Three Aspects of Green Bonds[±]

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Comments are welcome!

Abstract

This paper examines three fundamental questions regarding corporate green bonds – 'how shareholders react to the announcement of green bonds issuance in different countries? 'which firms issue green bonds?', and 'who supports their issuance?' The stylized facts suggest that green bonds issuance is highly concentrated among few firms (and their subsidiaries) in the US and Europe but diversified in the Asian region. On analyzing the market reaction to the announcement of green bonds and alternate green bonds (-social bonds, sustainability bonds, and sustainability-linked bonds) in 19 countries, I find that shareholders are either neutral to the issuance of green bonds or consider it as greenwashing. The sample bias drives the positive reaction observed in the past papers. I also find that firms with low environment scores, low ESG scores, high unscaled carbon emissions, and no target emissions issue more green bonds than others. The latter result supports the signaling hypothesis. Also, only domestic (and not foreign) institutional investors support the issuance of the green bonds, which implies the home-bias effect of domestic investors but the reluctance of foreign investors about this asset class. In sum, the paper suggests it is crucial to understand the intricacies in corporate green bonds issuance to correctly emulate stockholders' reaction, highlight the identity of green bond issuers, and know what kind of institutional investors support the issuance of the green bonds.

Keywords: Sustainable Finance; Climate Change; Green Bonds; Corporate Sustainability

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1. Introduction

Consciousness for environmental issues, especially climate change, has pushed the sales of green bonds to a monthly record of $32 billion in September 2020, bringing the market's overall size to nearly $1 trillion (WSJ, 2020).[1] Besides that, governments and companies issue $500bn in green debt in 2021, almost half the total that has been raised since the asset class's inception (Financial Times, 2021).[2] Although demand for green bonds has increased drastically, there is a debate whether there are any benefits against conventional bonds. This paper contributes to that debate by examines three fundamental questions – 'how shareholders react to the announcement of green bonds issuance in different countries?', 'who issues the green bonds?', and 'who supports their issuance?'.

Using the corporate green bonds from 2007-2017 of 28 countries, Tang and Zhang (2020) find that the stock market positively responds to the issuance of green bonds. However, there is no premium for it. Flammer (2021) also documents that the investors react positively to the announcement of green bond issuance, and the response is stronger for first-time issuers and bonds certified by third parties. She also finds that the issuers improve their environmental performance post-issuance (i.e., higher environmental ratings and lower CO2 emissions), and experience an increase in ownership by long-term and green investors. These studies' findings are based on pooled global data and, therefore, miss to provide country-level patterns in the market reaction to green bond issuance.

Consequently, I examine whether investors support green bonds or consider it greenwashing by analyzing the market reaction to the announcement of green bonds, social bonds,

[1] https://www.wsj.com/articles/why-going-green-saves-bond-borrowers-money-11608201002
[2] https://www.ft.com/content/021329aa-b0bd-4183-8559-0f3260b73d62

sustainability bonds, and sustainability-linked bonds issuance in different countries and highlighted the difference in responses –magnitude and direction. It is crucial because distinct countries have separate environmental policies, investor protection rights, and environmental disclosure requirements. Furthermore, I test two hypotheses regarding green bonds issuance. First, the 'signaling hypothesis' that firms with the weak environmental performance issue more green bonds than others to signal better environmental performance in the future. Second, the 'home-bias hypothesis' that due to information asymmetry about the proceeds of the green bonds, only domestic (not foreign) institutional investors support their issuance.

To examine the market reaction and test these hypotheses, I gather green bonds data for 2013-2018 from the Bloomberg terminal. After the exclusion of supranational and government bonds, there are 1,189 green bonds that constituents the sample. The issuance of green bonds has increased with time, and the majority of green bonds are from United States, China, Sweden, France, and Malaysia. The green bonds issuers' are mainly from sectors such as financials, energy, utilities, and industrials. The 864 bonds are third-party (such as ESG assurance provider, Climate Bond Initiative, etc.) approved. On computing cumulative abnormal returns (CAR) for the US and outside US green bond issuers, I find that positive market reaction to green bond issuance is driven by US issuers and not the issuers from other countries.

Furthermore, the US market reaction in a short window (CAR (-1,1)) suggests that this reaction is primarily driven by Tesla issued green bonds and not due to other issuers. Nevertheless, in the long window (i.e., CAR (-5,10)), a strong market reaction generates positive and significant results at the end of the event window. It suggests that Tang and Zhang (2020) and Flammer (2021) find that the shareholders react positively to green bond issuance due to only US green bonds in the long window and in the short window; the reaction is specific to green bonds issued by the

Tesla.[3] On conducting event studies for 18 countries outside the US, I find that the market reaction is different in different countries - direction and magnitude. The latter results are imperative as they signify the role of environmental regulation, investor rights, environmental disclosure level, and other factors in green bond issuing countries. Although using country fixed effects as adopted in Flammer (2021) can mitigate such concerns if the unobservable are time-invariant, highlighting the patterns in investor reaction at the country level is crucial. In some countries, the reaction is negative or neutral. The past papers miss highlighting these patterns. In the extended sample (i.e., data from 2019-2020), I find that market reaction is negative in both – US and Non-US markets in the short window. It strengthens the argument that positive (and significant) market reaction to green bonds from 2013-2018 is prominently due to Tesla's green bonds as no green bond was issued by it in 2019-2020. I also examine the reaction for first-time issues, but I find no significant results. As the popularity of green bonds leads to the issuance of alternate forms such as social bonds, sustainability bonds, or sustainability-linked bonds, I also check the market reaction to issuance to these types of bonds. I find that 3-day market reaction is negative 0.6 % for all these alternate green bonds combinedly and this comes from negative market reaction to sustainability and sustainability-linked bonds. In sum, these results suggest that the market reacts either neutral or negatively to the issuance of green bonds (or its alternative forms), considering it is greenwashing.

To know 'who issues the green bonds?', I test the 'signaling' hypothesis. To do that, first, I match the green bonds with non-green bonds using the nearest neighbor matching algorithm. Then, using the difference-in-differences methodology, I examine whether green bonds are issued by firms with weak environmental performance or not. Environmental score, ESG score, the

[3] It is not surprising as Tesla issued 70 % of US green bonds from 2013-2018.

logarithm of carbon emissions, and target emissions are used as environmental performance proxies. The results support the 'signaling' hypothesis that the green bonds are mainly issued by firms with low environmental scores, low ESG scores, high unscaled emissions, and no target emissions. It implies that by issuing green bonds, such firms signal the market for better environmental performance in the future.

Lastly, I examine 'who supports the issuance of the green bonds?'. As institutional investors are a significant force in pushing environmental issues at the firm level (Flammer, 2021; Azar, Duro, Kadach, and Ormazabal, 2021; Bolton and Kacperczyk, 2021). It is essential to check whether green bond issuance support is from domestic institutional investors, foreign institutional investors, or both. I find that firms with high domestic institutional holding and not foreign institutional holding issue green bonds. It implies that there is a home-bias effect from domestic investors. The latter results vary among the firms domiciled in major green issuing countries such as China, United States, Sweden, and France.

Related Literature and Contribution

Flammer (2021) discusses three rationales for issuing green bonds – signaling, greenwashing, and cost of capital. The 'signaling' argument is proposed based on the theory that investors often lack sufficient information to evaluate the company's commitment to the environment (e.g., Lyon and Maxwell, 2011; Lyon and Montgomery, 2015). From the investors' perspective, this creates a need to (credibly) distinguish between companies committed to the environment versus those that are not. And, by using green bonds, companies can signal their commitment towards the environment. The signal is credible because firms commit a substantial amount of money to green projects. Complying with the standards requires extensive managerial effort and resources, which is costly to the issuer. I argue that a firm would signal to improve future environmental performance not

due to genuine commitment towards the environment but to clean its image. Facts also support this argument as most green bonds' issuers belong to polluting sectors such as utilities, industrials, energy, and materials.

The 'greenwashing' argument is built on the hypothesis that the firm can make false claims about the environmental commitments, provide selective disclosure, dubious eco-labels, misleading visual imagery, and misleading narratives (for details, see Lyon and Montgomery, 2015). If indeed the greenwashing motive prevails, one would not expect any improvement in environmental performance following the issuance of corporate green bonds. Flammer (2021) finds that environmental performance increases post-issuance. However, Ehlers, Mojon, and Packer (2021) find that, in the long term, green bonds do not affect the carbon emissions by the firm and, therefore, suggested a rating system that can signal the investors about the potential of green bonds in reducing the carbon emissions. There is a possibility that investors understand the greenwashing related to green and alternate green bonds as issuers do not disclose enough about the use of proceeds in the prospectus and related documents. Therefore, if it is true, we should expect a negative market reaction from investors.

The third and last argument 'cost of capital' hypothesis argues that if green bond investors are willing to accept lower yields for the greater good of fighting climate change, green bonds may represent a cheaper source of financing. If it is true, one should expect a positive reaction from the stock market on the issuance of green bonds. Using the global data, Flammer (2021) and Tang and Zhang (2020) find a positive market reaction, but they convey that it is 'signaling' rather than investors' taste for sustainable investment products such as green bonds. In the current study, I examine the market reaction to issuing green bonds at the country level. It is crucial because different markets have different regulations and different investor protection rights. These diverse

regulations and investor protection rights influence whether the corporate green bonds would be issued at discount, premium, or at par. Hence, these differences lead to different market reactions in the green bond issuing countries. Nevertheless, using the pooled global data with country fixed effects miss capturing these exciting patterns.

Another area in which this paper contributes is regarding the institutional investors holding around the issuance of green bonds. Azar et al. (2021) examine the role of the "Big Three" (i.e., BlackRock, Vanguard, and State Street Global Advisors) on the reduction of corporate carbon emissions around the world and find that their engagement reduced carbon emissions among MSCI index constituents. Flammer (2021) finds that institutional investors holding increases in the firm post-issuance of green bonds. Contributing to that line of literature, I find that firms with high domestic institutional investors ownership, not the foreign institutions' ownership, issues the green bonds. It shows the 'home-bias' effect in support of institutional investors for green bonds issuance. Furthermore, the latter result varies among the key green bond issuer countries – Sweden, China, United States, and France.

2. Data

2.1 Green Bonds Data

Corporate Green Bonds data is extracted from Bloomberg fixed income database, and only those bonds are accepted, which are labeled as "green bonds".[4] There are 3,486 such bonds from 1st January 2013 to 31st December 2018.[5] I exclude green bonds with BICS code as "Sovereigns", "Government Agencies", "Government Regionals", "Supernationals", "Government Development

[4] Bloomberg tags bonds with the 'Green Bond' label in the use of proceeds field when an issuer self-labels its bond as 'green' or identities it as an environmental sustainability-oriented bond issue with clear additional statements about the company's commitment to deploy funds toward projects and activities related to renewable energy, energy smart technologies and energy efficiency, green buildings and infrastructure, agriculture and forestry, and other sustainability.

[5] Sample starts from 2013 because prior this year, corporate green bonds were almost non-existent.

Banks", "Winding up Agencies", "Central Bank" and "Government local." I also exclude the bonds from tax havens or if there is only one bond from a particular country or a specific BICS level 2 industry. There are 1,189 green bonds in the final sample. Details on the sample selection process and filters used to reach to final sample are provided in Table 1 Panel A.

Table 1 Panel B illustrates that the number of green bonds has monotonically increased from 2013 (number of green bonds: 15) to 2018 (number of green bonds: 396) except for the year 2016 (number of green bonds: 163), for which numbers plummeted marginally. Table 1 Panel C reports the country-wide distribution of green bonds. Most of the bonds are issued by China, United States, Sweden, France, Netherland, Germany, and Malaysia. Table 1 Panel D provides industry-wide distribution of green bonds and illustrates that green bonds are mainly concentrated in few sectors – energy (229 green bonds), financials (554 green bonds), utilities (293 green bonds), and industrials (75 green bonds). Surprisingly, 47 % of green bonds are issued by financial institutions such as banks to cover the risk of green loans or to provide support for LEED-certified buildings.

Although emerging countries are under pressure to curb carbon emissions, most of the green bonds are issued by firms in developed countries. Only 36 % of total corporate green bonds in the sample are issued in emerging markets (refer to Table C1 in Appendix C). Whether these bonds issued by public entities or private, data suggests that only a small number of green bonds, i.e, 263 are issued by public firms directly remaining 926 bonds are issued by either private firms or private subsidiaries of public firms such as out of 191 US green bonds, 140 are issued by a private subsidiary of Tesla. For more details, refer to section 2.4.

As per the Climate Accounting Standard Board (CASB) rules, the green bonds either should be certified by Climate Bonds Initiative (CBI) or through third-party agencies approved by

CBI. From 1,189 bonds in the sample, 864 are approved by CBI or through a third-party ESG assurance provider. For 66 bonds, this information is not available (refer Table C in Appendix C).

The Table in Appendix C reports the industry distribution of green bonds in all the countries. The firms from three sectors – financials, energy, and utilities, issue 90 % global green bonds. Out of 554 green bonds issued by firms in the financial sector, 69 % are from three countries – China, Sweden, and France. Similarly, from 229 green bonds issued in energy sector, 140 (61 %) are from US (from one private subsidiary of Tesla). Lastly, from 293 green bonds issued by utility firms, 90 % are from Malaysia, US, China, Netherland, Britain, and Brazil. This form of concentration in issuance of green bonds at industry and country level makes the inference from event study analysis challenging. Perhaps, interesting would be to know how the stock market participants in different countries react to the green bond issuance.

The use of proceeds provides information on the distribution of green bonds investment on various sustainable activities. In the sample, 974 bonds are issued as green bonds, green loans, or for project finance green bonds/loans, and 111 are issued for refinancing the existing green bonds or loans. For further details, refer Table C2 in Appendix C.

Regarding characteristics of the green bonds, The 75 % (887) of bonds in the sample expires at maturity, and 25 % of bonds include options such as call, put, sink, and convertible (refer to Table C4 in Appendix C). Most of them have a maturity of 3, 5, 7, or 10 years. However, 113 bonds in the sample have maturity of 15 years or more (refer to Table C5 in Appendix C). Bloomberg provides a composite rating only for 440 bonds, from which 202 are not 'not rated.' Table C6 provides the distribution of defaulted green bonds compared to which are not. There are only four green bonds in the sample which are defaulted. The similar evidence is also noted in

Flammer (2021). Most of the bonds are either lowest ranks (i.e., -BBB or BBB) or highest-ranked (i.e., A-, A, A+). For further details, refer Table C7 in Appendix C.

2.2 Firm Fundamentals and Environmental variables

The firm characteristics and environmental variables are collected from Worldscope and Thomson Reuters ESG databases through Datastream interface. *Firm Size* is measured as the logarithm of total assets. *Leverage* is measured as the ratio of long term debt by total assets. Environmental score, Social score, and Governance score are environmental pillar score, social pillar score, and governance pillar score from Thomson Reuters. ESG score is the overall score for environmental, social, and governance dimensions from Thomson Reuters. Scope 1 is the logarithm of scope 1 emissions (in tonnes).

2.3. Institutional Holding

The institutional ownership data is from the Factset Ownership database. Institutional ownership is the total institutional ownership divided by market capitalization. Domestic Institutional Ownership is the domestic institutional ownership divided by market capitalization. Foreign Institutional Ownership is the foreign institutional ownership divided by market capitalization.

2.4 Stylized Facts

Green bonds are concentrated in few public firms and their subsidiaries. From 2013-2018, in the US, 75 % (140 out of 191) of green bonds are issued by Tesla through its private subsidiary – Tesla Energy Operations Inc (incorporated in Delaware). In France, 70 % of green bonds are issued by Credit Agricole. Although green bonds issuance is evenly distributed in China, 129 (out of 209) are by either banks or finance firms. In Sweden, 124 (out of 140) are either by banks or finance firms. Five major Swedish companies which issued green bonds from 2013-2018 are Vasakronan

AB (36), Svensk FastighetsFinansiering AB (12), Rikshem AB (10) , Fabege AB (14) and Atrium Ljungberg AB (10). Other than these 5 firms, every other firm from Sweden in the sample has issued 1-5 green bonds. In Malaysia, 5 firms issued 92 (out of 98) Green bonds. For further details on who issued green bonds in these countries, refer Table B1 and Table B2 in Appendix B.

3. Empirical Methodology

3.1. Event Study

To conduct event study around the issuance of corporate green bonds, we use the market adjusted model. [6] The abnormal return for security i at day t is

$$AR_{it} = R_{it} - R_{mt}$$

Where R_{it} is daily return inclusive of dividends for security i in day t and R_{mt} is daily return of MSCI All Country World Index (ACWI) at day t. [7]

$$CAR\ (-t, t) = \sum_{T=-t}^{t} AR_{it}$$

$$Avg\ (CAR\ ) = \frac{1}{N} \sum_{n=1}^{N} CAR\ (-t, t)$$

$$\sigma(CAR) = \left(\frac{1}{N} \sum_{t=1}^{N} \left(CAR\ (-t, t) - Avg\ \left(CAR_{pt} \right) \right)^2 \right)^{0.5}$$

[6] The market adjusted model is one of the simplest model used for estimating security specific abnormal returns. It is used in Kothari and Warner (1997), Miller (1999), and other asset pricing papers.

[7] The MSCI ACWI captures large and mid-cap representation across 23 Developed Markets (DM) and 27 Emerging Markets (EM) countries. With 2,965 constituents, the index covers approximately 85% of the global investable equity opportunity set.

Test statistics using CAR (-t,t) = $Mean\ (CAR)/S.E.(CAR)$

To check the hypothesis, I test whether the test statistics is greater than critical value or not.

3.2 Matching

As the impact of issuance of green bonds on environmental outcomes and institutional holding is endogenous because of firm-level unobservables, therefore, running the simple OLS would give biased results. Consequently, due to unavailability of natural or quasi-natural exogenous shock, the matching is used to mitigate the endogeneity concerns. For matching, I use k-nearest neighbor algorithm with tolerance limit of 5.[8] The 1,189 green bonds are matched with non-green bonds based on country, industry, and year. Furthermore, I also confirm that the treated group (green bonds) and control group (non-green bonds) are match at firm-level variables such as size, leverage, and similar others.

3.3. Difference-in-Differences

To examine how environmental variables (such as carbon emissions, environmental score, and ESG scores) and institutional ownership of a firm changes around the issuance of green bonds, I use difference-in-differences regression. [9]

$$y_{ft} = \alpha_f + \alpha_c \times \alpha_t + \alpha_i \times \alpha_t + \beta\ Green\ Bond_{ft} + \varepsilon_{ft} \quad (1)$$

[8] Larcker and Watts (2020) and Flammer (2021) also use the matching algorithms to overcome endogeneity concerns. Flammer (2021) use nearest neighbor algorithm with Mahalanobis distance metric.

[9] This is the same regression specification used by the Flammer (2021).

Where, α_f, α_c, α_t, and α_i are fixed effects for firm, country, year and industry (2 digit- SIC). *Green Bond* is a dummy variable which takes value 1 if the firm issues a bond which has green label as per Bloomberg categorization; otherwise 0 for non-green bonds. The dependent variable (y) is environmental score, ESG score, log of carbon emissions, target emissions, total institutional holding, and domestic institutional holding. I examine this regression for full sample and also for sub-samples for countries such as China, Sweden, United States, and France, as majority of green bonds are issued in these four countries. For the country level sub-sample analysis, I replace country by year fixed effects ($\alpha_c \times \alpha_t$) with year fixed effects (α_t).

4. Results and Discussion

4.1 Summary Statistics

Table 2 reports the summary statistics at the bonds level. Out of 1,189 green bonds issued between 2013-2018, 552 are issued by private firms and 637 are issued by public firms directly or private subsidiaries of public firms. As different firms can issue green bonds on the same day, there are 729 unique issuer days for the overall sample, from which 343 are for private firms and 386 for public firms. There are 512 unique issuer-year for the full sample. The average green bond maturity is 7.9 years for the complete sample. The green bonds issued by private firms and public firms have the similar maturity. The average coupon rate on green bonds is 3.31 % for the overall sample, whereas it is 3.29 % if a green bond is issued by a private firm and 3.33 % if issued by a public firm. The differences in coupon rate between green bonds issued by private and public firms is statistically insignificant. The average amount of a green bond issued is 247 million USD for the overall sample, whereas the same is 243 million USD for a private firm and 252 million USD for a public firm. The 68.7 % of green bonds are certified by third-party agencies such as CBI or green

auditors such as Sustainalytics, KPMG, Price Water Coopers, etc. Whereas, 76 % and 62 % of green bonds issued by private and public firms are third-party approved. It infers that a greater number of private firms' bonds are third party approved to reduce information asymmetry. The average Bloomberg ratings for public and private green bonds are same i.e., AA-. The summary statistics suggests that there is not any significant difference between characteristics of public and private green bonds.

4.2 Event Study Results

Figure 1 (A) – (S) provides the graphs on stock market reaction in 19 countries on the announcements of green bonds. The market reaction can be categorized into three ways - positive, negative, or neutral. The graphs for countries such as China, United States, Sweden, and United Kingdom signifies that the stockholders support the issuance of the green bonds. Therefore, the market reaction is steeply positive in these countries. As, in the United States, 75 % of green bonds are by a private subsidiary of Tesla. Therefore, I also check the US market reaction excluding Tesla from the sample. Moreover, in countries such as Norway, Netherlands, Japan, Austria, and Hong Kong, the market reaction is continuously negative. Apart from these, there are countries such as India, Taiwan, Germany, Japan, Brazil in which market reaction to issuance of green bonds is either flat or the reaction changes from positive to negative (or negative to positive) in the event window. Figure 2 shows the CARs around the announcement of green bond issuance for the full sample and for the sub-samples such as US and outside US green bonds. These graphs signify that the market reaction is positive and steep for US green bonds and not for outside US green bonds. The positive reaction of 0.943 % in 3-day window by shareholders to US green bonds pull the mean reaction for overall sample to 0.130 %, or else, there is no significant reaction (0.015 %) for outside-US green bonds (refer, Table 3 Panel A-C). There is also a surge in market reaction in the

end of the 16-day event window i.e., for CAR (5,10).[10] Further analysis shows that the strong positive reaction to US green bonds is driven by Tesla's bonds, nevertheless, the market reaction to US green bonds excluding Tesla is insignificant. Panel D shows the 16-day CARs for 19 countries. In the sample of green bonds from 2013-2018, only for US and Swedish green bonds, the market reaction is positive and significant. Else, in many countries including China, France, Germany, Brazil, Singapore, Malaysia, Japan, and others, the market reaction is negative (but insignificant). [11]

The market reaction to first-time issuance of green bonds capture the untethered reaction of shareholders and therefore, it should be different from reaction to seasonal green bonds. Considering that, I examine the reaction for first-time issuance of green bonds separately. Results are these tests are provided in Table 4. The mean (standard errors) for 16-day CARs is 0.508 (0.477) which is driven by CARs in the same window of US green bonds (3.388 (2.464)) as compare to outside US green bonds (0.224 (0.485)).

As popularity of green bonds leads to issuance of alternative green bonds such as social bonds, sustainability bonds, and sustainability-linked bonds, I also examine the market reaction on announcement of these bonds. The event study results for these bonds are provided in Table 5. There are 118 unique events of issuance of alternate green bonds. I find that 3-day market reaction to alternate green bonds is -0.615 % and it is significant at 5 % level. This negative market reaction for alternate green bonds is due to sustainability and sustainability-linked bonds.

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[10] The mean (standard errors) of 16-day CARs (i.e., CAR (-5,10) is 0.459 (0.300) and it is similar to 0.481 (0.230) (statistics in Flammer (2021) page-10). The exact replication of event study in Flammer (2021) is hard to achieve due to lack of data cleaning steps.

[11] I also examine the market reaction to green bonds issued in 2019-2020. The results for these tests are provided in Internet Appendix Table IA 3. I find that 3-day market reaction to US green bonds is negative and significant. This supports the argument that shareholders are either neutral to the issuance of green bonds or consider them greenwashing. The average market reaction to overall extended sample and outside US green bonds is negative. The similar results prevail for first time issuance of green bonds in this extended sample.

4.3 Matching and Co-variate balance

Table 6 reports the matching results using the nearest neighbor algorithm. The 1,189 green bonds are matched with 1,164 non-green bonds based on country, industry, and issue year. Furthermore, it is also verified that the matched sample has a similar firm and environmental performance characteristics as green bond issuers. The average size of firms in the matched sample is 18.503, close to 18.112, the average size of green-bonds issuers. The matched sample firms have average leverage of 27.1 %, which is not statistically different from 26.2 % of green bonds issuers. The average unscaled emissions (log of scope 1 carbon emissions) for the matched sample is 11.729, which is indifferent from 11.219 of green bonds issuers. The matched sample is also balanced on environmental, social, governance, and aggregate ESG scores with respect to green bond issuers. At the bond level, the non-green bonds are similar to green bonds in characteristics such as coupon rate, maturity, the amount issued, and Bloomberg composite rating.

4.4. Environmental Performance and Green Bonds

Table 7 reports the association between the environmental performance of the firms and the green bond issuance. Column (1) – (2) provides the results for the environmental score and aggregate ESG score. It suggests that firms with lower environmental score and lower ESG score issues more green bonds than the comparable firms. Column (3) provides the results for scope 1 carbon emissions and It shows that firms with higher carbon emissions issues more green bonds by 2.4 %. The latter results are in line with environmental and ESG score results. Lastly, Column (4) provides the results for target emissions, and it suggests that firms which haven't set the target for curbing the emissions issues the green bonds in comparison to other firms. These results comply

with the signaling hypothesis that the firms with lower environmental performance issue the green bonds to display their commitment towards the environment in the future.

4.5 Institutional Ownership

The role of institutional investors in governance is well known in finance literature.[12] Recently, institutional investors have encouraged firms to support and invest in ESG projects (Matos, 2020). Therefore, it is relevant to check how institutions play role in the issuance of green bonds. Table 8 Panel A Column (1) reports the regression results for total institutional ownership (in %) on the issuance of green bonds. Results suggest that firms with higher institutional ownership issues more green bonds as compared to other firms. This confirms Flammer (2021) results and supports the notion that institutional investors back ESG investing. Nevertheless, the positive association between institutional ownership and green bonds issuance is not prevalent in all major green bond issuer countries such as in China and in France; the association is negative. For France, the stock market reaction to green bonds issuance is also negative, supporting the latter results. In China, the institutional ownership in firms is not as immense as compared to the developed markets. These can be the reasons that institutional ownership is negatively associated with green bond issuance in these countries. The robust positive association between these variables is in Sweden, which also has a steep market reaction to green bonds issuance.

However, it is unclear whether domestic and foreign institutions are equally interested in green projects, which have higher uncertainties in returns. There is a possibility of a home-bias

[12] Kindly refer Dasgupta, Fos, and Sautner (2020) for review on this topic.

effect because foreign institutional investors might not have substantial information about these projects as domestic institutional investors have. Therefore, I also check whether there is a home bias in supporting the green bonds by the institutions. Panel B Column (1) provides the regression results of domestic institutional ownership on green bonds issuance. The results suggest that there is a positive association between domestic institutional ownership and green bonds issuance. This confirms the home-bias effect in green bonds issuance. For China, the association between domestic institutional holding with green bonds issuance is positive. Still, the association with total institutional ownership is negative, which implies that foreign institutional investors are less interested in the corporate green bonds of China. This can be due to insufficient disclosure and lack of relevant information about the green projects on which proceeds would be invested. Similar to results for total institutional ownership, the association between domestic institutions holding and green bond issuance is more robust in Sweden than other countries.

5. Conclusion

Using the global data on green bonds, Flammer (2021) and Tang and Zhang (2020) show that the stockholders react positively to the issuance of green bonds. However, due to using country fixed effect, they miss acknowledging the different market reactions in other countries on issuance of green bonds. As these countries have different environmental regulations and investor protection rights, therefore, the market reaction can differ in these countries. The current study examines the market reaction in 19 countries and reports that the reaction can be categorized as positive, negative, or neutral. In the sample of green bonds from 2013-2018, the market reaction is positive and steep only for US green bonds and not for outside-US green bonds. The positive reaction of 0.943 % in a 3-day window by shareholders to US green bonds pulls the mean reaction

for the overall sample to 0.130 %; otherwise, there is no significant reaction to outside-US green bonds.

Further analysis shows that Tesla's bonds drive the strong positive reaction to US green bonds. Nevertheless, the market reaction to US green bonds excluding Tesla is insignificant. It suggests that the positive market reaction to green bonds in the past papers appeared to the sample bias as the reaction in their sample was affected by the strong positive reaction to Tesla green bonds. The country-level event studies show that the market reaction is positive and significant for US and Swedish green bonds. In many countries, including China, France, Germany, Brazil, Singapore, Malaysia, Japan, and others, the market reaction is negative (but insignificant). I also examine the market reaction to green bonds issued in 2019-2020 and find that 3-day market reaction to US green bonds is negative and significant. It is possible as Tesla didn't issue any green bond in these years. As the popularity of green bonds leads to the issuance of alternative green bonds such as social bonds, sustainability bonds, and sustainability-linked bonds, I also examine the market reaction to the announcement of these bonds. The 3-day market reaction to alternate green bonds is -0.615 %, and it is significant at a 5 % level. This negative market reaction for alternate green bonds is due to sustainability and sustainability-linked bonds. It supports the argument that shareholders are either neutral to the issuance of green bonds or consider them greenwashing.

I also examine 'who issues the green bonds?'. The stylized facts suggest that most of the green bonds in the US and Europe are issued by few public firms or their private subsidiaries. However, in Asia, green bond issuance is much diversified. The issuers are mainly from the financials, energy, or utility sectors. I also find that the green bonds are issued by firms with low

environmental scores, low ESG scores, high unscaled carbon emissions, and don't have target emissions.

Lastly, I focus on the institutional investors' holding. Similar to Flammer (2021), I also find that the institutional holding increased post-issuance. However, an increase in institutional ownership is by domestic investors and not by foreign investors. It suggests that institutional investors have a home bias effect in supporting the issuance of the green bond. The latter results vary among the leading green bond issuer countries such as China, United States, Sweden, and France.

To my knowledge, this is the first paper which examines the market reaction to green bonds in different countries, for extended sample, and alternate green bonds. It concludes that the market reaction to green bond issuance is either neutral or negative, signifies that the shareholders consider green bonds as greenwashing. Regarding 'who supports the issuance of green bonds?', I find that the increases in institutional Ownership post-issuance is by domestic investors rather than foreign investors, which supports the home bias effect for domestic investors and the information asymmetry (or greenwashing) from a foreign investors' perspective.

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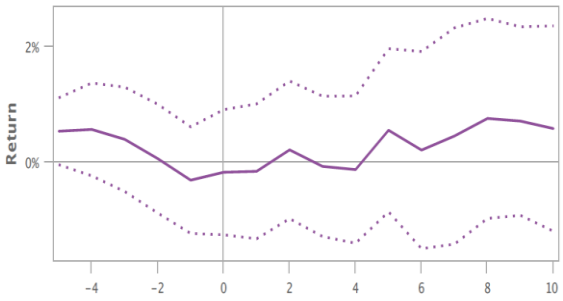
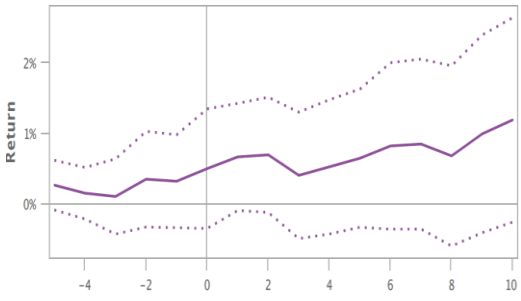
Figure 1: Corporate Green Bond Issuance and Market Reaction

This figure shows the market reaction on green bond issuance in 19 countries for the event window – 5 days prior to the event to 10 days after. (A) shows the market reaction in China. (B) shows the market reaction in Sweden. (C) shows the market reaction in France. (D) shows the market reaction in United States (including Tesla). (E) shows the market reaction in United States (excluding Tesla). (F) shows the market reaction in Germany. (G) shows the market reaction in Netherlands. (H) shows the market reaction in Norway. (I) shows the market reaction in Japan. (J) shows the market reaction in United Kingdom. (K) shows the market reaction in Brazil. (I) shows the market reaction in India. (M) shows the market reaction in Spain. (N) shows the market reaction in Italy. (O) shows the market reaction in Australia. (P) shows the market reaction in Malaysia. (Q) shows the market reaction in Hong Kong. (R) shows the market reaction in Taiwan. (S) shows the market reaction in Austria.

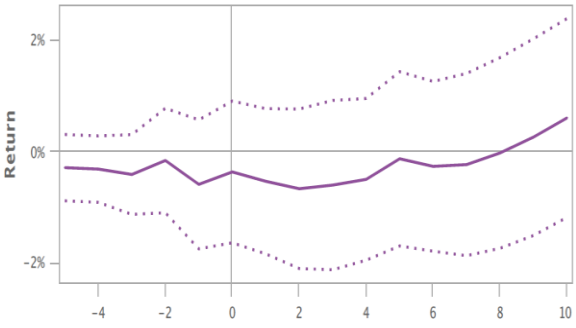
A: China



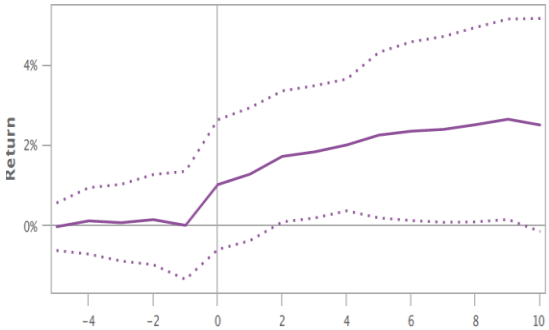
B: Sweden



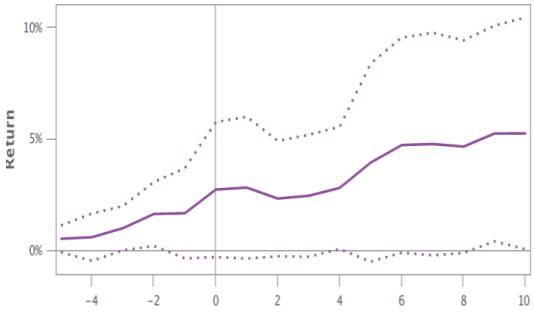
C: France



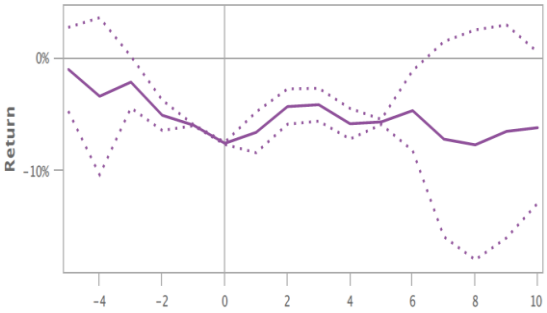
D: United States (incl. Tesla)



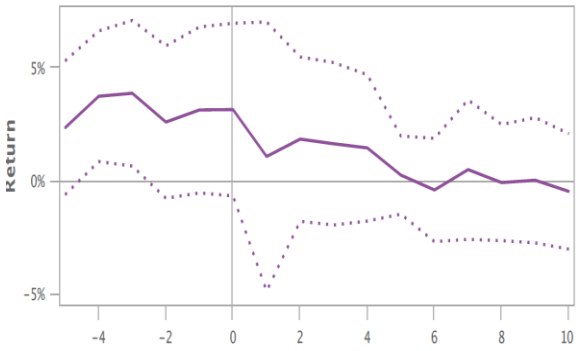
E: United States (excl. Tesla)



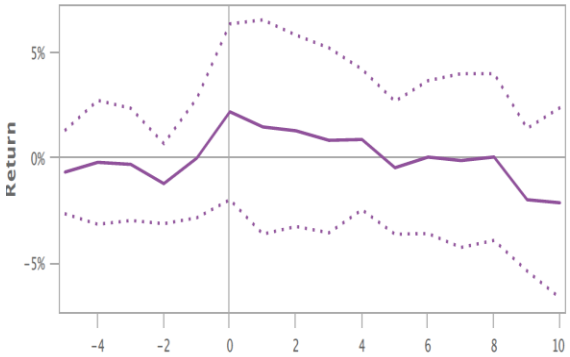
F: Germany



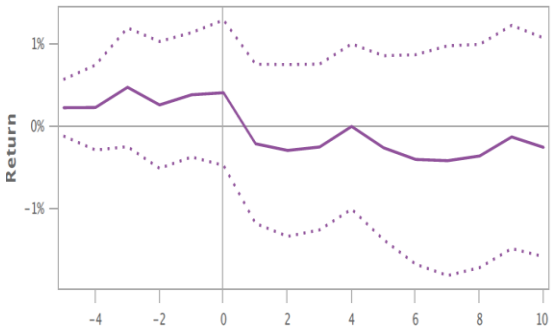
G: Netherlands



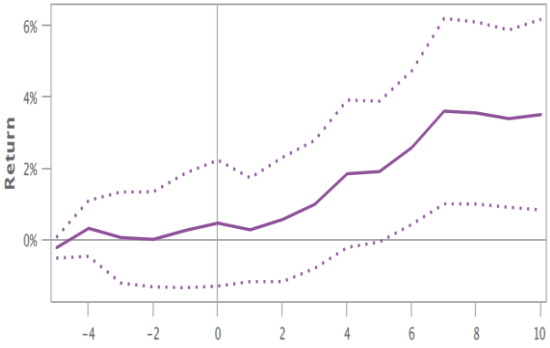
H: Norway



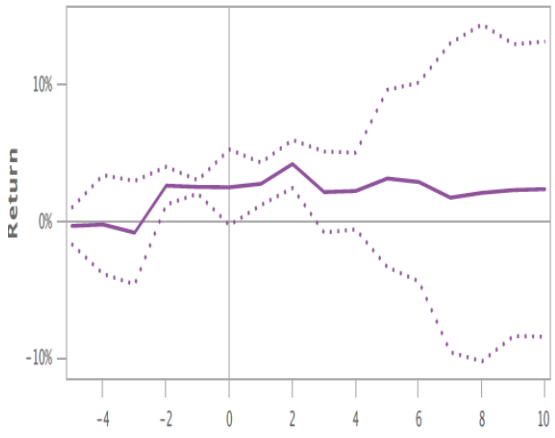
I: Japan



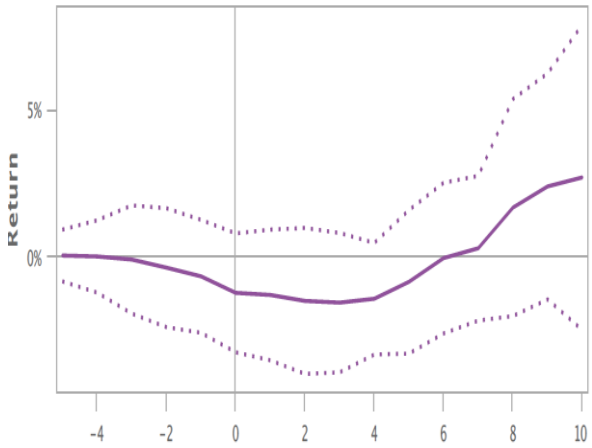
J: United Kingdom



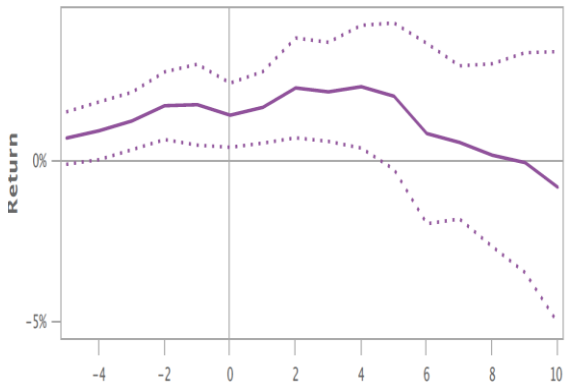
K: Brazil



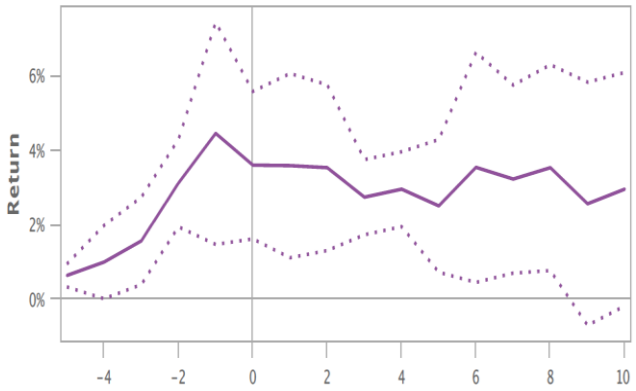
L : India



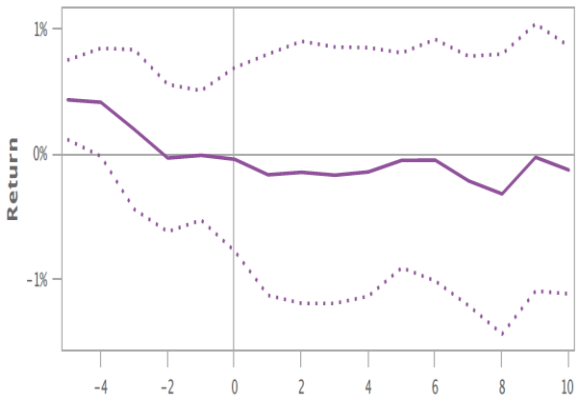
M: Spain



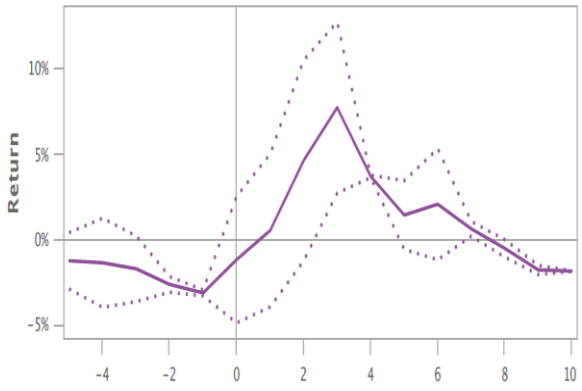
N: Italy



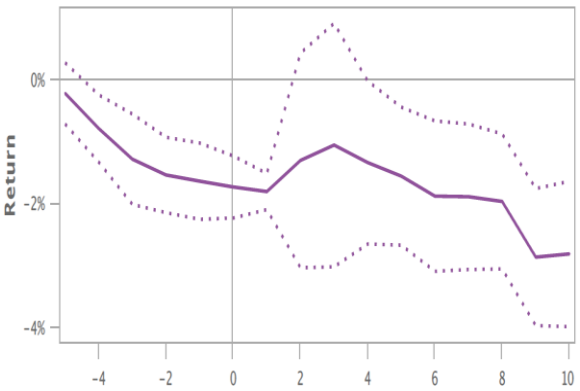
O: Australia



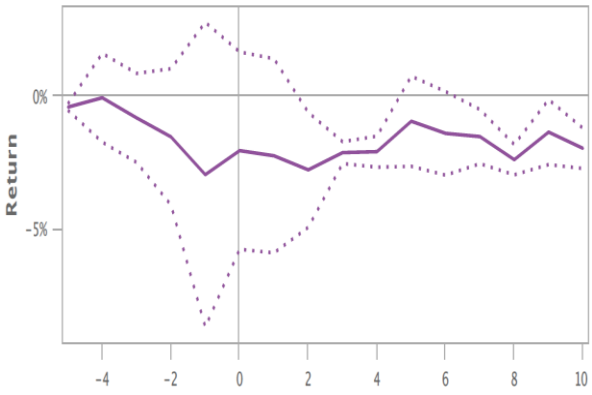
P: Malaysia



Q : Hong Kong



R: Taiwan



S: Austria

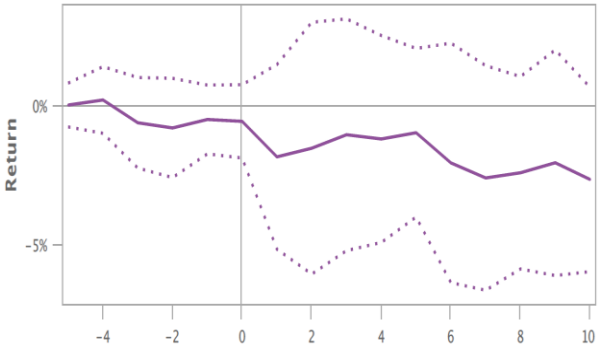


Figure 2: Green Bond Issuance and Cumulative Abnormal Return (CAR)

This figure shows the cumulative abnormal returns (CAR) on issuance of green bonds in full sample and for US and Outside US sub-samples. The event window is from five days before the event to ten days after the event. The abnormal returns are computed as market adjusted returns.

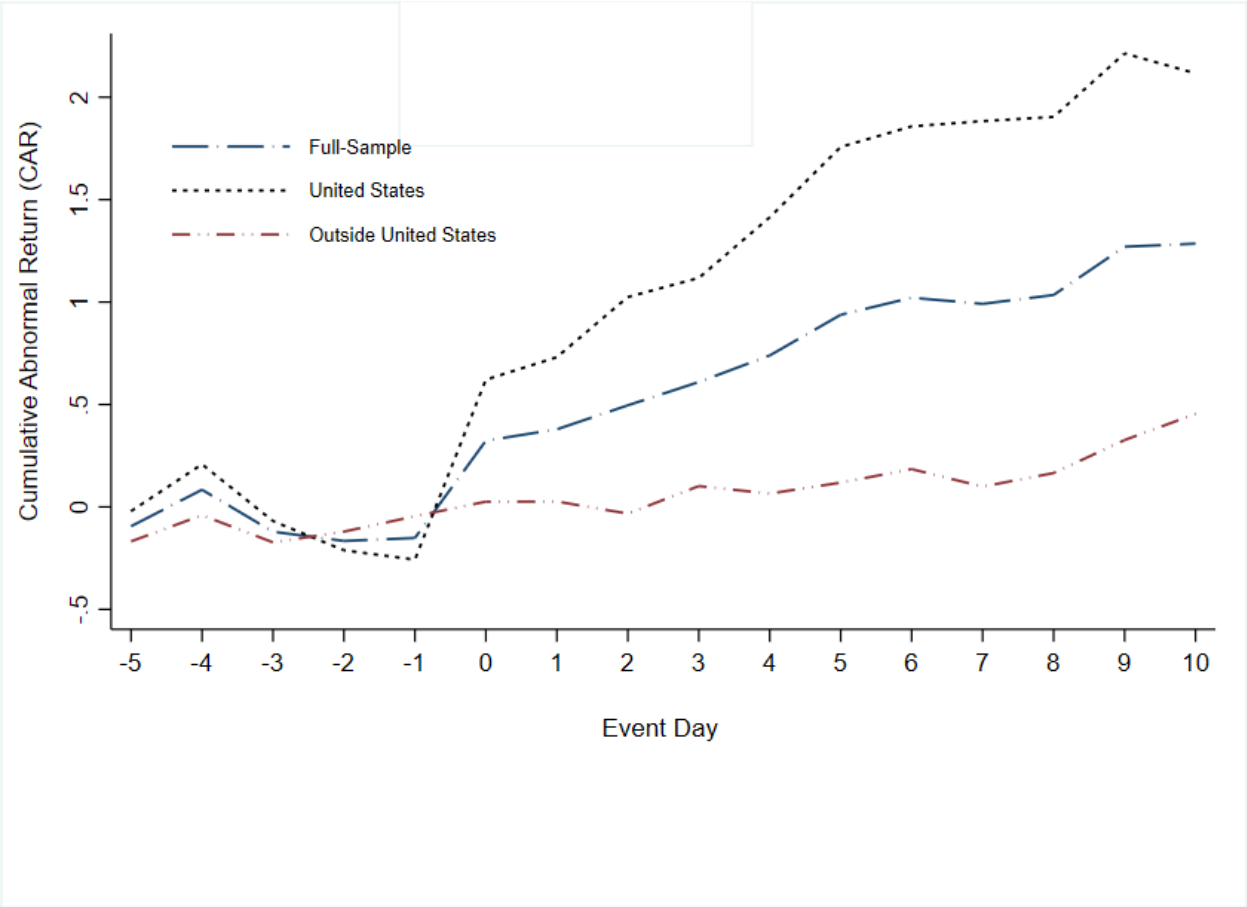


Table 1
Sample Selection and Trends in Green Bonds Issuance

This table provides the details on filtering criterion used for the sample selection and the trends in green bonds issuance. Panel A explains the sample selection process and the number of unique green bonds from the period 2013-2018. Panel B shows the yearly trends in green bonds issuance. Panel C shows the country level trends in green bonds issuance. Panel D shows the industry level (BICS level I) distribution of green bonds. Panel E shows the number of green bonds issued by public and private (incl. private subsidiary of public firms) firms. Panel F shows the number of green bonds certified by ESG assurance provider.

Panel A: Sample Selection Process

Panel A provides the details on filtering criterion used for the sample selection Column (1) explains the filtering criteria used. Column (2) shows the number of green bonds dropped due to the filtering criteria. Column (3) shows the number of unique green bonds left after the filter.

Sample Period : 2013-2018		
Filters		Number of Distinct Green Bonds
(1)	(2)	(3)
Total Green Bonds in Bloomberg Fixed Income Database		3,483
Less: Exclude bonds from government banks, government agencies, and central banks etc.	(2240)	1,243
Less: Issue date is missing	(1)	1,242
Less: Countries: Cayman Island, British Virgin, South Africa, Namibia, Peru, and Switzerland	(37)	1,205
Less: BICS level 2 industries with only one green for full sample	(16)	1,189

Panel B: Yearly Distribution of Green Bonds

Panel B provides the yearly distribution of green bonds from 2013 to 2018.

Year	Frequency	Percent	Cumulative
2013	15	1.26	1.26
2014	71	5.97	7.23
2015	222	18.67	25.9
2016	163	13.71	39.61
2017	322	27.08	66.69
2018	396	33.31	100
Total	1,189	100	

Panel C: Country Level Distribution

Panel C provides the country level distribution of green bonds from 2013 to 2018.

Country	# Green Bonds
China	187
Netherlands	46
United States	193
France	158
Germany	57
Mexico	9
Sweden	140
United Kingdom	35
Luxembourg	19
Spain	17
Hong Kong	22
Japan	34
Australia	13
Italy	10
Norway	20
India	18
Brazil	35
Canada	10
Denmark	4
Austria	6
South Korea	5
United Arab Emirates	3
Taiwan	17
Singapore	11
Others	120
Total	1,189

Panel D: Industry Level Distribution

Panel D provides the industry level distribution of green bonds in the sample. The industry classification is based on Bloomberg Industry Classification Systems (BICS) level 1.

BICS Level 1	Frequency	Percent	Cumulative
Consumer Discretionary	16	1.35	1.35
Consumer Staples	6	0.5	1.85
Energy	229	19.26	21.11
Financials	554	46.59	67.7
Health Care	2	0.17	67.87
Industrials	75	6.31	74.18
Materials	12	1.01	75.19
Technology	2	0.17	75.36
Utilities	293	24.64	100
Total	1,189	100	

Panel E: ESG Assurance Provider

Panel F provides the distribution of green bonds based on certification by ESG assurance provider. The ESG assurance provider constitutes Climate Bond Initiative (CBI) think-tank and the third party registered and verified by CBI.

ESG Assurance Provider	Freq.	Percent	Cum.
Information Not Available	66	5.55	5.55
Not Certified	309	25.99	31.54
Certified	814	68.46	100
Total	1,189	100	

Table 2
Bond Level Descriptive Statistics

This table provides the descriptive statistics at the bond level. Column (1) provides descriptive statistics for overall sample. Column (2) provides the descriptive statistics for green bonds issued by private firms. Column (3) provides the descriptive statistics for green bonds issued by public firms. *Maturity* is difference between year of maturity and year of issuance. *Coupon* is the coupon rate on green bonds, measured in percentage (%). *Amount* is the amount of which green bond issued, measured in million USD. *Certified* is the dummy variable which takes value 1 if the green bond is issued by ESG assurance provider; otherwise 0. *Rating* is Bloomberg composite rating given to a green bond.

	(1)	(2)	(3)
	All	Private	Public
# Green Bonds	1189	552	637
# Green bond issuer-days	729	343	386
# Green bond issuer-years	512	287	225
# Green bond issuers	393	224	169
Coupon (in %)	3.317 (2.376)	3.293 (2.481)	3.339 (2.281)
Amount Issued (in million USD)	247 (422)	243 (312)	252 (499)
Maturity (in years)	7.979 (29.542)	7.990 (6.743)	7.969 (39.927)
Certified (in %)	68	76	62
Rating	AA-	AA-	AA-

Table 3
Issuance of Green Bonds and Stock Market Reaction

This table provides stock market reaction on the issuance of green bonds. The cumulative abnormal return (CAR) is considered as a proxy of market reaction. The abnormal returns are computed as market adjusted returns. CAR (-1,1) is the CARs with event window of 1 day prior to the event day to 1 day after. CAR (-2,2)) is the CARs with event window of 2 days prior to the event day to 2 days after.). CAR (-3,3)) is the CARs with event window of 2 days prior to the event day to 2 days after . CAR (-4,4)) is the CARs with event window of 4 days prior to the event day to 4 days after. CAR (-5,5)) is the CARs with event window of 5 days prior to the event day to 5 days after. CAR(-5,10) is the CARs with event window of 5 days prior to the event day to 10 days after. N is number of unique events. Panel A shows the CARs for full sample in different event windows. Panel B shows the CARs for the green bonds issued by United States firms. Panel C shows the CARs for the green bonds issued by the firms domiciled outside United States. Panel D shows the CAR (-5, 10) for top 19 countries by number of green bonds issuance.

Panel A: Full Sample (2013-2018)

Panel A shows the CARs for full sample in different event windows.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	386	0.130	0.132	0.990	0.323
CAR (-2,2)	386	0.055	0.171	0.318	0.750
CAR (-3,3)	386	-0.002	0.195	-0.011	0.991
CAR (-4,4)	386	0.106	0.207	0.514	0.608
CAR (-5,5)	386	0.272	0.237	1.148	0.252
CAR (-5,10)	386	0.459	0.300	1.529	0.127

Panel B: United States

Panel B shows the CARs for the green bonds issued by United States firms.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	48	0.943	0.443	2.129	0.039
CAR (-2,2)	48	1.094	0.657	1.666	0.102
CAR (-3,3)	48	0.909	0.770	1.181	0.243
CAR (-4,4)	48	1.434	0.747	1.920	0.061
CAR (-5,5)	48	1.757	0.989	1.777	0.082
CAR (-5,10)	48	2.116	1.247	1.697	0.096

Panel C: Outside United States

Panel C shows the CARs for the green bonds issued by the firms domiciled outside United States.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	338	0.015	0.136	0.111	0.911
CAR (-2,2)	338	-0.093	0.171	-0.543	0.587
CAR (-3,3)	338	-0.132	0.194	-0.678	0.498
CAR (-4,4)	338	-0.082	0.209	-0.393	0.694
CAR (-5,5)	338	0.061	0.229	0.264	0.792
CAR (-5,10)	338	0.223	0.292	0.764	0.445

Panel D: Country Level Analysis

Panel D shows the CAR (-5, 10) for top 19 countries by number of green bonds issuance.

Index	Country	Mean	SE.	T-Stats
1	Australia	0.221	0.587	0.376
2	Austria	1.187	3.234	0.367
3	Brazil	-0.557	2.850	-0.196
4	China	-0.163	0.893	-0.183
5	France	-0.235	0.474	-0.495
6	Germany	-2.790	2.547	-1.096
7	Hong Kong	-0.613	2.189	-0.280
8	India	3.941	3.275	1.203
9	Japan	-0.194	0.876	-0.222
10	Malaysia	-1.452	1.330	-1.092
11	Netherlands	1.568	1.039	1.509
12	Norway	-1.819	2.429	-0.749
13	Singapore	-0.251	1.071	-0.234
14	Spain	-1.209	1.922	-0.629
15	Taiwan	-0.182	0.947	-0.192
16	UK	0.136	1.235	0.110
17	Sweden	2.013***	0.723	2.785
18	Italy	1.502	1.762	0.852
19	United States	2.1164*	1.247	1.697

Table 4
First Time Issuance and Market Reaction

This table provides stock market reaction on the first time issuance of green bonds. The cumulative abnormal return (CAR) is considered as a proxy of market reaction. The abnormal returns are computed as market adjusted returns. CAR (-1,1) is the CARs with event window of 1 day prior to the event day to 1 day after. CAR (-2,2)) is the CARs with event window of 2 days prior to the event day to 2 days after.). CAR (-3,3)) is the CARs with event window of 2 days prior to the event day to 2 days after . CAR (-4,4)) is the CARs with event window of 4 days prior to the event day to 4 days after. CAR (-5,5)) is the CARs with event window of 5 days prior to the event day to 5 days after. CAR(-5,10) is the CARs with event window of 5 days prior to the event day to 10 days after. N is number of unique events. Panel A show the CARs for full sample in different event windows. Panel B shows the CARs for the green bonds issued by United States firms. Panel C shows the CARs for the green bonds issued by the firms domiciled outside United States.

Panel A: Full Sample (2013-2018)

Panel A show the CARs for full sample in different event windows.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	156	0.008	0.215	0.038	0.970
CAR (-2,2)	156	-0.103	0.251	-0.409	0.683
CAR (-3,3)	156	-0.213	0.271	-0.788	0.432
CAR (-4,4)	156	-0.258	0.289	-0.893	0.373
CAR (-5,5)	156	0.204	0.367	0.556	0.579
CAR (-5,10)	156	0.508	0.477	1.065	0.288

Panel B: United States

Panel B shows the CARs for the green bonds issued by United States firms.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	14	0.961	1.066	0.902	0.384
CAR (-2,2)	14	0.476	1.174	0.405	0.692
CAR (-3,3)	14	-0.190	1.584	-0.120	0.906
CAR (-4,4)	14	0.515	1.342	0.384	0.707
CAR (-5,5)	14	2.217	2.202	1.007	0.332
CAR (-5,10)	14	3.388	2.464	1.375	0.192

Panel C: Outside United States

Panel C shows the CARs for the green bonds issued by the firms domiciled outside United States.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	142	-0.086	0.212	-0.405	0.686
CAR (-2,2)	142	-0.160	0.251	-0.635	0.526
CAR (-3,3)	142	-0.216	0.256	-0.841	0.402
CAR (-4,4)	142	-0.334	0.290	-1.153	0.251
CAR (-5,5)	142	0.006	0.340	0.016	0.987
CAR (-5,10)	142	0.224	0.461	0.485	0.628

Table 5
Alternate Green Bonds

This table provides stock market reaction on the issuance of alternative green bonds such as social bonds, sustainability bonds, and sustainability-linked bonds. The cumulative abnormal return (CAR) is considered as a proxy of market reaction. The abnormal returns are computed as market adjusted returns. CAR (-1,1) is the CARs with event window of 1 day prior to the event day to 1 day after. CAR (-2,2)) is the CARs with event window of 2 days prior to the event day to 2 days after.). CAR (-3,3)) is the CARs with event window of 2 days prior to the event day to 2 days after . CAR (-4,4)) is the CARs with event window of 4 days prior to the event day to 4 days after. CAR (-5,5)) is the CARs with event window of 5 days prior to the event day to 5 days after. CAR(-5,10) is the CARs with event window of 5 days prior to the event day to 10 days after. N is number of unique events. Panel A shows the CARs for the combined sample of alternative green bonds in different event windows. Panel B shows the CARs for the social bonds issued in different event windows. Panel C shows the CARs for the sustainability bonds in different event windows. Panel D shows the CARs for the sustainability-linked bonds in different event windows

Panel A: Combined

Panel A shows the CARs for the combined sample of alternative green bonds in different event windows.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	118	-0.615	0.277	-2.219	0.028
CAR (-2,2)	118	-0.698	0.336	-2.074	0.040
CAR (-3,3)	118	-1.079	0.385	-2.800	0.006
CAR (-4,4)	118	-1.005	0.416	-2.418	0.017
CAR (-5,5)	118	-0.760	0.443	-1.716	0.089
CAR (-5,10)	118	-0.543	0.536	-1.013	0.313

Panel B: Social Bonds

Panel B shows the CARs for the social bonds issued in different event windows.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	32	0.667	0.535	1.247	0.222
CAR (-2,2)	32	0.853	0.655	1.303	0.202
CAR (-3,3)	32	0.763	0.814	0.937	0.356
CAR (-4,4)	32	0.756	0.851	0.889	0.381
CAR (-5,5)	32	0.230	0.959	0.240	0.812
CAR (-5,10)	32	1.428	1.334	1.071	0.293

Panel C: Sustainability Bonds

. Panel C shows the CARs for the sustainability bonds in different event windows.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	67	-1.149	0.349	-3.290	0.002
CAR (-2,2)	67	-1.196	0.422	-2.833	0.006
CAR (-3,3)	67	-1.729	0.474	-3.645	0.001
CAR (-4,4)	67	-1.378	0.520	-2.648	0.010
CAR (-5,5)	67	-0.746	0.559	-1.336	0.186
CAR (-5,10)	67	-0.854	0.568	-1.504	0.137

Panel D: Sustainability Linked Bonds

. Panel D shows the CARs for the sustainability bonds in different event windows.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	19	-0.895	0.696	-1.286	0.215
CAR (-2,2)	19	-1.554	0.841	-1.847	0.081
CAR (-3,3)	19	-1.891	0.854	-2.215	0.040
CAR (-4,4)	19	-2.657	0.952	-2.791	0.012
CAR (-5,5)	19	-2.475	0.976	-2.535	0.021
CAR (-5,10)	18	-2.888	1.243	-2.323	0.033

Table 6
Nearest Neighbor Matching and Covariate Balance

This table provides the distribution and summary statistics of green bonds and matched non-green bonds. Panel A provides the number of green bonds and matched non-green bonds. Panel B provides bond level and issuer level summary statistics for green bonds and matched non-green bonds. *Maturity* is difference between year of maturity and year of issuance. *Coupon* is the coupon rate on a green (or non-green) bond , measured in percentage (%). *Amount* is the amount of which green (or non-green) bond issued, measured in million USD. *Certified* is the dummy variable which takes value 1 if the green (or non-green) bond is issued by ESG assurance provider; otherwise 0. *Rating* is Bloomberg composite rating given to a green (or non-green) bond. *Size* is the logarithm of total assets. Total assets is in million USD. Leverage is the ratio of total long-term debt to total assets. Log Emissions is the logarithm of scope 1 carbon emissions. Carbon emissions is in tonnes. *Carbon Intensity* is the ratio of total carbon emissions by sales. *Sales* is in million USD. *Environmental score* is the proprietary environmental pillar score by Thomson Reuters. *Social score* is the proprietary social pillar score by Thomson Reuters. *Governance Score* is the proprietary governance pillar score by Thomson Reuters. ESG score is the aggregate ESG score by Thomson Reuters. Target Emissions is a dummy variable which takes value 1 if a green bond issuer has target emissions to achieve; otherwise 0.

Panel A: Distribution of Green Bonds vs. Non-Green Bonds

Panel A provides the distribution of green bonds and non-green bonds post-matching based on nearest neighbor algorithm.

Bonds	Freq.	Percent	Cumulative
Green	1,189	50.53	100
Non-Green	1,164	49.47	49.47
Total	2,353	100	

Panel B: Summary Statistics of Green Bonds and Matched Non-Green Bonds

Panel B provides the bond and issuer level summary statistics of green bonds and matched non-green bonds. Column (1) provides the summary statistics of green bonds. Column (2) provides the summary statistics of matched non-green bonds. Column (3) provides the t-statistics on difference between green and non-green bonds

		Green Bonds (1)	Non-Green Bonds (2)	t-stat (3)
Bond Level				
	Maturity (years)	7.980	10.851	-2.53
	Coupon (in %)	3.318	4.153	-7.64
	Amount (in $M)	247.0	840.0	-25.94
	Bloomberg Composite Rating	AA-	BB+	-18.39
Issuer level				
	Size	18.112	18.503	-2.64
	Leverage	0.265	0.271	0.6
	Log Emissions	11.219	11.729	-1.87
	Carbon Intensity	316.064	461.367	-3.41
	Environmental Score	54.662	57.000	-1.11
	Social Score	48.380	61.725	-6.73
	Governance Score	45.853	59.894	-7.83
	ESG Score	49.829	59.764	-5.71
	Target Emissions	0.332	0.546	-6.31

Table 7
Issuance of Green Bonds and Environmental Performance

This table provides the regression results of environmental performance proxies on green bond issuance. Environmental score is Thomson Reuters environment pillar score. Social score is Thomson Reuters social pillar score. Governance score is Thomson Reuters governance pillar score. Log Emissions is the logarithm of scope 1 carbon emissions. Carbon emissions is in tonnes. Target Emissions is a dummy variable which takes value 1 if a green bond issuer has target emissions to achieve; otherwise 0. Firm is firm fixed effects. Country-Year is country by year fixed effects. Industry – Year is industry by year fixed effects. Cluster(Industry) is clustering errors at industry (BICS level 2) level. *, **, *** shows significance at 1 %, 5 %, and 10 % level.

	(1)	(2)	(3)	(4)
	Environmental	ESG	Log	Target
VARIABLES	Score	Score	Emissions	Emissions
Green Bond	-1.012*	-0.523***	0.024**	-0.002***
	(0.466)	(0.076)	(0.010)	(0.000)
Constant	56.540***	56.503***	11.586***	0.328***
	(0.162)	(0.026)	(0.003)	(0.000)
Observations	1,068	1,068	659	1,068
R-squared	0.997	0.998	1.000	0.988
Firm	Yes	Yes	Yes	Yes
Country-Year	Yes	Yes	Yes	Yes
Industry-Year	Yes	Yes	Yes	Yes
Cluster(Industry)	Yes	Yes	Yes	Yes

Table 8
Institutional Investors Holding and Green Bond Issuance

This table provides the regression results for institutional ownership on green bonds issuance. Panel A shows the results for full sample and country level subsamples using total institutional investors holding scaled by market capitalization as a dependent variable. Panel B shows the results for full sample and country level subsamples using domestic institutional investors holding scaled by market capitalization as a dependent variable. Inst. Inv. Holding is the total institutional investors holding scaled by market capitalization. Inst. Hold. Domestic is the domestic institutional investors holding scaled by market capitalization. Total institutional investors holding, domestic institutional holding, and market capitalization are in million USD. . Firm is firm fixed effects. Year is year fixed effects. Country-Year is country by year fixed effects. Industry – Year is industry by year fixed effects. Cluster(Industry) is clustering errors at industry (BICS level 2) level. *, **, *** shows significance at 1 %, 5 %, and 10 % level.

Panel A: Total Institutional Investors Holding

Panel A shows the results for full sample and country level subsamples using total institutional investors holding scaled by market cap. as a dependent variable. Column (1) shows the results for full sample. Column (2) shows the results for subsample where bond issuers are from China. Column (3) shows the results for subsample where bond issuers are from United States. Column (4) shows the results for subsample where bond issuers are from France. Column (5) shows the results for subsample where bond issuers are from Sweden. Column (3) shows the results for subsample where bond issuers are from countries other than United States, China, France, and Sweden.

	Full Sample	China	United States	France	Sweden	Others
VARIABLES	Inst.Inv. Holding	Inst.Inv. Holding	Inst.Inv. Holding	Inst.Inv. Holding	Inst.Inv. Holding	Inst.Inv. Holding
Green Bond	0.003**	-0.002***	0.001	-0.008	0.022***	0.008*
	(0.001)	(0.000)	(0.001)	(0.006)	(0.000)	(0.004)
Constant	0.389***	0.044***	0.675***	0.272***	0.285***	0.259***
	(0.001)	(0.000)	(0.000)	(0.002)	(0.000)	(0.001)
Observations	842	58	290	71	32	391
R-squared	1.000	1.000	1.000	0.999	0.998	0.999
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	No	Yes	Yes	Yes	Yes	Yes
Country-Year	Yes	No	No	No	No	No
Industry-Year	Yes	Yes	Yes	Yes	Yes	Yes
Cluster(Industry)	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Domestic Institutional Investors

Panel A shows the results for full sample and country level subsamples using total institutional investors holding scaled by market cap. as a dependent variable. Column (1) shows the results for full sample. Column (2) shows the results for subsample where bond issuers are from China. Column (3) shows the results for subsample where bond issuers are from United States. Column (4) shows the results for subsample where bond issuers are from France. Column (5) shows the results for subsample where bond issuers are from Sweden. Column (3) shows the results for subsample where bond issuers are from countries other than United States, China, France, and Sweden.

	Full Sample	China	United States	France	Sweden	Others
VARIABLES	Inst. Hold. Domestic	Inst. Hold. Domestic	Inst. Hold. Domestic	Inst. Hold. Domestic	Inst. Hold. Domestic	Inst. Hold. Domestic
Green Bond	0.007*	0.000***	0.002	-0.001**	0.016***	0.005***
	(0.003)	(0.000)	(0.002)	(0.000)	(0.000)	(0.001)
Constant	0.237***	0.016***	0.549***	0.061***	0.126***	0.083***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Observations	842	58	290	71	32	391
R-squared	1.000	1.000	0.999	1.000	0.998	0.999
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	No	Yes	Yes	Yes	Yes	Yes
Country-Year	Yes	No	No	No	No	No
Industry-Year	Yes	Yes	Yes	Yes	Yes	Yes
Cluster(Industry)	Yes	Yes	Yes	Yes	Yes	Yes

Appendix A
Variable Definition Sheet

Variable	Description	Source
Green Bond	Dummy variable which takes value 1 if the bond is labelled green by the Bloomberg; otherwise 0.	Bloomberg
CAR (-5, 10)	Cumulative abnormal returns with event window of 5 days prior to the event day to 10 days after. The abnormal returns are computed using market adjusted model with estimation period of 30 days and gap window of 20 days.	Global Compustat
BHAR (-5,10)	Buy-hold abnormal returns with event window of 5 days prior to the event day to 10 days after. The abnormal returns are computed using market adjusted model with estimation period of 30 days and gap window of 20 days.	Global Compustat
Coupon	Coupon rate on a green (or non-green) bond , measured in percentage (%).	Bloomberg
Maturity	Difference between year of maturity and year of issuance, measured in years.	Bloomberg
Amount	The amount of which green (or non-green) bond is issued, measured in million USD.	Bloomberg
Certified	Dummy variable which takes value 1 if the green (or non-green) bond is issued by ESG assurance provider	Bloomberg
Size	Size is the logarithm of total assets. Total assets is in million USD.	Datastream
Leverage	Leverage is the ratio of total long-term debt to total assets. Log Emissions is the logarithm of scope 1 carbon emissions.	Datastream
Environmental (E) Score	Thomson Reuters environment pillar score	Datastream
Social (S) Score	Thomson Reuters social pillar score	Datastream
Governance (G) Score	Thomson Reuters governance pillar score	Datastream
ESG Score	Thomson Reuters aggregate ESG score	Datastream
Log Emissions	Log Emissions is the logarithm of scope 1 carbon emissions. Carbon emissions is in tonnes.	Datastream
Target Emissions	Dummy variable which takes value 1 if a green bond issuer has target emissions to achieve; otherwise 0	Datastream
Inst. Inv. Holding	Total institutional investors holding scaled by market capitalization. Total institutional investors holding, and market capitalization are in million USD.	Factset Ownership
Inst. Inv. Domestic	Domestic institutional investors holding scaled by market capitalization. Total institutional investors holding, and market capitalization are in million USD.	Factset Ownership

Online Appendix

Table IA1
Distribution Green Bond Issuers in United States and in France

This table shows the distribution of green bonds issuers in United States and in France. Panel A shows the distribution of green bonds issuers in United States. Panel B shows the distribution of green bonds issuers in France.

Panel A: Distribution Green Bond Issuers in United States

This panel shows the distribution of green bonds issuers in United States.

Issuer Name	Freq.	Percent	Cum.
Alexandria Real Estate Equities Inc	1	0.52	0.52
Apple Inc	2	1.05	1.57
Avangrid Inc	1	0.52	2.09
Bank of America Corp	4	2.09	4.19
Boston Properties LP	1	0.52	4.71
Clearway Energy Operating LLC	3	1.57	6.28
DTE Electric Co	1	0.52	6.81
Digital Realty Trust LP	1	0.52	7.33
Duke Energy Carolinas LLC	2	1.05	8.38
ERP Operating LP	1	0.52	8.9
Evergy Kansas Central Inc	1	0.52	9.42
Georgia Power Co	1	0.52	9.95
Green Bancorp Inc	2	1.05	10.99
Hanjin International Corp	1	0.52	11.52
Interstate Power and Light Co	1	0.52	12.04
Kilroy Realty LP	1	0.52	12.57
MidAmerican Energy Co	3	1.57	14.14
Morgan Stanley	1	0.52	14.66
Pattern Energy Group Inc	2	1.05	15.71
Public Service Co of Colorado	2	1.05	16.75
Regency Centers Corp	1	0.52	17.28
Regency Centers LP	1	0.52	17.8
Solar Star Funding LLC	2	1.05	18.85
Southern Power Co	6	3.14	21.99
TerraForm Power Operating LLC	5	2.62	24.61
Terraform Global Operating LLC	2	1.05	25.65
Tesla Energy Operations Inc/DE	140	73.3	98.95
Toyota Motor Credit Corp	1	0.52	99.48
Vornado Realty LP	1	0.52	100
Total	191	100	

Panel B: Distribution Green Bond Issuers in France

This panel shows the distribution of green bonds issuers in France.

Issuer Name	Freq.	Percent	Cum.
Akuo Energy SAS	4	2.52	2.52
BNP Paribas SA	2	1.26	3.77
BPCE SA	1	0.63	4.4
Covivio	1	0.63	5.03
Credit Agricole CIB Financial Solution	6	3.77	8.81
Credit Agricole Corporate & Investments	104	65.41	74.21
Credit Agricole SA/London	1	0.63	74.84
Electricite de France SA	6	3.77	78.62
Engie SA	7	4.4	83.02
Fonciere INEA	2	1.26	84.28
Getlink SE	1	0.63	84.91
HSBC Continental Europe SA	3	1.89	86.79
ICADE	1	0.63	87.42
La Poste SA	1	0.63	88.05
Paprec Holding SA	10	6.29	94.34
Schneider Electric SE	2	1.26	95.6
Societe Generale SA	2	1.26	96.86
Societe Generale SA/Taipei	3	1.89	98.74
Unibail-Rodamco-Westfield SE	2	1.26	100
Total	159	100	

Table IA2

This table shows the distribution of green bonds based on its different characteristics. Panel A shows the distribution of green bonds issued by firms from emerging markets compare to others. Panel B shows the distribution of green bonds based on use of proceeds. Panel C shows the distribution of green bonds based on different options such as call, put, sinkable, and others. Panel D shows the distribution of green bonds based on years of maturity. Panel E shows the distribution of green bonds defaulted in the sample period. Panel F shows the distribution of green bonds based on Bloomberg composite rating. Panel G shows the country by industry-wide distribution of green green bonds.

Panel A: Emerging Market Green Bonds

This panel shows the distribution of green bonds issued by firms from emerging markets compare to others.

Emerging Market	Freq.	Percent	Cum.
No	765	64.34	64.34
Yes	424	35.66	100
Total	1,189	100	

Panel B: Use of Proceeds

This panel shows the distribution of green bonds based on use of proceeds.

Use of Proceeds	Freq.	Percent	Cum.
Green Bond/Loan	871	73.25	76.45
Project Finance Green Bond/Loan	103	8.66	87.89
Refinance Green Bond/Loan	93	7.82	96.64
Green Bond/Loan Bail-in	21	1.77	78.22
Working Capital Project Finance Green Bond/Loan	21	1.77	99.07
Project Finance Refinance Green Bond/Loan	11	0.93	88.81
Working Capital Refinance Green Bond/Loan	11	0.93	100
Intercompany Loan Green Bond/Loan	10	0.84	79.23
Others	48	4	
Total	1,189	100	

Panel C: Maturity Type

This panel shows the distribution of green bonds based on different options such as call, put, sinkable, and others.

Maturity Type	Freq.	Percent	Cum.
AT MATURITY	887	74.6	74.6
CALL/SINK	6	0.5	75.11
CALLABLE	171	14.38	89.49
CONVERTIBLE	2	0.17	89.66
PERP/CALL	18	1.51	91.17
PUTABLE	38	3.2	94.37
SINKABLE	67	5.63	100
Total	1,189	100	

Panel D: Distribution based on Maturity (in Years)

This panel shows the distribution of green bonds based on years of maturity.

Maturity (in years)	Freq.	Percent	Cum.
0	3	0.26	0.26
1	28	2.39	2.65
2	46	3.93	6.58
3	241	20.58	27.16
4	49	4.18	31.34
5	286	24.42	55.76
6	49	4.18	59.95
7	103	8.8	68.74
8	30	2.56	71.31
9	13	1.11	72.42
10	144	12.3	84.71
11	14	1.2	85.91
12	34	2.9	88.81
13	10	0.85	89.67
14	10	0.85	90.52
15	54	4.61	95.13
15+	57	4.91	
Total	1,171	100	

Panel E: Green Bond Default

This panel shows the distribution of green bonds defaulted in the sample period.

Defaulted	Freq.	Percent	Cum.
N	1,185	99.66	99.66
Y	4	0.34	100
Total	1,189	100	

Panel F: Green Bond Rating

This panel shows the distribution of green bonds based on Bloomberg composite rating.

BBG Composite	Freq.	Percent	Cum.
A	31	7.05	7.05
A+	30	6.82	13.86
A-	29	6.59	20.45
AA	2	0.45	20.91
AA+	2	0.45	21.36
AA-	14	3.18	24.55
AAA	1	0.23	24.77
B	6	1.36	26.14
B-	2	0.45	26.59
BB	4	0.91	27.5
BB+	6	1.36	28.86
BB-	8	1.82	30.68
BBB	7	1.59	32.27
BBB+	56	12.73	45
BBB-	40	9.09	54.09
Not Rated	202	45.91	100
Total	440	100	

Panel G : Country by Industry Distribution of Green Bonds

This panel shows the country by industry-wide distribution of green bonds.

BICS Level 1	AUSTRALIA	AUSTRIA	BELGIUM	BERMUDA	BRAZIL	BRITAIN	CANADA	CHILE	CHINA
Consumer Discretion..	0	0	0	0	0	0	0	0	9
Consumer Staples	0	0	0	0	2	1	0	0	1
Energy	0	0	0	1	5	2	0	0	13
Financials	14	4	1	1	1	2	6	0	129
Health Care	0	0	0	0	0	0	2	0	0
Industrials	0	0	2	0	0	1	0	0	22
Materials	0	3	0	0	0	0	0	2	1
Technology	0	0	0	0	0	0	0	0	0
Utilities	0	2	0	4	24	20	2	0	34
Total	14	9	3	6	32	26	10	2	209

BICS Level 1	COLOMBIA	COSTA RICA	DENMARK	ESTONIA	FINLAND	FRANCE	GERMANY	GREECE	HONG KONG
Consumer Discretion..	0	0	0	0	0	1	0	0	2
Consumer Staples	0	0	0	0	0	0	0	0	0
Energy	0	0	2	0	0	4	25	0	1
Financials	1	2	0	0	2	128	22	0	7
Health Care	0	0	0	0	0	0	0	0	0
Industrials	0	0	0	0	0	13	4	0	0
Materials	0	0	0	0	0	0	0	0	0
Technology	0	0	0	0	0	0	0	0	0
Utilities	0	0	2	1	1	13	6	1	4
Total	1	2	4	1	3	159	57	1	14

BICS Level 1	INDONESIA	ITALY	JAPAN	LATVIA	LITHUANIA	LUXEMBO..	MALAYSIA	MAURITIUS	MEXICO	NETHERL..
Consumer Discretion..	0	1	0	0	0	0	0	0	0	0
Consumer Staples	0	0	0	0	0	0	0	0	0	0
Energy	0	2	0	0	0	3	17	2	0	0
Financials	2	1	22	0	0	2	16	0	1	12
Health Care	0	0	0	0	0	0	0	0	0	0
Industrials	0	0	7	0	0	0	0	0	8	2
Materials	0	0	3	0	0	2	0	0	0	0
Technology	0	0	0	0	0	0	0	0	0	0
Utilities	0	6	0	2	2	4	65	4	0	32
Total	2	10	32	2	2	11	98	6	9	46

BICS Level 1	NORWAY	SINGAPORE	SOUTH KOREA	SPAIN	SWEDEN	TAIWAN	THAILAND	UAE	UNITED STATES	TOTAL
Consumer Discretion..	0	0	2	0	0	0	0	0	1	16
Consumer Staples	0	0	0	0	2	0	0	0	0	6
Energy	2	3	0	0	3	0	0	0	140	229
Financials	7	8	2	1	124	9	0	1	15	554
Health Care	0	0	0	0	0	0	0	0	0	2
Industrials	0	0	0	9	4	1	1	0	1	75
Materials	0	0	0	0	1	0	0	0	0	12
Technology	0	0	0	0	0	0	0	0	2	2
Utilities	11	0	1	7	6	4	0	0	32	293
Total	20	11	5	17	140	14	1	1	191	1,189

Table IA3
Stock Market Reaction and Issuance of Green Bonds (Extended Sample)

This Table shows the market reaction of green bonds for the extended sample (i.e., 2019-2020). The cumulative abnormal return (CAR) is considered as a proxy of market reaction. The abnormal returns are computed as market adjusted returns. CAR (-1,1) is the CARs with event window of 1 day prior to the event day to 1 day after. CAR (-2,2)) is the CARs with event window of 2 days prior to the event day to 2 days after.). CAR (-3,3)) is the CARs with event window of 2 days prior to the event day to 2 days after . CAR (-4,4)) is the CARs with event window of 4 days prior to the event day to 4 days after. CAR (-5,5)) is the CARs with event window of 5 days prior to the event day to 5 days after. CAR(-5,10) is the CARs with event window of 5 days prior to the event day to 10 days after. N is number of unique events. Panel A shows the CARs for full extended sample in different event windows. Panel B shows the CARs for the green bonds issued by United States firms. Panel C shows the CARs for the green bonds issued by the firms domiciled outside United States. Panel D shows the CARs for green bonds issued first time in different event windows. Panel E shows the CARs for the green bonds issued first time by United States firms. Panel F shows the CARs for the green bonds issued first time by the firms domiciled outside United States. Panel G shows the CARs for the green bonds in different countries and in different event windows. Panel H shows the CARs for the first time issued green bonds in different countries and in different event windows

Panel A: Extended Sample (2019-2020) - Combined

Panel A shows the CARs for full sample in different event windows

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	491	-0.218	0.154	-1.415	0.158
CAR (-2,2)	490	-0.060	0.202	-0.294	0.769
CAR (-3,3)	490	-0.043	0.237	-0.181	0.857
CAR (-4,4)	490	0.184	0.277	0.665	0.507
CAR (-5,5)	490	0.193	0.313	0.618	0.537
CAR (-5,10)	489	0.125	0.375	0.332	0.740

Panel B: Extended Sample (2019-2020) – United States

Panel B shows the CARs for the green bonds issued by United States firms.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	48	-1.272	0.688	-1.848	0.071
CAR (-2,2)	48	-0.942	0.749	-1.257	0.215
CAR (-3,3)	48	-0.291	0.897	-0.325	0.747
CAR (-4,4)	48	0.416	1.021	0.407	0.686
CAR (-5,5)	48	-0.116	1.184	-0.098	0.922
CAR (-5,10)	48	-0.413	1.351	-0.306	0.761

Panel C: Extended Sample (2019-2020) – Outside United States

Panel C shows the CARs for the green bonds issued by the firms domiciled outside United States.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	443	-0.104	0.153	-0.679	0.497
CAR (-2,2)	442	0.036	0.209	0.173	0.862
CAR (-3,3)	442	-0.016	0.244	-0.065	0.949
CAR (-4,4)	442	0.159	0.286	0.554	0.580
CAR (-5,5)	442	0.227	0.323	0.703	0.482
CAR (-5,10)	441	0.183	0.390	0.470	0.639

Panel D: Extended Sample (2019-2020) – First Time Issuers

Panel D shows the CARs for green bonds issued first time in different event windows.

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	193	-0.455	0.271	-1.680	0.095
CAR (-2,2)	193	-0.083	0.320	-0.259	0.796
CAR (-3,3)	193	0.024	0.365	0.066	0.948
CAR (-4,4)	193	0.311	0.407	0.762	0.447
CAR (-5,5)	193	-0.042	0.458	-0.091	0.928
CAR (-5,10)	192	-0.218	0.536	-0.406	0.685

Panel E: Extended Sample (2019-2020) – First Time Issuers – United States

Panel E shows the CARs for green bonds issued first time by United States firms in different event windows.

Variable	N	Mean	SE.	T- stat	P-value
CAR (-1,1)	26	-2.718	1.128	-2.410	0.024
CAR (-2,2)	26	-2.167	1.175	-1.844	0.077
CAR (-3,3)	26	-1.286	1.368	-0.940	0.356
CAR (-4,4)	26	-0.658	1.250	-0.527	0.603
CAR (-5,5)	26	-1.601	1.753	-0.913	0.370
CAR (-5,10)	26	-1.663	2.059	-0.808	0.427

Panel F: Extended Sample (2019-2020) – First Time Issuers – Outside United States

Panel F shows the CARs for green bonds issued first time by outside United States firms in different event windows.

Variable	N	Mean	SE.	T- stat	P-value
CAR (-1,1)	167	-0.102	0.250	-0.409	0.683
CAR (-2,2)	167	0.242	0.316	0.765	0.445
CAR (-3,3)	167	0.228	0.364	0.627	0.532
CAR (-4,4)	167	0.461	0.429	1.075	0.284
CAR (-5,5)	167	0.201	0.453	0.444	0.658
CAR (-5,10)	166	0.009	0.531	0.017	0.987

Panel G: Country Level Analysis

. Panel G shows the CARs for the green bonds in different countries and in different event windows.

China

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	86	0.240	0.354	0.679	0.499
CAR (-2,2)	86	-0.355	0.460	-0.772	0.442
CAR (-3,3)	86	-0.258	0.515	-0.502	0.617
CAR (-4,4)	86	0.066	0.641	0.102	0.919
CAR (-5,5)	86	0.223	0.691	0.322	0.748
CAR (-5,10)	85	0.514	0.855	0.601	0.550

Sweden

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	86	0.649	0.316	2.050	0.043
CAR (-2,2)	86	1.326	0.413	3.214	0.002
CAR (-3,3)	86	1.617	0.440	3.676	0.000
CAR (-4,4)	86	2.011	0.498	4.035	0.000
CAR (-5,5)	86	2.456	0.576	4.260	0.000
CAR (-5,10)	86	3.349	0.716	4.677	0.000

Japan

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	107	-0.266	0.260	-1.024	0.308
CAR (-2,2)	107	-0.109	0.246	-0.443	0.658
CAR (-3,3)	107	-0.070	0.291	-0.241	0.810
CAR (-4,4)	107	-0.254	0.349	-0.728	0.468
CAR (-5,5)	107	-0.349	0.388	-0.900	0.370
CAR (-5,10)	107	-0.260	0.463	-0.561	0.576

France

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	171	0.014	0.219	0.064	0.949
CAR (-2,2)	171	0.118	0.299	0.395	0.693
CAR (-3,3)	171	-0.102	0.354	-0.287	0.774
CAR (-4,4)	171	-0.191	0.424	-0.451	0.653
CAR (-5,5)	171	-0.197	0.481	-0.410	0.682
CAR (-5,10)	171	-0.617	0.606	-1.019	0.310

Germany

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	27	-0.257	0.542	-0.475	0.639
CAR (-2,2)	27	-0.669	0.788	-0.849	0.404
CAR (-3,3)	27	-0.319	1.054	-0.303	0.764
CAR (-4,4)	27	-0.593	1.303	-0.455	0.653
CAR (-5,5)	27	-0.698	1.417	-0.493	0.626
CAR (-5,10)	27	-0.047	1.639	-0.029	0.977

India

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	11	-1.250	0.877	-1.425	0.185
CAR (-2,2)	10	-1.875	1.580	-1.187	0.266
CAR (-3,3)	10	-2.244	1.482	-1.514	0.164
CAR (-4,4)	10	-2.411	1.393	-1.731	0.117
CAR (-5,5)	10	-2.052	2.026	-1.013	0.338
CAR (-5,10)	10	0.834	3.517	0.237	0.818

Netherlands

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	25	-0.017	0.412	-0.042	0.967
CAR (-2,2)	25	-0.232	0.481	-0.483	0.633
CAR (-3,3)	25	-0.487	0.674	-0.722	0.477
CAR (-4,4)	25	0.187	0.728	0.257	0.800
CAR (-5,5)	25	-0.225	0.778	-0.289	0.775
CAR (-5,10)	25	0.257	1.108	0.232	0.819

Italy

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	26	-0.013	0.426	-0.029	0.977
CAR (-2,2)	26	0.300	0.597	0.502	0.620
CAR (-3,3)	26	0.015	0.721	0.021	0.984
CAR (-4,4)	26	0.859	0.804	1.068	0.296
CAR (-5,5)	26	1.008	0.786	1.283	0.211
CAR (-5,10)	26	0.782	1.059	0.739	0.467

United Kingdom

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	20	-1.003	0.412	-2.436	0.025
CAR (-2,2)	20	-1.779	1.045	-1.701	0.105
CAR (-3,3)	20	-2.306	1.509	-1.528	0.143
CAR (-4,4)	20	-1.302	1.099	-1.184	0.251
CAR (-5,5)	20	-1.348	1.416	-0.952	0.353
CAR (-5,10)	20	0.605	1.683	0.360	0.723

Spain

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	46	-0.247	0.657	-0.376	0.709
CAR (-2,2)	46	0.202	0.802	0.252	0.802
CAR (-3,3)	46	0.519	0.932	0.557	0.580
CAR (-4,4)	46	0.973	1.000	0.973	0.336
CAR (-5,5)	46	1.687	1.142	1.477	0.147
CAR (-5,10)	46	0.605	1.281	0.472	0.639

Hong Kong

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	32	0.122	0.425	0.287	0.776
CAR (-2,2)	32	0.123	0.563	0.219	0.828
CAR (-3,3)	32	-0.371	0.514	-0.722	0.476
CAR (-4,4)	32	-0.052	0.798	-0.065	0.949
CAR (-5,5)	32	0.462	1.027	0.450	0.656
CAR (-5,10)	32	-0.622	1.190	-0.523	0.605

Norway

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	18	1.317	0.672	1.961	0.066
CAR (-2,2)	18	0.737	0.967	0.762	0.457
CAR (-3,3)	18	0.709	1.096	0.647	0.526
CAR (-4,4)	18	0.182	1.116	0.163	0.873
CAR (-5,5)	18	-0.400	1.098	-0.364	0.720
CAR (-5,10)	18	-0.702	1.049	-0.670	0.512

Panel H: Country Level Analysis of First Time Issuers

Panel H shows the CARs for the first time issued green bonds in different countries and in different event windows

China

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	37	-0.025	0.480	-0.052	0.959
CAR (-2,2)	37	-0.571	0.439	-1.301	0.202
CAR (-3,3)	37	-0.992	0.509	-1.949	0.059
CAR (-4,4)	37	-1.633	0.601	-2.716	0.010
CAR (-5,5)	37	-1.164	0.674	-1.726	0.093
CAR (-5,10)	36	-1.125	1.060	-1.061	0.296

Sweden

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	24	0.408	0.639	0.639	0.529
CAR (-2,2)	24	1.757	1.010	1.740	0.095
CAR (-3,3)	24	1.952	0.934	2.090	0.048
CAR (-4,4)	24	2.528	1.071	2.361	0.027
CAR (-5,5)	24	2.512	1.179	2.130	0.044
CAR (-5,10)	24	3.226	1.431	2.254	0.034

Japan

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	75	-0.101	0.297	-0.342	0.734
CAR (-2,2)	75	0.015	0.275	0.053	0.958
CAR (-3,3)	75	-0.102	0.337	-0.302	0.763
CAR (-4,4)	75	0.036	0.415	0.086	0.932
CAR (-5,5)	75	0.072	0.458	0.157	0.876
CAR (-5,10)	75	0.002	0.545	0.003	0.997

France

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	15	-0.748	0.639	-1.171	0.261
CAR (-2,2)	15	-0.866	0.583	-1.487	0.159
CAR (-3,3)	15	-0.646	0.655	-0.987	0.341
CAR (-4,4)	15	-0.753	0.746	-1.009	0.330
CAR (-5,5)	15	-1.012	0.959	-1.055	0.309
CAR (-5,10)	15	-0.554	1.264	-0.439	0.668

Germany

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	12	1.045	0.665	1.573	0.144
CAR (-2,2)	12	1.545	0.919	1.682	0.121
CAR (-3,3)	12	1.916	1.304	1.469	0.170
CAR (-4,4)	12	1.773	2.013	0.881	0.397
CAR (-5,5)	12	1.511	2.244	0.673	0.515
CAR (-5,10)	12	1.971	2.061	0.956	0.359

India

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	6	-1.187	0.907	-1.308	0.248
CAR (-2,2)	6	-1.711	1.271	-1.346	0.236
CAR (-3,3)	6	-2.464	1.526	-1.614	0.167
CAR (-4,4)	6	-2.274	1.475	-1.541	0.184
CAR (-5,5)	6	-1.146	1.984	-0.578	0.589
CAR (-5,10)	6	3.175	4.007	0.792	0.464

Netherlands

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	11	0.490	0.715	0.686	0.508
CAR (-2,2)	11	0.586	0.869	0.675	0.515
CAR (-3,3)	11	0.611	0.801	0.763	0.463
CAR (-4,4)	11	0.951	0.809	1.175	0.267
CAR (-5,5)	11	0.672	1.274	0.527	0.610
CAR (-5,10)	11	0.050	2.229	0.022	0.983

Italy

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	13	-0.746	0.604	-1.234	0.241
CAR (-2,2)	13	-0.330	0.824	-0.401	0.695
CAR (-3,3)	13	-0.265	0.913	-0.290	0.777
CAR (-4,4)	13	0.724	0.986	0.734	0.477
CAR (-5,5)	13	0.640	1.014	0.631	0.540
CAR (-5,10)	13	1.227	1.622	0.756	0.464

United Kingdom

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	10	-0.399	0.438	-0.911	0.386
CAR (-2,2)	10	-0.764	0.754	-1.014	0.337
CAR (-3,3)	10	-1.662	1.147	-1.449	0.181
CAR (-4,4)	10	-0.721	1.226	-0.589	0.571
CAR (-5,5)	10	-1.016	1.226	-0.829	0.429
CAR (-5,10)	10	1.113	1.475	0.754	0.470

Spain

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	15	0.389	1.612	0.241	0.813
CAR (-2,2)	15	1.016	1.843	0.551	0.590
CAR (-3,3)	15	2.339	2.097	1.115	0.283
CAR (-4,4)	15	3.420	2.263	1.511	0.153
CAR (-5,5)	15	3.810	2.269	1.679	0.115
CAR (-5,10)	15	2.043	2.464	0.829	0.421

Hong Kong

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	13	0.051	0.584	0.088	0.931
CAR (-2,2)	13	-0.460	0.824	-0.557	0.587
CAR (-3,3)	13	-0.415	0.940	-0.442	0.666
CAR (-4,4)	13	-0.543	1.531	-0.355	0.729
CAR (-5,5)	13	0.659	2.092	0.315	0.758
CAR (-5,10)	13	-0.709	2.384	-0.297	0.771

Norway

Variable	N	Mean	S.E.	T- stat	P-value
CAR (-1,1)	7	1.046	1.281	0.817	0.445
CAR (-2,2)	7	0.461	2.051	0.225	0.830
CAR (-3,3)	7	0.729	2.158	0.338	0.747
CAR (-4,4)	7	0.408	2.541	0.160	0.878
CAR (-5,5)	7	-1.022	2.362	-0.433	0.680
CAR (-5,10)	7	-2.077	1.783	-1.165	0.288