26%	0.69	0.490	[-0.0033; 0.0069]
ALL issuances	[-25; -11]	460	0.0050	0.24%	2.09**	0.037**	[0.0003; 0.0098]
ALL issuances	[-45; -26]	460	0.0055	0.28%	1.97**	0.049**	[0.0000; 0.0111]

Table 4 - CARs' linear regression estimates resumee for all green bonds on the sample

*This table reports the CAR for green bonds issuance. Here it was tested if CAR was significantly different from zero. P (sign-test) is the P value for the sign test, and it is non-parametric. Robust t statistics *** p < .01, ** p < .05, * p < .10) (Detailed information on Appendices 7 to 10)*

Event	Event window	number of obs	Coeficient	Robust Std. Err.	T	P>|t|	95% confidence interval
1st issuance	[11; 20]	229	0.0013	0.37%	0.34	0.737	[-0.0061; 0.0086]
1st issuance	[-10; 10]	229	0.0015	0.39%	0.37	0.7111	[-0.0063; 0.0092]
1st issuance	[-25; -11]	229	0.0088	0.36%	2.46**	0.015**	[0.0017; 0.0159]
1st issuance	[-45; -26]	229	0.0051	0.46%	1.13	0.261	[-0.0039; 0.0141]

Table 5 - CARs' linear regression estimates resumee for first time issued green bonds on the sample

*This table reports the CAR for green bonds issuance return. Here it was tested if CAR was significantly different from zero. P (sign-test) is the P value for the sign test, and it is non-parametric. Robust t statistics *** p < .01, ** p < .05, * p < .10) (Detailed information on Appendices 11 to 14)*

When analysing Table 5 values for the first-time issuances after September 4th, 2016, CAR is only significantly different from zero on one window, [-25; -11], with a p-value of 0.015. This is the lowest p-value for the sample, and it is consistent with the CARs values because this period is the one where CAR has the highest value (0.88%) of all study. This can most likely be explained by the fact that the information could already be known and, as the large part of the literature about the impact on stock markets caused by the issuance of green bonds says, "green bond issuers should not benefit from the label effect after their first-time green bond issuance" (Tang & Zhang, 2020, p. 10).

Although the average CARs are always positive for the first-time issuances, they are not always higher than the subsequent issuances (the only exception is the period [-25; -11] which is right before the event date), which is not consistent with the literature. This can be explained because not all companies announce their issuances with the difference in time to the issuance date (i.e., a company can announce that they will issue the bond in one week and another company can announce that they will issue the bond in 1 year) and without the announcement dates, it's harder to track when the bigger impact on the market will occur.

These findings are consistent to the large literature in corporate finance that studies how the stock market reacts to the issuance of securities. According to the literature, the impact of the green bond issue on the company's stock market price will be greater on the announcement date than on the issuance date because it is when the investors receive the information and make their decisions, otherwise they would have been late and acted after all other investors who got the best deals. As most of the times the issuance of these bonds is announced a few days earlier, when it gets to the issuance date, all investors will already have the information. It was possible to conclude this because, when the event windows were being anticipated, the better the results were getting. This can be explained with the fact that announcement dates have a higher impact on the stock values than the event date.

Even though the results about first-time issuances are not completely consistent with the literature, we can still say that the market responded positively to the issuance of this green financial instrument. The issuance of green bonds can be considered good news and so the market rewards the company with a higher firm value. Klassen and McLaughlin (1996) also found that firms receiving environmental awards show a significant positive abnormal reward after it.

6. Conclusion

This research highlights corporate green bonds, an instrument that has been growing exponentially in sustainable finance. Corporate green bonds have become more popular throughout the years. These bonds are more popular in the United States, China and Europe (specially in Sweden, France and Germany).

In this study we use a dataset that contains all green bonds issued by publicly traded companies after November 4th, 2016 because it was when the Paris Agreement entered into force and contributed to the exponential growth of the green bond market. Green bonds can be viewed as a way to firms finance their environmentally friendly projects and, at the same time, improve their ESG profile to get more attention from the investors that are starting to look for environmental responsible firms and help to contribute to a better world by investing with conscience.

This study aims to study the impact in stock markets to the issuance of green bonds by worldwide publicly traded companies. To this purpose, we conduct an event study using the market model because it is the most commonly used model to analyse event studies.

With the lack of free information about the green bonds' announcement dates, the study focuses on the green bonds' issuance dates as the event date. When we analyse how the stock market reacts to the issuance of these green bonds, we find that, in general, market reacts positively to it. Either for first time issuances and for all issuances, the market has positive and statistically significant CAR with values of 0.88% (p-value of 0.015**) and 0.51% (p-value of 0.037**), respectively, for the period between -25 trading days to -11 trading days.

With this, we are able to conclude that the stock market responds positively to green bond issuance specially prior to the issuance date because of the possibility that the information was certainly out before the referred date.

Overall, the results on this study are consistent with the main argument on this subject: when companies issue green bonds, they are signalling their commitment toward the environment and, therefore, they are being rewarded by the market. The stock market responds positively to good news, in this case an eco-friendly strategy and behaviour, and become more attractive for investors that are sensitive to the

environment. Something that is consistent with previous studies about the relation between this type of behaviour and stock market outcomes (e.g., Baulkaran, 2019; Flammer, 2021; Klassen & McLaughlin, 1996; Krueger, 2015).

This topic requires future research with a closer look to announcement dates. Since green bonds are a recent instrument, future research would be necessary with a higher volume of observations in order to have a better characterization about the long-term effects of green bonds. It would also be beneficial to analyse announcement dates to better understand the impact of fresh news entering the stock market. A question that would certainly benefit future studies in the green bonds' topic would be a better definition of this financial instrument and a uniformed set of criteria to certify these bonds.

Finally, as this is a recent topic with a huge potential of growth, there is a lot of room to improve in terms of literature.

REFERENCES

Armitage, S. (1995). Event study methods and evidence on their performance. Journal of economic surveys, 9(1), 25-52.

Badía, G., Pina, V., & Torres, L. (2019). Financial performance of government bond portfolios based on environmental, social and governance criteria. Sustainability, 11(9), 2514.

Baker, M., Bergstresser, D., Serafeim, G., & Wurgler, J. (2018). Financing the response to climate change: The pricing and ownership of US green bonds (No. w25194). National Bureau of Economic Research.

Baulkaran, V. (2019). Stock market reaction to green bond issuance. Journal of Asset Management, 20(5), 331-340.

Beaver, W. H. (1968). The information content of annual earnings announcements. Journal of Accounting Research, 6 (Supplement), 61-92.

Bénabou, R., & Tirole, J. (2010). Individual and corporate social responsibility. Economica, 77(305), 1-19

Ben-Rephael, A., Da, Z., & Israelsen, R. D. (2017). It depends on where you search: Institutional investor attention and underreaction to news. The Review of Financial Studies, 30(9), 3009-3047

Capelle-Blancard, G., & Monjon, S. (2012). Trends in the literature on socially responsible investment: Looking for the keys under the lamppost. Business ethics: a European review, 21(3), 239-250.

Castro, P., Gutiérrez-López, C., Tascón, M. T., & Castaño, F. J. (2021). The impact of environmental performance on stock prices in the green and innovative context. Journal of Cleaner Production, 320, 128868.

Climate Bonds Initiative. (2016). 2015 Green Bond Market Roundup. Retrieved from https://www.climatebonds.net/files/files/2015%20GB%20Market%20Roundup%2003A.pdf

Climate Bonds Initiative. (2017). Green Bonds Highlights 2016. Retrieved from https://www.climatebonds.net/files/files/2016%20GB%20Market%20Roundup.pdf

Climate Bonds Initiative. (2018). Green Bonds: The State of the Market 2018. Retrieved from https://www.climatebonds.net/resources/reports/green-bonds-state-market-2018, 1–28.

Climate Bonds Initiative. (2020, February). 2019 Green Bond Market Summary. Retrieved from https://www.climatebonds.net/files/reports/2019_annual_highlights-final.pdf

Coutts, J. A., Mills, T. C., & Roberts, J. (1994). The market model and the event study method: a synthesis of the econometric criticisms. International Review of Financial Analysis, 3(2), 149-171.

Dasgpta, S., Laplante, B., & Mamingi, N. (2001). Pollution and capital markets in developing countries. Journal of Environmental Economics and Management, 42(3), 310-335.

Derwall, J., Guenster, N., Bauer, R., & Koedijk, K. (2005). The eco-efficiency premium puzzle. Financial Analysts Journal, 61(2), 51-63.

Dimson, E., & Marsh, P. (1986). Event studies methodologies and the size effect: The case of U.K. press recommendations. Journal of Financial Economics, 17, 113-142.

Dowell, G., Hart, S., & Yeung, B. (2000). Do corporate global environmental standards create or destroy market value?. Management Science, 46(8), 1059-1074.

Eckbo, E.B., Masulis, R.W., Norli, O., 2007. Security offerings. In: Eckbo, B.E. (Ed.), Handbooks in Finance: Handbook of Empirical Corporate Finance. Elsevier/North-Holland, Amsterdam, pp. 233–373.

Fama, E. F., Fisher, L., Jensen, M., & Roll, R. (1969). The adjustment of stock prices to new information. International economic review, 10(1).

Fatica, S., Panzica, R., & Rancan, M. (2021). The pricing of green bonds: are financial institutions special?. Journal of Financial Stability, 54, 100873.

Firth, M. (1979). The profitability of takeovers and mergers. Economic Journal, 89,316-328.
Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The environmental awareness of investors. Academy of Management Journal, 56(3), 758-781.
Flammer, C. (2021). Corporate green bonds. Journal of Financial Economics.
Hachenberg, B., & Schiereck, D. (2018). Are green bonds priced differently from conventional bonds?. Journal of Asset Management, 19(6), 371-383.
Halbritter, G., & Dorfleitner, G. (2015). The wages of social responsibility—where are they? A critical review of ESG investing. Review of Financial Economics, 26, 25-35.
Hamilton, J. T. (1995). Pollution as news: Media and stock market reactions to the toxics release inventory data. Journal of environmental economics and management, 28(1), 98-113.
Ioannou, I., & Serafeim, G. (2015). The impact of corporate social responsibility on investment recommendations: Analysts' perceptions and shifting institutional logics. Strategic Management Journal, 36(7), 1053-1081.
IPCC, 2007: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 976pp.
Karpf, A., & Mandel, A. (2018). The changing value of the 'green'label on the US municipal bond market. Nature Climate Change, 8(2), 161-165.
Klassen, R. D., & McLaughlin, C. P. (1996). The impact of environmental management on firm performance. Management science, 42(8), 1199-1214.
Krueger, P., (2015). Corporate goodness and shareholder wealth. Journal of Financial Economics 115, 304–329
Larcker, D. F., & Watts, E. M. (2020). Where's the greenium?. Journal of Accounting and Economics, 69(2-3), 101312.
Mollet, J. C., & Ziegler, A. (2014). Socially responsible investing and stock performance: New empirical evidence for the US and European stock markets. Review of Financial Economics, 23(4), 208-216.
Morgan, S. (2017, October 11). Behind the green bond boom. Retrieved from https://www.morganstanley.com/ideas/green-bond-boom
Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. Journal of financial economics, 13(2), 187-221.
Pereira, P., Cortez, M. C., & Silva, F. (2019). Socially responsible investing and the performance of Eurozone corporate bond portfolios. Corporate Social Responsibility and Environmental Management, 26(6), 1407-1422
Revelli, C., & Viviani, J. L. (2015). Financial performance of socially responsible investing (SRI): what have we learned? A meta-analysis. Business Ethics: A European Review, 24(2), 158-185.
Tang, D. Y., & Zhang, Y. (2020). Do shareholders benefit from green bonds?. Journal of Corporate Finance, 61, 101427
Wang, J., Chen, X., Li, X., Yu, J., & Zhong, R. (2020). The market reaction to green bond issuance: Evidence from China. Pacific-Basin Finance Journal, 60, 101294.
World Bank (2019, March 18). 10 Years of Green Bonds: Creating the Blueprint for Sustainability Across Capital Markets. Retrieved from https://www.worldbank.org/en/news/immersive-story/2019/03/18/10-years-of-green-bonds-creating-the-blueprint-for-sustainability-across-capital-markets
Zerbib, O. D. (2019). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. Journal of Banking & Finance, 98, 39-60.
Zhou, X., & Cui, Y. (2019). Green bonds, corporate performance, and corporate social responsibility. Sustainability, 11(23), 6881.

APPENDIX 1 – STATA (DATA PREPARATION FOR EVENT STUDY IN STATA FOR ALL 460 GREEN BOND ISSUANCES)

```
use events

* As there may be more than an event per issuer, calculate how many events for each issuer
sort code
by code: gen eventcount=_N

* Number of events per company
by code: keep if _n==1
keep code eventcount
save tempeventcount, replace

*Merge tempeventcount with stock data
use firmret, clear
sort code
merge code using tempeventcount
tab _merge
keep if _merge==3
drop _merge

*Expand series of returns for firms that have more than one event
expand eventcount

drop eventcount
sort code date
by code date: gen set=_n
sort code set
save tempstockdata, replace
```

**Back to the original events file and create a similar 'set' variable that identifies different events for the same firm*

```
use events, clear
sort code
by code: gen set=_n
sort code set
save tempevents, replace
use tempstockdata, clear
merge code set using tempevents
tab _merge
keep if _merge==3
drop _merge
```

**Create a unique identifier: company event*

```
egen event_id=group(code set)
save tempevents1, replace
```

**Merge with market returns*

```
use countryret, clear
sort country date
replace country=trim(country)
save countryret, replace

use tempevents1, clear
sort country date
replace country=trim(country)
merge country date using countryret
keep if _merge==3
drop _merge
```

APPENDIX 2 – STATA (EVENT STUDY FOR ALL 460 GREEN BOND ISSUANCES)

** Create a variable that counts the trading days starting from the event day*

```
sort event_id date
by event_id: gen datenum=_n
by event_id: gen target=datenum if date==eventdate
egen td=min(target), by(event_id)
drop target
gen dif=datenum-td
```

**Eliminate firms for which event date cannot be found in the return's files*

```
drop if td==.
egen newevent_id=group(code set)
drop event_id
rename newevent_id event_id
order date code ret set name eventdate country event_id
sort event_id date
```

**Create event window and estimation window*

```
by event_id: gen event window=1 if dif>=-25 & dif<-11
egen count_event_obs=count(event window) if ret~=., by(event_id)
by event_id: gen estimation_window=1 if dif>=-300 & dif<-50
egen count_est_obs=count(estimation_window) if ret~=., by(event_id)
replace event_window=0 if event_window==.
replace estimation_window=0 if estimation_window==.
```

** Eliminate firms with less than a certain number of obs in the event window or estimation window*

```
drop if count_event_obs < 15 | count_event_obs==.
drop if count_est_obs < 250 | count_est_obs==.
drop if ret==.
```

** Identify the cases for which returns are missing for the event day.*

```
list event_id if ret==. & dif==0
```

```
egen newevent_id=group(code set)
drop event_id
rename newevent_id event_id
order date code ret set name eventdate country event_id
sort event_id date

* Estimating normal performance
gen predicted_return=.
egen id=group(event_id)
egen maxid=max(id)
local max=maxid

forvalues i=1(1)460 { /*note: max is the highest value of id */
        l id event_id if id==`i' & dif==0
        reg ret mktret if id==`i' & estimation_window==1
        predict p if id==`i'
        replace predicted_return = p if id==`i' & event_window==1
        drop p
}

*Abnormal returns and CAR
sort id date
gen abret=ret-predicted_return if event_window==1
by id: egen car = sum(abret)

* Test across all obervations
reg car if dif==0, robust
```

APPENDIX 3 – NUMBER OF ISSUED GREEN BONDS

Period	*Number of issued green bonds*	*Growth (%)*
2016.4°T	3	-
2017.1°T	15	400.00
2017.2°T	8	-46.67
2017.3°T	10	25.00
2017.4°T	13	30.00
2018.1°T	19	46.15
2018.2°T	20	5.26
2018.3°T	24	20.00
2018.4°T	24	0.00
2019.1°T	27	12.50
2019.2°T	51	88.89
2019.3°T	43	-15.69
2019.4°T	40	-6.98
2020.1°T	24	-40.00
2020.2°T	35	45.83
2020.3°T	50	42.86
2020.4°T	55	10.00
Total/ Average	461	38.57

APPENDIX 4 – AMOUNT OF ISSUED GREEN BONDS PER TRIMESTER

Period	*Amount issued (in billions of U$)*	*Growth (%)*
2016.4ºT	3.77	-
2017.1ºT	4.72	25.24
2017.2ºT	2.80	-40.69
2017.3ºT	4.49	60.34
2017.4ºT	5.12	13.90
2018.1ºT	3.28	-35.96
2018.2ºT	8.11	147.50
2018.3ºT	5.99	-26.21
2018.4ºT	18.58	210.34
2019.1ºT	8.96	-51.77
2019.2ºT	14.66	63.67
2019.3ºT	19.08	30.15
2019.4ºT	15.93	-16.51
2020.1ºT	7.88	-50.58
2020.2ºT	15.22	93.24
2020.3ºT	19.82	30.26
2020.4ºT	18.39	-7.21
Total/ Average	176.81	27.86

APPENDIX 5 – BOND CHARACTERISTICS PER COUNTRY

Issuers' country	*Number of issuances per country*	*AMOUNT ISSUED (In billions of U$)*	*Average time to maturity (y)*	*Average annual COUPON (%)*
Australia	9	3.07	6.14	2.11
Austria	12	2.19	6.31	1.37
Belgium	4	1.80	7.61	1.03
Brazil	6	0.45	9.78	3.61
Canada	5	2.34	7.31	2.18
Chile	7	2.07	8.44	2.02
China	16	20.01	4.07	4.06
Colombia	2	0.08	4.06	5.87
Denmark	1	0.58	5.08	1.63
Finland	8	2.60	5.52	1.58
France	41	25.35	8.38	0.82
Germany	15	10.68	18.32	2.23
Greece	1	0.58	6.09	2.75
Hong Kong	14	4.72	8.47	6.98
India	1	0.40	10.47	3.75
Italy	18	11.60	8.49	1.51
Japan	94	10.05	7.95	0.49
Mexico	1	0.71	12.18	1.85
Morocco	1	0.01	8.13	2.18
Netherlands	8	7.62	10.90	2.35
New zeland	5	0.54	6.53	3.77
Nigeria	1	0.04	5.08	15.50
Norway	14	2.72	5.98	2.04
Philippines	4	1.21	5.58	2.47
Portugal	3	2.90	43.20	2.61
Singapore	8	1.96	5.90	2.21
South africa	8	0.25	5.45	5.08
South korea	11	5.46	5.72	2.35
Spain	7	7.25	6.98	0.85
Sweden	65	7.37	5.38	1.47
Switzerland	8	2.17	6.41	1.62
Taiwan	6	0.61	6.26	0.61
Turkey	3	0.15	4.79	5.78
United Arab Emirates	3	0.73	6.85	2.09
United Kingdom	9	6.16	6.71	1.47
United States	42	30.37	12.85	2.61
Total/Average	461	176.81	8.13	1.90

APPENDIX 6 – NUMBER OF ISSUED BONDS PER ISSUER

Issuer	*Event count*
A2A SPA	1
ACCESS BANK PLC	1
ACTIVIA PROPERTIES INCO	3
AEON REIT INVESTMENT CORP	2
AES CORP	4
AES GENER SA	2
AGUAS ANDINAS SA	2
AKBANK TAS	1
ALERION CLEAN POWER SPA	1
ALEXANDRIA REAL ESTATE EQUITIES INCORPORATED	2
ANA HOLDINGS INCO	1
ANALOG DEVICES INCORPORATED	1
APPLE INCORPORATED	2
ASAHI GROUP HOLDINGS LTD	1
ASAHI KASEI CORP	1
ASCENDAS REAL ESTATE INVESTMENT TRUST	2
ASSICURAZIONI GENERALI SPA	2
ATRIUM LJUNGBERG AB	13
AVANGRID INCO	3
BANCO BILBAO VIZCAYA ARGENTARIA SA	2
BANCO DE CHILE	1
BANCO DE CREDITO E INVERSIONES	2
BANCO DE SABADELL SA	1
BANCO SANTANDER SA	2
BANCOLOMBIA SA	2
BANK OF AMERICA CORPORATION	3
BANK OF BEIJING CO LTD	1
BANK OF COMMUNICATIONS COMPANY LIMITED	1
BANK OF NAGOYA LIMITED	1
BANK OF NANJING CO LTD	1
BANK OF NINGBO CO LTD	1
BANK OF THE PHILIPPINE ISLANDS	2
BANK OF ZHENGZHOU CO LTD	1
BANKINTER SA	1
BANQUE POPULAIRE SA	1
BARCLAYS PLC	2
BASF SE	1
BAYWA AG	1
BKS BANK AG	4
BKW AG	1
BNP PARIBAS SA	16
BONHEUR ASA	1

CA IMMOBILIEN ANLAGEN AG	1
CAIXABANK SA	1
CENTURY TOKYO LEASING CORP	1
CHINA JUSHI CO LTD	2
CHINA LONGYUAN POWER GROUP CORP LTD	2
CHONGQING RURAL COMMERCIAL BANK CO LTD	1
CIFI HOLDINGS GROUP CO LTD	1
CITIGROUP INCO	4
CITY DEVELOPMENTS LIMITED	4
CITYCON TREASURY BV	1
CNP ASSURANCES SA	1
COCA-COLA FEMSA SAB DE CV	1
COFINIMMO SA	2
COMFORIA RESIDENTIAL REIT INCO	1
COMMERZBANK AG	2
COMMONWEALTH BANK OF AUSTRALIA	2
CONTACT ENERGY LIMITED	2
COREM PROPERTY GROUP AB	1
COVIVIO SA	1
CPI PROPERTY GROUP SA	3
CTEEP COMPANHIA DE TRANSMISSAO DE ENGA ELTC PAULISTA	2
DAIKEN CORP	1
DAIMLER AG	1
DAIO PAPER CORP	2
DAIWA HOUSE INDUSTRY COMPANY LIMITED	1
DAIWA HOUSE RESIDENTIAL INVESTMENT CORP	3
DAIWA OFFICE INVESTMENT CORP	2
DAIWA SECURITIES GROUP INCORPORATED	1
DANSKE BANK A/S	1
DBS GROUP HOLDINGS LTD	2
DEUTSCHE BANK AG	1
EDP ENERGIAS DE PORTUGAL SA	3
ELECTRICITE DE FRANCE SA	2
ELECTROLUX AB	1
ENBW ENERGIE BADEN WUERTTEMBERG AG	3
ENEOS HOLDINGS INCO	1
ENGIE SA	12
ENN ENERGY HOLDINGS LTD	1
ENTRA ASA	6
EQUINIX INCORPORATED	3
FABEGE AB	17
FAR EASTERN NEW CENTURY CORP	1
FASTIGHETS AB BALDER	3
FASTPARTNER AB	1
FEDERAL REALTY INVESTMENT TRUST	1
FIRST ABU DHABI BANK PJSC	3

FUYO GENERAL LEASE CO LTD	2
GETLINK SE	1
GLP J-REIT	3
GRIEG SEAFOOD ASA	1
GROWTHPOINT PROPERTIES LTD	3
GUNMA BANK LIMITED	1
HANG LUNG PROPERTIES LTD	1
HANKYU HANSHIN REIT INCO	2
HARBIN BANK CO LTD	1
HERA SPA	1
HITACHI ZOSEN CORP	1
HSBC HOLDINGS PLC	1
HUA XIA BANK COMPANY LIMITED	1
HUISHANG BANK CORP LTD	1
ICADE SA	1
INDUSTRIAL BANK CO LTD	3
ING GROEP NV	6
INTERSTATE POWER AND LIGHT CO	3
INTESA SANPAOLO SPA	2
INVESTA OFFICE FUND	1
IRANI PAPEL E EMBALAGEM SA	1
IREN SPA	3
JACCS COMPANY LIMITED	1
JAPAN EXCELLENT INCO	2
JAPAN HOTEL REIT INVESTMENT CORP	1
JAPAN PRIME REALTY INVESTMENT CORP	2
JAPAN REAL ESTATE INVESTMENT CORP	1
JAPAN RETAIL FUND INVESTMENT CORP	2
JPMORGAN CHASE & CO	1
KAJIMA CORP	1
KANEKA CORP	1
KBC GROEP NV	2
KENEDIX OFFICE INVESTMENT CORP	2
KIMCO REALTY CORPORATION	1
KLOVERN AB	2
KOREA ELECTRIC POWER CORP	4
KUNGSLEDEN AB	10
LANDSEA GREEN PROPERTIES CO LTD	1
LG CHEM LIMITED	6
LG DISPLAY COMPANY LIMITED	1
MAGNOLIA BOSTAD AB	1
MANILA WATER CO INCO	1
MANULIFE FINANCIAL CORP	2
MARUI GROUP COMPANY LIMITED	1
MEDIOBANCA BANCA DI CREDITO FINANZIARIO SPA	1
MERCURY NZ LIMITED	1

MERIDIAN ENERGY LIMITED	2
MILLICOM INTERNATIONAL CELLULAR SA	1
MITSUBISHI ESTATE COMPANY LIMITED	1
MITSUBISHI UFJ FINANCIAL GROUP INCORPORATED	6
MITSUBISHI UFJ LEASE & FINANCE COMPANY LIMITED	1
MITSUI FUDOSAN COMPANY LIMITED	1
MITSUI OSK LINES LTD	2
MITSUI SOKO HOLDINGS CO LTD	1
MIZUHO FINANCIAL GROUP INCORPORATED	1
MLS CO LTD	1
MODERN LAND CHINA CO LTD	5
MORI HILLS REIT INVESTMENT CORP	1
MOWI ASA	1
MTR CORP LTD	4
MUENCHENER RUECKVERSICHERUNGS GESELLSCHAFT AG IN MCHN	1
NATIONAL AUSTRALIA BANK LIMITED	2
NATIONAL BANK OF GREECE SA	1
NATIXIS SA	5
NATWEST GROUP PLC	1
NEDBANK LTD	5
NEXITY SA	2
NIAGARA MOHAWK POWER CORPORATION	2
NIPPON ACCOMMODATIONS FUND INCO	2
NIPPON PROLOGIS REIT INCO	3
NIPPON YUSEN KK	1
NOBINA AB (PUBL)	1
NOMURA REAL ESTATE MASTER FUND INCO	2
NORDEX SE	2
NP3 FASTIGHETER AB	1
NSTAR ELECTRIC COMPANY	1
OBAYASHI CORP	1
ODAKYU ELECTRIC RAILWAY CO LTD	1
ORIENT CORP	1
ORIX CORP	2
ORIX JREIT INCO	1
OWENS CORNING	1
PENTA-OCEAN CONSTRUCTION CO LTD	1
PFIZER INCORPORATED	1
POSTNL NV	1
POWER FINANCE CORPORATION LTD	1
RAIFFEISEN BANK INTERNATIONAL AG	6
RENEWI PLC	1
RICOH LEASING COMPANY LIMITED	2
RIOCAN REAL ESTATE INVESTMENT TRUST	1
RIZAL COMMERCIAL BANKING CORPORATION	1
ROYAL BANK OF CANADA	1

SAGAX AB	2
SCATEC ASA	1
SENKO GROUP HOLDINGS CO LTD	1
SHIMIZU CORP	1
SKANDINAVISKA ENSKILDA BANKEN AB	1
SNAM SPA	2
SPAREBANK 1 SMN	4
SSE PLC	2
STANDARD CHARTERED PLC	1
STORA ENSO OYJ	6
SUMITOMO FORESTRY COMPANY LIMITED	1
SUMITOMO MITSUI FINANCIAL GROUP INCORPORATED	2
SUMITOMO WAREHOUSE COMPANY LIMITED	3
SVENSKA HANDELSBANKEN AB	2
SWEDBANK AB	3
SWISS LIFE HOLDING AG	2
SYSCO CORPORATION	1
TAIWAN BUSINESS BANK LTD	1
TAIWAN COOPERATIVE BANK LTD	1
TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY LIMITED	3
TAKASAGO THERMAL ENGINEERING CO LTD	1
TELIA COMPANY AB	2
TERNA RETE ELETTRICA NAZIONALE SPA	3
THE BANK OF NOVA SCOTIA	1
THE PNC FINANCIAL SERVICES GROUP INCO	1
TODA CORP	3
TOHOKU ELECTRIC POWER CO INCO	2
TOKYO GAS COMPANY LIMITED	1
TOKYO TATEMONO COMPANY LIMITED	1
TOKYU FUDOSAN HOLDINGS CORP	1
TRANSMISSORA ALIANCA DE ENERGIA ELETRICA SA	3
TURKIYE GARANTI BANKASI AS	1
UDR INCORPORATED	2
UNION ELECTRIC COMPANY	1
UNIPOL GRUPPO SPA	2
UNIQA INSURANCE GROUP AG	1
UNITED URBAN INVESTMENT CORP	1
UPM-KYMMENE OYJ	1
VERIZON COMMUNICATIONS INCORPORATED	2
VINCI SA	1
VODAFONE GROUP PUBLIC LIMITED COMPANY	1
WALLENSTAM AB	4
WELLTOWER INCO	1
WESTPAC BANKING CORPORATION	3
WOOLWORTHS GROUP LIMITED	1
YAPI VE KREDI BANKASI AS	1

YUZHOU GROUP HOLDINGS CO LTD	1
ZHEJIANG HUAYOU COBALT CO LTD	1
ZUERCHER KANTONALBANK	3
Total	461

APPENDIX 7 – LINEAR REGRESSIONS FOR ALL ELIGIBLE EVENTS [11; 20]

Linear regression

Number of obs	=	460
F(0, 459)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.04551

car	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	-.0019242	.0021219	-0.91	0.365	-.006094	.0022455

Linear regression [11; 20] on all eligible events

```
. sum car
```

Variable	Obs	Mean	Std. Dev.	Min	Max
car	649,622	-.0019187	.0454603	-.1871136	.2844239

Sum CAR [11; 20] for all eligible events

APPENDIX 8 – LINEAR REGRESSIONS FOR ALL ELIGIBLE EVENTS [-10; 10]

Linear regression

Number of obs	=	460
F(0, 459)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.05543

car	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.0017844	.0025842	0.69	0.490	-.003294	.0068628

Linear regression [-10; 10] on all eligible events

```
. sum car
```

Variable	Obs	Mean	Std. Dev.	Min	Max
car	649,622	.0017732	.0553745	-.2103894	.2554018

Sum CAR [-10; 10] for all eligible events

APPENDIX 9 – LINEAR REGRESSIONS FOR ALL ELIGIBLE EVENTS [-25; -11]

Linear regression

Number of obs	=	**460**
F(0, 459)	=	**0.00**
Prob > F	=	**.**
R-squared	=	**0.0000**
Root MSE	=	**.05182**

car	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	**.005048**	**.0024161**	**2.09**	**0.037**	**.0002999**	**.009796**

Linear regression [-25; -11] on all eligible events

. **sum car**

Variable	Obs	Mean	Std. Dev.	Min	Max
car	**649,622**	**.0050762**	**.0516925**	**-.2618561**	**.2838194**

Sum CAR [-25; -11] for all eligible events

APPENDIX 10 – LINEAR REGRESSIONS FOR ALL ELIGIBLE EVENTS [-45; -26]

Linear regression

Number of obs	=	460
F(0, 459)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.06023

car	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.0055356	.0028083	1.97	0.049	.0000168	.0110543

Linear regression [-45; -26] on all eligible events

. sum car

Variable	Obs	Mean	Std. Dev.	Min	Max
car	649,622	.0055468	.0601698	-.2641791	.2645569

Sum CAR [-45; -26] for all eligible events

APPENDIX 11 – LINEAR REGRESSIONS FOR FIRST TIME ISSUED GREEN BONDS [11; 20]

Linear regression

Number of obs	=	229
F(0, 228)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.05618

car	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.0012502	.0037123	0.34	0.737	-.0060646	.008565

Linear regrassion [11; 20] on first time issued green bonds after November 4th, 2016

```
. sum car
```

Variable	Obs	Mean	Std. Dev.	Min	Max
car	323,396	.0012554	.0560693	-.355621	.3163417

Sum CAR [11; 20] on first time issued green bonds after November 4th, 2016

APPENDIX 12 – LINEAR REGRESSIONS FOR FIRST TIME ISSUED GREEN BONDS [-10; 10]

Linear regression

Number of obs	=	229
F(0, 228)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.0595

car	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.0014574	.0039321	0.37	0.711	-.0062905	.0092054

Linear regrassion [-10; 10] on first time issued green bonds after November 4th, 2016

```
. sum car
```

Variable	Obs	Mean	Std. Dev.	Min	Max
car	323,396	.0014575	.0593892	-.2028723	.2562791

Sum CAR [-10; 10] on first time issued green bonds after November 4th, 2016

APPENDIX 13 – LINEAR REGRESSIONS FOR FIRST TIME ISSUED GREEN BONDS [-25; -11]

Linear regression

Number of obs	=	229
F(0, 228)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.05413

car	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.0088092	.0035772	2.46	0.015	.0017606	.0158578

Linear regrassion [-25; -11] on first time issued green bonds after November 4th, 2016

. sum car

Variable	Obs	Mean	Std. Dev.	Min	Max
car	323,396	.0088052	.0540241	-.1362635	.2577969

Sum CAR [-25; -11] on first time issued green bonds after November 4th, 2016

APPENDIX 14 – LINEAR REGRESSIONS FOR FIRST TIME ISSUED GREEN BONDS [-45; -26]

Linear regression

Number of obs	=	229
F(0, 228)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.06899

car	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.0051329	.0045589	1.13	0.261	-.00385	.0141158

Linear regrassion [-45; -26] on first time issued green bonds after November 4th, 2016

```
. sum car
```

Variable	Obs	Mean	Std. Dev.	Min	Max
car	323,396	.005157	.0688301	-.2776081	.3029094

Sum CAR [-45; -26] on first time issued green bonds after November 4th, 2016