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DOES GREEN BONDS PLACEMENT CREATE VALUE FOR FIRMS?

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The goal of this research is to add to the existing corpus of knowledge concerning particular green finance instrument - green bonds. It tries to answer some questions relevant for both scholars and business in order to reinforce the development of green bonds market. One of these questions is whether green bonds issuance cause positive market reaction. Resent activities in global agenda, starting from United Nations Sustainable Goals released in 2015 and endings huge public attention for green issues in 2019 impose additional burden on companies' competitiveness. Our major hypothesis is that ecological factors affect investors' decisions whose portfolios and investment declarations are getting to be more aligned with global ecological agenda. The green bonds issuance provide a signal for investors that the issuing firm is involved in sustainable development and hence its stock may be included in the portfolio. The study discovers the significance of the "green" label for the stock market reaction. Alongside, it studies some other features of green bonds, fostering their evolvement and justifying their costs for issuers.

JEL Classification: Q01, G10, G12, G14.

Keywords: green bonds; stock returns; event study; bonds issuance.

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1. INTRODUCTION

Green bonds have been existing for approximately ten years. Green bonds are the same as conventional bonds, despite the fact, that use of proceeds must fund green or climate-oriented projects (Langhelle, 2016). Green bonds' issuers must direct 95% of proceeds acquired explicitly to green assets if they want to issue labeled green bonds (Climate Bonds Initiative, 2018d). Such requirement needs verification of its execution that is why the special characteristic of almost all green bonds is the external review of issuer and issuance. In fact, such review proves the compliance with some international standards or other methodology. Two main international standards exist: Climate Bonds Standards by Climate Bonds Initiative (CBI) and Green Bond Principles (GBP) by International Capital Market Association (ICMA).

The main goal in World Bank Report was to give the definition to green bonds, list the eligible projects funded by such bonds and predict the future development of the market (Reichelt, 2010). Reichelt (Reichelt, 2010) suggest, that a key feature of green bonds is the due diligence process that the issuer is expected to conduct to identify and monitor the projects (Reichelt, 2010). Mathews and co-authors (Mathews *et al.*, 2012) more deeply discovered the characteristics of such bonds. They considered, that green bonds are designed for institutional investors, they should be asset-backed, their maturity should be extended quite far and they should be as "plain-vanilla" structured as possible. Experts of S&P not just observe market trends, but also launched first related index – S&P Green Bond Index (Kochetygova *et al.*, 2014). Other researchers propose bonds as the solution for financing of land conservation projects (DuPont *et al.*, 2015).

Then some researchers (Barclay, 2015; Zerbib, 2016; Febi *et al.*, 2018) focused to the questions of market performance of green bonds. Some reports by market actors emerge, investigating whether issuers of green bonds can borrow money with negative premium, e.g. Barclay's report states, that investors should pay 17bps additionally for "being green" (Barclay, 2015). First scientific article concerning this problem (Zerbib, 2016) proposes panel regression methodology and states that the average premium of green bonds is negative relatively to the conventional bonds, up to -9 bps (in case of USD bonds with rating below –AAA). The main explanation was that there was the lack of green bonds in the market. This spread influences the liquidity of green bonds which is higher than in case of conventional ones, according to another paper (Febi *et al.*, 2018). Other scholars (Ehlers and Packer, 2017; Baker *et al.*, 2018; Hachenberg and Schiereck, 2018; Karpf and Mandel, 2018) use different methods for investigating the yield spread of green bonds on primary and secondary markets such as regression, matching, comparison, Oaxaca-Blinder decomposition and come to controversial results, that negative premium can fluctuate from -18bps to -1bps or even be positive (+7,8bps in case of Karpf and Mandel). At last, it is observed using upgraded methodology with controlling for liquidity and risk (Zerbib, 2019), that there is an yield premium -2bps, which demonstrates the effect of non-pecuniary intentions on the market, since conventional bonds with certainly same characteristics exist, but have higher yields. This premium caused by altruism is important, as it push the equilibrium level of asset price so as CAPM is not able to explain it and, on the other hand, it increases cost of capital of companies not involved in ESG activities. However, such small premium is not a real threat for investors to prevent them from shifting towards green bonds. Also, it should not be forgotten, that on the market there are various types of verification procedures, which also change the size of market spread, e.g. CBI certification causes the tightest spread of 18.4 bps for AAA green bonds in relation to government bonds (Katori, 2018). It is consistent with another paper (Li *et al.*, 2019), which analyses Chinese market of green bonds and comes to conclusion, that certification and also high credit ratings and CSR all have an impact on lowering the interest costs of issuers.

The investigating of yield spread is not the only task for scholars. Pham (2016) studies volatility of labeled and unlabeled green bonds markets in comparison with market of conventional bonds. The scientist demonstrates, that effect of volatility clustering is higher in case of labeled green bonds, moreover markets of labeled green bonds and conventional bonds have correlation, which strengthens in time and which is followed by volatility spillovers. Other paper (Chiesa and Barua, 2018) elaborates on the supply side of the market and finds relations between issue size and characteristics of bonds like coupon rate, credit rating, availability of collateral and so on, using Oaxaca-Blinder decomposition. Authors show, that emerging markets are even more mature, than developed ones, since sizes of issuances grew more, especially if bonds are nominated in local currencies as CNY. The instance of developing countries is uncovered in other research (Banga, 2019). It discovers barriers, which prevent market of green bonds to evolve more rapidly and offers the solution – to involve national development banks and multilateral banks in the processes of promoting and management of green bond issuances.

But the separate and very vital problem is the reaction of stock market on green bonds' issuances. Results of the multi-country event study (Roslen *et al.*, 2017) indicate, that investors positively react on issuance of green bonds a day after announcement, though Cumulative Abnormal Returns (CAR) are negative because of increasing of default risk. Results of another paper (Tang and Zhang, 2018) are much more positive. Scholars found significant rise of stock prices as the reaction to issuance of green bonds, especially in case of corporate ones. Authors state, that yield spread is not the reason for such effect, true sources of growth are expanded institutional ownership and increased liquidity of stocks. Another study is consistent with such results and even reveals that certified bonds cause better stock market reaction (Flammer, 2018). The other author (Baulkaran, 2019) explains positive CARs by firms and bonds characteristics – size of the firm and assets growth alongside with Tobin's Q are positively related to CARs, while cash flow and higher coupons vice versa.

Most of investigated papers (Roslen *et al.*, 2017; Flammer, 2018; Baulkaran, 2019; Tang and Zhang, 2018b; Manrique and Martí-Ballester, 2017) argue that green and ecological topics would increase their influence in corporate strategy and value creation. However, they are argued that the market is still too immature, data is limited and results are very sensitive to the number of observations, especially taking into account the temps of market growth. Moreover, they are concentrated only on labeled green bonds and their issuers, while there is the big amount of climate-oriented issuers, which are also green or under transition to green trends, as it mentioned below. As we can notice from other empirical research green bond for major number of companies are still rather marketing that pure financial instruments. The same story reveals from investor's stories: they expect increase of green topic and treat green bond as short and middle-term investments in highly popular topic. So, we have two hypotheses to check.

H1: The issuance of green or climate-aligned bonds causes positive stock market reaction on the international level.

H2: The presence of "green" label is significant and corresponding costs of such labelling are justifiable.

First hypothesis deals with the certain question of whether returns on the stock market of the issuer of green and climate-aligned bonds can change after the issuance. Here we do not distinguish two types of bonds. But second one is devoted to discovering of the difference between green and climate-aligned bonds and defining whether "green" labelling adds to the market reaction or not.

2. METHODOLOGY

To study the hypothesis about the existence of positive market reaction on issuance of green and climate-aligned bonds we apply event study method. This classical econometric tool designed for investigating the specificities of market incorporation of information was introduced in a widely well-known paper by Fama, Fisher, Jensen and Roll (1969). The original idea to apply the monthly return data to NYSE stock market turned out to be the prevalent approach for observing behavior of securities' prices around corporate events in following decades (Binder, 1998). By comparing observed returns on certain stocks with returns predicted by some broad market index authors were to receive abnormal returns which reflected deviations in security-holder wealth caused by the event (Khotari and Warner, 2006). While doing this, they make some assumptions: 1) The stock market efficiently incorporates information about the event and expresses its impact; 2) The event is unexpected and was not accounted yet in the price of security; 3) There are no confounding events affecting the stock price alongside studied event (Kothari and Warner, 1997).

Although, core idea remains quite stable, some significant developments occurred in event study methodology through last decades. Firstly, daily returns instead of monthly returns are used in many papers, which creates some statistical issues. Daily returns deviate from normal distribution much more than monthly data, moreover some additional problems with non-synchronous trading and cross-sectional dependence mutate the calculations (Warner and Brown, 1985). Secondly, a bunch of different models for predicting the normal return and tools for testing the significance of results appeared in literature as a response to need for long-horizon event studies, which trace market reactions during months or years after the event, but have less power and certainty (Khotari and Warner, 2006). Besides classical single-factor market model, when return of the stock is found by Ordinary Least Square (OLS) estimation using return on reference market as the basis, authors also exploit mean adjusted model, when return is subtracted from the mean return in estimation window. GARCH and EGARCH models, Fama-French three-factor model and so forth are also used (Binder, 1998). In case of green bonds most authors (Baulkaran, 2019; Tang and Zhang, 2018b; Roslen *et. al.*, 2017) exploit the market model with some additional nuances consistent with multi-country specificity, however (Flammer, 2018) in order to conduct robustness check also utilizes Fama-French three-factor model alongside market model, which allows to account for additional non-market factors, though no critical deviations from market model were discovered.

In our research we also use market model for event study, although it was criticized for some biased outcomes (Khotari and Warner, 2006). Owing to the fact, that all analyzed firms are settled and traded in various countries, we follow procedures of (Park, 2004) for conducting multi-country event study. As investigated event we propose the announcement of bond issuance. We find expected returns for each firm of the sample based on daily returns from day -250 to -10, where 0 is the day of the event. Also we use different short-horizon estimation windows (-10;10), (-10;0), (-5;0), (-1;0), (0;1) (0;5), (0;10) to compare the dynamics of investigated result in different periods before and after the event. While sampling firms in several countries, it is also recommended to account for time lags in different regions, e.g. Asian markets open with 12-hour time lag in comparison to U.S. ones and with 6-hours lag compared to Europe, in this case all dates should be corrected by 1 day in such regions for avoiding wrong time estimation inside the chosen window (Park, 2004). In our case this time lag exists between many companies, for instance the biggest one is between firms from Brazil and China. As reference market index we exploit MSCI World Index, because it is widely used in similar studies (Flammer, 2018; Baulkaran, 2019) and it comprises all countries gathered in sample. All stock prices and market index prices were downloaded from Bloomberg database in $US with same cross-rates programmed in the database, due to the evidence that foreign exchange rates significantly influence stock returns (Park, 2004). Some authors (Roslen *et.al.*, 2017) devise world market model with simultaneous use of world index and national market indexes (NIKKEI, DAX, SAS, etc.), (Baulkaran, 2019), on the contrary, split the investigation and compare results in two cases. Since there are no critical discrepancies in results of such researches, we would utilize the world index, assuming that global stock market movements significantly affect equity returns in circumstances of involvement of the country into the international economy (Park, 2004). Thus, after accounting for all specificities of multi-country event study we calculate the return of firm i on day t in a following way:

$$R_{ijt} = \alpha_i + \beta_i R_{wmt} + \varepsilon_{ijt}, \quad (1)$$

where R_{wmt} is the world's market index return on day t, and ε_{it} is the component of returns which is abnormal or unexpected, α_i and β_i are parameters of the model. Then using OLS model we compare observed returns with returns expected using parameter estimates and find the difference for all dates in chosen estimation window, which would be in fact – daily abnormal returns.

$$AR_{ijt} = R_{ijt} - (a_i + b_i R_{wmt}), \quad (2)$$

Then some average and cumulative parameters are to be found for further analysis. Cumulative Abnormal Returns (CARs) and Average Abnormal Returns (AARs) can be calculated using corresponding arithmetical operations for certain date windows and securities (firms):

$$CAR_i(t_j t_k) = \sum_{tj}^{tk} AR_{it}, \quad (3)$$

$$AAR = \frac{1}{N}\sum_{t=1}^{t_2} AR_{it}, \quad (4)$$

Cumulative Average Abnormal Return represents the mean value of all CARs for the chosen estimation window:

$$CAAR = \frac{1}{N}\sum_{t=1}^{t_2} CAR_{(t_1,t_2)}, \quad (5)$$

We looked for abnormal returns in different estimation windows on the basis market model with world index for all sample units, consisting of both green and climate-aligned bonds, and checked the hypothesis about the existence of positive market reaction on announcement of bond issuance by eco-oriented firm.

Baulkaran (Baulkaran, 2019), whose results are mentioned in the literature review section, regresses CARs around issuances of green bonds on control variables representing companies' characteristics and some specific variables. The author finds that returns are mostly correlated with a high environment materiality score of industries in which companies operate. The author suggests, that for industries where natural environment is the source of profit - issuance of green bonds causes consequently high returns. Also CARs are positively correlated with existence of certificate on green bonds and place in rating of environmental performance.

In our research we make two regressions. In the first one CARs estimated for the whole sample of bonds and regressed by bond characteristics in order to investigate which of them significantly influence the market reaction on announcements of bonds' issuance. Second one is to complement the first regression with variables representing some companies' characteristics.

Table 1. Description of variables for regression analysis

Regression with bonds' features	
CAR value	Dependent variable. Cumulative abnormal returns in all 95 cases for estimation windows (-5;0), (-1;0).
Green_Label	Dummy variable. Reflects whether bond is green (1) or climate-aligned (0).
Log_Amount	Natural logarithm of amount issued.
Log_Maturity	Natural logarithm of number of years to maturity date.
Coupon	Promised coupons mentioned in emission prospects.
Currency	Dummy variable. For US and EUR it is 1. For others – 0.
Regression with firms' features	
CAR Average	Averaged CARs for all bonds issued by 16 companies.
Log_Total_Assets	Natural logarithm of firms' average total assets for years when bonds were announced to be issued.
Tobin_Q	Average values of financial coefficients reflecting ratio between total market value of a company and its total asset value.

Source: devised by authors

The vital variable is the dummy variable "Green_Label". The negative or positive coefficient and its statistical significance should show whether issuance of green bonds provide reaction of investors. Other variables in the first regression are expected to complement the model with some significant factors.

The estimation equation of the model is: Car_Value = C(1)*Green_label + C(2)*Coupon + C(3)*Currency + C(4)*Log_Amount + C(5)*Log_Maturity + C(6).

Choosing variables for second model we follow other studies (Flammer, 2018; Baulkaran, 2019). The task of second regression is to approximately show using aggregated data, that firm characteristics are also prominent for investors and statistically significant in a model with average CARs as dependent variable.

3. DATA

The data for our research obtained from several resources. First, we send the data request to CBI in order to get information about issuers of both green bonds and climate-aligned bonds. CBI is one of organizations who have the database of green bonds and companies emitting them. CBI can willing to share information with researchers and has procedures for obtaining data in non-commercial aims. CBI send us some dataset, which included the list of 52 issuers from several countries. This dataset was available information about number of green and climate-aligned bonds. There are no banks in the list. So, we agreed with Tang and Zhang (2018b), that financial institutions do not benefit from market evaluation after the green bonds' issuance. They do not finance their own green projects, only projects of other companies or they can offer green loans.

Next, we collected data on bonds of each of the 52 issuing companies from Bloomberg database. The data sample includes Day of announcement of issuance, Issuer Name, Use of Proceeds, Announcement Day, Issue Date, Maturity, Coupon, Yield to Maturity, Currency, Ticker, ISIN. The list of bonds consisted of 698 issues.

Then we download financial data from the initial list of CBI (52 companies) and MSCI world index from Bloomberg database too. We use the data sample period 2007-2019, because in 2007 the first green bond was issued. Complying with indicators chosen by Baulkaran (Baulkaran, 2019) our data consists of Total Assets, Current Market Cap, Revenue, EBITDA, Return on Assets, Short and Long Term Debt, Financial Leverage, Tobin's Q Ratio, Cash From Operations (for all indicators the growth ratio was also extracted).

Many of the firms from the original list appeared to be private companies without listing on exchange for some of them data about stock prices was too fragmented, for others the information was not available for some reason. So, we have only 17 (from 52) issuers were put into the final list (Table 2).

Then we analyzed the bonds data. All bonds issued by companies without information about prices of stocks reduced from the sample. All bonds issued earlier than the emergence of green bonds' market reduced too. In addition, all duplicates occurring because of issuance of bonds in several tranches united. Next, we checked bonds' prospects or market news in order to make number of green bonds consistent with CBI data. As we can see on table 2, we have the final list of 95 bonds from 17 issuers in different countries, 28 of which are green bonds and 67 are climate-aligned ones. In our sample, China is a leader country with 5 companies and 29 bonds in two categories. If you add Hong Kong, then this is 35 bonds, which is more than a third place of the total amount. The most active issuers in terms of the number of bonds are Electricite de France SA with 15 bonds and Acciona SA with 13 bonds.

Table 2. List of issuers with number of green and climate-aligned bonds

Company	Country	Industry	Green bonds	Climate-aligned ones
Acciona SA	Spain	Diversified Construction Companies	3	10
Aguas Andinas SA	Chile	Water Companies	1	9
Arise AB	Sweden	Electric Power Companies	1	1
Beijing Enterprises Water Group Ltd	China	Miscellaneous Electronics	1	6
Brookfield Renewable Partners ULC	Canada	Exploration, Drilling Service & Equipment	1	1
CECEP Wind-Power Corp	China	Electric Power Companies	1	1
China Datang Corp Renewable Power Co Ltd	China	Electric Power Companies	3	3
China Longyuan Power Group Corp Ltd	China	Power Transmission Equipment	3	9
CPFL Energias Renovaveis SA	Brasil	Electric Power Companies	1	5
Electricite de France SA	France	Electric Power Companies	4	11
Klabin Finance SA	Brasil	Diversified	1	1
MTR Corp Ltd	Hong Kong	Transport Property	1	5
Nordex SE	Germany	Industrial Machinery	2	1
Orsted A/S	Denmark	Electric Power Companies	1	1
Poten Environment Group Co Ltd	China	General Diversified	1	1
Renewi PLC	Great Britain	Service Organizations	1	1
Verbund AG	Austria	Electric Power Companies	2	1
Total			***28***	***67***

Source: devised by authors.

As we can see on table 3, the mean amount issued in case of green bonds is approximately two times bigger with more or less the same maximum and minimum values and also maturity date is earlier. This results is consistent with findings of Baker and co-authors (Baker *et al.*, 2018), in which comparison was conducted between green and ordinary bonds. Moreover, the coupon on green bonds is consequently lower on average, which proves the results of Chiesa and Barua (Chiesa and Barua, 2018), stating that coupon rate is negatively correlated with issue size and is bigger for smaller issues. However, they mention that such rule does not work in developing markets like China, so these relationships between determinants of bonds supply need more detailed analysis.

Table 3. Market characteristics of bonds by category

Green bonds				Climate-aligned bonds			
	Amount, $ mln	Coupon, %	Maturity, years		Amount, $ mln	Coupon, %	Maturity, years
Mean	390.9	3.3	8.9	Mean	203.7	3.9	11.8
Median	123.6	3.5	7.0	Median	66.4	3.9	7.0
Maximum	1707.8	6.5	30.0	Maximum	1702.8	6.5	40.0
Minimum	1.9	0.0	2.0	Minimum	1.2	0.0	0.5
Std. Dev.	491.9	1.6	6.4	Std. Dev.	338.7	1.5	10.7

Source: computed by authors.

After the final data obtained, we done some preparation (calculation of logarithms, structuring and filtering for event study tool, etc.) for all groups of data – stocks, bonds, companies’ characteristics.

4. FINDINGS

The results of calculations made for several estimation windows presented in Table 4. The Cumulative Average Abnormal Returns (CAARs) are statistically significant only in (-5;0) and (-1;0) windows at the 10% level and have positive values of 0,0087 and 0,0061 respectively and values of t-statistics about 1,77 and 1,94. It means that market returns rise by 0,87% and 0,61% throughout five and one days before the issuance of green bonds plus on the event day itself (0 in tables).

Table 4. CAARs around the event day

	Value	**T-stat**
(-10;0)	0.0066	0.913
(-5;0)	0.0087	*1.767**
(-1;0)	0.0061	*1.943**
(0;1)	0.0033	1.065
(0;5)	0.0019	0.436
(0;10)	0.0088	1.248

Notes: * and ** denotes significance at the 10%, 5%, respectively.
Source: computed by authors in RStudio.

The results of analysis of AARs presented in Table 5. The biggest and most significant return is observed on the null day – the day of event. It is 0.52% and significant on the 5% level. However next day after the event it drops to negative and insignificant value. Also days -8 and -7 are remarkable, they are statistically significant on the 5 and 10% levels and have values of -0,42 and 0,35 respectively. Moreover, final tenth day of estimation window has significant and positive value 0,039.

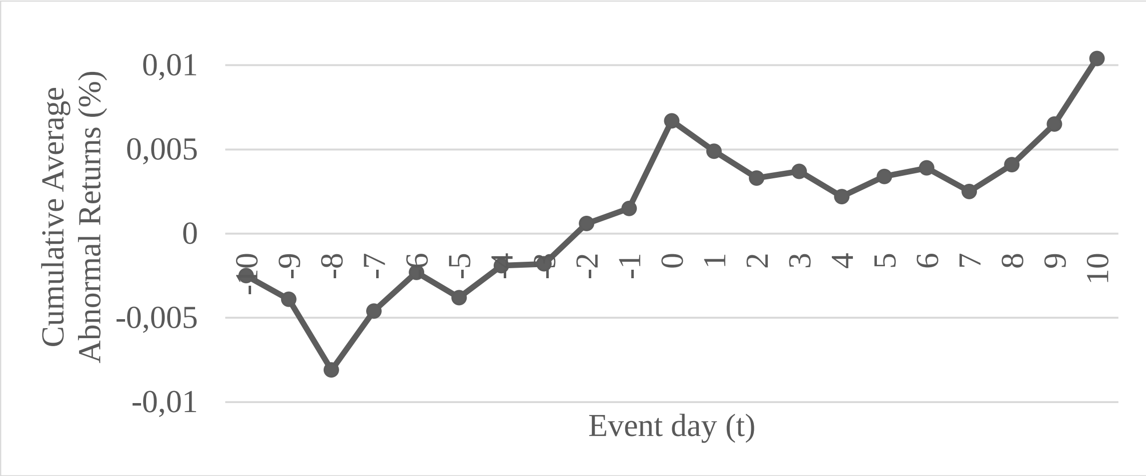
Table 5. AARs around the event day

DAY	***VALUE***	***T-STAT***
-10	-0.0025	-1.300
-9	-0.0014	-0.723
-8	-0.0042	*-2.071***
-7	0.0035	*1.746**
-6	0.0023	1.083
-5	-0.0015	-0.699
-4	0.0019	0.979
-3	0.0001	0.057
-2	0.0024	1.240
-1	0.0009	0.467
0	0.0052	*2.353***
1	-0.0018	-0.866
2	-0.0016	-0.757
3	0.0004	0.231
4	-0.0015	-0.895
5	0.0012	0.682
6	0.0005	0.262
7	-0.0014	-0.917
8	0.0016	0.792
9	0.0024	1.108
10	0.0039	*2.069**

Notes: * and ** denotes significance at the 10%, 5%, respectively.
Source: computed by authors in RStudio.

We got controversial results when null day is most noticeable to investors. The day after the event should be more important for the market. However, our results are consistent with other studies (Roslen *et al.*, 2017; Flammer, 2018), who also found significant returns in two-day estimation window (-1; 0). We analyzed the CARs day-by-day (Fig. 1) and seen that increase is traced in this estimation window (-1;0) and two days before from day -3.

Figure 1. Cumulative Average Abnormal Returns' growth around the event day



Source: devised by authors.

To conduct regression analysis we have taken two significant windows (-5;0) and (-1;0) and turned CARs among all observations into the dependent variable. Next, we show outputs in both variants and compare them in order to understand what determinants of increase in market returns by companies exist. The main task of this section is to understand whether particular variable representing the green label influences CAR values or not and if not – what other factors contribute better. Firstly, we need to look at the correlation matrix to understand if there are some strong enough links between dependent variable and regressors. If there are links between independent variables, which can outline the multicollinearity effect in the model.

In fact, correlations between all variables are not strong in both windows, which is promising in terms of getting unbiased results (Table 6), but at the same time means, that there are no strongly influencing factors in designed model. All values are below 0,4, the highest correlation is observed between currency and coupon, which is quiet logical as currency represent somehow the country of issuance, while the coupon is very affected by national interest rate, which set up the threshold under that bonds' coupons cannot be set up. Most of the correlation coefficients with the dependent variable are close to 0,1, which disclose weak relationships between CARs and chosen regressors.

Table 6. Correlation statistics for window (-5;0)

	Car_Value	Green_Label	Coupon	Currency	Log_Amount	Log_Maturity
Car_Value	1.000					
Green_Label	-0.018	1.000				
Coupon	-0.009	-0.185	1.000			
Currency	0.077	0.050	-0.381	1.000		
Log_Amount	-0.107	0.268	0.044	-0.001	1.000	
Log_Maturity	0.218	0.073	0.170	0.206	-0.202	1.000

Source: computed by authors in Eviews.

Between dependent variable and regressors also there are no strong correlation links in both variants, which predetermines some insignificance in results. Most of the correlation coefficients are below 0,2. In case of (-5;0) window the biggest value of correlation coefficient is 0,218 between CAR and logarithm of maturity, which is still not enough to call such relationship between variables reliable. In case of (-1;0) table it is even 0,177 between same variables (Table 7).

Table 7. Correlation statistics for window (-1;0)

	Car_Value	Green_Label	Coupon	Currency	Log_Amount	Log_Maturity
Car_Value	1.000	0.048	0.132	-0.024	0.158	0.177

Source: computed by authors in Eviews.

In the regression model the only significant variable is Log_Maturity (Table 6). It has a positive coefficient 0,008, which is still quiet low. Another positive effect has the Currency, but it is not significant. However, all variables with negative effects have very high P-values, the highest ones are observed in case of Currency and Green_Label variables, thus we cannot reject the null hypothesis, that corresponding coefficients are null. The model itself has a very low R-squared value – 0,054 and low value of F-statistic, which means, that the specification is not valuable and even not significant and it describes the dependent variable not sufficiently.

Table 6. Output of regression with bonds' for the window (-5;0)

Dependent Variable: CAR_VALUE				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
GREEN_LABEL	-0.003	0.012	-0.243	0.808
COUPON	-0.001	0.004	-0.333	0.740
CURRENCY	0.002	0.011	0.161	0.873
LOG_AMOUNT	-0.001	0.003	-0.496	0.621
LOG_MATURITY	0.008	0.005	1.843	*0.069**
C	0.001	0.020	0.069	0.945
R-squared	0.054	Mean dependent var		0.009
Adjusted R-squared	0.001	S.D. dependent var		0.048
S.E. of regression	0.048	Akaike info criterion		-3.173
Sum squared resid	0.205	Schwarz criterion		-3.012
Log likelihood	156.737	Hannan-Quinn criter.		-3.108
F-statistic	1.022	Durbin-Watson stat		1.820
Prob(F-statistic)	0.410			

Notes: * and ** denotes significance at the 10%, 5%, respectively.
Source: computed by author in Eviews.

In the second regression two variables are statistically significant, representing logarithms of maturity and amount (Table 7). Both are significant at 10% level and both influence positively on CAR values, they have coefficients around 0,003 for amount variable and 0,005 for maturity variable. Such results were not present in similar investigations. For example, (Baulkaran, 2019) received contrary outputs, the most influential variable for his sample was one representing coupon of bonds, while logarithm of maturity was insignificant, moreover both had negative marks.

Also, in our model the only positive effect except significant variables is observed in case of coupon variable, Currency surprisingly changed the mark on minus in this specification, however its t-statistics is very low to interpret somehow such phenomenon. Green label in both models is the less significant variable with negative marks, it has the coefficient close to null and can be easily excluded from the model. Roslen with co-authors (2017) confirmed that negative effect on CARs can be reasoned by increasing level of debt, which concerns investors vulnerable to the level of leverage of the company. Sometimes, such concerns can be even reinforced by issuance of labeled green bonds, which in addition have bigger amounts issued, as it could be seen from our summary statistics in appendix. In terms of quality second model has better characteristics, e.g. R-squared is close to 8%, but such percent is still not enough to describe relations between variables properly.

Table 7. Output of regression with bonds' for the window (-1;0)

Dependent Variable: CAR_VALUE				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
GREEN_LABEL	0.000	0.007	-0.061	0.952
COUPON	0.001	0.002	0.589	0.558
CURRENCY	-0.003	0.007	-0.358	0.721
LOG_AMOUNT	0.003	0.002	1.816	*0.073**
LOG_MATURITY	0.005	0.003	1.900	*0.061**
C	-0.021	0.012	-1.736	0.086
R-squared	0.080	Mean dependent var	0.006	
Adjusted R-squared	0.028	S.D. dependent var	0.031	
S.E. of regression	0.030	Akaike info criterion	-4.105	
Sum squared resid	0.081	Schwarz criterion	-3.944	
Log likelihood	200.988	Hannan-Quinn criter.	-4.040	
F-statistic	1.545	Durbin-Watson stat	1.910	
Prob(F-statistic)	0.184			

Notes: * and ** denotes significance at the 10%, 5%, respectively.
Source: computed by author in Eviews.

The regression with companies' characteristics is provided to understand whether such variables could improve the specification if there were more issuers for creating the sufficient model with huge number of observations and simultaneous presence of bonds' and companies' specificities. To check the possibility of existence of such phenomenon we have taken the estimation window (-1;0) as more significant and representative one, also such choice is consistent with Flammer (2018).

As we can see in Table 8, the variable representing Tobin's Q ratio is statistically significant at 5% level, also it has quiet high coefficient value, approximately -0,014, which is higher than all coefficients of variables representing bonds' characteristics in previous models. Furthermore, although in this model only two variables are included, one of which is not significant, R-squared is higher – 31,5% and model itself is significant at 10% level with P-value 0,7.

Table 8. Output of regression with firms' features for the window (-1;0)

Dependent Variable: CAR_AVERAGE				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LOG_TOTAL_ASSETS	0.000925	0.001375	0.672251	0.5124
TOBIN_Q	-0.01355	0.006093	-2.22341	*0.0432***
C	0.014227	0.016518	0.861316	0.4036
R-squared	0.314702	Mean dependent var		0.005113
Adjusted R-squared	0.216803	S.D. dependent var		0.010757
S.E. of regression	0.00952	Akaike info criterion		-6.31215
Sum squared resid	0.001269	Schwarz criterion		-6.16512
Log likelihood	56.65331	Hannan-Quinn criter.		-6.29754
F-statistic	3.214538	Durbin-Watson stat		1.987216
Prob(F-statistic)	0.070983			

Notes: * and ** denotes significance at the 10%, 5%, respectively.
Source: computed by authors in Eviews.

As we can see in Table 9 the logarithm of total assets of firm is not so strongly correlated with CAR values, it has the positive coefficient 0,27. The correlation between Tobin_Q and CARs is quiet strong - around 0,54, which unfolds the existence of meaningful relationships between two variables (Table 9), what is interesting, this relationship is negative. The correlation coefficient between two independent variables is also not high enough to create the situation of multicollinearity and bias the final results.

Table 9. Correlations between variables in regression with firms' features

	Car_Average	Log_Total_Assets	Tobin_Q
Car_Average	1		
Log_Total_Assets	0.269661	1	
Tobin_Q	-0.54091	-0.231	1

Source: computed by author in Eviews.

All these factors make this model more suitable for describing CARs and characterize issuers' financial specificities as more influential in case of market returns, than bonds' characteristics. In ideal model with more broad access to data both groups of variables should be included in order to investigate which of them are comparatively significant and valuable for determining CAR values.

5. Conclusions

Understanding the characteristics and financing conditions of green bonds is of great importance in a world that struggles to convert its production system into a more sustainable and circular economy in order to tackle environmental challenges and the threat of climate change.

In general, this study contributes to existing research in several ways. We contribute to the literature by examining issuer characteristics and the presence or absence of green verification to better understand green versus climate-aligned bonds. This is the first study that covers not only green bonds, but also climate bonds too. Using 95 bonds of 17 issuers as an example, this study confirms the first hypothesis that green bonds and climate-aligned bonds cause a positive market reaction and increase the value of the company. These results contribute to the fact that financial papers are faced with the problem of optimal capital structure and the influence of leverage on the value of the company. It also shows that this reaction does not depend on the presence of a green label in the case of a particular sample, as mentioned in the second hypothesis. Other variables at the bond and firm level of the issuing company play significant role in determining cumulative abnormal returns.

Further researchers might deepen this investigation with bigger data sample and highlight green and climate bonds in terms of market reaction to their issuance with more valuable models. In addition, such dichotomy of two groups of bonds can be apply in practice in other areas of studying green bonds, such as yield spread investigation, stock liquidity, ownership, etc. Finally, the nature of climate-aligned bonds themselves and the reasons why these bonds were not labelled as “green” and how to motivate further issuers to do this are very relevant issues for business.

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APPENDIX

Table A1. Descriptive statistics of variables for regression with bonds' features

	Mean	Median	Maximum	Minimum	Std. Dev.
GREEN_LABEL	0.284211	0	1	0	0.45343
LOG_AMOUNT	4.155329	4.53903	7.442961	0.14842	2.05542
LOG_MATURITY	2.077593	1.946693	6.908418	-0.70694	1.21931
COUPON	3.736513	3.86	6.5	0	1.582495
CURRENCY	0.442105	0	1	0	0.499272

Source: computed by authors in Eviews.

Table A2. Descriptive statistics of variables for regression with firms' features

	Mean	Median	Maximum	Minimum	Std. Dev.
TOBIN_Q	1.298267	1.259565	2.455053	0.84143	0.401443
LOG_TOTAL_ASSETS	9.164126	9.389317	12.68444	5.50529	1.778385

Source: computed by authors in Eviews.

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